Team 508: SAE Aero Design Competition Geometric Integration

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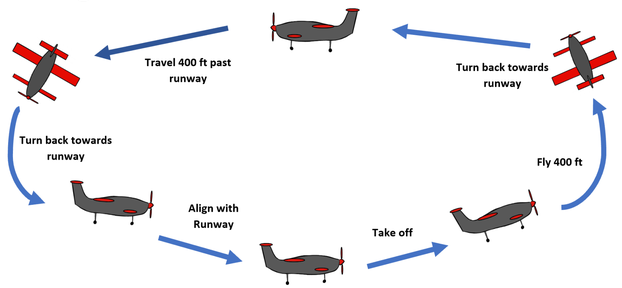
Project Objective

To design and manufacture the most innovative RC plane at the SAE Aero Design East Competition using additive manufacturing

Flight Mission Requirements

- Two minutes and 100 ft to take off
- One minute to unload cargo Required Flight Mission:

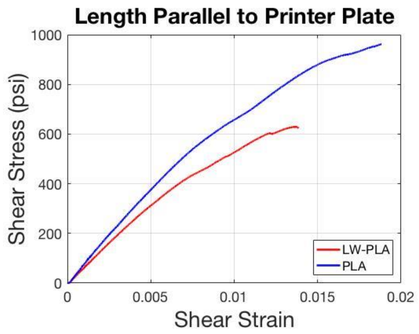


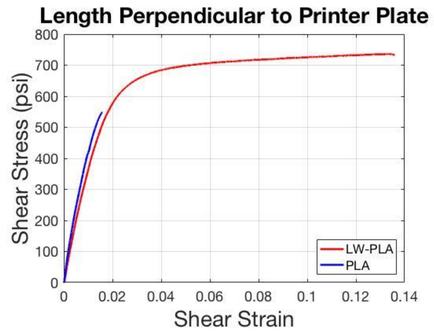
SAE Competition Requirments

- Dimensions
  - Maximum wingspan of 120 inches
  - Maximum plane weight of 55 pounds
- Cargo
  - Size 5 soccer ball and a one-pound box weight
  - Rubber bands, tape, velcro, and friction cannot secure the box weight
- Power Source & Building Materials
  - Maximum power of 1000W
  - Li battery of at least 22.2V and 3000mA, 25c
  - No FRP's or lead in building the plane
  - Propeller cannot be made of metal

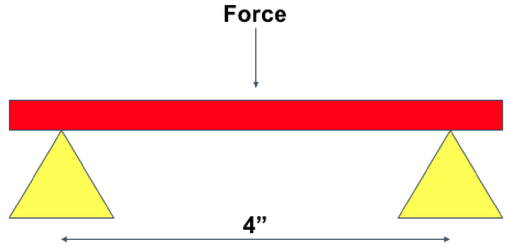
Material Selection: PLA or LW-PLA

Shear Stress-Strain Curves



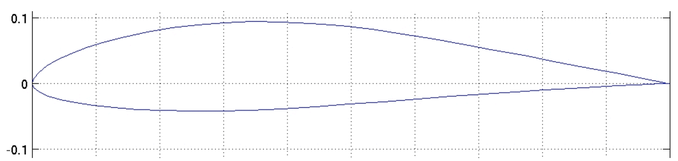


Three-point Bending Stress Test Layout

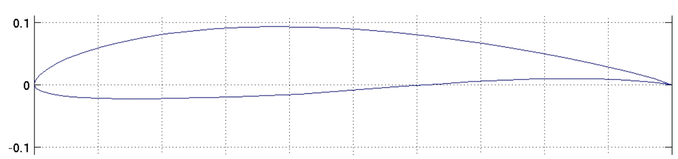


Airfoil Selection

Canards: Eppler 197

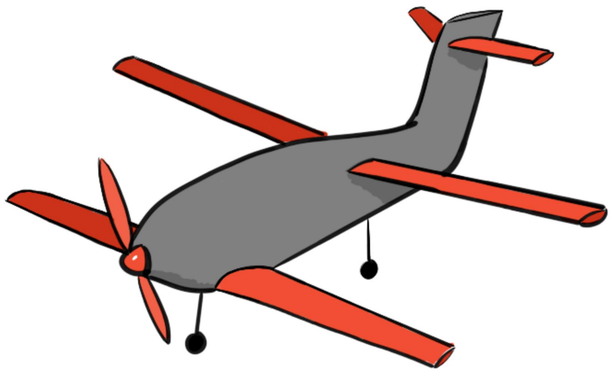


Main Wings: Eppler 214



Final Airplane Design

- The final concept uses rectangular wings with a high-wing profile and canards with a mid-wing profile, and a T-tail
- Flying boat fuselage with tricycle landing gear and a top loading cargo system
- Printed using LW-PLA



- 72" in length
- 80" - 85" Main Wingspan with 15" chord
- 50" - 55" Canard Wingspan with 12" chord
- 35" - 40" Tail Wingspan with 12" chord
- 20 lb total take-off weight

Future Work

- Design all plane parts in CAD
- Wind tunnel test with small prototype
- Print all parts for assembly
- Manufacture a full-size prototype
  - Preform a test flight with prototype
- Complete all SAE pre-competition assignments/paperwork
- Fly at the SAE Competition