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Vorticity confinement technique for drag prediction ALEX POVITSKY, TROY SNYDER, University of Akron — This work couples wake-integral drag prediction and vorticity confinement technique (VC) for the improved prediction of drag from CFD simulations. Induced drag computations of a thin wing are shown to be more accurate than the more widespread method of surface pressure integration when compared to theoretical lifting-line value. Furthermore, the VC method improves trailing vortex preservation and counteracts the shift from induced drag to numerical entropy drag with increasing distance of Trefftz plane downstream of the wing. Accurate induced drag prediction via the surface integration of pressure barring a sufficiently refined surface grid and increased computation time. Furthermore, the alternative wake-integral technique for drag prediction suffers from numerical dissipation. VC is shown to control the numerical dissipation with very modest computational overhead. The 2-D research code is used to test specific formulations of the VC body force terms and illustrate the computational efficiency of the method compared to a "brute force" reduction in spatial step size. For the 3-D wing simulation, ANSYS FLUENT is employed with the VC body force terms added to the solver with user-defined functions (UDFs). VC is successfully implemented to highly unsteady flows typical for Micro Air Vehicles (MAV) producing oscillative drag force either by natural vortex shedding at high angles of attack or by flapping wing motion.

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