

Improving the Aerodynamic Efficiency of Airplanes using a Nature-Inspired Adaptive Wing

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Through natural selection over millions of years, birds have perfected the art of flying. The key to their aerodynamic efficiency is their ability to constantly adapt the shape of their wing and body to maximize lift and minimize drag. In this project, two adaptive wing designs (AW2 and AW3) were built and tested in a home-made wind tunnel setup. AW2 had one movable section, while AW3 had two independently movable wing sections. The designs used servos embedded within them controlled by an arduino nano processor, to adjust the wing’s shape. Lift and drag curves for these wings were measured. The AW3 design was found to have superior aerodynamic performance and control compared to the AW2 design. The aerodynamics of these airfoils were tested using a Computational Fluid Dynamics (CFD) simulation. All of the hypotheses set out in the research plan were tested.

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