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Experimental Investigation of Vortex Ring Evolution at Low Reynolds Number[1] LAUREN COUCH, PAUL KRUEGER, Southern Methodist University — Evolution of low Reynolds number vortex rings in an infinite fluid has been well studied numerically and analytically, but the vortex formation process is typically ignored in these studies. In the present investigation, vortex rings were studied experimentally to determine the effects of formation conditions on vortex ring evolution as Reynolds number is decreased. Vortex rings were generated using a mechanical piston-cylinder vortex ring generator for jet Reynolds numbers in the range 10 to 1000 and piston stroke to jet diameter ratios between 0.5 to 2.0. The vortex rings were imaged using planar laser induced fluorescence and using dye visualization, both recorded with a digital camera. The images were used to obtain the vortex ring velocity and net displacement. The results show increased ring velocity and displacement with higher stroke ratios. Additionally, lower Reynolds numbers resulted in quicker deceleration and decreased maximum displacement. The experimental results will be compared with analytical models of viscous vortex rings traveling in an infinite fluid.

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