UCI Samueli School of Engineering

Spring Design Review 2019

UAV FORGE

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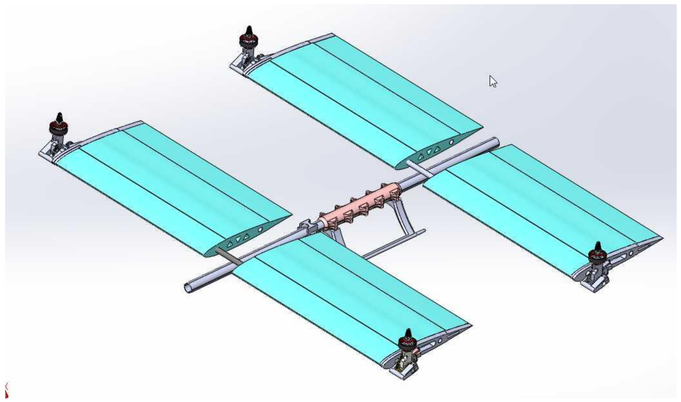
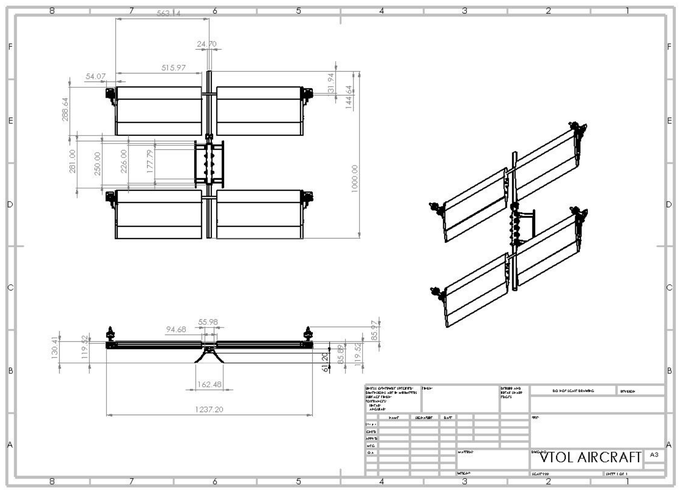
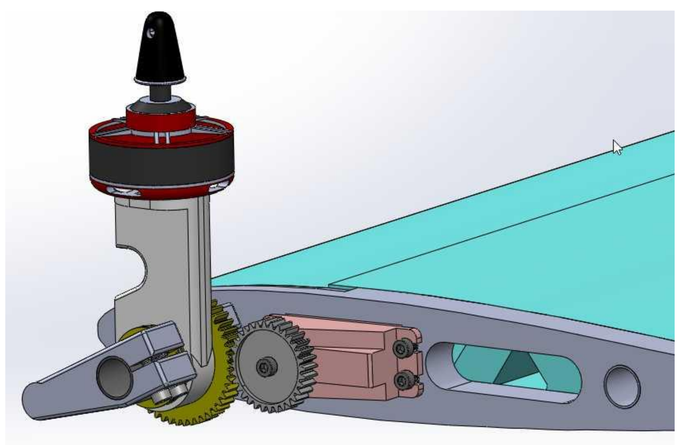
VTOL AIRCRAFT DESIGN





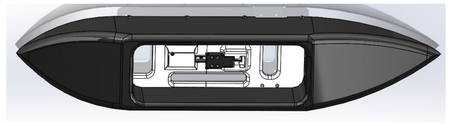


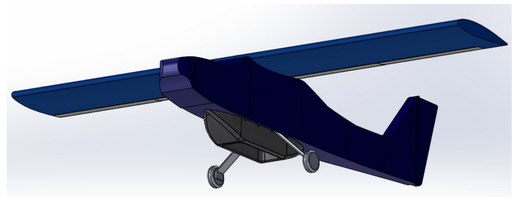
ENGINEERING APPROACH

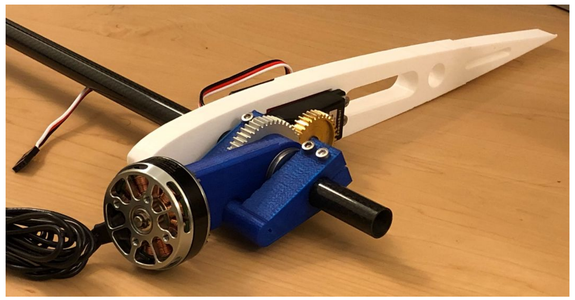
Competition Aircraft: Avistar Sport

- A high wing aircraft configuration allows for a more stable flight
- Wing Area: 1448 in^2
- Wing Loading: ~2 lb/ft^2
- Wingspan: 90.5 in
- Motor: SUNNYSKY X5320
- Max Static Thrust: 80.41 N

Drop Mechanism for Unmanned Ground Vehicle:







VTOL Aircraft

Design Requirements:

i. Must deliver payload with minimum weight of 2 lbs
ii. Fit a volume of 1 m^3
iii. Max. aircraft weight of 13 lbs
iv. Be able to operate within 8 sq miles
v. Be able to operate for at least 15 minutes
vi. Removable parts with ease of access
vii. Vertical Take-Off/Landing
viii. All components are still operable after a year
ix. Able to withstand modes of vibrations caused by motors.
x. Operate in 15 knot winds with gusts of up to 20 knots
xi. Manufacturing costs do not exceed $300

II. **Wing Characteristics**
a. Airfoil Type: NACA 0012

Figure I. NACA 0012 Airfoil

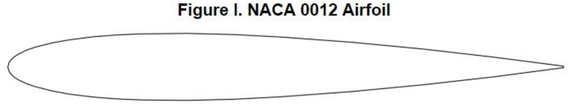


Table I. NACA 0012 Parameters

Maximum Wing Thickness $(t/c)_{MAX}$	12%
Location of Maximum Thickness	30% chord (measure from leading edge)
Operating Reynolds Number	~ 4×10^4 to

Table II. Wing Parameters

Chord Length	12 inches
Wingspan	39.37 inches
Planform Area	472.44 sq. inches
Aspect Ratio	3.28
Taper Ratio	0%
Sweep	0 degrees
Maximum Wing Thickness	1.44 inches
Location of Maximum Thickness	3.6 inches from the leading edge
Front Wing Incidence	5 degrees
Back Wing Incidence	8.5 degrees
Max L/D	25.7 at 5 degrees

TIMELINE

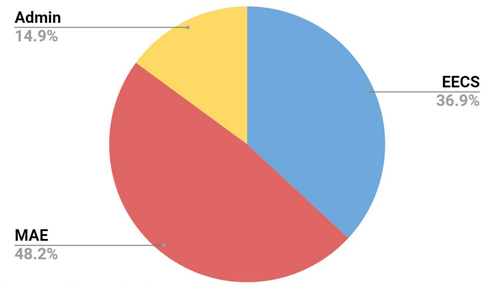
Spring Quarter Goals:

- Successfully deploy the UGV mid-flight
- Improve autonomous flight capabilities
- Design and manufacture a unique and fully functional Vertical Take-off/Landing (VTOL) aircraft without exceeding the project budget
- Prepare team for transition to new academic year

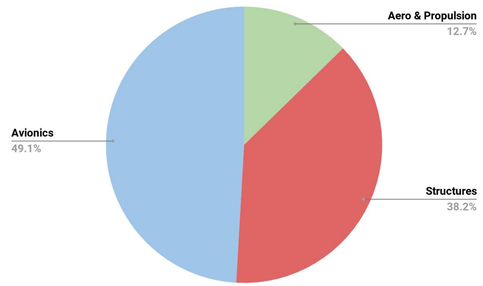
SPENDING SUMMARY

Overall Team Breakdown

Total: $7,423



Sub-Team Breakdown



TEAM STRUCTURE