Solar Airplane 2019-2020

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 our 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

<table>
<thead>
<tr>
<th>Component</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuselage</td>
<td>$200</td>
</tr>
<tr>
<td>Wing</td>
<td>$89</td>
</tr>
<tr>
<td>Tail</td>
<td>$200</td>
</tr>
<tr>
<td>Avionics</td>
<td>$740</td>
</tr>
<tr>
<td>Total</td>
<td>$1,259</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research, design, and create simulations of electrical and aero components</td>
<td>Stress analysis, component testing, manufacturing</td>
<td>Flight testing, performance analysis and design modifications</td>
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</tbody>
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Requirements
- Maximum UAV weight of 15 pounds
- Maximum UAV dimensions are 24 ft
- 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

For further inquiry, contact:
- Project Manager: Saingyou Eung
- Wing Lead: Samuel Beltran
- Fuselage Lead: Andre Necochea
- Tail Lead: Forrester Sherrick
- Avionics Lead: Christopher Vejar
- MM114 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

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