Boundary Layer Transition on Elliptic Cones in Hypersonic Flow[1]

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— We are studying transition to turbulence at hypersonic conditions using a combination of parabolized stability equations and direct numerical simulations. In this work we perform DNS of acoustic disturbances interacting with the Mach 8 flow over a 4:1 elliptic cross-section cone to model the experiments of Huntley and Smits (2000). A fourth-order accurate low-dissipation numerical method is used, with large-scale body-fitted grids to obtain accurate results. A spectrum of planar random phase acoustic disturbances are introduced in the free-stream with amplitudes consistent with experiment. We observe instability growth and non-linear behavior similar to that observed in the filter Rayleigh scattering flow visualization taken at Princeton.

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