Cargo Plane

Advisor: Professor John C. LaRue

UCI Samueli School of Engineering

Design

The design objective is based on maximizing lift in order to attempt the heaviest cargo. For the compeition, the max take off weight is 55lbs. The plane will be designed to carry this weight and further optimized to minimize drag inducing features.

Background

The purpose of the Cargo Plane Senior Design Project is to design and manufacture an aircraft to compete in the SAE Aero West competition on March 10, 2017

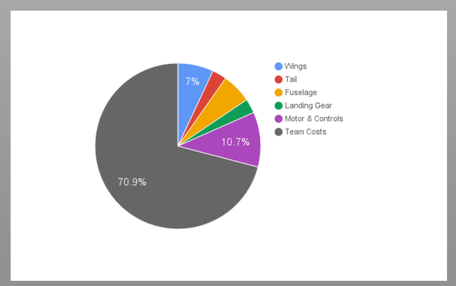
Goal

Engineer a battery powered aircraft capable of flying with a take off weight of 55lbs for the SAE Aero West Competition.

Requirements

- No fiber-reinforced plastic (landing gear & motor mount excepted)
- Single Motor
- 1000 Watt power limiter
- Payload of tennis balls as "passengers" and metal plates as "luggage"

Budget



Costs:

SAE & Team Expenses: $3050
Landing Gear: $120
Fuselage: $250
Wings/Tail: $420
Total: $4300

Fall

- ❑ **Wing Design**
- ❑ **Fuselage Design**
- ❑ **Tail Design**
- ❑ **Dimension Balancing**
- ❑ **Preliminary Testing**
  - ➢ **Lift enhancements**
- ❑ **Begin Manufacturing**

Winter

- ❑ **Model Testing**
- ❑ **Manufacturing**
- ❑ **Motor Component Testing**
- ❑ **Assembly**

End of Quarter:

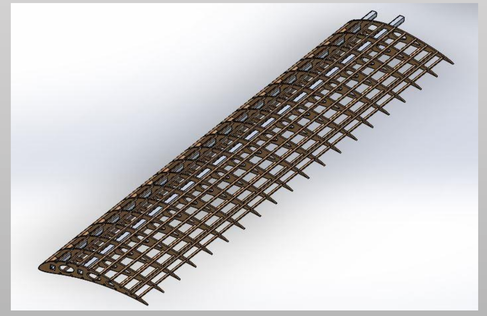
- ❑ **Competition, March 10-12**

Spring

- ❑ **Plane Testing**
- ❑ **Final Report**

Wing

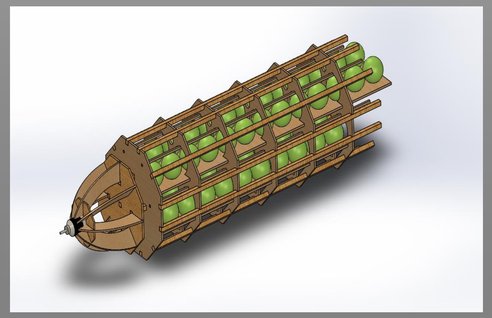
- Rectangular planform for ease of manufacturing
- 14.47 ft span and 1.45 ft chord
- Eppler 423 airfoil for high lift at low speed
- High wing configuration for better stability
- High strength, light weight Aluminum Alloy 6061-T6 spars with balsa ribs, stringers and leading edge reinforcement
- High aspect ratio of 10 for better performance characteristics
- Weight of 3.95 pounds per wing
- Monokote wing surface wrap



Pictured left is a Solidworks model of the left wing structure sans ailerons for preliminary design

Fuselage

- 60" x 12" x 12" full scale dimensions
- Manufactured with birch plywood bulkheads and balsa wood stringers.
- Fully loaded the fuselage weights 40lbs. Passenger's luggage weights, 28lbs, will be kept below the lower passanger deck.
- A total of 56 passangers(tennis balls) will be seated in custom 3d printed seats.
- Laser cut design in RapidTech facilities
- Long Balsa wood rod/boom will run through fuselage to provide support and connect to tail.



Tail

- Conventional empennage configuration
- Symmetric NACA 0012 airfoil
- Volume coefficient parameters are Vh=0.7 and Vv=0.04
- Horizontal tail with 5.32 ft span and 1.33 ft chord
- Vertical tail with 1.91 ft span and 2.12 ft chord

Landing Gear

- Tricycle (nose gear) Arrangement
- Main gear, 18" x 5" x 8" aluminum 6061-T6, fixed to fuselage
- Nose gear: high tensile music wire, 6061-T6 aluminum and aircraft quality 4130 alloy steel tubing
- 3" Tires: Threaded lightweight tires

Controls

- Remote Controlled
- Ailerons, Elevator, and Rudders controlled by servos
  - Servos: small motors that move primary flight control systems

Pictured left is the DX8 Controller, capable of 8 channels and a 2.4 GHz band frequency.

Team Breakdown

Tyler Gorman	Team Lead
Brandon Ialenti	Wing
Luyao Zhao	Wing
Jesus Martinez	Wing
Gabriela Arevalo	Tail
Othman Al-Shikhli	Tail
Victor Cabanas	Fuselage
Vu Nguyen	Fuselage
Tyler Rasmussen	Motor, Controls

Contact Information:
Tyler Gorman
tgorman@uci.edu