Induced Shock Wave / Laminar Boundary Layer Interaction

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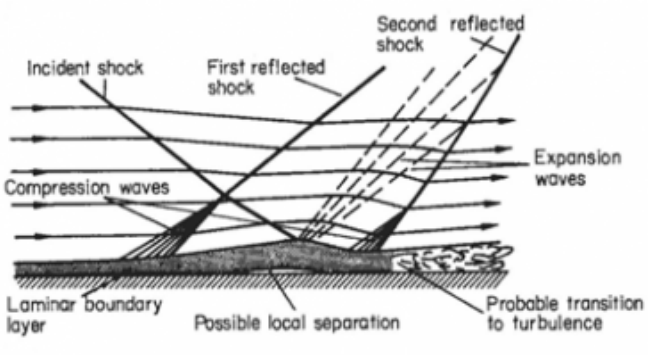
ABSTRACT

This computational study focuses on shock wave-laminar boundary layer interaction mechanism on a flat plate. We conduct a parametric study to understand the shock induced separation by letting a planar shock to impinge on a laminar boundary layer at various angles systematically. We quantify the strengths of the resulting shocks, separation and reattachments shock waves as well as the size of the separation bubble forming on the flat plate. We classify the resulting flows in terms of their physics and check steadiness and two dimensionalities of the flows by performing additional computations. We use structured meshes consisting of hexahedral elements in the computations and inquire mesh independency by doubling mesh size in vertical and horizontal directions. We perform all the computations by using an open source compressible Navier-Stokes solver based on finite volume method. The solver, rhoCentralFoam is a density-based compressible flow solver based on central-upwind schemes of Kurganov and Tadmor. It is first and second order accurate in time and space, respectively. We will compare the obtained results with the experiments available in literature to assess the modelling capability of the solver.



Shock wave laminar boundary layer interaction (SWBLI) [Houghton et al., 2012]

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