

Abstract Submitted
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Novel Design for a Wind Tunnel Vertical Gust Generator

ZACHARY SMITH, ANYA JONES, Univ of Maryland-College Park, JOHN HRYNUK, Army Research Labs — Gust response of MAVs is a fundamental problem for flight stability and control of such aircraft. Current knowledge about the gust response of these vehicles is limited and gust interaction often results in damage to vehicles. Studying isolated gust effects on simple airfoil models in a controlled environment is a necessity for the further development of MAV control laws. Gusts have typically been generated by oscillating an airfoil causing the shedding of vortices to propagate through the system. While effective, this method provides only a transient up and downdraft behavior with small changes in angle of attack, not suitable for studying MAV scale gust interactions. To study these interactions, a gust that creates a change in flow angle larger than the static stall angle of typical airfoils was developed. This work was done in a low speed, low turbulence wind tunnel at base operating speed of 1.5 m/s, generating a Reynolds number of 12,000 on a NACA 0012 wing. It describes the fundamental mechanisms of how this gust was generated and the results obtained from the gust generator. The gust, which can alter the flow field in less than 1 second, was characterized using PIV and the interactions with a stationary airfoil at several angles of attack are evaluated.

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