

SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS1006

12 March 2025

A DCAMM seminar No. 783 will be presented by

Professor Antonio Filippone School of Engineering, The University of Manchester, United Kingdom

The title of the lecture is

Summary of Propeller Research at Manchester

Abstract:

We present a summary of propeller research at our institution. There will be two selected themes. The first deals with aerodynamic and aeroacoustic investigations of propellers with unequal blade spacing. The use of non-uniform blade spacing could reduce the contribution at the blade passing frequency and its multiples, while giving rise to non-zero contribution at frequencies multiple of the revolution frequency. The acoustic experiments were carried out in an anechoic chamber in the absence of free stream; this leads to recirculation effects of the chamber is not large enough. The experimental analysis evidenced the presence of noise peaks at multiples of 1/2 blade passing frequency. The numerical analysis was performed by the combined application of an aerodynamic solver based on a boundary integral formulation for potential flows and an aeroacoustic solver based on the Farassat 1A formulation for the tonal noise.

Second there will be a discussion on using fast computations of multi-rotor configurations based on a surrogate model of the inflow. A rich data set, whether numerical or experimental, is initially used as a training set to which a modal decomposition method is applied to extract dominant spatial modes. These modes and their associated coefficients can then be interpolated across the design domain to obtain predictions of the rotor inflow at unknown design points. As a first step towards proving this framework, an aerodynamics code based on the vortex particle method was used to obtain training data in the form of rotor inflow distributions corresponding to isolated rotors with different blade geometries, over a range of advance ratios. The proper orthogonal decomposition (POD) was applied to the inflow snapshots to obtain a set of orthogonal bases, one for each advance ratio.

DATE:	Wednesday, 26 March 2025
TIME:	13:30 – 14:15
PLACE:	Building 414, Room 050 DTU, Technical University of Denmark

Danish pastry, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Jan Becker Høgsberg

• TECHNICAL UNIVERSITY OF DENMARK • AALBORG UNIVERSITY • AARHUS UNIVERSITY • UNIVERSITY OF SOUTHERN DENMARK