Abstract Submitted
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Interaction of a Crossflowing Jet with a Downstream Fin on a Full-Scale Flight Vehicle Configuration STEVEN BERESH, Sandia National Laboratories — Stereoscopic particle image velocimetry data have been acquired for studying jet/fin interaction created by exhaust plumes from spin rockets on a full-scale model of a finned body of revolution. Crossplane measurements just upstream of the leading edge of the fin root display the counter-rotating vortex pair that dominates the far-field of the interaction and the remnant of the horseshoe vortex near the vehicle surface. Velocity fields measured over a range of flow conditions and model orientations show that the vortex of negative sign is always closer to the fins than its positive counterpart and does not greatly change location as flow parameters are altered. The circulation of this vortex correlates with a reduction in the simultaneously-measured vehicle roll torque. Further correlations are hindered by untreatable bias errors in the velocimetry. Instead, a model of the vortex structure derived from the velocimetry data reveals that the angle of attack induced upon the fins by the counter-rotating vortex pair correlates with the roll torque loss. Similar correlations suggest that in level flight this effect is dominant, but at angle of attack the horseshoe vortex on the windward side has an additional influence.

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