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Meander of a Fin Trailing Vortex Measured using Particle Image Velocimetry STEVEN BERESH, JOHN HENFLING, RUSSELL SPILLERS, Sandia National Laboratories — The trailing vortex shed from a tapered fin installed on a wind tunnel wall was studied using stereoscopic particle image velocimetry in the crossplane to investigate the low-frequency meander of the vortex, with data acquired at several locations downstream of the fin trailing edge for multiple fin angles of attack at Mach 0.8. Analysis shows that the meander amplitude increases with downstream distance and decreases with vortex strength, consistent with previous studies indicating that meander is induced by an influence external to the vortex itself. Instantaneous vector fields reveal that the turbulence originating in the boundary layer on the nearby wind tunnel wall is lifted and drawn towards the vortex core, suggesting that this wall turbulence may contribute to the vortex meander. This was confirmed by energizing the incoming boundary layer using low-profile vortex generators and observing a substantial increase in the meander amplitude. These results demonstrate that for low-aspect-ratio lifting surfaces in proximity to a wall, such as missile fins, vortex meander results from the wall boundary layer turbulence as well as known sources such as turbulence from the wind tunnel freestream or the lifting surface wake.

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