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A hybrid method for jet noise predictions based on Large Eddy Simulation and Reynolds-Averaged Navier-Stokes simulations

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A hybrid jet noise prediction method combining steady and unsteady flow calculations is discussed. The main objective is to merge advantages of each technique to obtain a robust acoustic prediction tool, which will be able to correctly evaluate design and installation effects such as chevron nozzles or jet-pylon interaction for instance. The low-frequency component of acoustic spectra is computed using large-eddy simulations and the integral formulation derived by Ffowcs-Williams & Hawkings (1969, Phil. Trans. Roy. Soc. Lond., vol. 264). The high-frequency component associated with fine scale turbulence is obtained thanks to Tam & Auriault's mixing noise theory (1999, AIAA Journal, vol. 37) from Reynolds-Averaged Navier-Stokes simulations. The oral presentation will detail the two methods, the LES simulations for subsonic round single and coaxial jets, and the matching between the two approaches to get a complete picture of the acoustic spectra.