Cargo Plane

Advisor: Professor John C. LaRue

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Department of Mechanical and Aerospace Engineering

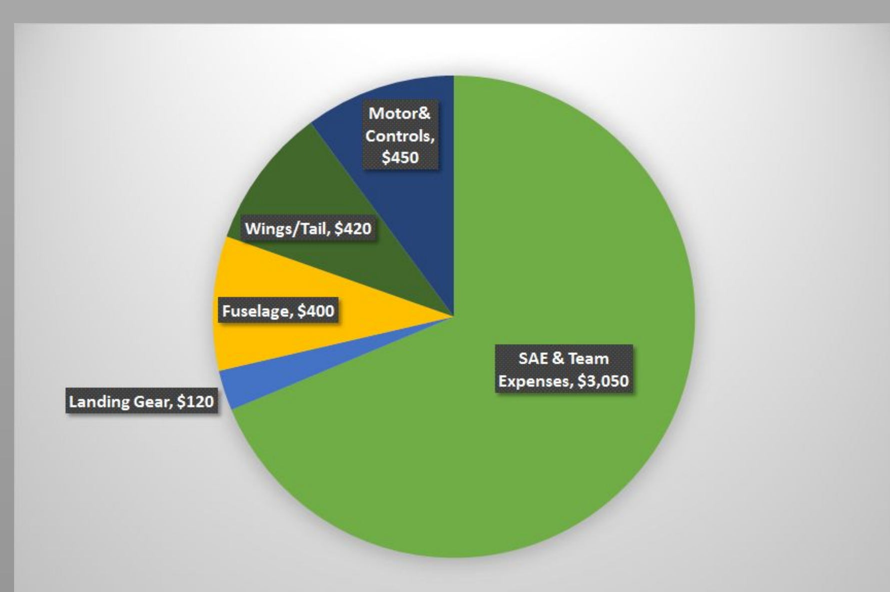
Design
The design objective is based on maximizing lift in order to attempt the heaviest cargo. For the competition, the max take off weight is 55lbs. The plane will be designed to carry this weight and further optimized to minimize drag inducing features.

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

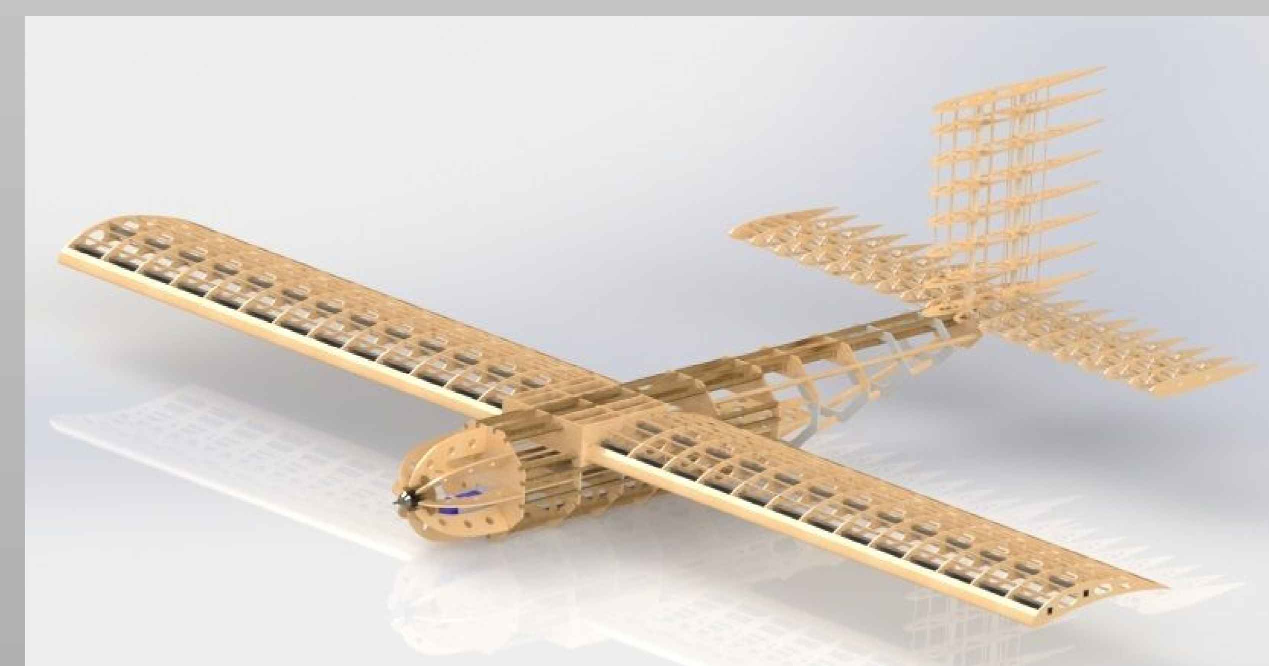


Fall
- Wing Design
- Fuselage Design
- Tail Design
- Dimension Balancing
- Begin Manufacturing

Winter
- Model Testing
- Manufacturing
- Assembly
- Competition, March 10-12

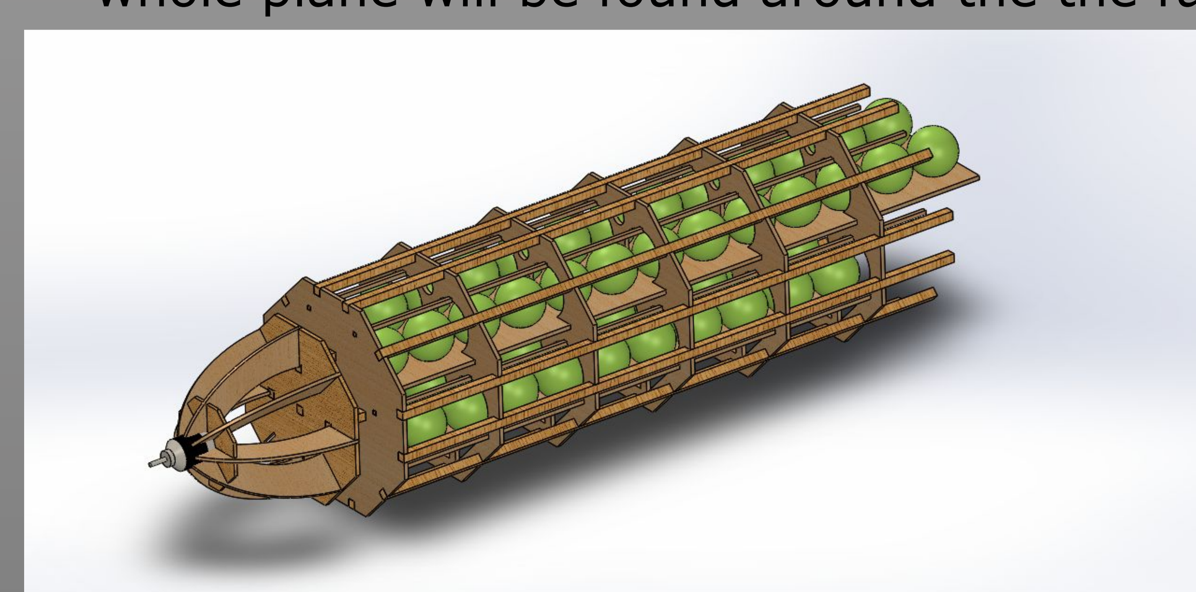
Spring
- Plane Testing
- Final Report

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 the Solidworks model of the Cargo Plane.

Fuselage
- 60" x 12" x 12" full scale dimensions
- Manufactured with birch plywood bulkheads and balsa wood stringers.
- Fully loaded the fuselage weighs 40lbs. Passenger's luggage weighs 28lbs and will be kept below the lower passanger deck similar to a commercial aircraft.
- A total of 56 passengers(tennis balls) will be seated in custom 3d printed seats. Velcro will be tested out to see if the balls will be kept in place. One major change will likely to take place is having a single deck for all the balls.
- Laser cut design in RapidTech facilities and all parts will be assemble together.
- Long Balsa wood rod/boom will run through fuselage to provide support and connect to tail. The CG of the whole plane will be found around the the fuselage.



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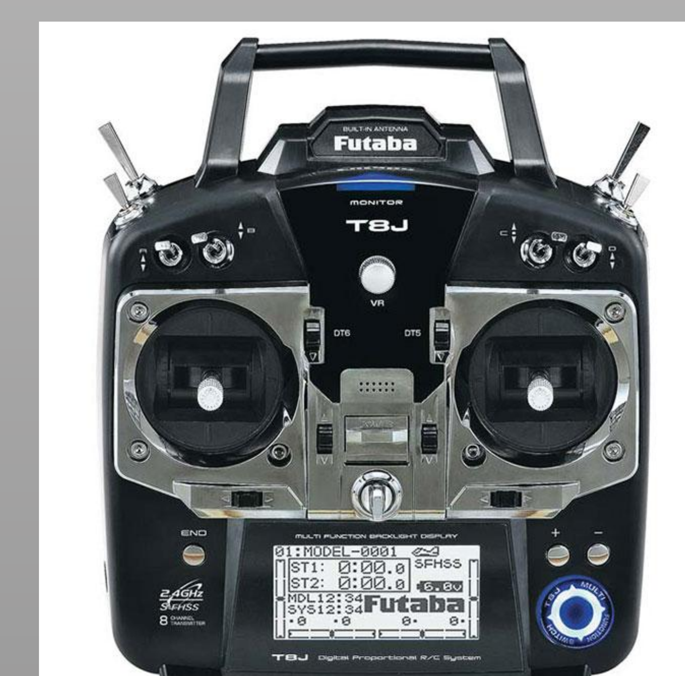
Tail
- Conventional empennage configuration
- 5085MG servos attached to vertical and horizontal stabilizers
- Symmetric NACA 0012 airfoil
- Volume coefficient parameters are Vh=0.7 and Vv=0.04
- Horizontal tail with 5.32 ft span and 1.33 ft chord
- Vertical tail with 1.91 ft span and 2.12 ft chord

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 Futaba 8JA 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
Pedro Salcedo	Tail
Julian Elizarraras	Tail
Victor Cabanas	Fuselage
Vu Nguyen	Fuselage
Joseph Rivera	Fuselage
Tyler Rasmussen	Motor, Controls