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New Trends in Aeroacoustics: From acoustic analogies to direct numerical simulations

Daniel Juvé

Ecole centrale de Lyon, 36 avenue Guy de Collongue, 69134 Ecully cedex, France

Modern aeroacoustics started in the early 50's when Lighthill developed his famous acoustic analogy in an attempt to understand, and reduce, the terrifying noise generated by jet aircrafts. For nearly 50 years the subject of aerodynamic sound was dominated by approaches based upon this analogy or variants of it. Recently, the availability of powerful computing facilities combined with the development of numerical algorithms specially designed to simulate sound propagation over large distances has paved the way for "a second golden age of aeroacoustics" (to quote Lighthill himself). In this talk we will first give an overview of this evolution from acoustic analogies to computational aeroacoustics (CAA). Typical illustrations of the CAA approach will then be presented and applications for transportation systems will be discussed.