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The importance of being top-heavy: Intrinsic stability of flapping flight LEIF RISTROPH, New York University, BIN LIU, Brown University, JUN ZHANG, New York University — We explore the stability of flapping flight in a model system that consists of a pyramid-shaped object that freely hovers in a vertically oscillating airflow. Such a "bug" not only generates sufficient aerodynamic force to keep aloft but also robustly maintains balance during free-flight. Flow visualization reveals that both weight support and intrinsic stability result from the periodic shedding of dipolar vortices. Counter-intuitively, the observed pattern of vortex shedding suggests that stability requires a high center-of-mass, which we verify by comparing the performance of top- and bottom-heavy bugs. Finally, we visit a zoo of other flapping flyers, including Mary Poppins' umbrella, a flying saucer or UFO, and Da Vinci's helicopter.

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