

## **Research Associate in Hydrogen Combustor Development for Sustainable Aviation**

**Job Ref: REQ230984**

*As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.*

### **Project Description**

This is an exciting opportunity the team in the National Centre for Combustion and Aerothermal Technology (NCCAT). We are looking for a post-doctoral researcher to support the development of a hydrogen combustion system as part of CAVENDISH: the Consortium for the AdVent of aero-Engine Demonstration and aircraft Integration Strategy with Hydrogen. Led by Rolls-Royce, this consortium will involve significant academic, research, and industrial partners. An aim of CAVENDISH is to integrate liquid hydrogen systems onto a modern donor engine for ground testing. The Loughborough part of the project will help explore alternative enabling technologies in the form of a dual fuel combustor system.

We will be assessing combustion performance on our test facilities at NCCAT and are looking for a post-doctoral researcher who can support this with numerical simulations. As such we expect the successful candidate to have experience of advanced numerical methods up to PhD level. However, there will be opportunities for gaining experience in experimental methods so any prior knowledge in this area (although not essential) would be advantageous. This is a great opportunity to join a work leading research team focused on transforming aviation towards a sustainable and climate neutral future.

CAVENDISH is co-funded by the European Union's Clean Aviation Joint Undertaking. Pulling together the best talent and capabilities of the private and public sectors and developing cutting-edge technologies and making these available for a transformational leap in aircraft performance in the 2030s, the Clean Aviation Joint Undertaking will pave the way towards the EU's ambition of climate neutrality by 2050.

### **The National Centre for Combustion and Aerothermal Technology (NCCAT)**

The National Centre for Combustion and Aerothermal Technology (NCCAT) opened in 2020 and is a global centre of excellence that was funded through a partnership comprising the Department for Business, Energy and Industrial Strategy, the Aerospace Technology Institute, Innovate UK and with support from Rolls-Royce. The Centre builds on the long-standing strategic partnership between Loughborough and Rolls-Royce which was formalised in 1991 when the Loughborough based Rolls-Royce University Technology Centre in Combustion System Aerothermal Processes (UTC) was established. The UTC (which is located within NCCAT) is an innovative strategic partnership which brings together a leading UK University with one of the world's foremost aerospace companies. The partnership provides a unique infrastructure in which Rolls-Royce and University staff work together to advance understanding and provide design capability in the field of Combustion Aerodynamics and Aerothermal technology. This cutting-edge collaborative research is driven by real industrial challenges and generates

innovative technologies for current and next generation low emission gas turbine engines.

Building on the experience of working with industry over the last 30 years, the National Centre incorporates a world leading research group of multi-disciplinary researchers within the fields of fluid mechanics and combustion, primarily targeting highly applied challenges faced by the aerospace gas turbine industry. With Rolls-Royce as a lead industrial partner, NCCAT primarily focuses on the development of future low emission aerospace combustion systems and will play a key role in moving towards sustainability and meeting the Government target of a carbon neutral economy by 2050. NCCAT is an open-access facility, and beyond aerospace, supports commercial customers with the development of key technologies across several UK sectors, such as distributed power generation and the development of measurement technology for harsh environments. This necessitates the development and application of highly specialised research techniques in bespoke facilities that are also used for commercial activities. In addition, the Centre acts as a training ground for current and future aerospace engineers in a critical skill area for the UK, partially achieved through the current EPSRC Centre for Doctoral Training for Future Propulsion and Power (CDT) also hosted within NCCAT.

The group now represents a critical mass of circa 55 personnel including academic staff, researchers, specialist technical staff, technicians, and an admin support team. To deliver its objectives NCCAT has also developed a state-of-the-art laboratory which incorporates highly bespoke, unique, and technically complex facilities. At any given time the group has a large number of active research projects over a range of Technology Readiness Levels (TRL's).

## Job Descriptions

**Job Family & Grade:** Specialist and Supporting Academic Grade 6

**Job Purpose:** To explore alternative enabling technologies in the form of a dual fuel (kerosene / hydrogen) combustor system, for future low-emission aero gas turbines.

### Job Duties:

- To be responsible for undertaking the main research activities.
- To develop scientific and technical research using numerical methods, supported by the experimental facilities within NCCAT.
- To develop geometries and models based on the experimental test facility (or configurations provided by consortium partners).
- To undertake suitable numerical predictions (e.g., CRN, CFD - RANS, LES/DES, FGM etc.) to assist in the investigation and understanding of dual fuel (kerosene / hydrogen) combustion systems.
- To help develop configurations and geometries offering the potential of improved performance.
- To assist in the modification of existing experimental rigs to evaluate combustion performance, emissions and operability. Where necessary, to liaise with outside manufacturers and University technical staff to support the manufacture, construction, or modification of experimental facilities.
- To support the NCCAT engineers during the experimental campaign.
- To suitably analyse, interpret, present and report on the data and research outcomes generated by the numerical prediction and experimental campaign.
- To provide guidance and support to the industrial partner (Rolls-Royce) and other collaborators.
- To attend and present work at progress meetings at UK and European sites as and when required.
- To collaborate and work with other experimental researchers within NCCAT as and when necessary to meet research project objectives.
- To develop new lines of research and the writing of research proposals.

- To undertake such other duties as may reasonably be requested and that are commensurate with the nature and grade of the post.

**Points To Note:** The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed.

### **Special Conditions**

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures. All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures. Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Respecting Diversity and, where appropriate, Recruitment and Selection.

### **Organisational Responsibility**

Reports to: Dr A Duncan Walker

## Person Specification

Your application will be reviewed against the essential and desirable criteria listed below. Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application. Stages of assessment are as follows:

- 1 – Application
- 2 – Interview

### Essential Criteria:

Area	Criteria	Stage
Experience	Recent relevant research in an academic or industrial environment.	1, 2
	Experimental and/or numerical research areas involving complex flows and combustion.	1, 2
	Experience of undertaking numerical predictions (to PhD level) using computational fluid dynamics. Including various types of turbulence modelling (e.g., RANS, DES/LES).	1, 2
	Knowledge of combustion modelling (e.g., Chemical Reactor Networks, Flamelet Generated Manifold in CFD).	1, 2
	Experience of data processing techniques relating to complex fluid flows	1, 2
	Ability to coordinate project activities, manage project tasks, prioritise, and meet deadlines	1, 2
	Evidence of writing academic papers or equivalent	1, 2
Skills and abilities	Ability to work independently and as part of a team	1, 2
	Excellent inter-personal and communication skills – both written and oral	1, 2
	Ability in problem solving, particularly related to experimental and/or numerical methods	1, 2
	Ability to write project reports and make technical presentations to industrial and academic research groups	1, 2
	Use of data analysis software (e.g., MATLAB, Tecplot, C++)	1, 2
	Use of 3D CAD software (e.g., Siemens NX)	1, 2
	Use of CFD software (e.g., ANSYS Fluent, StarCCM+)	1, 2
Training	A willingness to undertake further training as appropriate and to adopt new procedures as and when required	1, 2
Qualifications	A 2.1 or higher first degree in a relevant engineering discipline	1
	A relevant PhD qualification (or near completion) in a relevant subject area	1
Other	Commitment to always observing the University's Equal Opportunities policy.	1
	Commitment to always maintain confidentiality	1, 2
	Willingness to travel	1, 2

### Desirable Criteria

Area	Criteria	Stage
Experience	Knowledge of gas turbine engines	1, 2
	Knowledge of gas turbine combustion systems	1, 2

	Knowledge of hydrogen combustion.	1, 2
	Experience of designing and operating experimental facilities for the measurement of complex fluid flows with combustion.	1, 2
	Knowledge of various types of fluid mechanic instrumentation.	1, 2
	Experience in helping to formulate research proposals	1, 2
Other	Licensed for driving in the UK	1

## Conditions of Service

The position is full-time and fixed term for a period of 24 months. Salary will be on Specialist and Supporting Academic Grade 6, £33,966 - £44,263 per annum, depending on experience. A starting salary will be confirmed on offer of appointment.

The appointment will be subject to the University's Terms and Conditions of Employment for staff grades 6 and above, details of which can be found [here](#).

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which can be found [here](#).

The University offers a wide range of employee benefits which can be found [here](#).

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: <http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html>)

In addition, the University is supportive, wherever possible, of flexible working arrangements. We also strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see <http://www.lboro.ac.uk/services/hr/athena-swan/>