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*](mailto:Richard.Whalley@newcastle.ac.uk)*. 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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landscape architecture

rural planning

surveying

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bioinformatics

biophysics

biotechnology

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developmental biology

ecology

ecotoxicology

entomology

environmental biology

evolution

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structural chemistry

synthetic chemistry

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digital media

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production

public relations

publishing

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computer vision

computer graphics

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data science

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internet of things

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networks

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art

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design

drama

fashion

film studies

fine art

graphic design

interior design

music

music technology

photography

theatre studies

other

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econometrics

financial economics

macroeconomics

microeconomics

political economics

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nursery education

primary education

secondary education

special needs education

other

Engineering

acoustics engineering

aerospace engineering

atomic engineering

automotive engineering

bioengineering

biomedical engineering

chemical engineering

civil engineering

communications engineering

control systems

cybernetics

dynamics

electrical engineering

electronic engineering

energy technologies

environmental engineering

fluid mechanics

gas engineering

geotechnical engineering

integrated engineering

manufacturing engineering

marine engineering

mechanical engineering

mechanics

mechatronics

nanotechnology

offshore engineering

petroleum engineering

robotics

solid mechanics

structural engineering

structural mechanics

systems engineering

thermodynamics

other

Environmental Sciences

climate science

hydrology

marine sciences

meteorology

pollution

soil science

other

Finance

actuarial science

banking

financial management

insurance

investment

taxation

other

Food Sciences

food hygiene

food production

other

Forensic and Archaeological Sciences

archaeological science

forensic science

other

Geography

agricultural geography

cultural geography

economic geography

environmental geography

geographical information systems gis

historical geography

human geography

marine geography

physical geography

political geography

remote sensing

social geography

transport geography

urban geography

other

Geology

applied geology

geochemistry

geophysics

geoscience

geotechnology

hydrogeology

marine geology

palaeontology

seismology

volcanology

other

History & Archaeology

african history

american history

ancient history

archaeology

asian history

australasian history

british and irish history

economic history

european history

heritage studies

history

history of art

history of religions

history of science

medieval history

military history

modern history

russian history

social history

world history

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Information Services

information security

information systems

librarianship

other

Languages, Literature & Culture

african studies

american studies

asian studies

australasian studies

chinese

danish

dutch

english language

english literature

european studies

finnish

french

german

italian

japanese

middle eastern studies

norwegian

portuguese

russian

spanish

swedish

other

Law

criminal law

commercial law

contract law

property law

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Linguistics & Classics

ancient greek

celtic studies

classics

latin

linguistics

other

Materials Science

ceramics

glass

metallurgy

polymers

textiles

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Mathematics

applied mathematics

applied statistics

computational mathematics

data analysis

engineering mathematics

mathematical modelling

medical statistics

operational research

probability

pure mathematics

statistics

stochastic processes

other

Medicine

anatomy

audiology

biomechanics

cardiology

complementary medicine

dentistry

endocrinology

epidemiology

neural engineering

neurology

nutrition

ophthalmology

optometry

pathology

pharmacology

pharmacy

physiology

physiotherapy

podiatry

radiology

speech science

tissue engineering

toxicology

other

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counselling

dental nursing

environmental health

health informatics

medical nursing

mental health nursing

midwifery

occupational health

occupational therapy

paediatric nursing

paramedical science

surgical nursing

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Philosophy

ethics

metaphysics

philosophy of science

other

Physics

acoustics

astronomy

astrophysics

chemical physics

computational physics

electromagnetism

environmental physics

experimental physics

medical physics

nuclear physics

optical physics

particle physics

quantum mechanics

solid state physics

space science

theoretical physics

other

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development studies

government

international relations

politics

public policy

other

Psychology

child psychology

clinical psychology

community psychology

counselling psychology

developmental psychology

educational psychology

forensic psychology

health psychology

neuropsychology

occupational psychology

organisational psychology

psychotherapy

sport psychology

other

Sociology

criminology

disability studies

gender studies

socio economics

social work

other

Sport & Exercise Science

sport coaching

sport development

sport performance

sport technology

sport therapy

other

Theology & Religious Studies

divinity

religious studies

theology

other

Veterinary Sciences

animal welfare

veterinary dentistry

veterinary medicine

veterinary nursing

veterinary nutrition

veterinary pathology

other