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**Effects of fluid behavior around low aspect ratio, low Reynolds number wings on aerodynamic stability** MATTHEW SHIELDS, KAMRAN MOHSENI, University of Florida — The innovation of micro aerial vehicles (MAVs) has brought to attention the unique flow regime associated with low aspect ratio (LAR), low Reynolds number fliers. The dominant effects of developing tip vortices and leading edge vortices create a fundamentally different flow regime than that of conventional aircraft. An improved knowledge of low aspect ratio, low Reynolds number aerodynamics can be greatly beneficial for future MAV design. A little investigated but vital aspect of LAR aerodynamics is the behavior of the fluid as the wing yaws. Flow visualization experiments undertaken in the group for the canonical case of varying AR flat plates indicate that the propagation of the tip vortex keeps the flow attached over the upstream portion of the wing, while the downstream vortex is convected away from the wing. This induces asymmetric, destabilizing loading on the wing which has been observed to adversely affect MAV flight. In addition, experimental load measurements indicate significant nonlinearities in forces and moments which can be attributed to the development and propagation of these vortical structures. A non-dimensional analysis of the rigid body equations of motion indicates that these nonlinearities create dependencies which dramatically change the conventional linearization process. These flow phenomena are investigated with intent to apply to future MAV design.

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