

## Preliminary Design and Aerodynamic Study of Hybrid Aerial Vehicle

**Authors :** Pratyush Agnihotri

**Abstract :** This paper presents a comprehensive overview of the conceptual design process for a fixed-wing vertical take-off and landing (VTOL) unmanned aerial vehicle (UAV). Fixed-wing VTOL UAVs combine the advantages of rotary-wing aircraft, such as vertical take-off and landing capabilities, with the efficiency and speed of fixed-wing flight. The primary objective of this study is to explore the aerodynamic design principles that optimize performance parameters, including range, endurance, and stability while maintaining the VTOL capability. The design process involves selecting appropriate airfoils, optimizing wing configurations, and integrating propulsion systems suitable for both hovering and forward flight. Analytical methods are employed to evaluate aerodynamic performance, with a focus on lift-to-drag ratio, power requirements, and control strategies. The results highlight the challenges and trade-offs inherent in designing such hybrid aircraft, particularly in balancing the conflicting requirements of VTOL and fixed-wing flight. This study contributes to the development of efficient, versatile UAVs capable of operating in diverse environments.

**Keywords :** fixed wing, hybrid, VTOL, UAV

**Conference Title :** ICAH 2024 : International Conference on Aerodynamics and Hydrodynamics

**Conference Location :** Goa, India

**Conference Dates :** December 09-10, 2024