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Trajectory of an Elliptic Vortex Ring DEEPAK ADHIKARI, TEE TAI LIM, National University of Singapore — An elliptic vortex ring is known to be unstable due to its oscillatory deformation while propagating. It oscillates periodically at low aspect ratios, but deforms and breaks up into two smaller rings at high aspect ratios. Although studies on elliptic vortex rings have been conducted before, certain aspects of the vortex ring behavior remain unclear; in particular the influence of Reynolds number on their trajectories. Moreover, most of the earlier experimental studies were conducted using flow visualization techniques, which provide only qualitative description on the motion of elliptic vortex rings and not their velocity and vorticity fields. In the present investigation, we focus our attention on the vorticity field during various stages of the vortex ring deformation; particularly the effect of Reynolds number and aspect ratio on the vortex ring trajectory. Experiments are conducted in a water tank using elliptic nozzles of aspect ratios 1, 2 and 3. Obviously, the nozzle aspect ratio of 1 represents a circular nozzle, and the results are included here for comparison. Preliminary results show that the trajectory of elliptic vortex ring of aspect ratio 2 is insensitive to changes in the Reynolds numbers, but this is not the case with the aspect ratio 3, where noticeable deviation of the trajectory at lower Reynolds numbers is observed. The cause of this deviation and its implication will be discussed.

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