Applications are invited for the following a PhD studentship for the following project:

Gas turbine combustion for high-hydrogen and alternative fuels.

The position will be based within the Turbomachinery Research Group team of Professor Stephen Spence within the School of Engineering and the Advanced Materials and Bioengineering Research Centre (AMBER) centre.

Summary of project

There is a major shift in the power and propulsion sectors to enable decarbonization. For the power generation industry, hydrogen and other high-hydrogen fuels (e.g. ammonia) offer the opportunity for long-term storage of renewable energy to provide dispatchable electricity through combustion in gas turbine engines. Gas turbine manufacturers are already offering engines with 50% hydrogen capability, with ambitions to increase this to 100% through developments in combustion technology.

The commercial aviation sector relies almost entirely on gas turbines for propulsion because of their very high power output and light weight. Efforts for decarbonisation are focused on combustion of new non-fossil fuels in conventional gas turbine propulsion units, because fully electric aircraft are not expected to achieve practical ranges for commercial sized aircraft. Those new fuels include synthetic aviation fuels and hydrogen derived from renewable energy.

Hydrogen fuels avoid carbon emissions and particulate emissions. However, there are challenges in combusting hydrogen due to its high flame temperature and much higher flame speed. This demands new combustor concepts for stable combustion, reduced NOx and limiting the maximum temperature that components are exposed to. This project will establish a small-scale pressurized combustion test rig at TCD and a 3D multi-physics combustion modelling platform. Collectively, these capabilities will enable new combustor designs to be assessed for high-hydrogen fuels and other synthetic fuels. This capability will expand the existing collaboration between TCD and industrial gas turbine manufacturers and aligns with the research at TCD to characterize sustainable aviation fuels.

The outcomes will guide investment and regulatory policy for future design and production of zero carbon gas turbines. They will provide fundamental insights into the combustion characteristics of new fuels and enable the aviation and power generation sectors to anticipate future technologies associated with alternative fuels.

The successful applicant will produce an independent piece of research in the form of a PhD thesis. They will also assist their supervisor with other elements of the project (for example: research tasks; conference organisation; workshop management). Our doctoral candidates are registered on the 4 year structured Trinity PhD programme. The student will have access to a variety of taught modules, both discipline specific and generic skills, to enhance and support their own research.

Applicants should have 1st Class Honours degree (or equivalent) in Mechanical Engineering, Aerospace Engineering or a related subject. A relevant Master's degree and/or experience in one or more of the following will be an advantage: Turbomachinery, Energy Systems, Aerospace Technology.

How to apply: CVs with the names and addresses of two referees should be submitted to *Prof. Stephen Spence*

spences@tcd.ie

Positions will remain opened until filled but preferred start date is September or October 2022. Only short-listed applications will be acknowledged.

This position is funded by AMBER, SFI Research Centre for Advanced Materials and BioEngineering Research & CRANN Institute. The AMBER research centre, as a community of researchers, welcomes its responsibility to provide equal opportunities for all. We are actively seeking diversity in our research teams and particularly encourage applications from underrepresented groups.