**Micro-aerial robots powered by soft artificial muscles**

Flying insects capable of navigating in highly cluttered natural environments can withstand inflight collisions because of the combination of their low inertia and the resilience of their wings, exoskeletons, and muscles. Current insect-scale (<10 cm, <5 g) aerial robots use rigid microscale actuators, which are typically fragile under external impact. Towards improving collision robustness of micro-aerial robots, we develop the first heavier-than-air aerial robots powered by soft artificial muscles that demonstrate open-loop, passively stable ascending flight as well as closed-loop, hovering flight. First, we design and fabricate lightweight (0.1 g), power-dense (600 W/kg), and high bandwidth (500 Hz) dielectric elastomer actuators (DEA) to drive the robots. Second, we increase actuator output mechanical power and improve its control authority by addressing challenges unique to soft actuators, such as nonlinear transduction and dynamic buckling. Third, we demonstrate our robot can both achieve controlled hovering flight and passive inflight collision recovery. Our work demonstrates how soft actuators can achieve sufficient power density and bandwidth to enable controlled flight, illustrating the vast potential of developing next-generation agile soft robots.