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Wing Warping, Roll Control and Aerodynamic Optimization of Inflatable Wings ANDREW SIMPSON, SUZANNE SMITH, JAMEY JACOB, University of Kentucky — The research presents work on aerodynamic control by warping inflatable wings. Inflatable wings are deformable by their nature. Mechanical manipulation of the wing's shape has been demonstrated to alter the performance and control the vehicle in flight by deforming the trailing edge of the wing near the wing tip. Predicting and correlating the forces required in deforming the wings to a particular shape and the deformation generated for a given internal pressure were conducted through the use of photogrammetry. This research focuses on optimizing the roll moments and aerodynamic performance of the vehicle, given the current level of wing warping ability. Predictions from lifting line theory applied to wing shape changes are presented. Comparisons from the experimental results are made with lifting line analysis for wings with arbitrary twist and the solutions are used to determine rolling moment and optimum L/D. Results from flight tests will also be presented.

Jamey Jacob
University of Kentucky

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