

Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Reduction of shock induced noise in imperfectly expanded supersonic jets using convex optimization SAM ADHIKARI, Sysoft, Research and Development Division, Integratise Inc. — Imperfectly expanded jets generate screech noise. The imbalance between the backpressure and the exit pressure of the imperfectly expanded jets produce shock cells and expansion or compression waves from the nozzle. The instability waves and the shock cells interact to generate the screech sound. The mathematical model consists of cylindrical coordinate based full Navier-Stokes equations and large-eddy-simulation turbulence modeling. Analytical and computational analysis of the three-dimensional helical effects provide a model that relates several parameters with shock cell patterns, screech frequency and distribution of shock generation locations. Convex optimization techniques minimize the shock cell patterns and the instability waves. The objective functions are (convex) quadratic and the constraint functions are affine. In the quadratic optimization programs, minimization of the quadratic functions over a set of polyhedrons provides the optimal result. Various industry standard methods like regression analysis, distance between polyhedra, bounding variance, Markowitz optimization, and second order cone programming is used for Quadratic Optimization.

Sam Adhikari
Sysoft, Research and Development Division, Integratise Inc.

Date submitted: 07 Aug 2007

Electronic form version 1.4