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Sizing passive biomimetic surfaces within a turbulent boundary layer for separation control CHRIS JARMON, SEAN DEVEY, AMY LANG, PAUL HUBNER, University of Alabama — The detriments of flow separation have led researchers to explore methods of separation control with inspiration from nature. Water tunnel studies have shown that shark skin samples can passively reduce flow separation. Microscopic denticles are able to passively actuate to heights of 1-5% of the boundary layer. Recent attempts have been made to reproduce this mechanism in air by covering a NACA 0012 airfoil with an array of additively manufactured passive microflaps which have geometry similar to shortfin mako shark denticles. The microflaps actuated to over eight percent of the boundary layer and were found to be ineffective for separation control at this scale. In the current study, a microflap array is placed on the suction side of a trailing edge flap behind a variable length flat plate to increase the boundary layer height over the microflap array. Boundary layer thicknesses range from approximately 2 cm to 4.5 cm at the onset of the trailing edge flap. In these conditions, microflaps can actuate within the bottom five percent of the boundary layer height. Surface flow visualization is observed and force data is acquired for baseline and biomimetic flaps at multiple angles of flap deformation. Results will be presented as to the effectiveness of separation control over the flap with respect to microflap and boundary layer sizing.

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