

Team 25: SAE Aero Design Regular Class

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Objective Statement

To design an aircraft that can maximize the flight score by carrying as many passengers (tennis balls) and luggage as possible within power limitations and other specifications set forth by SAE International and compete in the SAE Aero Design West Competition on April 6-8, 2018.

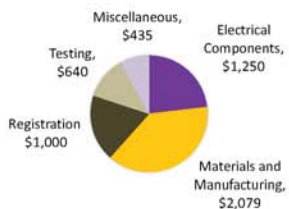
$$Final\ Flight\ Score\ (FFS) = \frac{1}{40N} \left[\sum_{1}^N \$100P + \$50C - \$100E \right]$$

- N = Total number of flight rounds during competition
- P = Number of seated passengers carried on a flight
- C = Luggage weight [lb]
- E = Number of empty seats

Engineering Specifications & Features

- Goal Passengers: 30
- Estimated Payload Weight: 19 pounds
- Estimated Empty Weight: 15 pounds
- Power Limit: 1000 Watts
- Wingspan: 11 ft + 7.5 in wide fuselage
- Aspect Ratio: 5.5
- Strut-braced wings
- Tailwheel landing gear

Budget



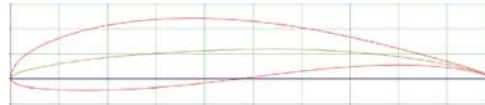
Safety

- Red arming plug to control aircraft propulsion system
- Safety nut to secure propeller to aircraft
- Exercise caution when propeller is in use
- Monitor battery during charging

Embodiment

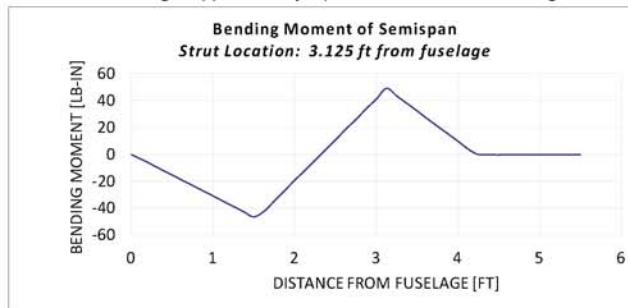


Wing airfoil: Wortmann FX 63-137



Analysis: Wing Strut Location

Goal: Choose strut location to minimize overall bending moment along the semi-span. This is chosen by finding the strut location where the bending moment at the wing is approximately equal to the maximum bending moment.



Manufacturing

Component	Process	Material
Wings & Tail	Built up with "D-box" spar with laser-cut ribs; UltraKote® cover	Sitka spruce, aircraft plywood, balsa
Fuselage	Built up truss structure with longerons; UltraKote® cover	Douglas Fir, balsa wood, aircraft plywood
Landing Gear	Carbon fiber frame with Atom Matrix® wheels	Carbon Fiber
Luggage	Water jet, welding	A36 steel
Passenger Cabin	Water jet	Polystyrene foam board



Uncovered 1st iteration Left Wing and Aileron

Testing

Test	Method	Results
Motor	Static/dynamic thrust using engine stand	Static: 11.9 lbs Dynamic: 10.1 lbs @ 20 mph
Flight Time	Check battery capacity using testing stand	3.75 min
Wing Loading Verification	Load wing to failure with weights	81.1 lb/wing
Stability	Verify center of gravity with use of stand	Wing quarter chord is 2.98 ft from propeller

