To Predict ▶ To Design ▶ To Perform

College of Engineering
Department of Mechanical & Industrial Engineering

ME, ECE, BE Capstone Design Programs

Team 25: SAE Aero Design East Regular Class Aircraft

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COMPETITION BACKGROUND

The Society of Automotive Engineers (SAE) holds the Aero Design Competition every year. The competition consists of four flight rounds. The teams are scored primarily on the weight of the payload carried and earn bonus points based on the accuracy of the payload prediction submitted with the design report.

$$FFS = Final\ Flight\ Score = \sum_{n=1}^{n} FS_n - \sum T + B_n$$

$$B_n = 20 - (P_p - P_a)^2$$

FS= Flight Score n=number of rounds T=penalties Bn=Bonus Points

P_p=Payload Predicted P_a=Actual Payload

TEAM OBJECTIVES

- Flying every round. No points are earned for rounds the team does not fly.
- Fly each round with the maximum target payload to maximize the points received per round.
- Create a base of knowledge to expedite the design process for next year's team.

CONSTRAINTS

- Sum of the length, width, and height of aircraft must be 175 inches or less
- Max power of the propulsion system is limited to 1000 Watts
- Fully loaded weight of the aircraft is limited to 55lbs
- Takeoff distance is limited to 200 ft. and landing distance to 400 ft.
- Battery requirements: 6 cell, 22.2V LiPo with 3000mAh minimum
- Material restrictions: no lead, fiber-reinforced plastics, or metal propellers

REFERENCES

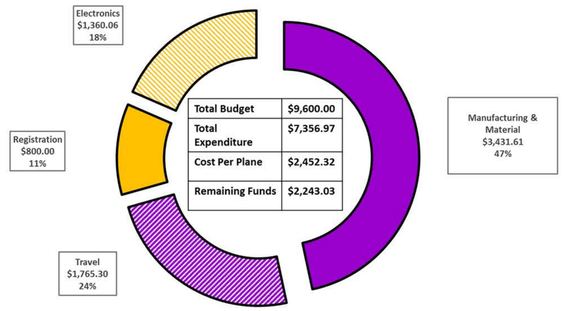
- Roskam, Jan. Airplane Design: Part I-VII. Lawrence, Kan.: DARcorporation, 2004. Print.
- Phillips, Warren F. Mechanics of Flight. Hoboken, NJ: Wiley, 2004. Print.

PLANE SPECIFICATIONS

- Length: 56 inches
- Width: 101 inches
- Height: 18 inches
- Airfoil: Selig 1223
- Wing Span: 101 inches
- Wing Chord: 16.8 inches
- Aspect Ratio: 6
- Est. Empty Weight: 9.8lbs
- Payload weight: 27lbs

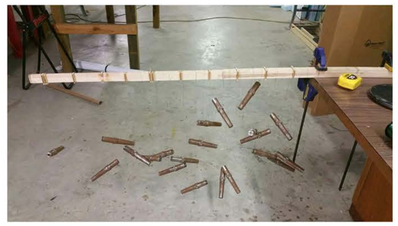
COMPETITION RESULTS
Finished 15 of 49

BUDGET



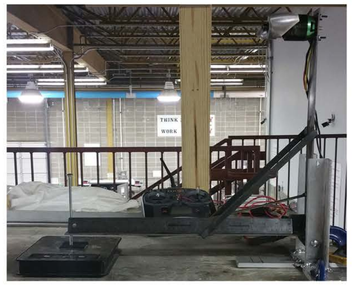
TESTING

Spar testing
Half spar failed with 35 lb loading



Flight testing:
Configuration was stable in flight

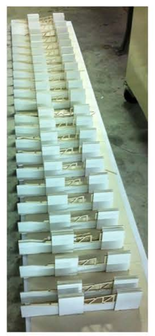
Propulsion tests:
Resulted in 13.2 lbs of thrust



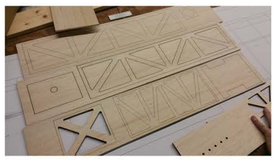
SAFETY

- Arming plug in accessible location incorporated for emergency shutdown
- Closed toe shoes required at the flight line and for all flight testing
- Safety glasses are required at all times
- No fly zones around the course require immediate grounding of the plane

MANUFACTURING



Wing jig created to accurately manufacture wing



Balsa pieces for the wing framers and fuselage were laser cut

Trailing edges were 3D printed and sandwiched with 1/32" balsa sheets

TIMELINE

DESIGN COMPLETION: Nov 25 → BEGIN MANUFACTURING: Dec 13 → TESTING: Dec 4 - Mar 5 → COMPETITION: Mar 11-13

SPONSORS: LaSpace, Jack Rettig, LSU MIE Department, ExxonMobil **ADVISERS:** Dr. Keith Gonthier, Jack Hawkins, Sean King