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Prediction of broadband trailing edge noise from a NACA0012 airfoil using wall-modeled large-eddy simulation[1] MOHAMMAD MEHRABADI, DANIEL BODONY, University of Illinois at Urbana-Champaign — In modern high-bypass ratio turbofan engines, the reduction of jet exhaust noise through engine design has increased the acoustic importance of the main fan to the point where it can be the primary source of noise in the fight direction of an airplane. While fan noise has been reduced by improved fan designs, its broadband component, originating from the interaction of turbulent flow with a solid surface, still remains an issue. Broadband fan noise is generated by several mechanisms, usually involving a turbulent boundary layer interacting with a solid surface. To prepare for a wall modeled large eddy simulation (WMLES) of the NASA/GE source diagnostic test fan,we study the broadband noise due to the turbulent flow on a NACA0012 airfoil at zero degree angle-of-attack, a chord-based Reynolds number of 408,000, and a Mach number of 0.115 using WMLES. We investigate the prediction of transition-to-turbulence and sound generation from the WMLES and examine its predictability compared with available experimental and DNS datasets for the same flow conditions. Verification of WMLES for such a canonical problem is crucial since it provides useful insight about the WMLES approach before using it for broadband fan noise prediction.

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