Aerodynamisches Institut und Lehrstuhl für Strömungslehre | RWTH AACHEN UNIVERSITY

Bachelor/Master Thesis

Landing gear noise mitigation using porous materials

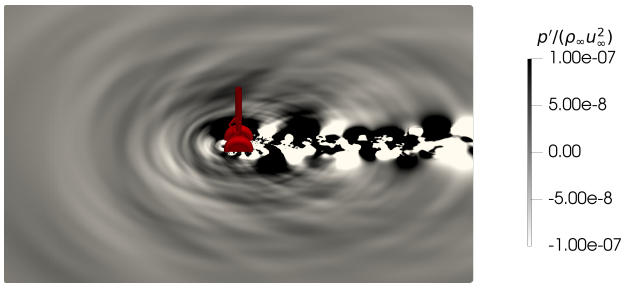
Air traffic, which is a major cause of environmental noise, is expected to steadily increase in the near future. The noise generation becomes relevant at low flight altitude, i.e., during take-off and approach. In these phases aircraft noise mainly originates from (i) engine noise generated by the fan and the jet, and (ii) airframe noise mostly arising from high lift devices and landing gears. Mitigating noise at the current level of technology requires new disruptive concepts. Previous studies showed, that the installation of porous material at the trailing edge of lifting surfaces offered beneficial properties lowering the overall sound pressure level (OASPL) up to 6 dB.

The lattice Boltzmann method (LBM) is featuring low numerical dissipation and dispersion error making it suitable for direct aeroacoustic simulation. This is especially efficient in regions where the grid resolution is determined by resolving the turbulent flow field. To predict the acoustic far-field the acoustic near-field is extrapolated using Ffowcs Williams-Hawkings (FWH) method.
Resolving the flow scales inside of the porous micro-structures $\mathcal{O}(100\mu m)$ in a realistic application case is computational unfeasible even on modern high-performance computing (HPC) resources. Modeling these materials as equivalent regions is a possibility to understand and optimize the installation effects of add-ons such as porous fairings.

Research aspects

- LBM for direct aeroacoustic simulations
- Development of porous media models
- Large-scale simulations on HPC resources

If you are interested in writing your thesis within this research field, feel free to contact me. Usually it is possible to find a topic suiting your ideas and our needs.



Perturbed pressure field around a nose landing gear predicted by a direct aeroacoustic LBM simulation.

You ...

- ... are interested in fluid dynamics and acoustics
- ... have advanced programming experience (preferably c++)
- ... are eager to learn new skills and are able to work in an independent manner

If you are interested, please contact:

Contact:	Miro Gondrum, M.Sc.
	Lehrstuhl für Strömungslehre und Aerodynamisches Institut
	Wüllnerstr. 5a, 52062 Aachen
Room:	001
Tel.:	+49 - (0)241 - 80 - 95433
Mail:	m.gondrum@aia.rwth-aachen.de