

Solis Fur "The Sun Thief" Solar Plane

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Abstract / Introduction

Electric airplanes rely on batteries for energy storage which, given the current state of battery technology, requires immense size and weight due to the low energy density they contain. Extending the range and reducing the weight of these electric airplanes would revolutionize the industry and possibly make electric airplanes a viable source of travel. Because of this possible revolution, engineers have come together to find a solution which could lead to indefinite flight through the use of solar power. Extensive design and testing has been completed to successfully build a remote-controlled aircraft that will sustain flight on only solar power.

Project Goals

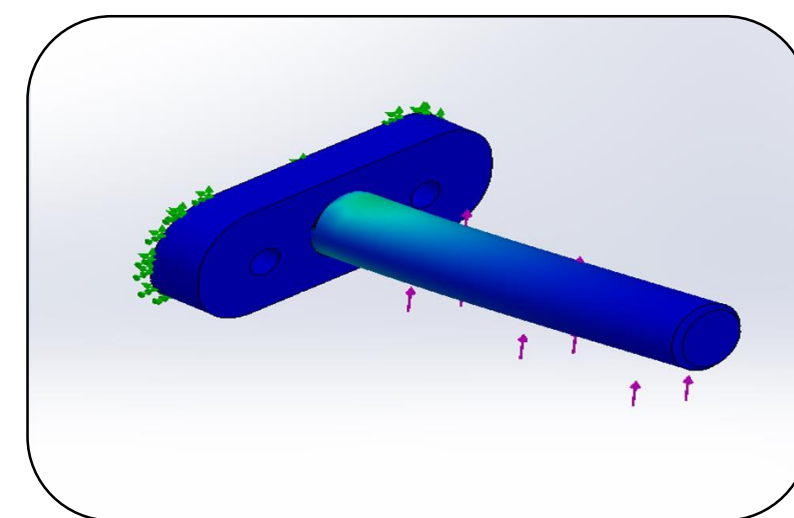
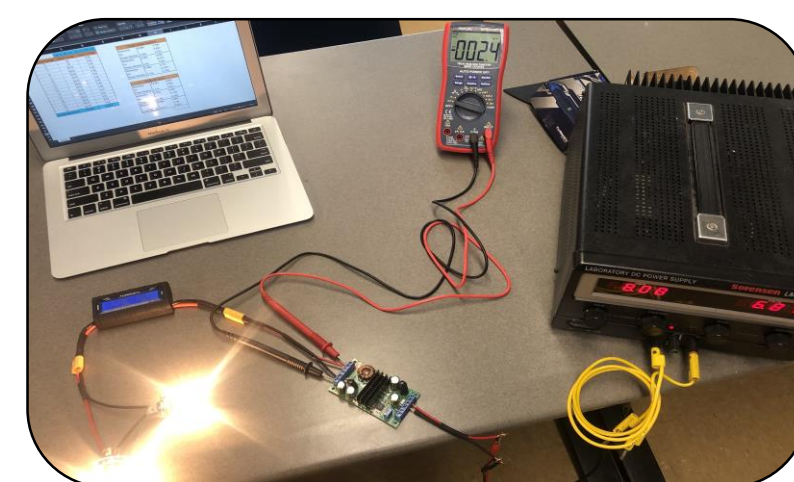
Explore the use of engineering principles to design and build a solar powered RC aircraft capable of sustaining indefinite flight while the sun is out.

Goals	Methods
Maximize power output	<ul style="list-style-type: none"> High efficiency solar cells Innovative wiring methods
Minimize power consumption	<ul style="list-style-type: none"> Optimize motor/propeller combination Low power accessories
Minimize weight	<ul style="list-style-type: none"> Carbon fiber and balsa wood construction Streamlined body designs
Minimize drag	<ul style="list-style-type: none"> High efficiency airfoil Streamlined fuselage and surfaces
Data logging	<ul style="list-style-type: none"> Sensors: GPS, Airspeed Sensors: Voltage, Current Draw

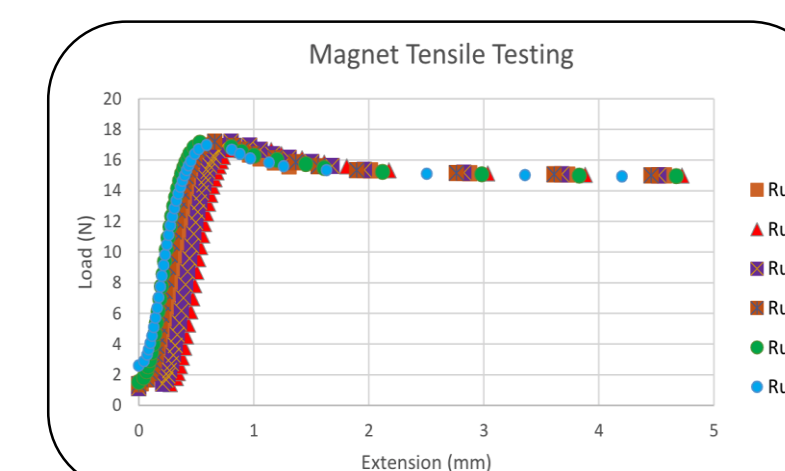
The Team



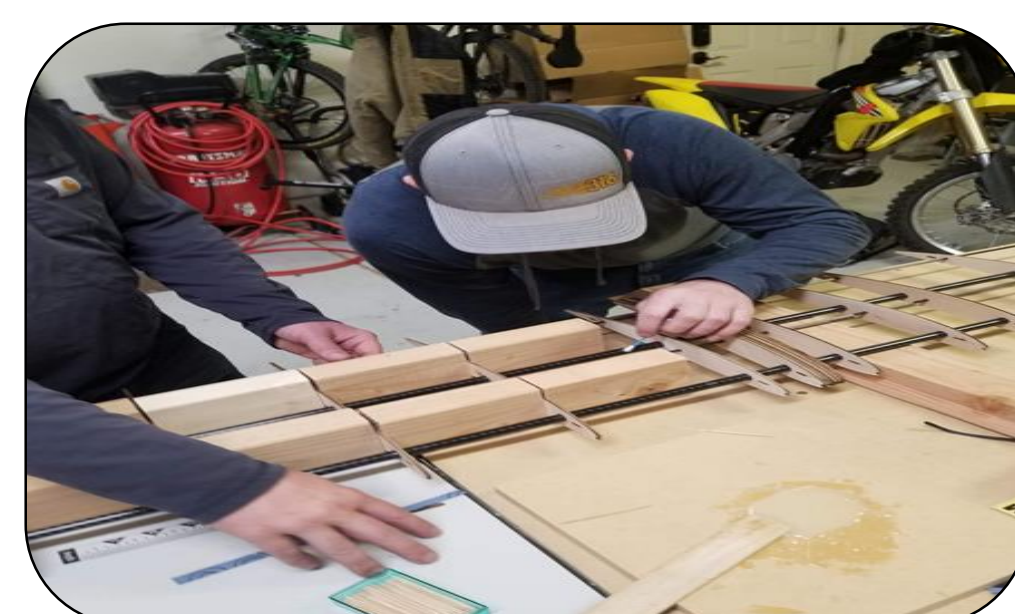
Test Methods



A variety of tests were conducted with the interest to best predict how the airplane would perform. Tests such as voltage regulator efficiency, magnet tensile strength, wing mount force analysis, motor power draw, wing coating UV transmittance, and ground station thrust testing.

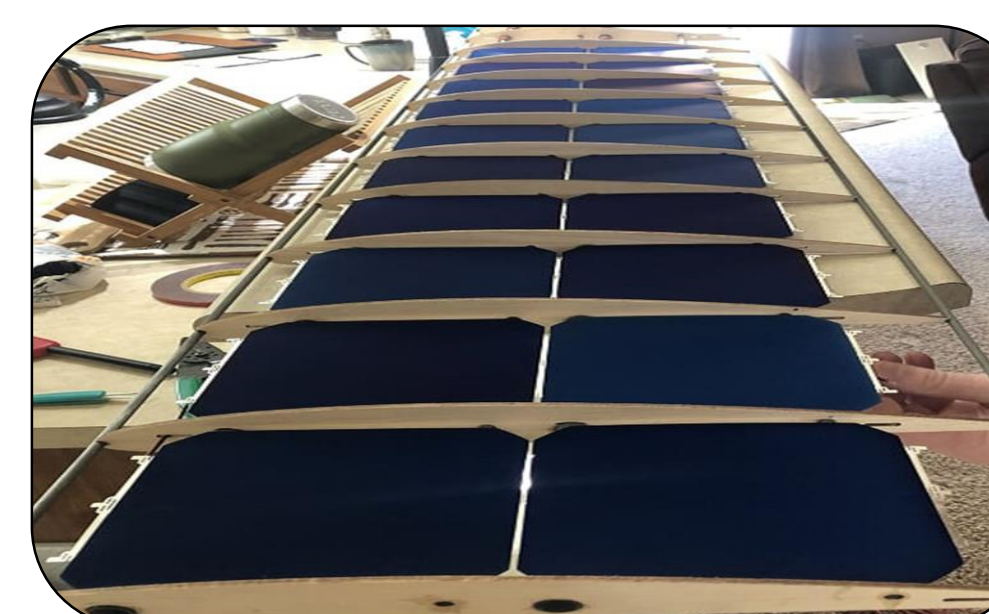
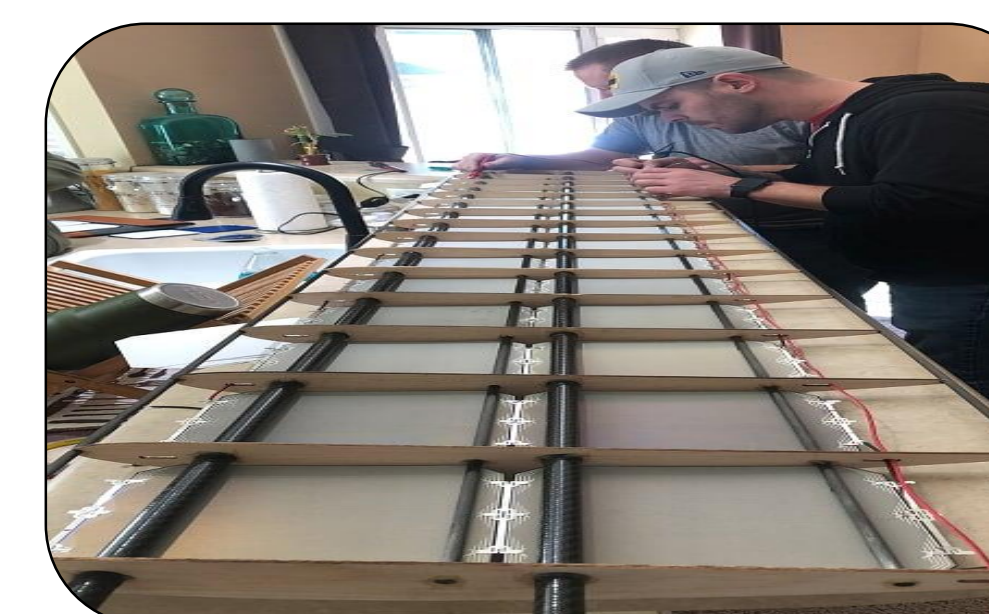


Manufacturing



Total Manufacturing Time

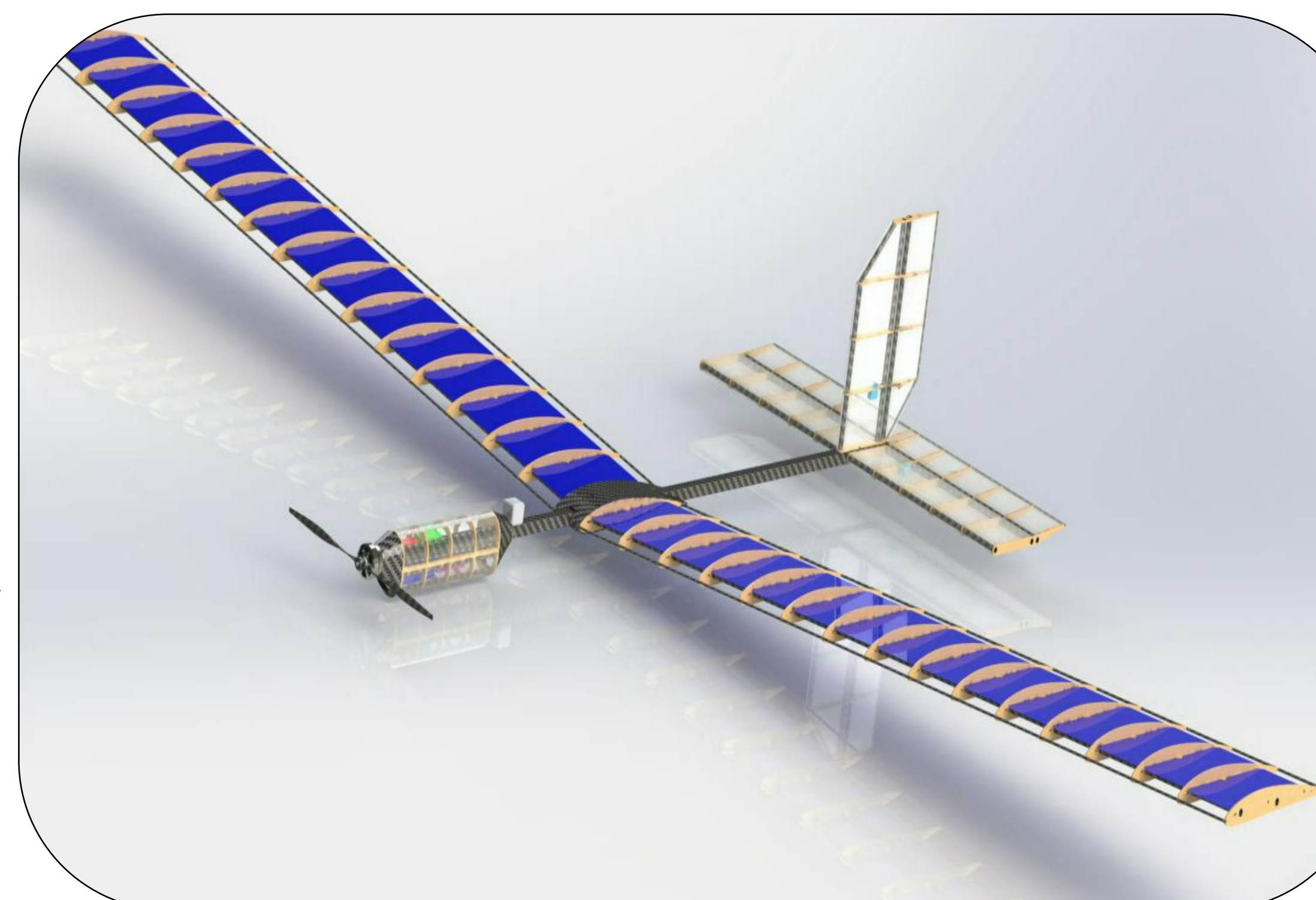
- 218+ man hours
- 32 hours soldering solar panels
- 58 hours building the wings and tail
- 15 hours machining wing mounting brackets



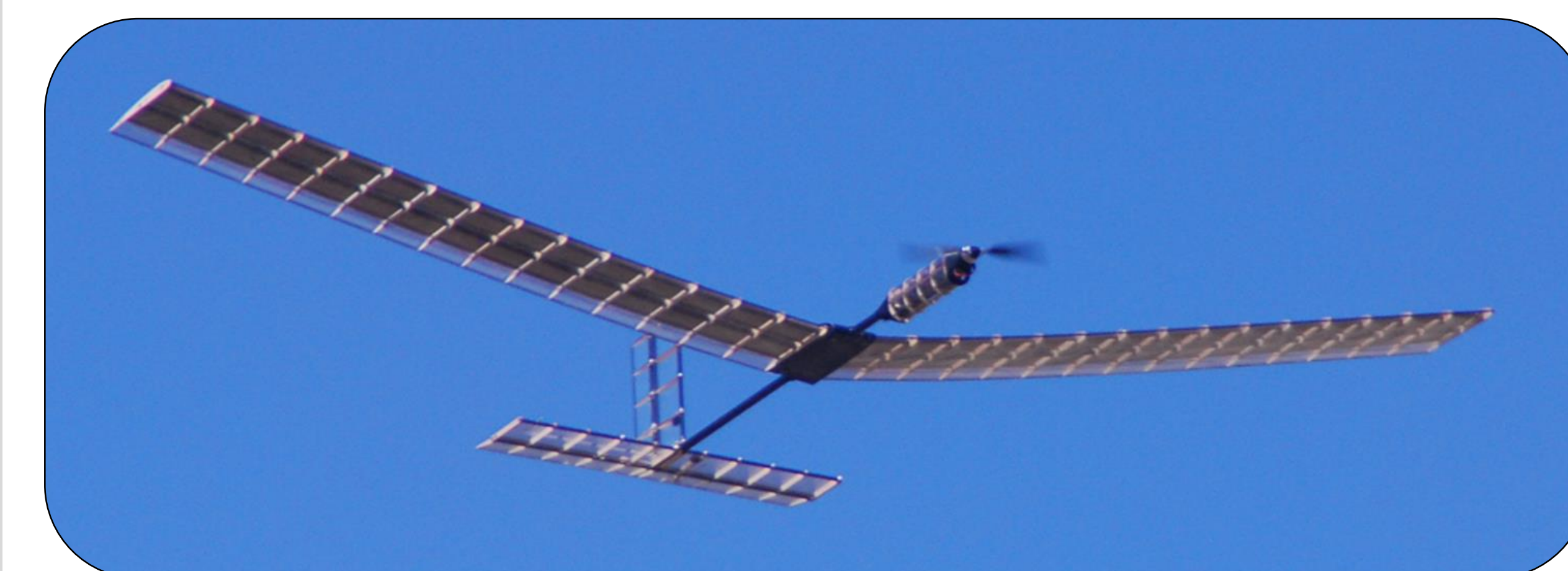
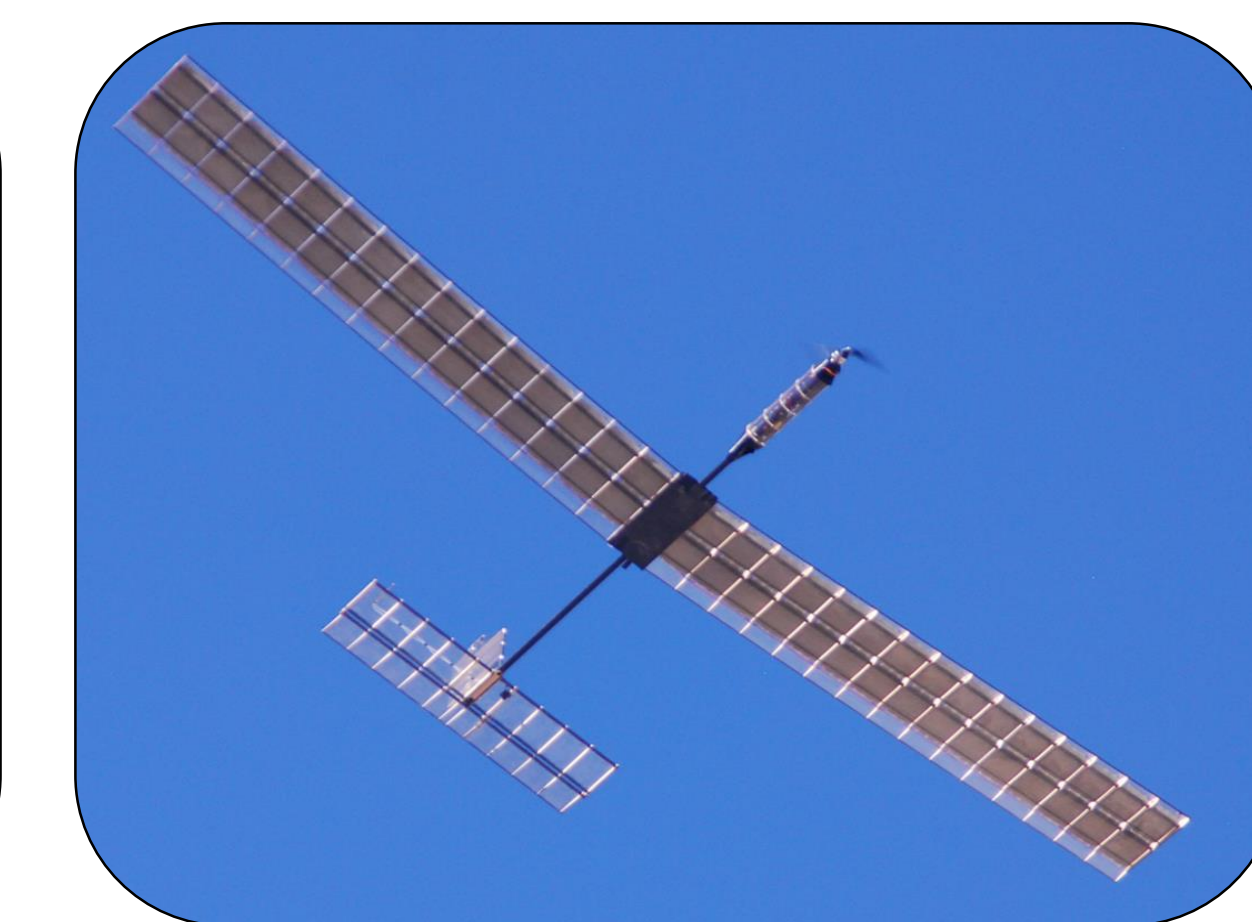
Final Design

Specifications

- Wing span: 4 m (13.25 ft)
- Wing dihedral: 6°
- Wing area: 1.4 m² (15.2 ft²)
- Total weight: 3.5 kg (7.6 lbs)
- Number of solar cells: 60
- Maximum power output: 200 W
- Operating voltage: 17.2 V
- Propeller: 457x152mm (18x6 in)
- Flight speed: 10 m/s (22 mph)



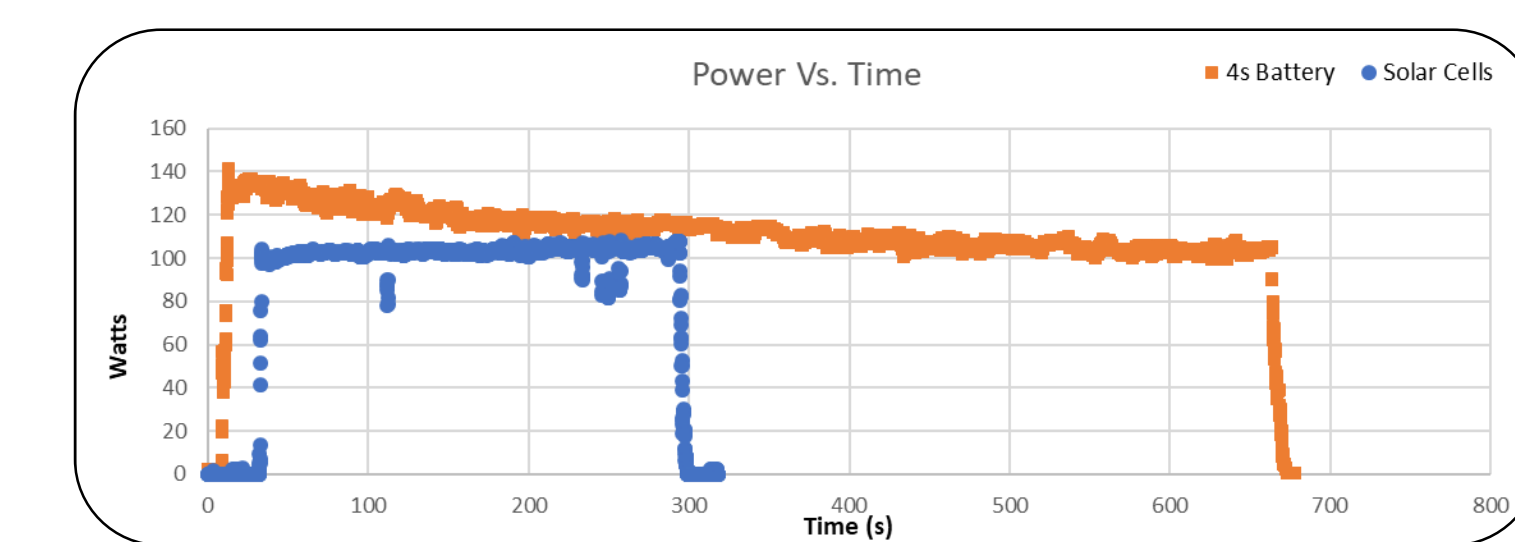
Flight Testing



Data Results

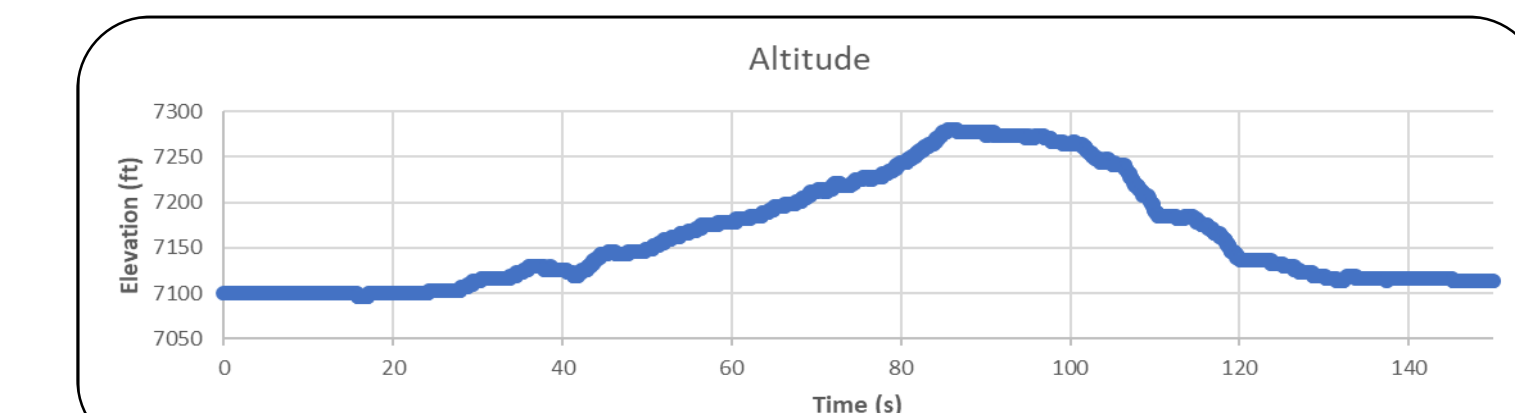
Ground Testing Results

- Solar cells created higher voltage but less amperage than battery.
- Solar power remained consistent over time.



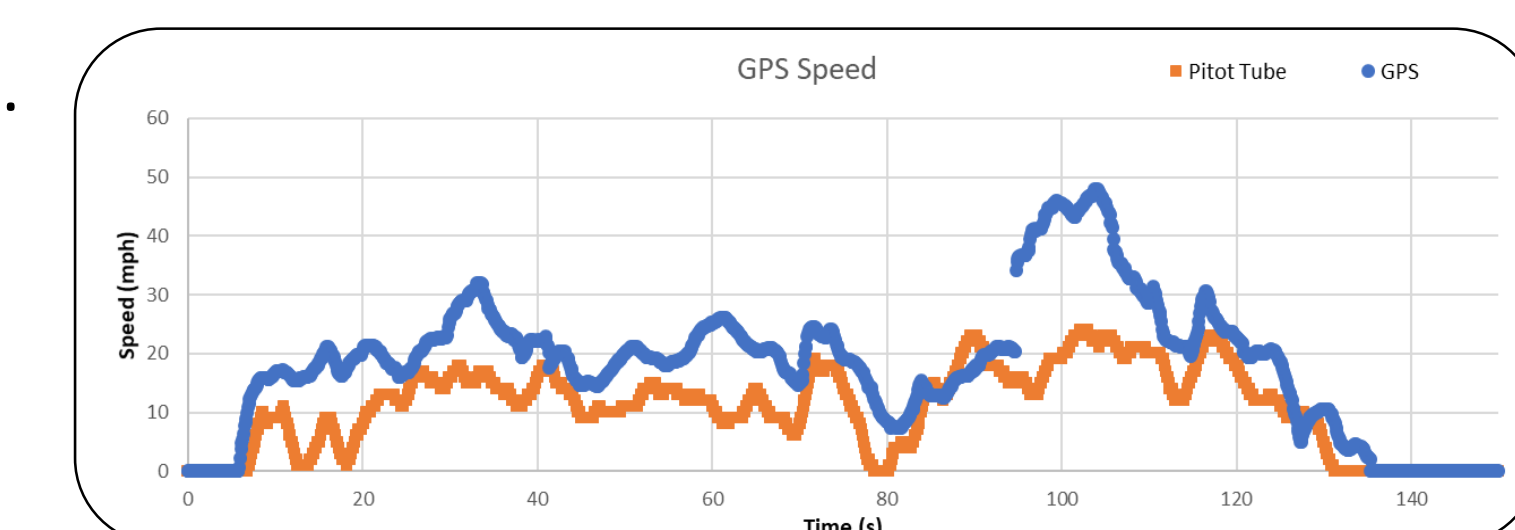
Flight Results

- Test flight reached 170 ft off the ground.
- The plane was able to achieve the calculated speed.



Estimate Flight Time

- Indefinite while the sun is out!



Acknowledgements



David Trevas, PhD

