S1 – Aeroacoustics of turbomachines

Organizers: Michel Roger & Stéphane Moreau

Aeroacoustics refers to aerodynamic sound generation and propagation. It is a real concern in many areas of turbomachinery applications such as aeronautical propulsion systems, cooling and air-conditioning systems, drones, urban air vehicles and wind-turbine technology. It differs from structural-vibration noise in that it is an essential signature and by-product of unsteady flows in blade or vane rows. In aeronautics the growing interest for aeroacoustics is justified by the emergence of more and more stringent ICAO standards and the targeted reduction of community noise around airports. In low-speed air-engineering applications new regulations are also defined to meet the everyday-life comfort required by populations. Noise is one of the features to be reduced in multidisciplinary optimization approaches, together with pollutant emissions and energy losses/consumption. The growing development of wind turbines, both inside and outside cities, and moreover of drones and urban air mobility, generates new challenges to reduce noise exposure of populations. Aeroacoustics also requires the most demanding extensions of the computational resources presently used to produce realistic predictions of unsteady flows in turbomachinery stages. The session Aeroacoustics of turbomachines of ISROMAC 18 is aimed at making a point on recent advances in rotating-blade aeroacoustics, which includes: (1) - aerodynamic noise prediction strategies based on analytical and/or numerical methods; (2) - experimental studies dedicated to the characterization of aerodynamic noise sources; (3) - physical understanding and the connection with unsteady flows in turbomachines.

Non-exhaustive list of suggested topics

- Hybrid methods in Computational AeroAcoustics (CAA) for blade/vane rows
- Tonal interaction noise in turbomachinery stages
- Turbomachinery broadband noise
- Broadband noise of loaded airfoils, basic studies
- Acoustic signature of off-design conditions (surge, rotating stall, dynamic stall...)
- Advanced experimental techniques for noise-source characterization
- Sound transmission in turbomachinery ducts
- Aerodynamic and acoustic installation effects
- Wind-turbine noise
- Drones and urban air mobility

Organizers

Michel Roger is working as a Professor at Ecole Centrale de Lyon (ECL, France). Teaching General Aeroacoustics, he coordinates the research activities of the Laboratoire de Mécanique des Fluides et Acoustique (LMFA) of ECL in the field of rotating-blade and airfoil noise, essentially by means of experimental and analytical methods.

Stéphane Moreau has been working as a Research Manager at Safran Aircraft Engines and Valeo (France), before he obtained a Professor position in the Mechanical Engineering department of Sherbrooke University (Québec, Canada). He develops advanced numerical and analytical methods in unsteady Fluid Dynamics, dedicated to the aeroacoustics design of rotating-blade technologies.

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