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Hovering of a free rigid pyramid in an oscillatory air flow BIN LIU, NYU, BRENDAN FOLIE, HMC, ANNIE WEATHERS, JUN ZHANG, STEPHEN CHILDRESS, NYU — We investigate the dynamics of free rigid bodies when moving in an oscillating background flow. Given a pyramid-shaped object, the fluid drag due to a downward flow and an upward flow around the body differ when the inertia of the air flow is relevant. We find that when the amplitude of the air flow is above a threshold, the net lift on the pyramid overcomes its weight. The body then starts to hover, despite the fact that the air flow has no upward or downward preference. The threshold amplitude of the oscillating air depends on the weight of the rigid object and its geometric anisotropy. We show that at a given frequency there is an optimal shape of the pyramid, such that hovering occurs at minimal amplitude of the flow.

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