

Abstract Submitted  
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**Analysis of Wake Profiles for Free Leading Edge Membranes in Low Reynolds Number Flow**<sup>1</sup> ANDREW WRIST<sup>2</sup>, ZHENG ZHANG<sup>3</sup>, JAMES P. HUBNER<sup>4</sup>, University of Alabama — MAVs (micro air vehicles) are similar in size and flight velocity to nature's evolved flyers such as bats. Bats have flexible membrane wings that provide them with aerodynamic advantages, effectively reducing energy necessary to maintain flight. This study was inspired by the free LE (leading edge) and TE (trailing edge) combinations found on certain bat species. In previous research, silicone substitutes for these membranes have been tested on rigid frames, and it was found in certain cases that their lift-to-drag ratios outperform those of flat plates. In this study, wake profiles for different LE/TE combinations were analyzed, as increasing wake depth and width are related to increasing drag. Silicone membranes with an aspect ratio of one were constructed and tested at various angles of attack, pretensions, and fixed/free LE/TE configurations in a low speed wind tunnel at 10 m/s ( $Re = 50,000$ ). The wake of each membrane configuration was measured using a hotwire probe. The results indicate that membrane airfoils with free LEs produced a greater momentum deficit due to increased losses on the leeward side of the membrane. Further characteristics and trends are discussed in the presentation.

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