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Large Eddy Simulations of Flow Over a Circular Cylinder Using Unstructured Grids SELIN ARADAG, KELLY COHEN, JURGEN SEIDEL, STEFAN SIEGEL, TOM MCLAUGHLIN, US Air Force Academy, Colorado Springs, CO — Three dimensional computations of the flow over a circular cylinder were performed using unstructured grids and the flow solver Cobalt. A Reynolds number of 20,000 based on the cylinder diameter was simulated using Large Eddy Simulation employing the numerical dissipation of the code as a subgrid scale model. At this Reynolds number, the attached boundary layer on the cylinder surface is laminar but the wake is fully turbulent. Iso-surfaces of vorticity show that both the large and small scale oscillations can be captured well with the method. The results were compared to the experimental results in literature in terms of time-averaged drag coefficient, Strouhal number, length of vortex formation region, velocity profiles and surface pressure distribution. Experiments will also be performed and the time-dependent flowfield, as well as full flow field and surface Proper Orthogonal Decomposition (POD) of both results will be compared. The ultimate aim of this study is to control the Karman Vortex street at the wake of the cylinder at high Reynolds numbers which causes a sharp rise in drag, noise and fluid-induced vibration. The results of the computations and experiments will be used in the modeling of closed loop flow control using POD and Artificial Neural Networks (ANN).

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