Solar Powered Airplane

Alvin Cao, Joseph Cuevas, Christopher Gay, Kenneth Miranda, Jonathan Wong
Department of Materials Science
Professor Albert Yee
The Henry Samueli School of Engineering

Goal

Our team is attempting to build a remote controlled aircraft powered by solar cells. We hope to use solar power to produce run times significantly better than those of traditional, battery-powered aircraft.

Background

The purpose of this project is to design an aircraft that integrates solar cells into design for sustained flight. Transportation accounted for more than one third of CO_2 emissions, and fossil fuel consumption continues to increase globally so alternatives fuels would have a tremendous impact on the environment.

Many engineers hope to create an airplane that is powered with solar powered, but solar cells were too heavy and inefficient to make this goal plausible. With new developments in the semiconductor industry, new solar cells offer promise for applications that were previously not possible such as the NASA Helios, an aircraft meant to stay aloft indefinitely under purely solar power.

Applications for solar powered airplanes range from long term aerial surveillance to planning for construction and monitoring crops. In more recent years, advanced solar cells have become more accessible to the common consumer. With this project, we hope to use newly available technologies to create a smaller scale solar powered aircraft.

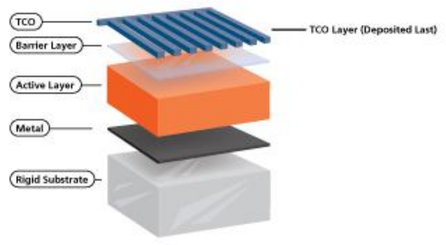
Team Members

Member / Major	Subteam Responsibilities
Alvin Cao / ME & MSE	Solar cell and airfoils research, poster
Joseph Cuevas / ME & MSE	Solar cell research, fuselage design
Christopher Gay / ME & MSE	Team leader, components and overall design research
Kenny Miranda / ME & MSE	Materials and dihedrals research
Jonathan Wong / ME & MSE	Materials research, poster

CIGs Solar Cells

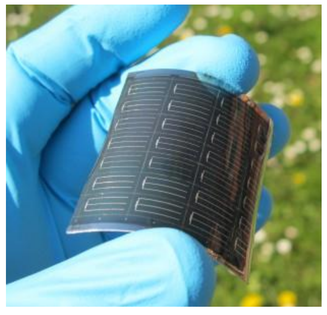
Voltage	18.5V
Current	243mA (0.234A)
Voltage (oc)	25.5V
Current (sc)	295mA (0..295A)
Power Output	4.5 [W] → .00769 [W/cm^2]
Total Size	(170 x 344mm)
Weight	(105 g) → .180 [g/cm^2]
Price	$40.00 ea → 0.0684 [$/cm^2]
Efficiency	~20%

CIGS



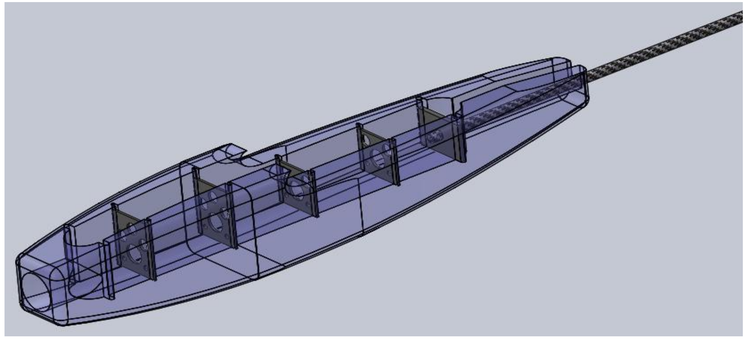
Pros:
Completely flexible
Easy to connect
Inexpensive
Direct exposure to sunlight; don't need to rely on transparent film

Cons:
Moderately heavy
Does not come in smaller sizes



Fuselage

Our preliminary fuselage design incorporates a streamlined teardrop shape in an attempt to minimize drag. The carbon fiber boom used to support the tail wings will be a low profile, low weight, high strength alternative to having a foam fuselage that extends to the end.



Materials and Estimated Cost

The following table sums up the most important materials we will need for the project and their costs (including tax and shipping):

Item	Cost (USD)
Hitec Optic 6 Radio Transmitter and Receiver System	$240
(2) Hitec HS-85MG+ Servos	$75
Himax HG2025 Inrunner Brushless Motor	$75
Castle Creations Phoenix 25 Electronic Speed Controller	$90
Thunder Power TP13003SPP45 Battery	$45
Thunder Power TP610C Lithium Battery Charger (for testing and ground use)	$140
Thunder Power TP425C light Lithium Charger (to be dismantled for onboard battery charging circuit)	$70
(22) WaveSol Mobile (EIPV Module) – WSME-0045 Solar Cells	$880
Hangar 9 Heat Gun (for shrinking films onto the plane)	$30
Weller 80W Soldering Iron (for connecting solar cells and making in field repairs)	$50
5 Minute Epoxy (for securing major joints and making in field repairs)	$50
Insta-Cure Cyanoacrylate Glue (fast and minor repairs)	$20
Mylar film rolls	$50
Polystyrene blocks	$50
Carbon fiber rods	$70
Fiber reinforced Nylon sheets	$400

Progress and Future Work

Fall 2012: Project definition, planning, budget
Initial research for design and materials selection
Submit project to UROP, Fall Design Review
Winter 2013: Detailed design & Implementation plan, revised budget
Initial prototype, initial test, update design approach
E-Week BBQ & Senior Display
Spring 2013: Design Revision, Final Prototype & Demonstration
Final Design Review & Symposium

Contact Information

Advisor: Prof. Albert Yee
Email: afyee@uci.edu
Phone: (949) 824-7320

Team Leader: Christopher Gay
Email: cgay@uci.edu
Phone: (949) 422-6691