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Accelerated Transonic Flow past a curvature discontinuity THOMAS DE COINTET, ANATOLY RUBAN, Imperial College London — The aim of this talk is to investigate High Reynolds number Transonic flow past a discontinuity in body curvature. Starting with the inviscid flow outside the boundary layer, our analysis will focus on the flow in a vicinity of the point of discontinuity, where a solution of the Euler equations will be sought in self-similar form. This reduces the Euler equations to an ordinary differential equation. The analysis of this equation shows that the pressure gradient on the airfoil surface develops a strong singularity, which is proportional to $(x_0 - x)^{-1/3}$ as the discontinuity point x_0 is approached. We then study the response of the boundary layer to this extremely favourable pressure gradient. We show that the boundary layer splits into two parts, the main body of the boundary layer that becomes inviscid on approach to the singularity, and a thin viscous sublayer situated near the wall. The analysis of the behaviour of the solution in the viscous sublayer shows that Prandtl's hierarchical concept breaks down in a small region surrounding the singular point, where the viscous-inviscid interaction model should be used. In the final part of this talk we present a full formulation of the viscous-inviscid interaction problem and discuss numerical results.

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