Commercialization of Autonomous EagleEye UAV

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Abstract

Unmanned Aerial Vehicle (UAV) has increased the possibility of quick surveillance, 3D mapping, thermal imaging, military services, environmental study, emergency relief, and aerial seeding. So EagleEye has been designed to achieve these applications with low cost and speedy task execution. It can fly around a specified area for about 60 minutes continuously. It had been made with such a design that it costs about Rs. 90,000 which is almost half of the cost of a drone (multirotor) made for the same application.

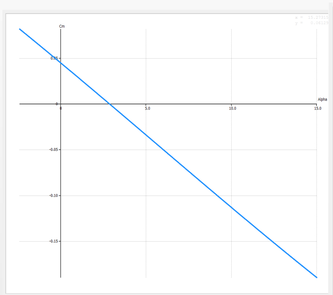
Introduction

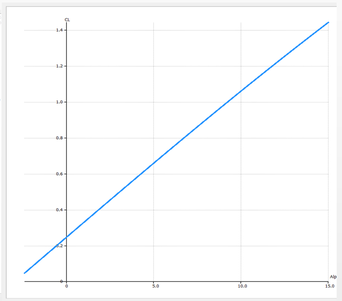
EagleEye is a fully autonomous electric UAV designed to handle large-scale and long-range missions for commercial and industrial applications. An autonomous flying wing is a tailless UAV capable of being maneuvered in the air across certain altitudes autonomously with the use of a Ground Control Station (GCS) which includes a mission planner or QGroundControl software and a Two-way Communication system (Radio Telemetry) between GCS and UAV. A fixed-wing UAV (Unmanned Aerial Vehicle) is an aircraft that operates without a human pilot onboard. It can be controlled by a human operator through RC or autonomously via an onboard flight controller.

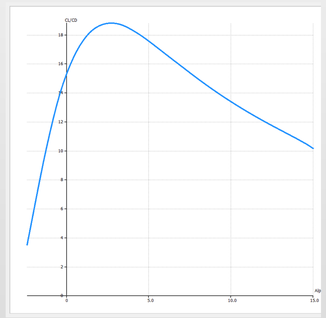
Design & Development

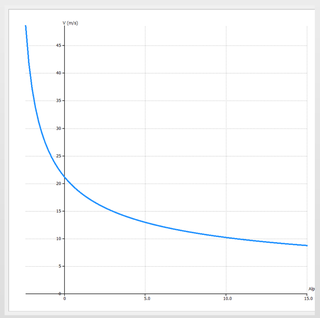
MH60 Airfoil was selected as the best airfoil to meet the required purpose with the help of XFLR5 software. Aerodynamic and Stability Analysis was done using this software. XFLR5 is an analysis and designing tool for airfoils, wings, and planes operating at low Reynolds Number. The design of the EagleEye had developed with due consideration for aerodynamic, structural, and environmental aspects. To develop this UAV for the mentioned application's payload, dynamic flight effects, and dimension calculations had been done.

Fig: 3D model in CATIA V5









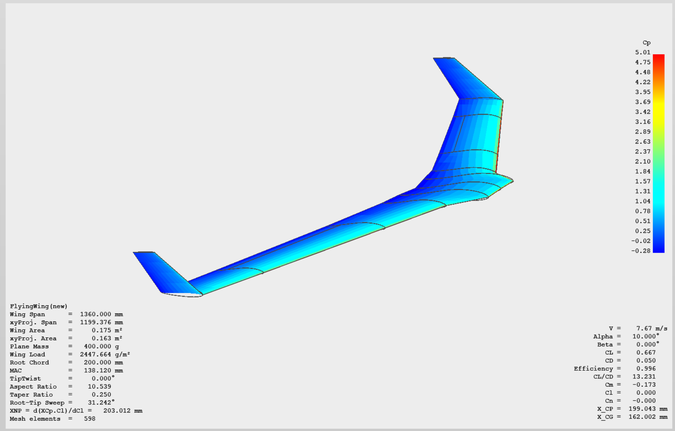


Fig: Pressure Contours in XFLR5

Key Highlights

- Reliable and Safe: Free from Complicated Mechanism
- Secured Data with BlackBox (SD Card)
- Fully Autonomous Flight
- Durable Depron Foam Airframe
- Safe Launch: Hand or Catapult
- Adverse Weather Tolerance
- Low Energy Loitering
- Endurance (Flight Time) up to 1 hour

Scan to Watch Flight Test

Components

- Pixhawk 4 Flight Controller
- 2200kv Brushless Motor with 6 inch propeller for Propulsion
- Servo Motors for actuation of Elevons
- 60A Electronic Speed Controller (ESC)
- 4-Cell 1500mAh Li-Po (Lithium Polymer) Battery
- Transmitter And Receiver
- Radio Telemetry
- GPS Module
- Camera

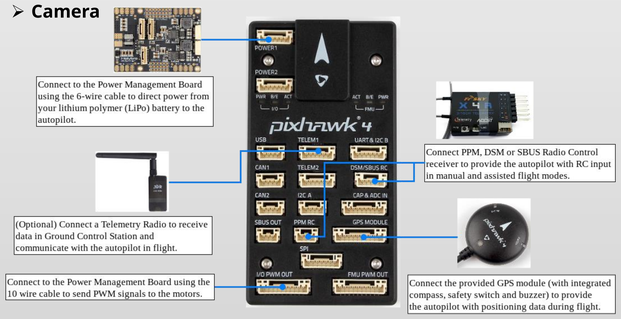
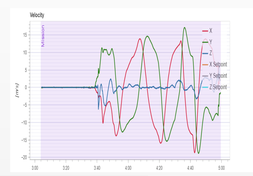


Fig: Flight Controller

Methodology

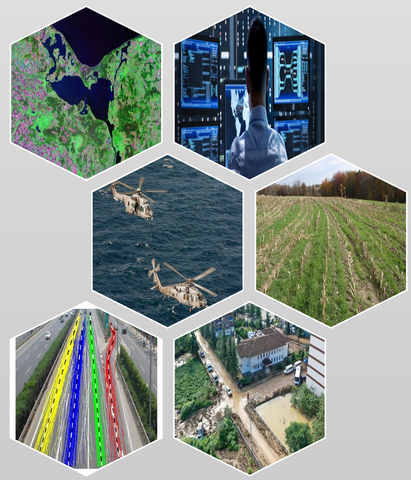
- Selection and testing of hardware materials
- Aerodynamic and Structural Analysis
- Calibration of Flight Controller
- Hardware Assembly And Software Installation
- Fabrication of body
- Optimization of physical parameters
- Range and Efficiency Estimation
- Test Flight

Post Flight Data



Application

- Aerial mapping
- Surveillance
- Search and rescue operations (SAR)
- Disaster area reconnaissance
- Wildfire detection using Thermal Imaging Camera
- Aerial Seeding
- Monitoring of power lines, industrial facilities, oil and gas pipelines
- Promote destinations through aerial photography to enhance tourism
- Road monitoring
- Identification of drier region in a crop field



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