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Low-Reynolds-number vortex dynamics around moving wings RYAN JANTZEN, KUNIHIKO TAIRA, Florida State University, MICHAEL OL, KENNETH GRANLUND, U.S. Air Force Research Lab — The focus for the present research is to investigate the fundamental flow physics around low-aspect-ratio flat-plate wings undergoing pitching and surging motions. Numerical simulations performed with the immersed boundary projection method are used to investigate the three-dimensionality of the low-Reynolds-number flow around these wings. Of particular interest is the influence of wing motion on the formation of the leading-edge, trailing-edge, and tip vortices. To determine the relationship that these pure motions have on the formation of these vortices, we vary the aspect ratio, pitching rate, and pivot-point location. The spanwise variation in the roll-up of the leading and trailing-edge vortices under the influence of tip effects is analyzed. The aerodynamic forces generated during these unsteady wing motions will be compared to force measurements obtained from moderate-Reynolds-number towing tank experiments. A further understanding of the underlying flow physics for these idealized motions is necessary in order to understand more complex wing maneuvers.

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