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Shock-wave boundary layer interactions in an engine intake with a spectral/hp element method.[1] GIACOMO CASTIGLIONI, FRANCESCO MONTOMOLI, SPENCER J. SHERWIN, Imperial College London — During take off and climbing, i.e. at high angle of attack and high mass flow rate through the engine, the flow on the upper surface of a nacelle bottom lip can develop a region of supersonic flow. The supersonic pocket terminates with a near normal shock-wave which interacts with the incoming boundary layer leading to a shock-wave boundary layer interaction (SWBLI). The aim is to assess the capability of discountinous Galerkin spectral element methods in conjunction with an artificial viscosity shock capturing method to predict the onset of SWBLI unsteadiness in complex geometries relevant to industrial applications. Here it is simulated an experimental rig recently investigated by Coschignano *et al.* The rig is designed around a section of the bottom dead center of a real 3D intake lip; the geometry downstream of the lip is arbitrary and resembles that of an airfoil. Under resolved direct numerical simulations are performed at design conditions which are characterized by an angle of incidence of 23 deg and a free stream Mach number $Ma = 0.435$ resulting in a closed, shock-induced, boundary layer separation; the Reynolds number based on lip thickness overlaps the lowest one available experimentally ($Re_L = 4 \times 10^5$).

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