Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Trajectories of Vortex Rings Formed from Tube and Orifice Openings at Small Stroke Ratios[1] PAUL S. KRUEGER, SMU — The sudden ejection of a jet of slug length L and diameter D from a tube or orifice opening engenders the formation of a vortex ring for $L/D \sim 1$. For a vortex ring close to the tube/orifice exit at jet termination ($L/D << 1$), the results of Sheffield (*Phys. Fluids*, **20**, 1977) suggest the vortex ring will travel back into the generator. Sheffield, however, only considered 2D (planar) flows and did not consider the vortex formation process. In the present investigation, $L/D << 1$ behavior is studied computationally for tube and orifice openings at a jet Reynolds number of 2000 and $0.02 < L/D < 2.0$. In all cases, the formation of a vortex ring is observed and it does not propagate back into the generator. A stopping vortex is also generated at jet termination. As L/D decreases, the stopping and primary vortices become more closely spaced at jet termination and strongly influence each other. In the case of the tube configuration, the stopping vortex is drawn out of the generator for $L/D < 0.1$. For the orifice configuration, the two vortices convect toward the axis for $L/D < 0.1$, but diverge as the axis is approached.

[1]This work is supported by NSF grant CTS 0347958.

Paul S. Krueger
SMU

Date submitted: 04 Aug 2005 Electronic form version 1.4