**Deutsches Zentrum**
**für Luft- und Raumfahrt** e.V.

Institut für Aerodynamik
und Strömungstechnik

Lilienthalplatz 7
38108 Braunschweig

**Lecture Announcement**

Dr.-Ing. Roland Ewert, Prof. Dr.-Ing. Jan Delfs

In the summer term 2014 we will hold the lecture

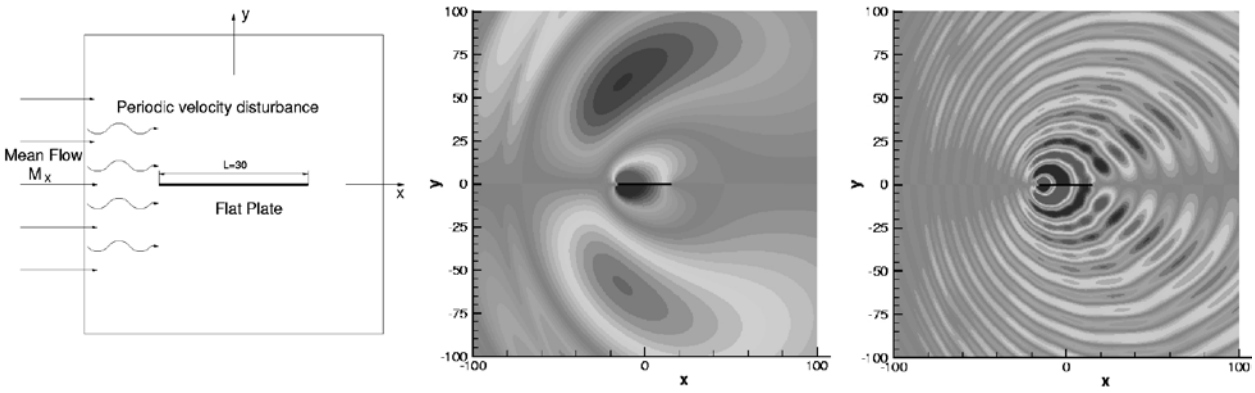
# Numerical Methods in Computational Aeroacoustics (CAA)

**Place:** Raum 315, Institut für Aerodynamik & Strömungstechnik (Geb. 130)
Deutsches Zentrum für Luft- und Raumfahrt (DLR), BS, Lilienthalplatz 7
**Time:** Fridays, 2:00h-3:30h P.M.
**Start:** April **25**, 2014

**Background:**
The reduction of noise generated by turbulent flow has become an important topic in various engineering areas such as automotive, civil, or aeronautical engineering. The field of aeroacoustics concerns the noise generation and propagation in turbulent flow and has matured dramatically in the past three decades, especially through the increasingly stringent limits imposed on the noise emissions of civil aircraft. For a continuous progress in the reduction of aircraft noise emissions numerical tools will become essential in the future to achieve an optimized low-noise design of critical aircraft components. In the last years numerical techniques evolved in the framework of Computational Aeroacoustics (CAA) that are optimized for the simulation of wave-propagation and generation in non-uniform flows. CAA can be deemed to be a sub-discipline of Computational Fluid Dynamics (CFD). However, the main objective of CAA to understand the physics of noise generation and propagation differs considerably from that of CFD such that own numerical issues and methods became neccessary. This lecture aims at introducing into the new numerical concepts of CAA. Furthermore the lecture mediates the skills that are neccessary to enable further studies of the topic with the help of current scientifical literature. A prior attendance at the lecture 'Grundlagen der Aeroakustik' that introduces into the physical and mathematical concepts of aeroacoustics is useful but not mandatory for an understanding of the lecture.

**Content of the lecture 'Numerical Methods in Computational Aeroacoustics':**

Governing equations in aeroacoustics, dispersion relation, numerical discretization via finite differences, stability and von Neumann method, high-order dispersion relation preserving methods on structured grids, governing equations on curvilinear structured grids, low dispersion and dissipation Runge-Kutta methods, damping and filtering of spurious waves, high-fideltiy non-reflecting boundary conditions, overview over unstructured methods in CAA, stochastic and deterministic source concepts for CAA, integral methods for far-field extrapolation
Requirements: Basic knowledge in fluid mechanics
Along with the lecture a field trip to the "Acoustic Windtunnel Braunschweig" (AWB) of DLR (MB-ISM-103) is recommended.




Sound generation at a flat plate due to incident gusts of different wave-lengths
21.03.14, Jan Delfs, R. Ewert