IMPERIAL

PhD Studentship in Aeronautics: High-Fidelity Simulation of Titan/Mars Entry Vehicles with PyFR (AE0061)

Start Date: Earliest start date is 1 August 2025 and latest start date is 1 July 2026

Introduction and Objectives: Next-generation Entry, Descent, and Landing (EDL) systems for Titan and Mars must safely slow down increasingly large payloads. One particular challenge occurs during the transonic phase of descent, where the spacecraft is subject to aerodynamic instabilities that can cause uncontrolled oscillations, posing a significant risk of mission failure. This project will further develop the GPU-accelerated computational fluid dynamics flow solver PyFR (www.pyfr.org) – implementing improved shock capturing approaches and a full 6-DOF free-flight capability – and use it to study dynamic stability in the transonic phase of descent. The work will be undertaken in collaboration with Texas A&M University and NASA Ames.

Supervisors: The project will be computational, and led by Prof. Peter Vincent, with relevant multi-domain expertise in EDL technology provided by Prof. Oliver Buxton, Dr. Paul Bruce and Prof. Matthew Santer, who will all act as co-supervisors.

Learning opportunities: You will develop expertise in high-order methods for computational fluid dynamics, novel cross-platform implementation paradigms, and transonic flow physics associated with entry vehicles for Titan and Mars. There is also significant scope for direct interaction with project partners at Texas A&M University and NASA Ames.

Professional Development: You will have access to engaging professional development workshops in areas such as research communication, computing and data science, and professional progression through our Early Career Researcher Institute.

Duration: 3.5 years.

Funding: Full coverage of tuition fees and an annual tax-free stipend of £21,237 for Home, EU and International students. Information on fee status can be found at: www.imperial.ac.uk/study/pg/fees-and-funding/tuition-fees/fee-status/.

Eligibility: You must possess (or expect to gain) a First class honours MEng/MSci or higher degree or equivalent in a relevant field e.g. computer science, physics, mathematics, engineering etc. You should have experience of coding, ideally in Python, C, and CUDA. A passion for fluid dynamics, space exploration and a desire to work on interdisciplinary projects with real-world applications is important.

How to apply: Submit your application at: www.imperial.ac.uk/study/apply/postgraduate-doctoral/application-process/. You will need to include the reference (AE0061) and address your application to the Department of Aeronautics. When making your application, please type 'Aeronautics Research (PhD)' into the programme search bar.

For queries regarding the application process, please contact Lisa Kelly at: l.kelly@imperial.ac.uk

Application deadline: 9 January 2025

Equality, Diversity and Inclusion: Imperial is committed to equality and valuing diversity. We are an Athena SWAN Silver Award winner, a Stonewall Diversity Champion, a Disability

Confident Employer and are working in partnership with GIRES to promote respect for trans people.