

## **ABSTRACT**

### **AERODYNAMIC PERFORMANCE ANALYSIS OF A NON-PLANAR C-WING USING EXPERIMENTAL AND NUMERICAL TOOLS**

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Non-planar wing systems are optimally loaded wings with higher aerodynamic efficiency than planar wings with the same aspect-ratios. One potential innovation for commercial and military aviation could come in the form of semicircular lifting arcs or C-Wings which are capable of achieving a higher lift-to-drag ratio and stalling angle than conventional plane rectangular wings.

The objective of this project is first to perform force (lift and drag) measurements on a C-wing with a NACA0012 profile at different angles of attack and compare the results obtained with those corresponding to a conventional plane rectangular wing. The second part of this project deals with incorporating a C-Wing into a remote controlled aircraft that can be maneuvered using ailerons mounted on the C-Wing.

A three – pronged approach using Computational Fluid Dynamics, wind tunnel tests and working model demonstration has been followed. Three dimensional inviscid Computational Fluid Dynamics (CFD) analyses of eight different C-Wing geometries, with the same aspect ratio as that of the planar wing, have been carried out to finalize the wind tunnel model based on lift/drag ratio. Comparison of the aerodynamic forces obtained from the preliminary wind tunnel test results strongly suggests that the C-Wing do possess capabilities to reduce the induced drag significantly, which could be owed to the reduction in the downwash of the complete configuration. A radio-controlled model incorporated with C-Wing is being designed and fabricated.