Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Prediction of the noise of flow over a cylinder by direct computation and acoustic analogy[1] ALI MANI, Center for Turbulence Research, Stanford University, MENG WANG, Department of Aerospace and Mechanical Engineering, University of Notre Dame, PARVIZ MOIN, Center for Turbulence Research, Stanford University — The sound field of flow over a circular cylinder at $Re_D = 3900$ and $Ma = 0.4$ is evaluated using Large-Eddy Simulation (LES). The acoustic results computed directly from LES are compared with those obtained using an integral solution of the Ffowcs Williams-Hawkings (FW-H) equation in conjunction with the LES source field data. The modified FW-H solution is derived using a free-space Green function which accounts for the uniform mean flow and spanwise periodicity in the flow simulation. In the implementation of the FW-H solution, the cylinder surface and three porous surfaces with different distances from the cylinder are used as integration surfaces. The effect of turbulent flow structures crossing the integration boundary on the generation of artificial noise is studied. The quadrupole terms in the FW-H equation are found to be important in canceling artificial noise regardless of their physical significance. Alternative formulations of acoustic analogy that can better handle the boundary terms will be discussed.

[1]Supported by AFOSR

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Date submitted: 03 Aug 2007 Electronic form version 1.4