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# Strong Shock–Vortex Interaction – a Numerical Study

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The intersection of a longitudinal vortex by a normal shock is studied with a numerical solution of the Euler and Navier–Stokes equations for time-dependent, three-dimensional, laminar flow. Earlier investigations of the shock–vortex interaction problem were mainly focussed on the generation of vortices by moving shocks. The present study is concerned with the destruction of the vortex core, usually referred to as vortex breakdown or bursting, by letting the shock intersect the vortex normal to its axis. The pressure rise across the shock decelerates the oncoming supersonic axial flow to subsonic flow and enforces a redistribution of vorticity. A stagnation point is formed downstream from the shock and the swirling motion is locally stopped. The flow exhibits periodic fluctuations, resulting from vortex shedding from the burst part of the vortex. Results are presented for a free-stream Mach number $Ma_\infty = 1.6$, with a longitudinal Burgers vortex as inflow condition. The calculations were performed on a Cartesian mesh with approximately 2 millions grid points. The computations show noticeable differences between the two solutions, and viscous forces become important in the burst part of the vortex. Visualization studies clearly reveal the time-dependent, three-dimensional nature of the flow after breakdown.

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