Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Numerical Study of the Formation and Interaction of Concentric Vortex Rings[1] VAHID SADRI, PAUL S. KRUEGER, SMU — Transient flow between concentric cylinders produces concentric opposite signed vortex rings, which exhibit a range of interesting behavior. Concentric vortex–ring interaction was studied numerically to determine the effects of cylinder gap ratio ($\Delta D/D$) and jet stroke length-to-gap ratio ($L/\Delta D$) on the evolution of the vorticity and the trajectories of the resulting vortex pair. The flow was simulated at a jet Reynolds number of 2,000, $L/\Delta D$ in the range 1–15, and $\Delta D/D$ in the range 0.05–0.25. The results showed that the position of the vortices relative to each other during the formation phase played an important role in the trajectories of the vorticity centroids at later time. In particular, the vortex pair did not separate during the simulation period when the gap size was less than 0.1 and $L/\Delta D$ was larger than 5. In the case that $\Delta D/D$ was smaller than 0.1 and $L/\Delta D$ was less than 5, the stopping vortices disturbed the orientation of the vortex pair and affected the evolution of the flow at later time. The general behavior of the vortex trajectories was categorized with respect to the generator parameters ($L/\Delta D$, $\Delta D/D$).

[1]This material is based upon work supported by the National Science Foundation under Grant No. 1133876

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Date submitted: 30 Jul 2014 Electronic form version 1.4