Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

How birds can negate gusts and maintain heading by crabbing into the wind passively[1] DANIEL QUINN, University of Virginia, DANIEL KRESS, ANDREA STEIN, MICHAL WEGRZYNSKI, LATIFAH HAMZAH, DAVID LENTINK, Stanford University — Everyday observations show birds flying stably in strong lateral gusts in which aerial robots cannot operate reliably. However, the mechanisms that birds use to negate lateral gusts are unknown. Therefore, we studied the motions of lovebirds as they flew through strong gusts in a long mesh corridor. The corridor was painted to simulate a forest (vertical stripes), a lake (horizontal stripe), and a cave (dark with a small light at the end). Fan arrays outside the corridor imposed three wind conditions: still air, a uniform gust, and wind shear. We found that lovebirds consistently yaw their body into the wind direction, crabbing like a fixed-wing aircraft, while keeping their head oriented towards the landing perch, unlike aircraft. These results were the same for all three visual conditions, showing how lovebirds can even negate gusts in the dark with a faint point source as a target. Because the naive birds had never experienced gusts before, the gust mitigation behavior is innate. Motivated by these observations, we developed a physical model that shows how yaw corrections can be passive in flapping flight. Our model offers a foundation for understanding wind negation in birds and other flying animals and offers inspiration for aerial robots that are more robust to gusts.

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Date submitted: 25 Sep 2017 Electronic form version 1.4