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Large eddy simulation of a vortex ring impinging on a bump XI-YUN LU, HENG REN, University of Science and Technology of China — Large eddy simulation of a vortex ring impacting a three-dimensional bump has been carried out for different bump heights and vortex core thicknesses related to thin and thick vortex rings. Various fundamental mechanisms dictating the flow behaviors, including the dynamics and instability of vortex ring, the evolution of vortical structures, and the flow transition from laminar to turbulent state, have been studied systematically. Based on the analysis of the evolution of vortical structures, the formations of loop-like vortices wrapping around the primary and secondary vortex rings and the hair-pin vortices due to the severe distortion of the secondary ring are investigated. The circulation of the vortex ring reasonably elucidates some typical phases of flow evolution. Further, the analysis of turbulent kinetic energy reveals the transition from laminar to turbulent state.

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