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Experimental Study of Shock-Induced Compression and Vortex Generation in the Shock-Bubble Interaction DEVESH RANJAN, BRADLEY MOTL, JOHN NIEDERHAUS, JASON OAKLEY, MARK ANDERSON, RICCARDO BONAZZA, University of Wisconsin-Madison, JEFFREY GREENOUGH, Lawrence Livermore National Laboratory — Results are presented from experiments studying the interaction of a planar shock wave of strength $1.4 < M < 3.0$ with a spherical soap bubble composed of helium. Experiments are performed in a 9.2-m-long vertical shock tube with a square internal cross-section, 0.254 m on a side, equipped with a pneumatically driven retracting bubble injector. The absence of a bubble holder during shock wave passage allows for a cleaner initial condition while avoiding complications associated with holder/shock interaction. As the planar shock passes over the bubble, the intense vortical and nonlinear acoustic phenomena characterized initially by Haas and Sturtevant (*J. Fluid. Mech.*, 1987) are observed, including vortex ring formation, intense mixing, and growth of turbulence-like features. Flow visualizations are obtained using planar laser diagnostics rather than integral measures. The origin and growth of distinctive counter-rotating secondary vortical features are observed in high Mach number experiments. A number of features of the shock bubble interaction are investigated and parameterized with the incident M and the initial density difference. These include the axial and lateral extents of the bubble, the translational velocity of the bubble and associated vortex rings, and the circulation of the vortex rings.

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