PhD Advert Template

Project title: Project **CHLOE**: Sustainable energy redu**c**tion t**h**rough innovative aerodynamic f**l**ow contr**o**l in th**e** Cloud

Project ID *(optional)*:

Accept all year-round applications

Funding information: Self-funded students only

Project description:

Nominally 50% of the total energy consumption of a commercial aircraft or high-speed train is due to the turbulence flowing over every surface of the moving vehicle. Taming the turbulence over these aerodynamic surfaces with intelligent sensing and actuation technologies reduces the vehicle’s energy consumption, and thereby reduces the load on the vehicle’s propulsion system, which in turn reduces transport emissions, leading to vast economic savings and wider health and environmental benefits through improved air quality. To place this into context: just a 3% reduction in the turbulent forces acting on a long-range commercial aircraft would save £1.2M in jet fuel per aircraft per year and prevent the annual release of 3,000 tonnes of carbon dioxide (CO2). There are currently around 23,600 aircraft in active service around the world, collectively producing c. 860 million tonnes of CO2 each year – a billion-pound problem to solve. Innovative strategies to control turbulence now would drive the UK towards the zero-carbon economy it strives to be, and in the future would substantially reduce the amount of alternative-energy required to power the global transportation network in the green revolution.

The research from CHLOE will provide a strong scientific background, and a framework for rollout for the adoption of innovative flow-control solutions with direct applications to not only next-generation aircraft, but across the global transportation network. CHLOE will help to maintain the UK as the primary location for aerodynamic and hydrodynamic design and research in Europe.

The primary aim of CHLOE is to find new, innovative ways of controlling turbulence to reduce the illustrious drag forces experienced by all moving vehicles. The successful applicant will be trained to a high technological standard in advanced wind tunnel testing at Newcastle University, using state-of-the-art diagnostics including Particle Image Velocimetry (PIV), Laser Doppler Velocimetry (LDV) and hot-wire anemometry. CHLOE will make full use of our newly developed machine-learning framework ‘NUBO’ which can efficiently optimise over tens to hundreds of interdependent variables in near real-time (i.e. optimise over actuators used to control the flow) on the Cloud environment. They will also be trained to use our recently patented Micro-Electro-Mechanical-Systems (MEMS) sensors for measuring drag in the wind tunnel. They will work as part of a larger team investigating novel ways to control aerodynamic fluid flows. Specific objectives are as follows:

(1) Develop robust, reliable and energy efficient actuators technology to control drag forces on vehicles

(2) Implement our machine learning framework to generate significant levels of drag reduction, with focus on achieving net-energy savings, in a series of advanced wind tunnel investigations.

Further information on our lab, and details of our existing project can be found here: [www.experimental-fluid-dynamics.com](http://www.experimental-fluid-dynamics.com).

*Newcastle University is committed to being a fully inclusive Global University which actively recruits, supports and retains colleagues from all sectors of society. We value diversity as well as celebrate, support and thrive on the contributions of all our employees and the communities they represent. We are proud to be an equal opportunities employer and encourage applications from everybody, regardless of race, sex, ethnicity, religion, nationality, sexual orientation, age, disability, gender identity, marital status/civil partnership, pregnancy and maternity, as well as being open to flexible working practices.*

Application enquires: *Dr Richard Whalley**. More information on our lab, team and existing projects can be found here:* [*www.experimental-fluid-dynamics.com*](http://www.experimental-fluid-dynamics.com)*.*

[Staff Profile - School of Engineering - Newcastle University (ncl.ac.uk)](https://www.ncl.ac.uk/engineering/staff/profile/richardwhalley.html)

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[ ]  agricultural technology

[ ]  arable farming

[ ]  livestock farming

[ ]  forestry & arboriculture

[ ]  other

Anthropology

[ ]  biological anthropology

[ ]  social anthropology

[ ]  other

Architecture, Building & Planning

[ ]  architecture

[ ]  built environment

[ ]  construction management

[ ]  landscape architecture

[ ]  rural planning

[ ]  surveying

[ ]  urban planning

[ ]  other

Biological Sciences

[ ]  bacteriology

[ ]  behavioural biology

[ ]  biochemistry

[ ]  biodiversity

[ ]  bioinformatics

[ ]  biophysics

[ ]  biotechnology

[ ]  cancer biology

[ ]  cell biology

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Business & Management

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Chemistry

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Communication & Media Studies

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Computer Science

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Creative Arts & Design

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Economics

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Education

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Engineering

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Environmental Sciences

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Finance

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Food Sciences

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Forensic and Archaeological Sciences

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Geography

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Geology

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History & Archaeology

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Information Services

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Languages, Literature & Culture

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Law

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[ ]  contract law

[ ]  property law

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Linguistics & Classics

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Materials Science

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Mathematics

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[ ]  computational mathematics

[ ]  data analysis

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[ ]  medical statistics

[ ]  operational research

[ ]  probability

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Medicine

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Nursing & Health

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[ ]  community nursing

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Philosophy

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Physics

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[ ]  other

Politics & Government

[ ]  development studies

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[ ]  international relations

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Psychology

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Sociology

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Sport & Exercise Science

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Theology & Religious Studies

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Veterinary Sciences

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