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Sideways flight of insects by phased wing flips LEIF RISTROPH, GORDON BERMAN, ATTILA BERGOU, Z. JANE WANG, ITAI COHEN, Cornell University — Insects are enviable flyers and are capable of unusual maneuvers, such as sideways flight. We show that fruit flies generate sideways forces in flight, and we propose an aerodynamic mechanism that takes advantage of the unique features of flapping flight. Specifically, flies induce asymmetries between the right and left wing angles of attack just as the wings rapidly flip over, and this leads to unbalanced drag forces that contribute to the lateral force. Remarkably, these delicate asymmetries can be simply induced by flipping each wing at slightly different times. We measure that fruit flies use wing rotation timing differences of around 1 millisecond while undergoing a half g lateral acceleration.

Leif Ristroph
Cornell University

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