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Entrainment in interacting vortex rings RAMMAH SHAMI, BHARATHRAM GANAPATHISUBRAMANI, Department of Aerodynamics and Flight Mechanics, University of Southampton — The efficiency of entrainment in single vortex rings has been examined by various studies in the literature. These studies have shown that this efficiency is greatly increased for smaller stroke-time to nozzle-diameter ratios, L/D. However, no clear consensus exists regarding the effect on the entrainment process for the sectioned delivery of the vortex forming impulse. In the present work the entrainment mechanism associated with the interaction between two co-axially separated vortex rings is explored. Planar, time-resolved particle image velocimetry (PIV) measurements are taken of a interacting vortex flow field. Lagrangian coherent structures (LCS) extracted from the finite-time Lyapunov exponent (FTLE) fields are employed to determine the vortex boundaries of the interacting rings and is then used to measure entrainment. Preliminary results indicate that whilst the most efficient entrainment of ambient fluid by the ring pairs occurs at larger separations, the rate and overall mass transport increase can be controlled by altering the spatial/temporal separation between successive rings and is higher at smaller ring spacing. Variation in mass transport behaviour for different ring strengths (L/D) and Reynolds numbers will also be discussed.

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