

# Local Large-Eddy Simulation of a Slat-Wing Configuration

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## LOCAL LARGE-EDDY SIMULATION OF A SLAT-WING CONFIGURATION



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Shaker Verlag Mrz 2010, 2010. Buch. Condition: Neu. Neuware - Noise generated by high-lift devices is an essential part of the emitted sound of an airplane especially during approach when the engines run almost in idle conditions. The sound spectra are characterized by a mix of tonal and broadband components which are originated by the turbulent flow field, i.e., the noise generation is dominated by vortex-vortex and vortexwall interaction. Therefore, in the present study the turbulent flow field over a slat-main wing configuration is investigated by a large-eddy simulation (LES) and subsequently, the obtained unsteady flow data is used to analyze the acoustic field based on the acoustic perturbation equations (APE). The computations are performed at a freestream MACH number of Ma=0.16 at an angle of attack of 13 deg. The REYNOLDS number which is based on the clean chord length and the freestream velocity is Re= 1.4x10 6. It is shown that a pure LES is not suitable for industrial applications when high REYNOLDS numbers are considered due to the vast required computational effort. Therefore, in the present work a zonal method is developed and implemented which combines the Ravsorns-averaged NAVIER-STOKES (RANS) equations and the spatially filtered NAVIER-STOKES equations solved in a large-eddy simulation, i.e., in regions where unsteady turbulent flow data is required an LES is performed whereas the remaining flow field regions are computed by a RANS simulation which is in terms of computational effort more efficient than an LES. First, the zonal RANS/LES method is validated by turbulent channel flow simulations and, second, it is applied to the slat-main wing configuration. 123 pp. Englisch.

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