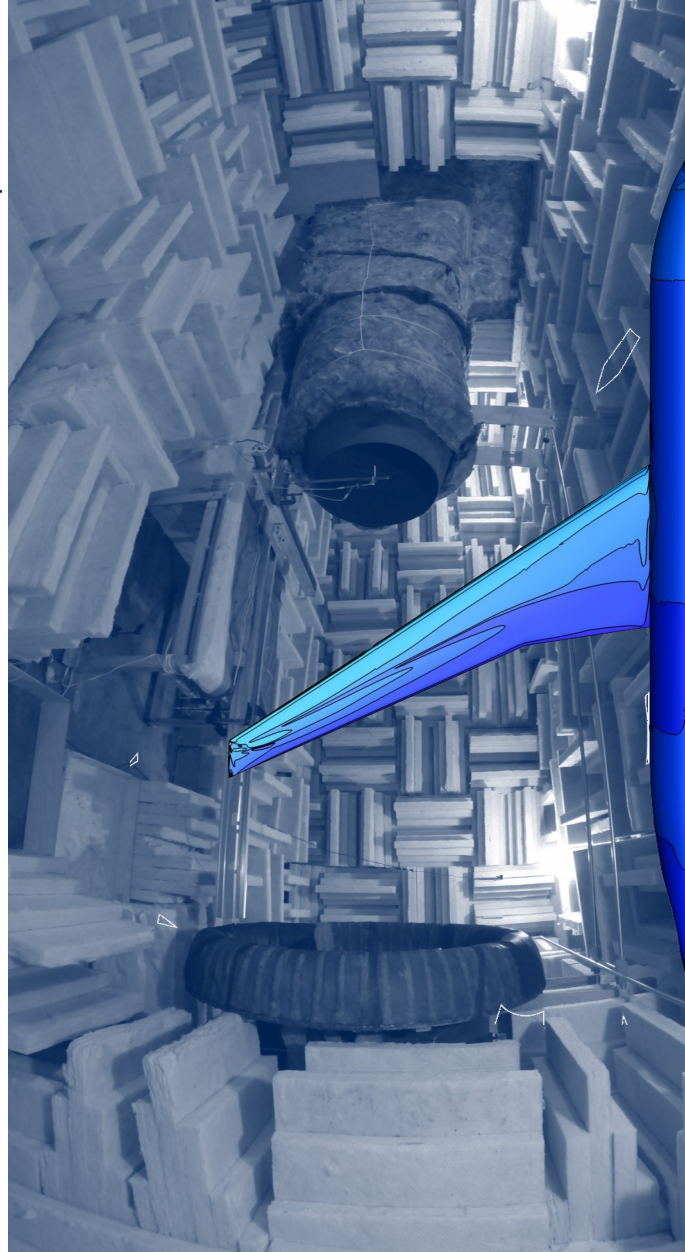


Centre for Research in Sustainable Aviation

The Centre for Research in Sustainable Aviation (CRSA) is a multidisciplinary initiative that focuses on innovative research and student training with the aim to reduce the environmental impact of civil aviation. The CRSA brings together researchers and students from a wide set of backgrounds (aerospace, chemical, civil and mechanical engineering) to address all topics related to sustainable aviation, from drag reduction and bio-fuel production to life cycle analysis and atmospheric physics. This enables an holistic approach to research and training where the interdependence and trade-offs between each discipline can be explored.

The CRSA is pleased to hold its second annual summer school on Sustainable Aviation. This summer school series covers different topics related to aviation and its impact on the environment, with this year's topic being aeroacoustics. The four international instructors brought for this year's edition will cover the basics of aeroacoustics up to applications for jet and airframe noise.

Dr. Philippe Lavoie,
Associate Director,
Centre for Research in
Sustainable Aviation,
Institute for Aerospace Studies



Institute for Aerospace Studies
UNIVERSITY OF TORONTO

Summer School on Sustainable Aviation



Date: May 20th –21st, 2014

Time: 9:00am–5:00pm

**University of Toronto
Institute for Aerospace Studies
4925 Dufferin Street,
Toronto, ON M3H 5T6**

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Speakers

Daniel Bodony

University of Illinois at Urbana-Champaign, USA
Introduction to Aeroacoustic Theory

Aeroacoustics research relies heavily on several fundamental concepts involving the generation of sound by or in an unsteady fluid, and its propagation through a non-uniform medium from the source to the receiver. An introduction to the most important concepts will be given to (a) provide a solid foundation on which to build more detailed understanding and to (b) prepare the student for the three subsequent discussions in this summer school. Those topics to be discussed will include the fundamental equations of acoustics, Green's functions, Kirchhoff's formula, elementary sources and acoustic analogies of Lighthill and Goldstein.

Meng Wang

University of Notre Dame
Hybrid Methods for Aeroacoustic Predictions

An overview of computational methods for aeroacoustics and hybrid techniques combining aeroacoustic theories with flow simulations will be covered. Topics will include: Lighthill's theory and extensions, Ffowcs Williams-Hawkings equation, and their numerical evaluations; methods for incorporating the effect of solid boundaries; high-fidelity CFD methods for acoustic source computations; prediction and control of noise from airfoils, bluff bodies and turbulent boundary layers with surface roughness or discontinuities; and aeroacoustic source mechanisms.

Peter Jordan

Université de Poitiers, France
Coherent Structures and Jet Aeroacoustics

The first part of the lecture will introduce aeroacoustics theory and review what it has and has not been able to explain vis-à-vis jet noise. Part two will address the issue of coherent structures in turbulent flows: What are they? How can they be deduced from experimental and numerical data? How can they be modeled? Can they provide a unified theory of jet noise? What prospects, if any, do they present for control?

Richard Sandberg

University of Southampton, UK
Direct Noise Computations of Airfoils and Noise Reduction Approaches

This lecture will focus on direct methods of computing the sound field in the context of airfoil noise. It will cover the types of airfoil noise mechanism that exist, with discussions of tones and feedback loops, as well as additional noise sources other than trailing-edge noise. The lecture will conclude with a presentation of noise reduction strategies such as serrations and compliant trailing edges.

Schedule

Tuesday, May 20th, 2014

- 9:00 – 12:15 Daniel Bodony, University of Illinois at Urbana-Champaign, USA
Introduction to Aeroacoustic Theory
- 12:15 – 13:30 **Lunch**
- 13:30 – 16:45 Meng Wang, University of Notre Dame, USA
Decoupled methods and the Lighthill Theory

Wednesday, May 21st, 2014

- 9:00 – 12:15 Peter Jordan, Université de Poitiers, France
Coherent Structures and Jet Aeroacoustics
- 12:15 – 13:30 **Lunch**
- 13:30 – 16:45 Richard Sandberg, University of Southampton, UK
Direct Noise Computations of Airfoils and Noise Reduction Approaches

Fees

	Early Bird (ends April 30)	Standard
Students	\$200	\$300
Academic or Industrial Guests	\$400	\$500

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