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# TRANSITION OPTIMIZATION OF A TILT-WING ELECTRIC VERTICAL TAKEOFF AND LANDING AIRCRAFT

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**Abstract:** Electric vertical takeoff and landing (eVTOL) aircraft for urban mobility are currently receiving considerable attention due to their potential to change the way we move within and between cities. Although electric aircraft are not a new concept, improvements in technologies like batteries and autonomous control have made them significantly more feasible for short distance on-demand transportation. However, this sector of the aviation industry is still in its infancy and there is a lot of scope for development. In this work we focus on the trajectory of a distributed propulsion tilt-wing eVTOL aircraft. Optimizing the trajectory of a tilt-wing aircraft provides an interesting challenge because the transition from vertical to horizontal flight is a delicate balancing act in which the fans need to provide sufficient thrust to maintain lift and accelerate while transferring the burden of lift to the wings. Additionally, optimizing this phase is a unique design challenge because it requires considering states in which the flow over the wing is separated. We use gradient-based optimization methods and high-fidelity CFD, with actuator disk models for the fans to model the aerodynamics, and optimize the trajectory of a selected eVTOL aircraft configuration.