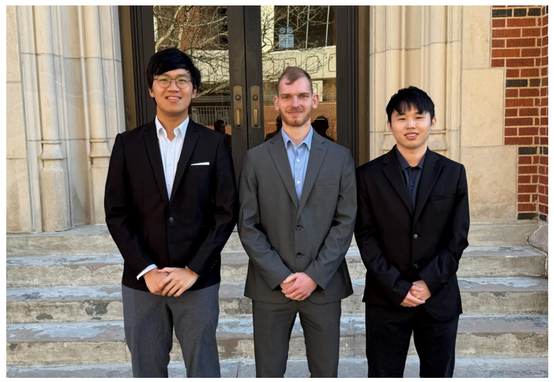
GALLOGLY COLLEGE OF ENGINEERING
SCHOOL OF AEROSPACE AND MECHANICAL ENGINEERING
The UNIVERSITY *of* OKLAHOMA

The "Hover-inator" VTOL

Vertical Take-off and Landing Aircraft Development Team

Sponsor: Dr. Wei Sun Advisor: Dr. Srikanth Bashetty

Team



Left to Right: Yong Bin, Jacob Brede, Yu Cheng

Project Objective

Convert a DBF aircraft into a tilt-rotor VTOL system capable of smooth transition between hover and forward flight, with minimal performance loss in level-flight performance, and stable dynamics in hover mode.

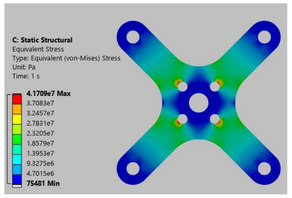
Design Constraints

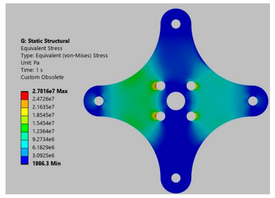
- **Budget:** $2000 (OU Aerospace Department funded)
- **Configuration:** Fixed geometry (no major structural redesign allowed)
- **FAA drone regulations:** FAA Regulations Title 14, Chapter I, Subchapter C, Part 23

Design Specifications

Wingspan	7.95 ft
MAC	0.97 ft
Wing Airfoil	NACA 6412
Motor	Hacker A40 kv610
Battery	Tattu 12-Cell LiPo
Tilting Servo	35kg dual axis servo
Flight Controller	Pixhawk 4

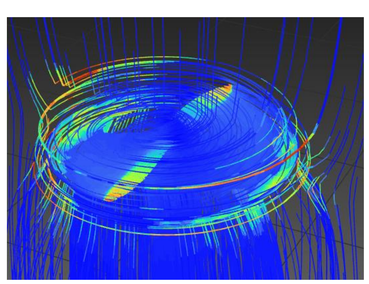
ANSYS FEA Analysis





Component	Max Deflection (mm)	Min. Safety Factor
Servo Adapter	0.095	2.5
Motor Adapter	0.016	5.1

ANSYS CFD Analysis

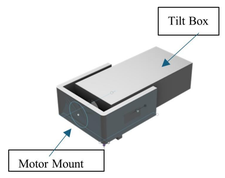


CFD analysis on propeller

Rotation Speed (RPM)	Thrust (N)	Torque (Nm)
7000	24.6	0.40
7500	28.3	0.45
8000	32.3	0.50
8500	36.6	0.57
9000	40.9	0.68

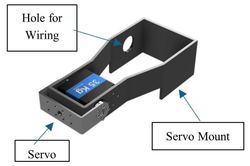
Design Progression

Initial Iteration



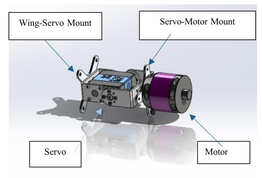
Robust, enclosed housing strategy to ensure maximum structural rigidity

Second Iteration



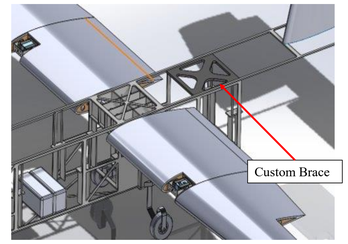
Streamlined, skeletonized bracket architecture to optimize the weight-to-strength ratio

Final Iteration



External support structures were discarded in favor of a direct-mount wing integration

Structural Support



A brace was added to reduce the deflection of the internal structure of the aircraft

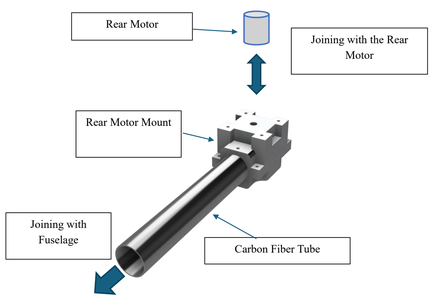
Engineering Standards

Standard	Application
FAA Regulations Title 14, Chapter I, Subchapter C, Part 23	Essential safety and performance standards for aircraft design.
FAA Regulations Title 14, Chapter I, Subchapter F, Part 107	Ensuring safe and legal UAV testing.
ASTM F3173/F3173M-24	Ensuring stable, responsive, and predictable flight behavior.

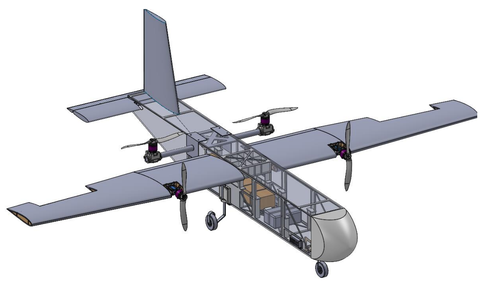
Final Design



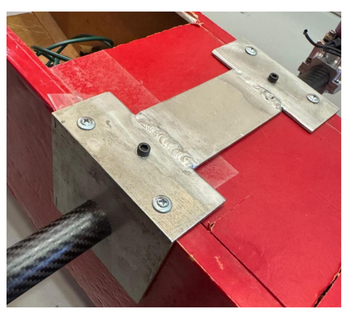
Full Assembly of Aircraft



Rear Motor in Detail



Full Assembly Aircraft in SolidWorks

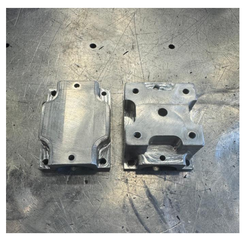


Rear Motor Bracket Assembly

Manufacturing & Assembly



Right: Wing-Servo Adaptor
Left: Motor to Servo Adaptor



Rear Motor Mounts



Tilting Mechanism

Component	Method
Adapters	Waterjet by OU Fab Lab
Rear Mounts	CNC Machined
Frame Brace	Laser Cut
Rear Brackets	Welded from sheet metal



Front View of Aircraft