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Stability Characteristics of Low Reynolds Number, Low Aspect Ratio Wings MATTHEW SHIELDS, University of Colorado at Boulder, KAMRAN MOHSENI, University of Coloradoat Boulder — The recent interest in Micro Aerial Vehicles (MAVs) has led to the development of many different aircraft; however, little progress has been made in understanding the physics of MAV flow. MAVs aerodynamics is affected by low Reynolds number flow and low aspect ratios. As a result nonlinear effects due to tip vortices are quite important. We have developed a new experimental setup for measuring stability derivatives in a small wind tunnel. Using a four degree of freedom actuation system, a model can be placed in the test section and maneuvered in such a way to isolate the flow components responsible for creating stability derivatives. Accurate measurements of the aerodynamic loading can then be used to compute these values. Initial testing was conducted primarily on a series of flat plates of different aspect ratios. In addition, the CU MAV was tested as a specific case study. Test results indicate that some of the cross coupled stability derivatives, ignored for larger aircrafts, are on the same order of magnitude as standard derivatives and thus can not be ignored in the derivation of the linear equations of motion for a micro aerial vehicle. As a result, a more general set of equations of motion are derived based upon experimentally obtained stability derivatives.

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