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Separation Control in a Centrifugal Bend Using Plasma Actuators MICHAEL ARTHUR, THOMAS CORKE, University of Notre Dame — An experiment and CFD simulation are presented to examine the use of plasma actuators to control flow separation in a 2-D channel with a 135° inside-bend that is intended to represent a centrifugal bend in a gas turbine engine. The design inlet conditions are $P = 330\,\text{psia.}$, $T = 1100°\text{F}$, and $M = 0.24$. For these conditions, the flow separates on the inside radius of the bend. A CFD simulation was used to determine the location of the flow separation, and the conditions (location and voltage) of a plasma actuator that was needed to keep the flow attached. The plasma actuator body force model used in the simulation was updated to include the effect of high-pressure operation. An experiment was used to validate the simulation and to further investigate the effect of inlet pressure and Mach number on the flow separation control. This involved a transient high-pressure blow-down facility. The flow field is documented using an array of static pressure taps in the channel outside-radius side wall, and a rake of total pressure probes at the exit of the bend. The results as well as the pressure effect on the plasma actuators are presented.

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