Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Bluff Body Flow Control Using Dielectric Barrier Discharge Plasma Actuators[1] FLINT THOMAS, ALEXEY KOZLOV, University of Notre Dame — The results of an experimental investigation involving the use of dielectric barrier discharge plasma actuators to control bluff body flow is presented. The motivation for the work is plasma landing gear noise control for commercial transport aircraft. For these flow control experiments, the cylinder in cross-flow is chosen for study since it represents a generic flow geometry that is similar in all essential aspects to a landing gear strut. The current work is aimed both at extending the plasma flow control concept to Reynolds numbers typical of landing approach and take-off and on the development of optimum plasma actuation strategies. The cylinder wake flow with and without actuation are documented in detail using particle image velocimetry (PIV) and constant temperature hot-wire anemometry. The experiments are performed over a Reynolds number range extending to $Re_D = 10^5$. Using either steady or unsteady plasma actuation, it is demonstrated that even at the highest Reynolds number Karman shedding is totally eliminated and turbulence levels in the wake decrease by more than 50%. By minimizing the unsteady flow separation from the cylinder and associated large-scale wake vorticity, the radiated aerodynamic noise is also reduced.

[1]Supported by NASA under NNX07AO09A.

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Date submitted: 01 Aug 2008 Electronic form version 1.4