

## **Design and Optimization of a Mini High Altitude Long Endurance (HALE) Multi-Role Unmanned Aerial Vehicle**

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**Abstract :** This paper discusses the aerodynamic and structural design, simulation and optimization of a mini-High Altitude Long Endurance (HALE) UAV. The applications of this mini HALE UAV vary from aerial topological surveys, quick first aid supply, emergency medical blood transport, search and relief activates to border patrol, surveillance and estimation of forest fire progression. Although classified as a mini UAV according to UVS International, our design is an amalgamation of the features of 'mini' and 'HALE' categories, combining the light weight of the 'mini' and the high altitude ceiling and endurance of the HALE. Designed with the idea of implementation in India, it is in strict compliance with the UAS rules proposed by the office of the Director General of Civil Aviation. The plane can be completely automated or have partial override control and is equipped with an Infra-Red camera and a multi coloured camera with on-board storage or live telemetry, GPS system with Geo Fencing and fail safe measures. An additional of 1.5 kg payload can be attached to three major hard points on the aircraft and can comprise of delicate equipment or releasable payloads. The paper details the design, optimization process and the simulations performed using various software such as Design Foil, XFLR5, Solidworks and Ansys.

**Keywords :** aircraft, endurance, HALE, high altitude, long range, UAV, unmanned aerial vehicle

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