School of Aeronautical, Automotive, Chemical and Materials Engineering
National Centre for Combustion and Aerothermal Technology (NCCAT)

Research Associates (x2) in Afterburner Aerodynamics

Job Ref: REQ230025

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.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 to join our afterburner (reheat) team in the National Centre for Combustion and Aerothermal Technology (in collaboration with Rolls-Royce). We are looking for **two post-doctoral researchers** to support an isothermal investigation into the effect of various parameters on the aerodynamic performance of reheat systems. We would expect one position to be predominantly computational, one to be predominantly experimental and we are looking for candidates with a PhD level experience in these areas. However, there is certainly scope for cross-over between the two roles and development of new skills.

Overall, the project will:

(i) use computational fluid dynamics to examine the isothermal aerodynamic performance of candidate systems and their sensitivity to various geometrical or aerodynamic parameters, and

(ii) modify and use an existing isothermal test facility to experimentally validate candidate designs using five-hole probes, hot-wire anemometry, and CO2 gas tracing.

Both positions are initially funded for a period of 24 months, but the prospects of further funding to continue this work is high.

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 Description

Job Family & Grade: Specialist and Supporting Academic Grade 6

Job Purpose: To improve the aerodynamic understanding of, and to develop afterburner (reheat) systems for future gas turbines.

Job Duties: (covers both the experimental and computational roles).

Overall:

- To be responsible for undertaking the main research activities.
- To develop scientific and technical research using the experimental facilities, instrumentation, data processing and numerical methods used within the UTC and NCCAT.

Computational:

- To develop geometries and CFD models based on the experimental test facility.
- To undertake suitable CFD predictions (e.g., RANS, LES/DES) to assist in the investigation and understanding of reheat systems.
- To develop configurations and geometries offering the potential of improved performance.

Experimental:

- To design/modify an existing experimental rig to simulate the important aerodynamic processes that are relevant to future reheat concepts.
- To liaise with outside manufacturers and University technical staff to enable the manufacture, construction, or modification of experimental facilities.
- To conduct experimental isothermal aerodynamic measurements using instrumentation such as five-hole probes, hot-wire anemometry, CO2 gas tracing.

Joint:

- To suitably analyse, interpret, present and report on the data and research outcomes generated in the experiments and/or CFD predictions.
- 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 and the UTC 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:
[i]*Essential for the experimental role / desirable for the numerical role*
[ii]*Essential for the numerical role / desirable for the computational role*
All other criteria are essential for both roles.

Area	Criteria	Stage
Experience	Recent relevant research in an academic or industrial environment	1, 2
	Experience in fluid mechanics and/or aerodynamics to PhD level	1, 2
	Experimental and/or numerical research areas involving complex flows	1,2
	Experience of designing and operating experimental facilities for the measurement of fluid flow / aerodynamics[i]	1, 2
	Knowledge of various types of fluid mechanic instrumentation (e.g., five-hole probes, hot-wire anemometry)[i]	1, 2
	Experience of undertaking numerical predictions using computational fluid dynamics[ii]	1, 2
	Knowledge of various types of turbulency modelling (e.g., RANS, DES/LES)[ii]	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[i] and/or numerical[ii] 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 data acquisition and rig control software (e.g., LabVIEW)[i]	1, 2
	Use of 3D CAD software (e.g., Siemens NX)	1, 2
	Use of CFD software (e.g., ANSYS Fluent, StarCCM+)[ii]	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 observing the University's Equal Opportunities policy at all times.	1

	Commitment to maintain confidentiality at all times	1, 2
	Willingness to travel	1, 2

Desirable Criteria
[i]*Desirable for the experimental role / essential for the numerical role*
[ii]*Desirable for the numerical role / essential for the computational role*
All other criteria are desirable for both roles.

Area	Criteria	Stage
Experience	Knowledge of gas turbine engines	1, 2
	Knowledge of afterburner / reheat systems	1, 2
	Knowledge of gas turbine combustion systems	1, 2
	Experience of designing and operating experimental facilities for the measurement of fluid flow / aerodynamics[ii]	1, 2
	Knowledge of various types of fluid mechanic instrumentation (e.g., five-hole probes, hot-wire anemometry)[ii]	1, 2
	Experience of undertaking numerical predictions using computational fluid dynamics[i]	1, 2
	Knowledge of various types of turbulency modelling (e.g., RANS, DES/LES)[i]	1, 2
Skills and abilities	Use of data acquisition and rig control software (e.g., LabVIEW)[ii]	1, 2
	Use of CFD software (e.g., ANSYS Fluent, StarCCM+)[i]	1, 2
	Ability to use reactor network numerical models (e.g., Cantera, Chemkin)	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, £32,348 - £42,155 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/