Aero Competition Team

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Advisor: Dr. Mostafa Hassanalian

Sponsor: Merrion Oil & Gas, NMT Mechanical Engineering dept

Background and Objective

The aero competiton team will design and build an unmanned aerial vehicle (UAV) which carries and deploys payload to compete at the 2021 AIAA competition in Tucson, Arizona on April 15-18.

Mission Requirements

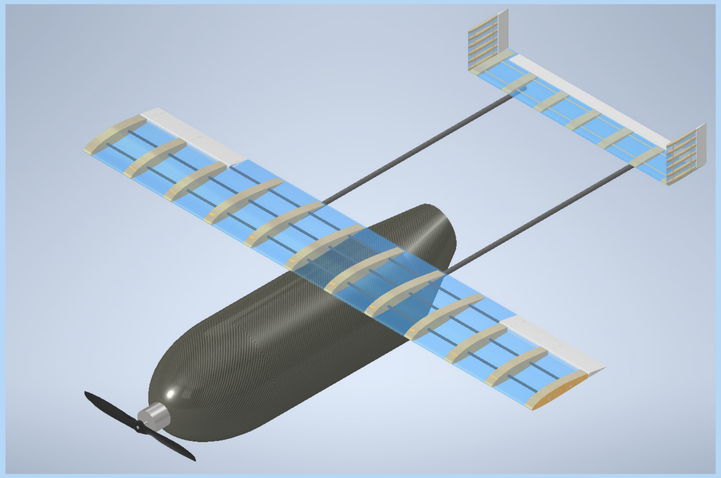
Ground Mission:
- A drop test from a height of 10 inches is performed on all six sides of the payload container
- The crew will load the aircraft with max payload and the pilot will show that the controls are functional.
- The payload deployment/ recovery mechanism is also tested to ensure functionality

Mission 1: Flight with no payload
- Plane is flown empty with no added cargo
- Complete 3 laps within 5 minutes
- Mission score based off successful landing

Mission 2: Payload flight
- The plane is loaded to max cargo capacity
- Complete 3 laps within 5 minutes
- Mission score is based off the number of containers flown over time

Mission 3: Sensor deployment
- Only the container with deployable sensor is loaded
- Unlimited number of laps within a 10 minute window
- Sensor is deployed mid-flight during the first lap and must be retracted before the plane lands
- Mission score is based on laps flown and the dimensions/weight of the sensor container

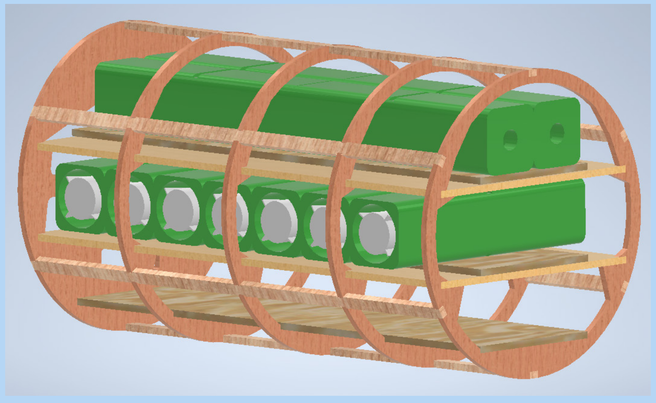
Airplane Design



Current design

- **Wingspan:** 60 inches
- **Aspect ratio:** 5
- **Airfoil:** K3311 (smoothed)
- **Cargo capacity:** 11 containers
- **Est. weight loaded:** 14 lbs
- **Est. weight unloaded:** 4.88 lbs

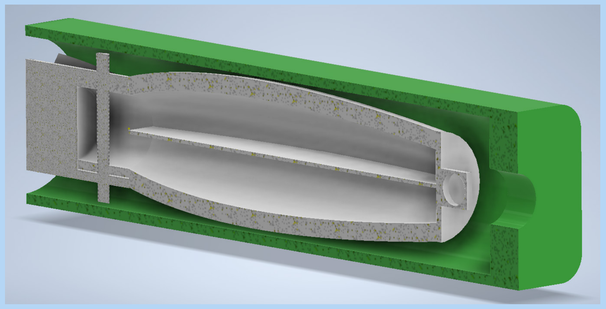
- The fuselage will be constructed with a fiberglass outer shell with a cargo hold built with laser cut balsa wood
- The wings, tail, and vertical stabilizer will be constructed with laser cut balsa and covered with MonoKote
- The containers, towed sensor, and deployment mechanism will be 3D printed with PLA



Cargo hold layout

Payload Design

Our plane will carry two different types of payloads:
- One which contains a sensor that can be towed and retracted via winch and is depoyed mid-flight.
- The rest of the containers will have a identical weight and dimesions but will be non fuctional and will not carry any sensor



Cross-section view of the container and sensor. It has a removable tail and has a compartmented internal section which allows for the weight to be varied without moving the center of mass. Coloring will be applied to top and bottom to increase efficiency which is based on our biomimicry reaserch into different types of long range birds.

Progress

Milestones Achieved
- We were accepted into AIAA Design Build Fly competition
- Airfoil analysis and selection of the K3311 (smoothed) airfoil
- Wing, tail and fuselage analysis and CAD design
- Payload and container design
- Wiring diagram

Future Tasks
- 3D printing parts for sensor/plane
- Order other building materials and electronics
- Sensor stability aerodynamic analysis
- Flight testing