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Vortex Ring Interaction with a Permeable Flat Surface.[1] CHRISTIAN NAAKTGEBOREN, ALI B. OLCAY, PAUL S. KRUEGER, JOSÉ L. LAGE, Southern Methodist University — The interaction of vortex rings impinging on a permeable flat surface oriented normal to the ring motion is experimentally investigated. The vortex rings are formed using a piston-cylinder mechanism and visualized by laser induced fluorescence (LIF). Flow features such as the primary vortex ring trajectory, the formation of secondary vortices, flow separation, and mixing are observed for different jet Reynolds number and piston stroke-to-diameter ratios. Results show flow features similar to those observed during the interaction of a vortex ring with an impermeable flat surface—such as spreading of the primary ring as it approaches the surface and the appearance of a counter-rotating secondary vortex. Several new features are also observed, such as the emergence of an axisymmetric vortex ring on the back side of the permeable surface (having less momentum than the primary ring) and the entrainment of ambient fluid across the permeable surface.

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