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Effect of gust on force generation around a robotic hummingbird wing[1] ELOY MARQUEZ, RUIJUN TIAN, FANGJUN SHU, New Mexico State University — Among the computational, theoretical and experimental studies on the high efficiency flapping flight, many are focused on the mystery of hovering. Most of these studies were conducted under steady in flow conditions. However, real-life ornithopters in the field have to routinely tackle gust and directional changes of the wind. These sudden perturbations could produce significant effect on humming bird hovering due to the small Reynolds numbers. Our experimental work was performed in a water channel using a two degree-of-freedom humming bird model. The dynamic response of the hovering motion to gust from different directions was investigated. PIV was used to measure the effect of the gust on the surrounding flow field including vortex evolution. In addition, a six-component force/torque sensor was used to measure the real-time lift and drag forces generated by the wing with and without gust. Results show that gust changes the magnitude of lift force in one stroke. However, the time-averaged lift force keeps approximately constant.

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