

Abstract Submitted
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Low Reynolds Number Drag Alteration Inspired by Butterfly Scales¹ BRENT LAFORTE, COURTNEY KRONENBERGER, AMY LANG, University of Alabama — Biomimetics is the process of looking towards nature's adaptations for answers to today's engineering obstacles. An age-old engineering dilemma is trying to find new methods to reduce the amount of drag over a body. This research finds inspiration from butterfly scales which are hypothesized to alter surface friction over the wings. Drop testing was performed on axisymmetric, streamlined, teardrop models which were rapid-prototyped such that the surface was covered with either streamwise or transverse cavities modeled after the Monarch butterfly. The drop tank contained silicone oil with a viscosity two hundred times that of water insuring flow similarity between the model cavities (2.5 mm cavity depth) and the butterfly scale structures (about 30 microns cavity depth). A variation in Reynolds number was achieved by altering the model weight such that terminal speeds ranged from 5 to 70 cm/s. Results showed a reduction in surface friction for the transverse cavity configurations based on the roller-bearing effect. These findings suggest that the cavity shape and ratio is directly correlated to the amount of drag alteration.

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