T513: SAE Aero Design Competition

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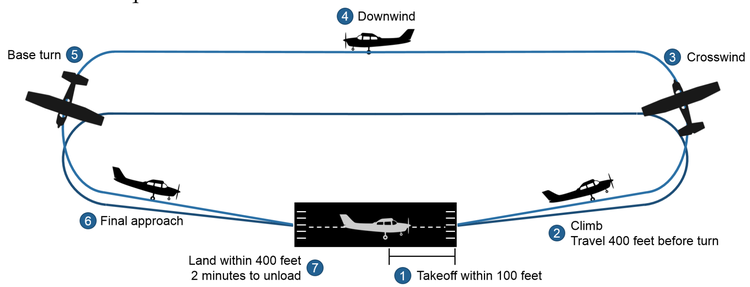
FAMU-FSU Engineering

Objective

- Use additive manufacturing to produce a radio-controlled airplane capable of competing in the SAE Aero Design East Competition

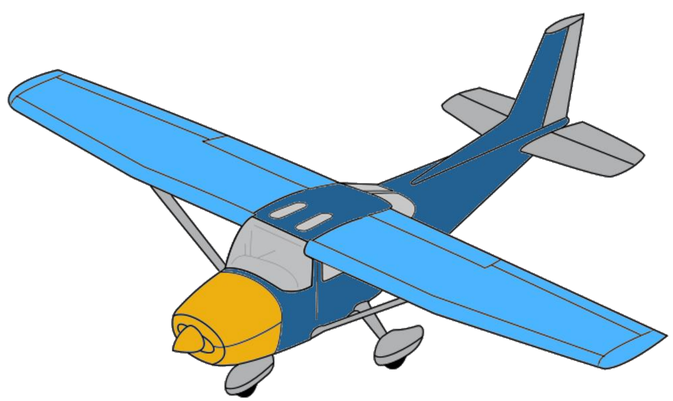
Competition Requirements

Mission Requirements:



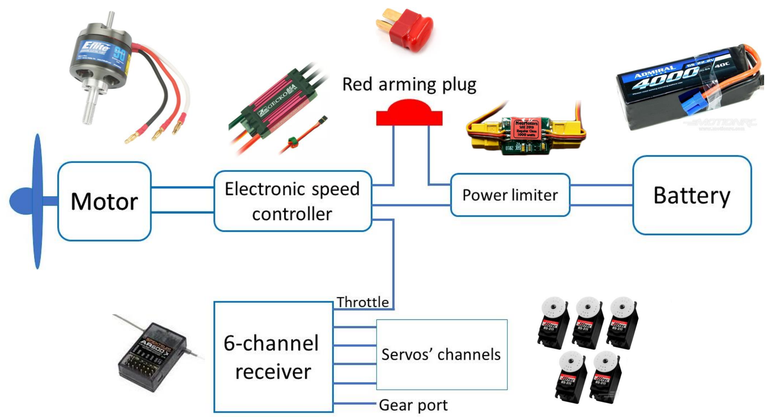
Airplane Requirements:

- Maximum wingspan of 120 inches
- Maximum gross-take-off weight of 55 lbs
- Carry an unmodified size 5 soccer ball
- Limited to 1000 W of Power
- Minimum 6S 22.2V Lithium polymer battery
- No lead of fiber-reinforced materials

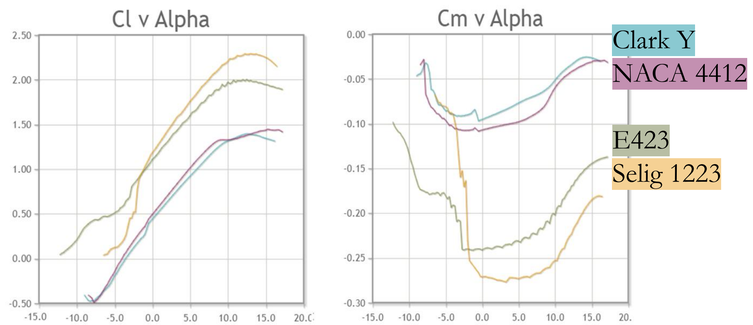


Electronics Setup

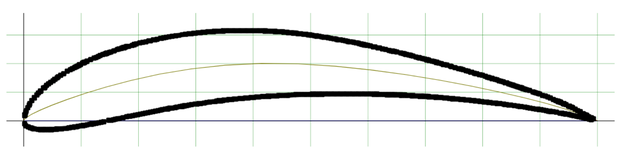
- The final wiring diagram for the plane, showing the acquired parts and components to complete the circuit



Airfoil Selection

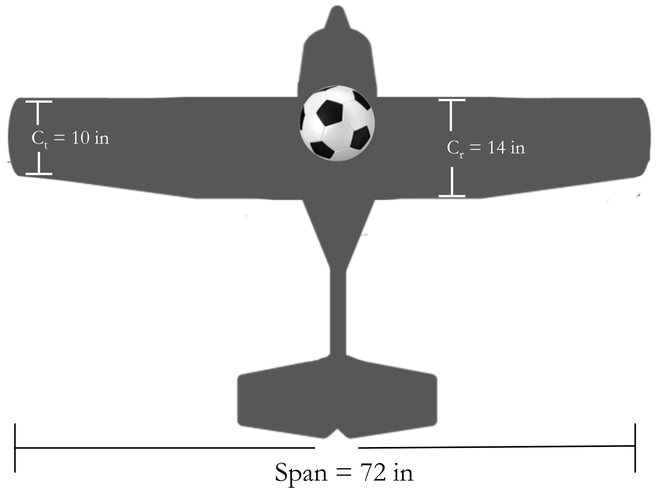


- Considered four airfoils: (2) heavy lift UAV style and (2) STOL style
- Desired high lift and stable airfoil style
- Selected Eppler E423 airfoil with $C_{l,max} = 2.00$



Airplane Design

- The final selected concept is a semi-tapered rectangular wing located high on a flying boat fuselage with boom tail and conventional horizontal and vertical stabilizer
- Tail dragger style landing gear. 3D printed with light-weight PLA



Gross Takeoff Weight = 15 lb.

- Estimated performance parameters:
  - Takeoff distance of 49.6 ft at 23.4 mph
  - Wing loading of 34.3 oz/in^2 and aspect ratio of 5.1

Future Work

- Rapid prototype for unloading payload design
- Create CAD model of all airplane components
  - Satisfy stability and control requirements
  - Compare theoretical to actual center of gravity
- Conduct 3D printing infill tests to find appropriate strength-to-lightweight compromise
- Manufacture flight worthy prototype
  - Prototype test flight
- Prepare SAE competition documents
- Attend SAE competition