Solar Airplane 2019-2020

SAMUELI SCHOOL OF ENGINEERING
UNIVERSITY of CALIFORNIA · IRVINE

Faculty Adviser: Professor Yun Wang

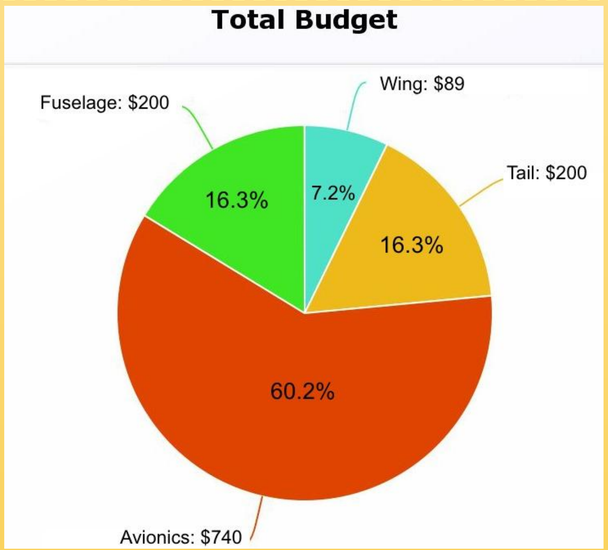
Background

Solar Airplane aims to create a UAV that utilizes solar energy to extend the flight time by at least 15% for disaster relief efforts where accessibility is difficult for humans or visibility is limited. The team aims to achieve this goal by utilizing a GPS and camera that will relay constant feedback back to the team during the duration of the flight.

Goals and Objectives

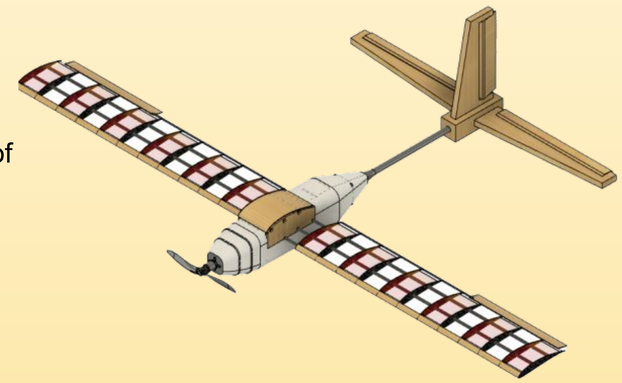
- Purpose is to provide students an understanding of integrated systems and aeroplane design and manufacture
- Aim to increase the flight time of out UAV by integrating solar panels and minimizing mechanical losses
- This quarter's objectives were to research the components of a UAV, create a design in AutoDesk Fusion 360, run simulations on each component, and create simulations and models on electrical components

Total Budget

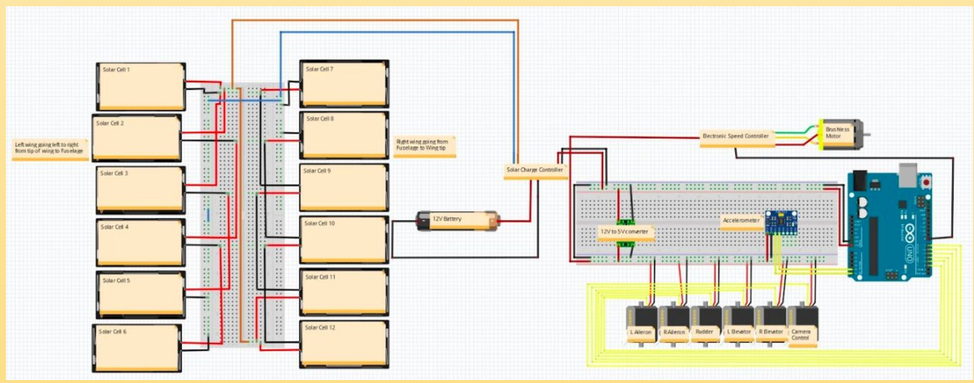


Preliminary CAD Model

- MH114 airfoils built by balsa wood
- Size of solar panels placed on top of monokoted wing determined airfoil amount
- Semi-monocoque style fuselage made out of balsa wood with a monokoted skin
- Balsa wood tail
  - pushrod mechanism for elevators and rudder to move the flaps
- Servos will be fitted near aileron, elevators, and rudder and wired to the fuselage
- Bungee Launch take-off mechanism



Avionics System Block Diagram



Innovation:

- Integration of a Renewable Fuel Source:
  - Integration of solar cells onto the wings to produce solar energy, which is fed to the main battery
  - The battery in turn supplies energy to the motor and the servos, which control the ailerons, elevators, and rudder
- Solar Cells:
  - The solar cells themselves are flexible which allows for more innovative and less labor intensive installation

Timeline

Fall
Research, design, and create simulations of electrical and aero components

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Winter
Stress analysis, component testing, manufacturing

→

Spring
Flight testing, performance analysis and design modifications

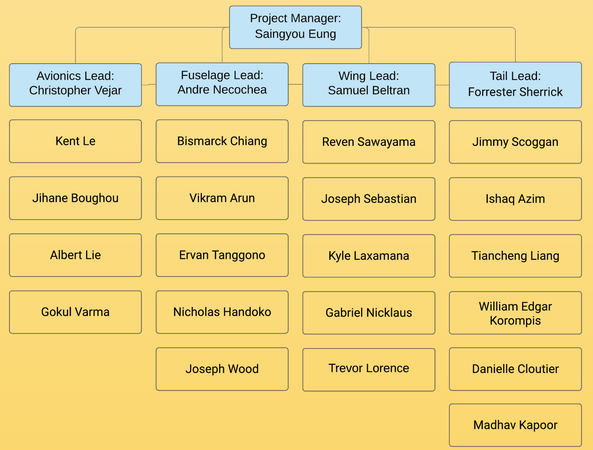
Requirements

- Maximum UAV weight of 15 pounds
- Maximum UAV dimensions are 24 ft ^{2}
- Technical payload of 2 pounds
- Minimum flight time of 10 minutes
- Solar panels must extend flight time by a minimum of 15%
- Camera must be incorporated
- Must fly at an altitude between 300 to 400 feet above sea level
- Must have 2 control systems that respond to environmental or operating conditions
- One component must be made of carbon fiber

Next Steps

- Updating CAD models
- Running simulations using ANSYS
- Acquiring proper electrical equipment
- Assembling model airplane

Team Formation



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