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Fluid Dynamics Prize Otto Laporte Lecture: Turbulence and Aeroacoustics

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Some significant advances obtained over the years for two closely related fields, Turbulence and Aeroacoustics, are presented. Particular focus is placed on experimental results and on physical mechanisms. For example, for a 2D channel flow, skewness factors of velocity fluctuations are discussed. The study of isotropic turbulence generated by grids in the “Velvet wind tunnel” of Stanley Corrsin, constitutes a masterpiece. Of particular note are the Eulerian memory times, analysed for all wavenumbers. Concerning hot-wire anemometry, the potential of the new constant voltage technique is presented. Some results obtained with Particle Image Velocimetry are also reported. Two flow control examples are illustrated: lift generation for a circular cylinder, and noise reduction for a high speed jet. Finally, the propagation of acoustic waves through turbulence is considered. Experimental data are here completed by numerical simulations showing the possible occurrence of caustics.