

Abstract Submitted
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Investigation of Lift Distribution and Its Effect on Aerodynamic Performance SCOTT WEEKLEY, COLE KELLY, JAMEY JACOB, Oklahoma State University-Stillwater — This effort evaluates the use of bell-shape lift distributions, as opposed to elliptical, to improve aerodynamic performance of flying-wing aircraft configurations. Such a distribution was originally proposed by Prandtl in 1923 to minimize bending moment along the wing and thus reduce structural wing weight. Using unique, geometric wing twist to change the lift distribution, the landscape of regions of upwash and downwash change with potential ramifications for drag reduction. Through a computational fluid dynamics (CFD) investigation, we evaluate how these changes impact aerodynamic efficiency. In particular, the efficacy of a coordinated turn is examined by observing how the inboard regions of upwash create induced thrust at the aileron-deflected wingtips. This induced thrust creates a favorable differential longitudinal force in roll, otherwise known as proverse yaw. CFD results indicate that the use of a bell-shaped lift distribution may improve aerodynamic performance for certain aircraft configurations.

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