Solar-Powered Unmanned Aerial Vehicle

Update#1
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Sultan Hazawbar & Gabriel Martin

Project Client: David Willy
Project Sponsor: Gore
Project Advisors: Venkata Yaramasu, Ph. D &
Alexander Dahlmann, GTA
Project Partners: ME 486C Team

Overview

Goal: To construct a solar powered unmanned aerial vehicle (UAV) that will fly 1 ½ times the duration that a sole onboard battery would fly it for.

Progress Update Since 9.9.22

1) Ordering & Receiving Materials
2) Charge Controller Adjustment
3) ME Progress
    - Hot Wire Drone Cut
    - Initial Prototypes
    - RF9 Simulation & Flight Testing
4) Panel Durability and Initial Reads
5) PV Array Adjustment & Assembly
6) Next Steps

Solar UAV System Architecture

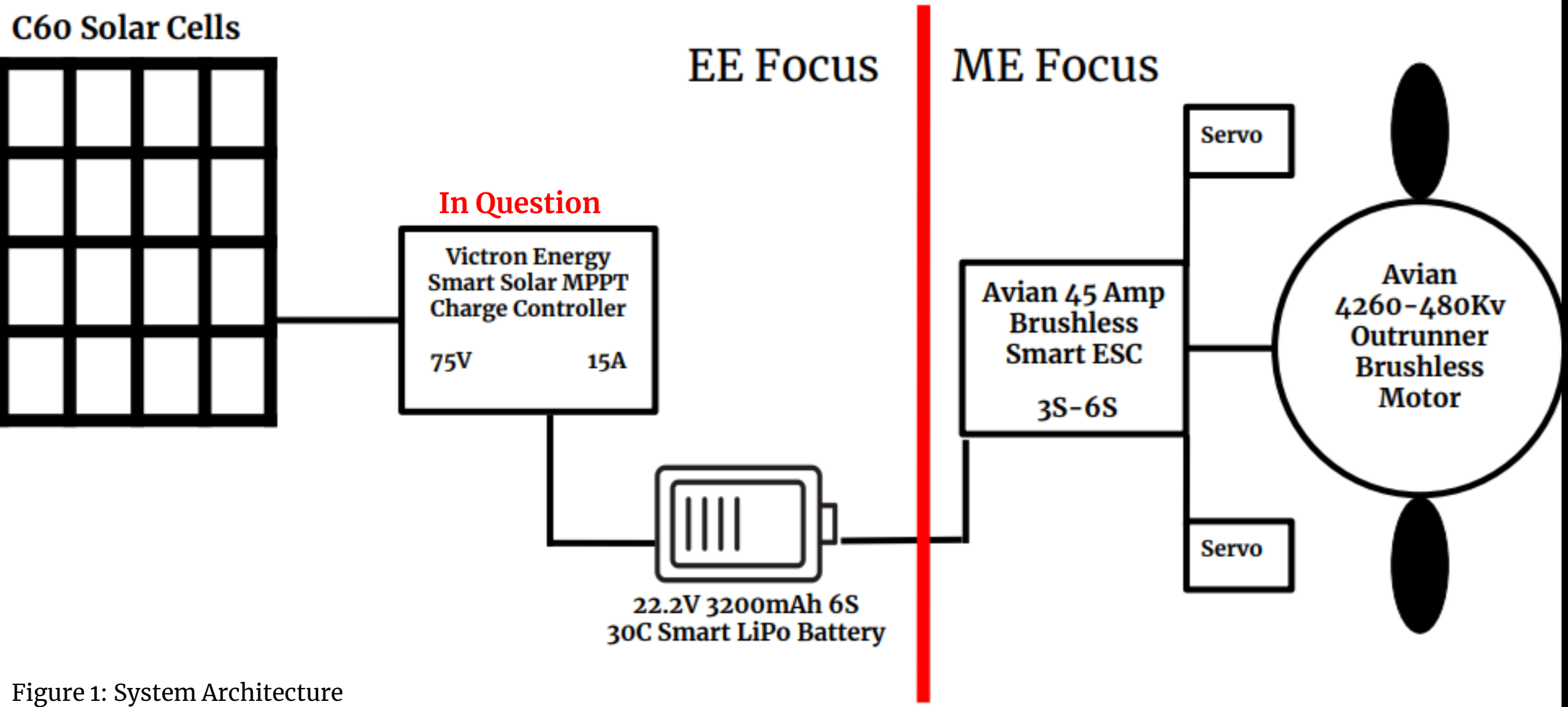
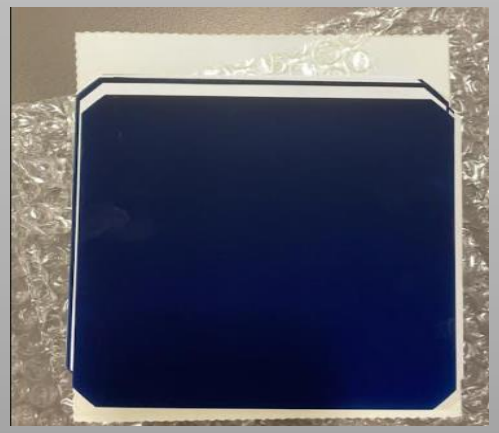


Figure 1: System Architecture

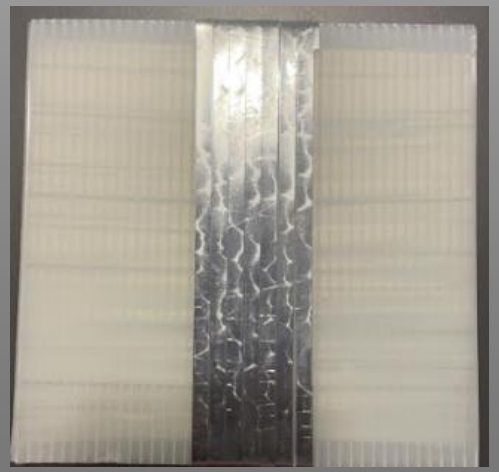
Ordering & Receiving Materials

Victron Energy Smart Solar MPPT Charge Controller 75V 15A



Sunpower C60 Monocrystalline Silicon Solar Cells

Dog Bone Tabbing Connector & Flux Pen for Soldering



DC Solar Tabbing Wire

Other Assembly Materials

- Soldering Tool
- Soldering Rosin
- 14 Gauge Wire
- Dogbone / Bus Connectors
- Wire Strippers
- Digital Multimeter
- Super Glue
- Powder Free Latex Gloves
- Clear Glass Plates

Charge Controller Adjustment

Victron Energy Smart Solar MPPT Charge Controller 75V 15A

BougeRV 10A PWM Solar Panel Regulator

- Weight decrease from 1.1lbs (498g) to .3lbs (136g). Slightly smaller dimensions as well.
- User friendly / spade terminals included to ensure tight connection.
- PWM: Will cycle PV input current and battery voltage on the main interface every 3 seconds.
- Foreseeable Issues:
  - Finicky compatibility with our wire selection of 14AWG (recommends 10 & 12 AWG).
  - Strays away from the original client requirement of using an MPPT charge controller.

ME Progress – Hot Wire Drone Cut

- Built using PVC tubing, wires, a car battery, finite wire, and a toggle switch.
- Marked out dimensions on insulation foam and made precise cuts.
- After practice, the plane took 30 minutes to carve out.
- Idea was given by Home Depot (Gage's Workplace & Potential Sponsor).
- Brushing over plane to clear residue and unevenness.

ME Progress – Prototyping

Prototype A: Hot Wire Foam Cut UAV w/ Motor System (No Solar)

Prototype B: Wood Airfoil Cuts, Struts & Plastic Coating UAV w/ Motor System (No Solar)

ME Progress – RF9 Simulation & Flight Testing

ME Flight Testing in Twin Peaks (Prototype A)

RF9 Simulator Compatible w/ Spektrum Smart Controller Used to Control ESC/Motor System

ME Progress – Flight Testing (No Solar)

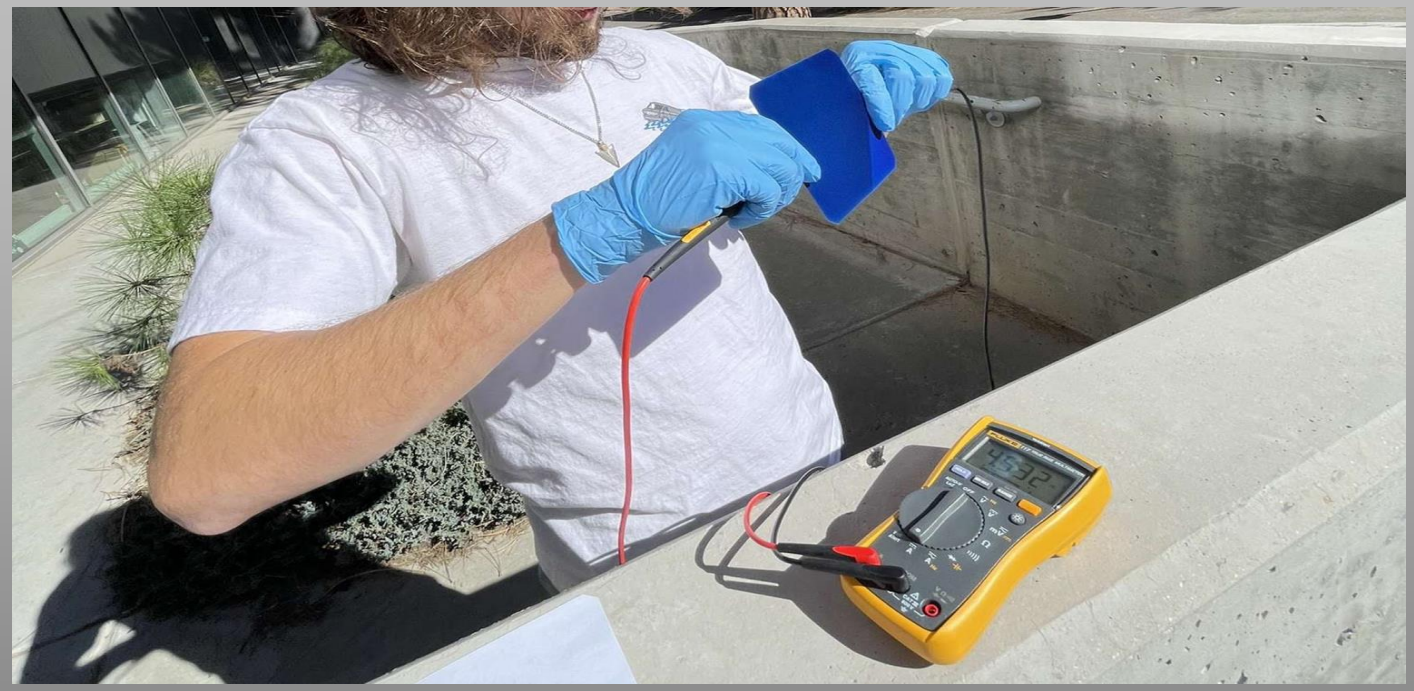
ME Flight Testing in Twin Peaks (Prototype A)

Positive: Achieved an uphill trajectory.

Negative: The plane broke.

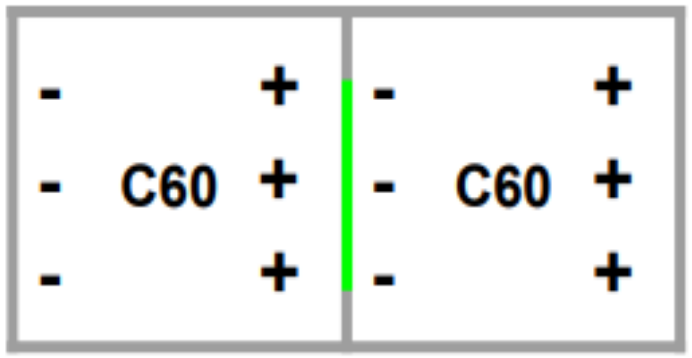
Takeaway: Calls for redesign (Prototype B)

Panel Durability and Initial Reads



Single Cell Specifications (@STC)	
- Ppv	3.42 W
- Vpv	.58 V
- Ipv	5.93 A
- Voc	.68 V
- Isc	6.28 A
- Weight	7 g

Single Cell Measurements	
- Temperature	66°
- Voc	.602 V
- Isc	6.18 A
- Weight	6.9 g
- Durability (Degrees of Bend)	4°-7°

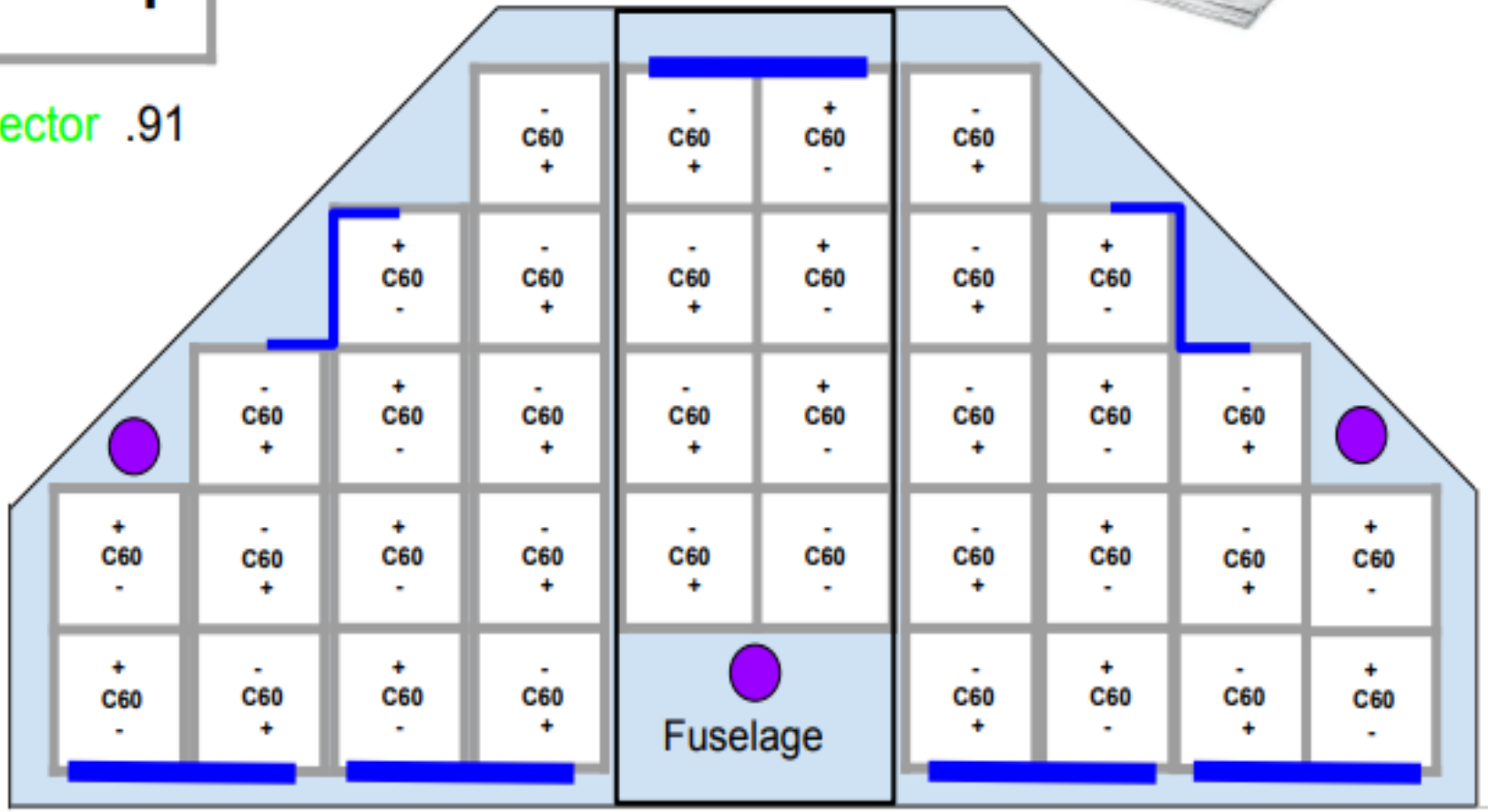


Dog Bone Connector .91 g Each

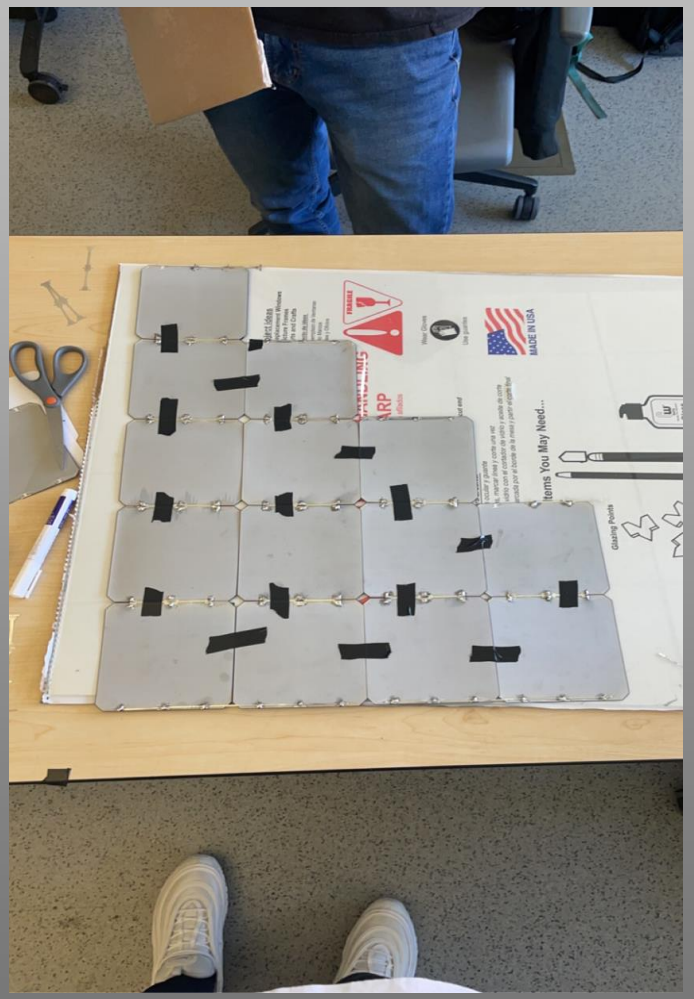
Fuselage Access Point

Tabbing Wire

Fuselage Connections Are In Red Using 14 Gauge Wire



PV Array Assembly - Prototype A



Positive: Built an array of 14 cells and received a reading.

Negative: Significant voltage loss from our goal of reaching outputs close to Voc and Isc along STC.

Takeaway: Review assembly procedure, investigate the probable cause of losses, and make a plan.

Next Steps

1) Investigation of solar array performance
2) Full assembly and successful read of solar configuration
3) Monitor a successful flight without solar to set marks
4) Request additional funding for device construction
5) Panel installation on top of plane
6) Class deliverables and syponism preparation

Questions ?