

ACOUSTICS2008/1084 Jet Noise Prediction Using RANS CFD input

Magdi Omais^a, Stephane Redonnet^b, Bastien Caruelle^c and Eric Manoha^b

^aAirbus / ONERA, 64 avenue de Paris, 92320 Châtillon, France

^bONERA (French aerospace Center), CFD & Aeroacoustics Department, BP 72, 29 avenue de la division
Leclerc, 92322 Chatillon Cedex, France

^cAirbus S.A.S, Department of Acoustic & Environment, 316 route de Bayonne, 31000 Toulouse, France

In the present work, a volume source model based on the SNGR approach, first proposed by Bailly, has been implemented and developed for jet noise prediction purposes. This method presenting the advantage of providing unsteady three-dimensional turbulent data from a RANS computation, it shall be compatible with industrial development processes.

First, the theoretical aspects of the original SNGR model were revisited. More particularly, analytical developments showed that considerable modifications were needed to take local flow effects into account while generating unsteady turbulent data. Moreover, the way to include anisotropy effects in the model, as originally proposed by Billson, was improved by using a non-linear extension of Boussinesq approximation to recover the local Reynolds stress tensor.

In a second step, the potentialities of the stochastic tool for jet noise simulations have been evaluated against existing numerical and experimental databases. In addition to that concern, its sensitivity to a slight modification of the RANS input data was studied.

As a last step, the possibility of accounting for high frequency dynamics in reasonable CPU times has been deeply investigated.

The main results obtained from this study show that the stochastic approach should be a promising method for future applications to industrial nozzle configurations.