

Abstract Submitted
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Transition to Turbulence and Heat-Transfer Overshoot in an Adverse Pressure Gradient High-Speed Boundary Layer¹ KENNETH FRANKO, SANJIVA LELE, Stanford University, STANFORD UNIVERSITY TEAM — Spatial direct numerical simulations (DNS) of transitional high-speed boundary layers with zero and adverse pressure gradients and an isothermal wall are presented for different transition scenarios. The maximum momentum thickness Reynolds numbers vary between 2500 and 5500 and the edge Mach numbers vary between 6 and 4.8 for the different cases presented. Disturbances are introduced into the initially laminar boundary layer through suction and blowing at the wall. Different transition scenarios including first mode oblique breakdown and second mode fundamental resonance are explored. The presence of an adverse pressure gradient accelerates the transition process. Comparisons of the nonlinear modal growth and breakdown for the different initial forcing scenarios will be shown. First mode oblique breakdown is shown to lead to an overshoot in heat transfer and the most rapid development to a turbulent state.

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