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Control of High-Speed Spray Flows Using a Steady, Parallel Control Flow Under the Influence of the Coanda Effect DUSTIN ALLEN, BARTON SMITH, Utah State University — An experimental demonstration of a jet vectoring technique used in our novel spray device called a Coanda-assisted Spray Manipulation (CSM) nozzle is presented. The CSM makes use of a Coanda-like effect on axisymmetric geometries through the interaction of a high volume-flow primary jet flowing through the center of a collar and a secondary high-momentum jet parallel to the first and adjacent to a convex collar. The control jet attaches to the convex wall and vectors due to the Coanda effect, entraining and vectoring the primary jet, resulting in controllable r-theta directional spraying. Various annular secondary exit holes and curved wall radii were tested over a range of momentum flux ratios to study the effects of these variables on the vectored jet angle. Particle Image Velocimetry (PIV) was used to determine the vectoring angle and the profile of the primary jet in each experiment. The experiments show that the secondary exit hole size and curve wall radius, along with the momentum ratios of the two jets predominantly affect the vectoring angle of the primary jet. Also, the jet profile is largely unchanged with vectoring for high velocity flows, which is important for the thermal spray applications for which CSM will be used.

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