School of Mechanical and Manufacturing Engineering
Flow Noise Group
Seminar Series 2019

Reducing Airfoil Noise with Bio-Inspired Design Adaptations

Speaker: **Dr Lorna Ayton**
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University of Cambridge

Chair: **Dr Danielle Moreau**
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Date/Time: Thursday 15 August, 6.00 pm
Place: Design Next Studio, Ainsworth Building J17, Level 5, Room 504
University of New South Wales

<u>Abstract</u>

A dominant source of broadband aeroengine noise arises when the unsteady wakes shed from rotors interact with downstream stators. This so-called leading-edge noise cannot be eliminated, but it can be reduced. By altering the spanwise geometry of the leading edge of an airfoil it is known through experimental testing that leading-edge noise can be significantly reduced over broadband frequencies. In recent years, a multitude of different shapes have been tested and all are seen to have benefits for different frequency ranges, which may be ideal for the reduction of tonal noise, but the question remains; which design is optimal for broadband noise reduction?

A similar source of noise occurs when the turbulent boundary layer over an aerofoil scatters off the sharp trailing edge, in so-called trailing-edge noise. Similar variations to the spanwise geometry are effective in reducing this noise, but also alterations to the porosity or flexibility of the trailing edge have been seen to be efficient, however again no predictive tool for the optimum adaptation has been developed.

This talk will present a range of theoretical models for different aerofoil adaptations which are known to reduce broadband turbulence interaction noise, and will illustrate how they may be used as a stepping stone towards determining optimally quiet designs.

<u>About the Speaker</u>

Lorna Ayton completed her PhD under the supervision of Nigel Peake in 2014 in the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge. Form there she undertook a 3-year Junior Research Fellowship funded by Sidney Sussex College, and now is funded by a 5-year EPSRC Early Career Fellowship held in DAMTP. Her research focusses on developing theoretical models for aeroacoustics, in particular aerofoil-turbulence interaction, and on advancing fundamental mathematical methods for application to acoustic scattering problems.

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