CERFACS

JOB OFFER – STUDY ENGINEER – CDD

Large Eddy Simulation of Hydrogen/Air Combustion in Aeronautical Environments (H/F)

OFFER INFORMATION

Reference: ES-2025-QD-02
Team: E&S
Location: 42 Avenue Gaspard Coriolis – 31057 Toulouse
Contact person: DOUASBIN Quentin

Period: 12 months - from: 01/09/2025
Salary: from 30 K€/year (gross) depending on qualifications and experience
Level of education required: Master 2

Key words: H2 Safety LES AVBP AIRBUS

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, formerly the CFD-Combustion team, focuses on cross-disciplinary activities aimed at developing, optimizing and deploying scientific codes dedicated to advanced combustion calculations in 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

Hydrogen is a key enabler of the energy transition, yet its combustion remains poorly understood, particularly in complex, high-pressure industrial and aeronautical environments. Accurate modeling of hydrogen dispersion and combustion is crucial to ensure safety and performance in next-generation propulsion systems.

Large Eddy Simulation (LES) plays a central role in capturing the unsteady, turbulent nature of hydrogen flames under these challenging conditions. At CERFACS, several ongoing research projects focus on advancing the understanding of hydrogen combustion through LES, and on developing **new physical models** to enhance predictive capabilities.

To support these efforts, the **study engineer will contribute to the development of advanced modeling strategies** within the AVBP code—a world-leading LES solver for reactive flows used in both academia and

industry. A particular focus will be on **modeling accidental hydrogen leaks and potential ignition scenarios**, a critical aspect for safety assessment and risk mitigation in hydrogen-powered systems.

MISSION

In the context of **hydrogen safety**, you will build upon the work of previous PhD students and postdoctoral researchers, extending it to address **realistic industrial geometries** and configurations.
The core physical phenomena of interest include:

1. **Hydrogen dispersion** in air, driven by the sudden release of a **supersonic H_2 jet** into the surrounding environment.
2. **Ignition mechanisms** within the resulting H_2/air flammable cloud.
3. **Full simulation of the explosion event**, capturing combustion dynamics and pressure wave propagation.
4. **Venting and mitigation strategies**, including the activation of **pressure relief devices** to prevent potentially destructive overpressure buildup.

This work directly contributes to the predictive modeling and risk assessment of hydrogen systems, a key challenge in enabling the safe deployment of hydrogen technologies in industrial and energy applications.

DESIRED PROFILE

- **Background in Computational Fluid Dynamics (CFD)** is required.
- Experience in **numerical methods** and/or **turbulent combustion** is highly valued.
- Proficiency in **coding for LES and high-performance computing**, particularly in **Fortran 90**.
- Demonstrates autonomy, curiosity, and a dynamic work ethic.
- Knowledge in **combustion physics** is a significant asset.
- Fast learner with the ability to adapt quickly to new challenges.

Well-organized and capable of providing **regular technical updates to external partners** (weekly reporting expected).

WHAT WE OFFER AT CERFACS

- Broad access to technology, a rich interpersonal environment, in-house skills recognized nationally and internationally.
- An inclusive and equitable work environment.
- A structure accessible to people with disabilities.
- A complementary health insurance scheme offering excellent health care coverage in addition to social security, with the possibility of enrolling family members (spouse and children).
- 6 weeks' annual leave (with the possibility of 22 extra days' leave per year linked to your choice of a 39-hour rather than 35-hour working week).
- Flexible working arrangements, with the possibility of working from home up to two days a week.
- A sustainable mobility package enabling employers to pay up to a maximum of 500 euros a year to cover the home-to-work travel costs of staff who cycle to work.

HOW TO APPLY ?

To apply, please send your CV and covering letter to quentin.douasbin@cerfacs.fr , applications are open until 30/09/2025.

See you soon at CERFACS!