CERFACS

JOB OFFER – STAGE

Simulation of hydrogen explosion scenarios (ERC SAFE_H2 program)

OFFER INFORMATION

Reference: E&S-2026-1-T
Team: E&S

Location: 42 Avenue Gaspard Coriolis – 31057 Toulouse

Supervisors:

- Thierry POINSOT, poinsot@cerfacs.fr
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Gratification: 800€ net per month - M2 level or last year at engineering school

Period: 6 months - from: 09/02/2026

Key words: HYDROGEN EXPLOSION

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

The internship and then the thesis will be carried out within the framework of the European ERC project SAFE-H2 (www.cerfacs.fr/safe-H2) on hydrogen. Hydrogen is a powerful energy vector, but its deployment on the scale envisaged today by governments and companies cannot be achieved without rigorous control and regulation of combustion risks. Hydrogen leaks can occur and cause fires and explosions that must be prevented. To achieve this, regulations are necessary, but these are currently based on an incomplete understanding of the fundamental mechanisms controlling the combustion of hydrogen in air or must take into account new uses of hydrogen, particularly in transport (planes, trains, cars, etc.). SAFE-H2 combines theory, high-precision experiments, and simulations to provide reliable knowledge on the ignition, propagation, acceleration, and attenuation of hydrogen-air flames in three canonical cases: flames stabilized on a hole, flames interacting with

a wall, and closed-containment explosions. The project associates (1) the IMFT, where two dedicated hydrogen experimental sites will be used for low (< 40 kW) and high-power (300 kW) experiments, and (2) CERFACS, which provides the high-performance 3D simulation tools used to calculate all IMFT experiments. Experimental diagnostics from the aerospace domain will be applied to the IMFT safety scenarios to validate the simulation tools. SAFE-H2 will focus on simple and generic cases to address the fundamentals of hydrogen-air flames. Thus, the simulation tools integrate correct and validated physical models and can replace expensive and dangerous experimental tests. All SAFE-H2 experiments will be designed to be used for simulation validations. These detailed simulation-to-experiment comparisons will be used to test models for 1) gas-phase and near-wall hydrogen-air chemistry, 2) autoignition and plate ignition, 3) flame turbulence and flame-wall interaction, and 4) transition to detonation. SAFE-H2 will provide fundamental scientific knowledge, but also models for all simulation codes used in industry and regulatory agencies to understand and regulate hydrogen combustion safety.

MISSION

The internship will focus on the calculation of the first hydrogen-air mixture explosion experiments planned at IMFT in 2026. The intern will have to learn explosion physics, the AVBP code and interact with IMFT experimenters. AVBP is a large 3D calculation code in which the intern will be trained. Other training (combustion, meshing, source management) will also be done between April and June. The internship should continue with a thesis in October 2026 with funds from the SAFE-H2 program.

DESIRED PROFILE

- Master 2 or engineering school

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- 50% reimbursement of public transport costs.

HOW TO APPLY ?

To apply, please send your CV and covering letter to poinsot@cerfacs.fr , qdouasbin@cerfacs.fr , applications are open until 09/02/2026.

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