

Abstract Submitted
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Design and Validation of a Constant Wall Temperature Plate

DRUMMOND BILES, ALIREZA EBADI, ALLEN MA, CHRIS WHITE, Univ of New Hampshire — A thermally conductive constant temperature wall-plate has been constructed and wind tunnel validation tests of the wall-plate design have been performed. The wall-plate is a sectioned wall design, where each section is independently heated and controlled. Each section consists of an aluminum 6061 plate, an array of resistive heaters affixed to the bottom of the aluminum plate, and a calcium silicate holder used for thermal isolation. A 3×3 grid of embedded thermocouples in each aluminum plate are used to monitor wall temperature and for feedback control of wall heating. The streamwise (flow direction) length of each section increases with downstream position since the wall heat flux decreases with downstream position. The section components sit in a Delrin (acetal) frame, chosen for its low thermal conductivity and machinability. The wall-plate will be used to investigate thermal transport in non-equilibrium boundary layer flows. In this talk, we report on the validation tests performed to-date to investigate the aerodynamic and thermal performance of the wall-plate, and the capability of the controller to maintain the wall-plate at a pre-selected fixed temperature in steady and unsteady laminar boundary layer flow.

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