3D-Printed Aircraft Competition

Team Members: Alejandro Cervantes, Guillermo Vazquez, Gael Chavez, Manuel Delgado, Alan Montenegro
Faculty Advisor: Sangbum S. Choi

Departments of Mechanical Engineering, Electrical Engineering, and Engineering Technology
College of Engineering, Computer Science, and Technology
California State University, Los Angeles

GOLDEN EAGLE ONE

Background

Fixed-wing gliders are key tools in aeronautical engineering for studying aerodynamics, stability, and structural efficiency. Recently, 3D printing has transformed how prototypes and functional components are designed and built, enabling faster, low-cost development.

Objective

Build and operate an RC controlled 3D-printed airplane glider that will fly powered for 8 seconds and continue to glide within a 300 x 160-foot area successfully for the 2025 CSU 3D-Printed Fixed-Wing Aircraft Competition.

System-Level Requirements

Components	Configuration	Power and Control
• Printed using purely 3D printed technology. • Propellers, rotors, electronics should be commercial off-the-shelf hardware.	• Mass constraint of 55lbs • PLA material • No lighter-than-air methods may be used (e.g., no helium).	• Aircraft may be powered for a maximum continuous duration of 8 seconds.

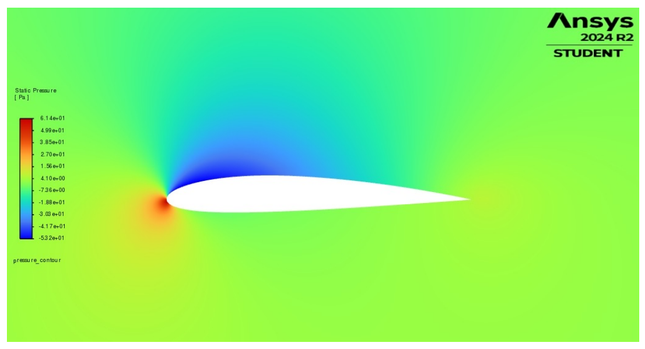
Design Overview

Wingspan: 45 in (1.143 m)
Average Chord Length: 3 in (.0762 m)
Aspect Ratio: 15
Weight: 1.10 lbs. (0.5 kg)
Airfoil: NACA 2412, NACA 0012
Dihedral Angle: 5°

Overall Design Approach

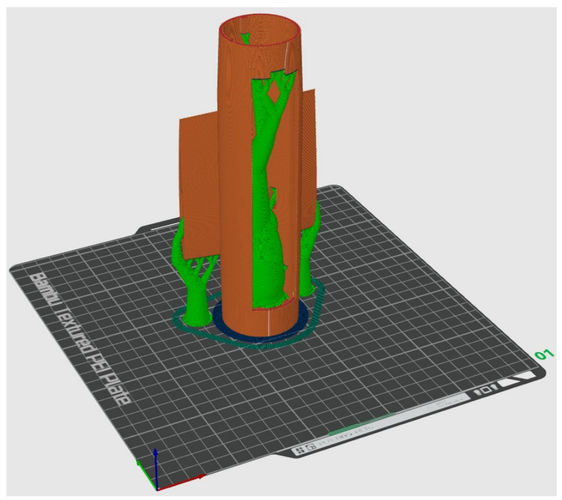
Research and Analysis | Prototypes | Power and Control

Ansys Simulation



The NACA 2412 provide the best lift to drag ratio and pressure difference when compared with other airfoils.

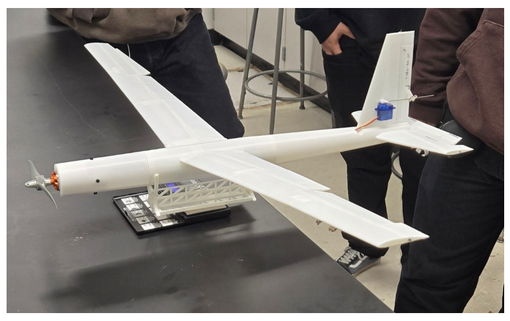
3D Printing



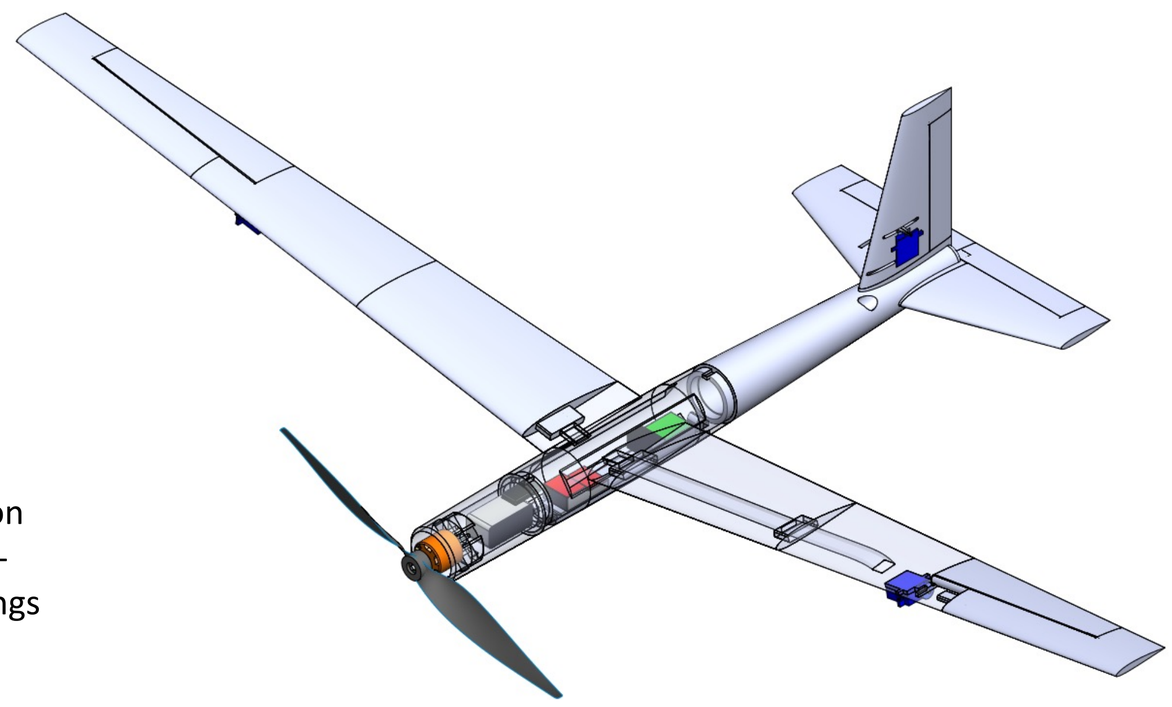
We used Bambu Studio in combination with the Bambu A1 3D printer to fine-tune our prints by adjusting key settings such as wall loops, rectilinear infill, outer wall speed, and tree supports.



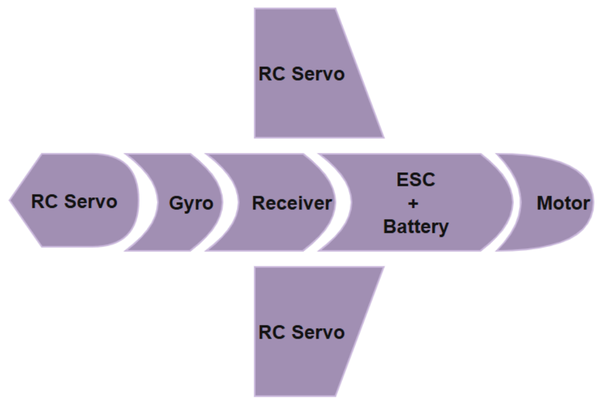




Final Design



Diagram



Each location for the electrical components were housed taking the center of gravity into account.

Electrical Components

Motor	Flash Hobby D2826
Battery	Tattu 3s LiPo
Servos	Miuzei Sg90
Receiver	FS-iA6
ESC	Hawks Work 20A
Gyro	HobbyEagle A2 Pro

Results and Conclusion

Through iterative design and optimization, we successfully reduced the weight of our original prototype from **1.1 kg to .5 kg**, meeting our target. Key aerodynamic improvements included **increasing the wing aspect ratio from 6 to 15**, **introducing a 5° dihedral angle** for greater lateral stability, and **tapering the wings by 50%** to reduce drag. Currently, we are **printing our sixth glider** of the final design and conducting **test flights** to evaluate performance and refine pilot handling before the upcoming **flight duration competition**. The final competition results are to be determined.