School of Mechanics & Engineering Science

PEKING UNIVERSITY

ES Seminar Series No. 64

Lattice-Boltzmann prediction of rotor noise: from sUAS noise to eVTOL community noise

This keynote presentation examines emerging challenges and recent advances in rotor aeroacoustics, with applications spanning small unmanned aerial systems (sUAS) to electric vertical take-off and landing (eVTOL) aircraft. Urban Air Mobility (UAM) introduces new complexities in community noise assessment, as novel rotorcraft configurations increasingly operate near densely populated environments and under flight conditions that differ markedly from those of conventional rotorcraft. The first part of the presentation focuses on fundamental noise-generation mechanisms that are particularly relevant to modern low-tip-speed and multi-rotor configurations. Topics include broadband noise associated with laminar separation bubbles at low Reynolds numbers, as well as aeroacoustic effects arising from rotor operation in ground effect. Emphasis is placed on the underlying flow physics, the role of transitional boundary layers and wake interactions, and the implications of these mechanisms for noise characteristics during hover, takeoff, and landing. The second part of the keynote introduces a model-based, multi-fidelity simulation framework for evaluating the noise impact of eVTOL vehicles across complete flight missions. High-fidelity Lattice-Boltzmann / Very Large Eddy Simulation (LB/VLES) methods are used to capture complex aeroacoustic phenomena such as blade–vortex interaction and broadband noise sources. Acoustic data from these simulations are compiled into a Noise Hemisphere Database (NHD), which, when coupled with efficient propagation models, enables realistic prediction of ground-level noise footprints in urban environments. This integrated workflow supports mission-level noise analysis and identification of noise-critical flight segments, and provides a scalable foundation for community noise mitigation and emerging hybrid digital–physical noise certification strategies.

23th January, 2026 (Friday)

14:00-15:30 Beijing Time

210，NO.1 BUILDING
School of Mechanics & Engineering Science

Benshuai Lyu
Assistant Professor

Prof. Damiano Casalino

Delft University of Technology

Damiano Casalino, PhD in fluid-dynamics (Turin Polytechnic) and acoustics (Ecole Centrale de Lyon) has research interests in aeroacoustics that cover frequency-domain CAA for duct acoustics and installation effects, sound propagation in sheared flows, integral methods, stochastic noise generation, advanced experimental techniques for space launcher noise, helicopter trajectory optimization, vortex-airfoil interaction noise, acoustic liners and porous treatments.

Damiano is currently R&D director at Dassault Systèmes and chair of aeroacoustics in the aerospace faculty of Delft University of Technology. His main focus is on the industrial exploitation of the lattice Boltzmann method for airframe and engine noise prediction. More recently, he has started developing methodologies for Urban/Advanced Air Mobility and Wind-Energy applications. His current research goal is to integrate computational aeroacoustics in system engineering frameworks for aircraft, rotorcraft and wind-turbine community noise prediction in realistic operational scenarios.

Damiano has co-authored about eighty archival journal publications in the field of aeroacoustics, co-authored several patents and has obtained the Aeroacoustics Award in 2023 from the Council of European Aerospace Societies.