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Shape matters: improved flight in tapered auto-rotating wings YUCEN LIU, LIONEL VINCENT, EVA KANSO, University of Southern California — Many plants use gravity and wind to disperse their seeds. The shape of seed pods influence their aerodynamics. For example, Liana seeds form aerodynamic gliders and Sycamore trees release airborne helicopters. Here, we use carefully-controlled experiments and high-speed photography to examine dispersion by tumbling (autorotation) and we focus on the effect of geometry on flight characteristics. We consider four families of shapes: rectangular, elliptic, tapered, and sharp-tip wings, and we vary the span-to-chord ratio. We find that tapered wings exhibit extended flight time and range, that is, better performance. A quasi-steady two-dimensional model is used to highlight the mechanisms by which shape affects flight performance. These findings could have significant implications on linking seedpod designs to seed dispersion patterns as well as on optimizing wing design in active flight problems.

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