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A Panel-Particle Method for Studies of Maneuvering Aircraft Formations MAZIAR HEMATI, JEFF D. ELDREDGE, Mechanical and Aerospace Engineering, University of California, Los Angeles — It is well established that flying a set of aircraft in formation leads to improvements in overall aerodynamic efficiency through the reduction of induced drag. Though many efforts have been made on controlling and optimizing such formations, these analyses have traditionally been restricted to quasi-steady aerodynamic models with flat wakes. Such models, though insightful, fail to capture essential wake dynamics during maneuvers. Here, a hybrid panel-particle method is presented to introduce unsteady wake effects in the study of formation flight systems. A fast-multipole algorithm is used for numerical speed-up. This approach is less computationally expensive than high-fidelity CFD, but is still able to capture essential wake physics lacking in quasi-steady approaches. Moreover, the representation of the wake as vortex particles allows for studies of wake-body interactions to be handled with greater ease. This presentation will introduce the method and demonstrate its merits in simulating single and multiple aircraft undergoing maneuvers.

Maziar Hemati
Mechanical and Aerospace Engineering,
University of California, Los Angeles

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