Turbulence and Noise Generation
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Post-doctoral position (12 months – EU Prog. ENOVAL)
Modeling and numerical simulation of liners in the presence of a mean flow

- Collaboration between Laboratoire de Mécanique des Fluides et d'Acoustique (UMR CNRS 5509) & Aircelle (Safran group)
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In previous studies performed in our laboratory, hybrid active-passive absorbers have been implemented in a test section of a channel flow to achieve acoustic treatments in the presence of a turbulent flow. The control algorithm is working correctly, even for high flow velocities. The acoustic efficiency is however poor compared to expectations. In particular, the efficiency of the wall treatment significantly decreases as the flow velocity increases.[1]
The objectives of this research are to investigate the sources of these differences and to relax some assumptions, which are currently used in the modeling and appear too simplistic. For that, it is proposed to develop a novel numerical approach to study more realistic flow conditions inside the liner. The research is a part of the European project ENOVAL (ENgine mOdule VALidators) and is funded by AIRCELLE, a company of the group SAFRAN.
The project is organized as follows. First, the definition and implementation of a time-domain impedance boundary conditions into a numerical solver of the fluid mechanics equations will be examined in a simplified geometry of a liner. Several teams[2,3] have already developed this kind of approach and have investigated the role of the mean flow on the acoustic propagation by solving the linearized Euler equations. Related works have also been performed in the Laboratory.[4,5] Depending on work progress, an unsteady description of the flow will be considered.[6] There are only few attempts to deal with such a flow in the literature[7] so far. Second, the determination of an optimal impedance will be discussed.
Besides, in the context of the ENOVAL project, the aerospace agency in the Netherlands, the NLR, evaluates the performance of various acoustic treatments in a liner in their wind tunnel in Marknesse, Netherlands. Prescriptions on the method to educe the surface impedance in flow[8] will be given. Travels to Netherlands are expected.

References

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