

Abstract Submitted  
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**Wing-Fixed PIV and force measurements of a large transverse gust encounter** GINO PERROTTA, Univ of Maryland-College Park — The unsteady aerodynamics of an aspect ratio 4 flat plate wing encountering a large-amplitude transverse gust were investigated using PIV in the wing-fixed reference frame and direct unsteady force measurements. Using a new experimental facility at the University of Maryland, the wing was towed at Reynolds number 20,000 through a 7m-long tank of nominally quiescent water containing a single cross-stream planar jet with velocity equal to the wing's towed velocity - a transverse gust ratio equal to one. The planar jet was created by pumping water through 30 cylindrical nozzles arranged in a single row. PIV confirms that the individual jets converge into a single, narrow, planar gust with a streamwise velocity profile resembling a canonical cosine-squared gust. Forces and fluid velocities of this wing-gust interaction will be presented for two pre-gust conditions: attached flow on the wing and stalled flow over the wing. In both cases, the gust encounter results in a momentary spike in lift coefficient. The peak lift coefficient was measured between 3 and 6 and varies with angle of attack. At low angle of attack, the attached flow wing produces less lift before the gust and much more (non-circulatory) lift during the gust than the stalled wing. Although the flow over the wing at low angle of attack separates during the gust and reattaches afterwards, the recovery time is similar to that of the high angle case, on the order of 10 chord lengths travelled.

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