CERFACS

# JOB OFFER – POST-DOCTORAL

## Sustainable Aviation Fuels (SAF) modeling for LES: coupling between physical and chemical surrogates

## OFFER INFORMATION

**Reference**: E&S-2026-ER-01
**Team**: E&S
**Location:** 42 Avenue Gaspard Coriolis – 31057 Toulouse
**Contact person**: Eleonore Riber

**Period**: 1 year - from: 01/04/2026
**Salary**: 42 K€/year (gross)
**Level of education required**: Phd

**Key words**: SAF, surrogate model, liquid fuel, evaporation, gas phase chemistry, LES, AVBP

## CERFACS

Cerfacs is a private research, development, transfer and training center for modeling, simulation and high-performance computing. Cerfacs designs, develops and proposes innovative software methods and solutions to meet the needs of its partners in the aeronautics, space, climate, environment and energy sectors. Cerfacs trains students, researchers and engineers in simulation and high-performance computing.
Cerfacs works closely with its seven partners: Airbus, Cnes, EDF, Météo France, Onera, Safran et TotalEnergies.

## HOSTING TEAM - E&S

The Energy & Safety team focuses on cross-disciplinary activities aimed at developing, optimizing and deploying scientific codes dedicated to advanced combustion calculations in both academic and industrial geometries. The team focuses on the simulation of flows, applying them to aircraft, rockets, helicopters, car engines, turbines and more. The result is essential tools for a wide range of applications, with the leitmotiv: let's calculate systems before we build them. More specifically, team members develop models and tools covering chemical reduction, turbulence, combustion, two-phase systems, combustion instabilities, etc., to meet both academic and industrial challenges. Thanks to its position, the team collaborates with numerous scientific groups, design offices of Cerfacs associates, and other Cerfacs teams.

## CONTEXT

The use of Sustainable Aviation Fuels (SAFs) is one of the main levers for reducing greenhouse gas emissions in the aviation sector in the short and medium term. Currently, their use in aircraft engines is limited to a 50% blend with conventional fuels because, when used in their pure form, their physico-chemical properties fall outside current standards. Moreover, it has been shown that using them without blending can affect the operational limits of engines. To understand this effect, it is therefore necessary to improve modeling tools for this type of fuel. In particular, CERFACS has been working for several years on the modeling of SAFs in order to reproduce as accurately as possible the characteristics of these fuels, both in Direct Numerical Simulation of canonical flame configurations and in Large Eddy Simulations (LES) of turbulent flames in complex geometries. These models are integrated into the LES code AVBP, developed by CERFACS (https://avbp-wiki.cerfacs.fr), which is used by many national and European laboratories as well as by several industrial partners (SAFRAN and AIRBUS, shareholders of CERFACS, Saint-Gobain, etc.). To improve the modeling of SAFs, further work is still required to enhance the models for the liquid phase (particularly evaporation) and the gaseous phase chemistry, as well as their coupling.

## MISSION

In this context, the objective of this position is to study and evaluate different coupling strategies between the models used for evaporation (mono-/multi-component; discrete/continuous) and the model for the gaseous phase (mono-/multi-component, number of components). Two main tasks have been identified:

- First, the study will focus on multi-component evaporation models in order to improve the existing discrete model and to implement, within CERFACS codes, a continuous model applicable to SAFs. This development work will be based on existing models from the literature, in particular those proposed by C. Laurent et al. (*Int. J. Multiph. Flow* 36, 2010) and P. Le Clercq and J. Bellan (*Proc. Combust. Inst.* 30, 2004).

- Then, coupling strategies between the fuel model used for the liquid phase on the one hand and for the gaseous phase on the other hand will be evaluated, with the aim of improving the representativeness of the fuel model while limiting the computational cost associated with these new model developments.

These new developments will first be evaluated in idealized canonical configurations (auto-ignition of an isolated droplet, 1D two-phase flame) and will then be applied to more representative cases of increasing complexity (turbulent two-phase flame). In particular, an academic swirled-stabilized spray burner (SSB) operated at DLR representative of aeronautical technologies will be studied to assess the impact of the developments on LES results.


J. Wirtz, Phd thesis 2022

## DESIRED PROFILE

- PhD defended less than 3 years ago.
- PhD in computational fluid dynamics and/or combustion
- Programming skills in Fortran and Python

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## HOW TO APPLY ?

To apply, please send your CV and covering letter to lesaffre@cerfacs.fr, jaravel@cerfacs.fr, riber@cerfacs.fr , applications are open until 01/06/2026.

See you soon at Cerfacs!