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Identifying Sources of Lift Production on Rapidly Pitching Trailing Edge Flaps PETER MANCINI, ANYA JONES, Univ of Maryland-College Park, MICHAEL OL, AFRL — Recent work has delved into the design and quantification of the aerodynamic response of large trailing edge flaps. Ultimately, these flaps would be used as a control mechanism to provide an immediate aerodynamic response to the vehicle, e.g. in the event of a gust encounter. The present work explores the individual sources and contributions of lift in the case of a large, rapidly pitching trailing edge flap. The flap is 50% of the chord length, and thus produces large acceleration and pitch rate terms that dominate the lift production. In the experiment and simulations presented here, the front element remains fixed at a constant angle of attack, while the rear element pitches to a final incidence angle, which in this study ranges from 5 degrees to 40 degrees. Although the front element does not pitch throughout the motion, it is important to consider the time history of the lift distribution on that wing section and assess whether the rapid pitching of the aft element affects the forces experienced on the stationary front element. These results are then used to suggest a simplified method for predicting lift production of a wing with a large trailing flap.

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