Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Prediction of noise generated by complex flows at low Mach number[1] YASER KHALIGHI, ALI MANI, PARVIZ MOIN, Center for Turbulence Research, Stanford University, Stanford, CA, 94305 — We present a computational aero-acoustics method to evaluate noise generated by low Mach number flow over complex configurations. This method is a hybrid approach which uses Lighthill's acoustic analogy in conjunction with source-data from an incompressible calculation. Scattering of sound waves are computed using a Boundary Element Method. This approach can be applied to flow configurations with practical complexities where turbulence interacts with arbitrary shaped solid objects. We present a validation study for sound generated by flow over a circular cylinder at $Re = 100$ and $Re = 10000$. The hybrid method is validated against directly computed noise using a high order compressible flow solver as well as solution of the Ffowcs Williams-Hawkings equation in conjunction with compressible noise sources. We concluded that the noise predicted by a 2^{nd} order hybrid approach is as accurate as directly computed noise by a 6^{th} order compressible flow solver in the low frequency range where the low order numerics can accurately resolve the flow structures.

[1]This work is supported by DOE's ASC program and NASA.

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Date submitted: 04 Aug 2008 Electronic form version 1.4