

EE/CprE/SE 492 GROUP PROGRESS REPORT #3

Group number: 01

Project title: Hybrid solar/battery for electronic derailleur

Client: Dr. Raj Raman

Advisor: Dr. Raj Raman

Team Members: Aydin Bashich, Elba Estarellas, Connor Davison, Mohamed Mohammad, Seth Pierre, Rachel Vallier, and Jack Waskow

○ **Project Summary:** The client requested a solar/hybrid battery to provide power to an electronic derailleur. The derailleur is currently powered by a battery that is charged through a wall outlet. The benefit of having the solar/hybrid battery is that the battery will never need to be taken off the derailleur to charge and, therefore, will hypothetically never die because the sun will be able to charge the battery since the bike is outside. For the project, the team determined the components needed to accomplish a set of criteria the client provided for the project. Key constraints include a dark-run time of 10 hours, a charge time of 6 hours in direct sunlight, a weather-proof system that adheres to IP58 standards, and a detachable and compact design.

○ **Accomplishments**

Below is the breakdown of large tasks with subtasks and the people involved.

	A	B	C	D	E	F	G
1	Big Tasks	Sub Task	Person(s)	Sub Task	Person(s)	Sub Task	Person(s)
2	Verification	Cross-checks	Mohamed				
3	Testing Circuit	Programming Arduino	Aydin	Building Arduino	Connor	Watching	Connor
4	Battery Assembly	Test Battery on breadboard	Jack	Electrical Assembly	Jack (Seth backup)		
5	Case Design	Model	Seth	Electical Connections (battery to derailleur)	Mohamed	Weather Proofing	Seth
6	Documentation	Biweekly Report	Rachel and Elba	Correct/Update Design Document	Rachel and Elba	Update website	Seth

Group 1: Aydin, Connor, and Mohamed

1. Tested battery by simulating a gear shift every 30 seconds per shift, which translates to 470 mA per shift. This test determined the SRAM battery enables the derailleur to operate for approximately 13.7 hours. *Figure 1* is a graph of voltage vs. time which corresponds to this part. As seen in the graph, when the voltage reaches 6 V, there is a hard cut-off due to the battery protection.
2. Tested the LiPo battery, which the team selected to use based on the client's criteria and constraints. Subjected the LiPo battery to the same test cycle as above. *Figure 2* is the graph of voltage vs. time, which shows the ride time of approximately 8 hours. This verified the system would meet the requirement of a run time of 10 hours because this test was conducted at a more intense rate than

in practical use. Additionally, due to on-the-go charging, the duration will be longer due to the additional charge the battery will receive.

- Aydin, Mohamed, and Connor researched IP58. Created plan to conduct environmental testing, which included water, dust, temperature, shock, and vibration, which meet IP58 standards.

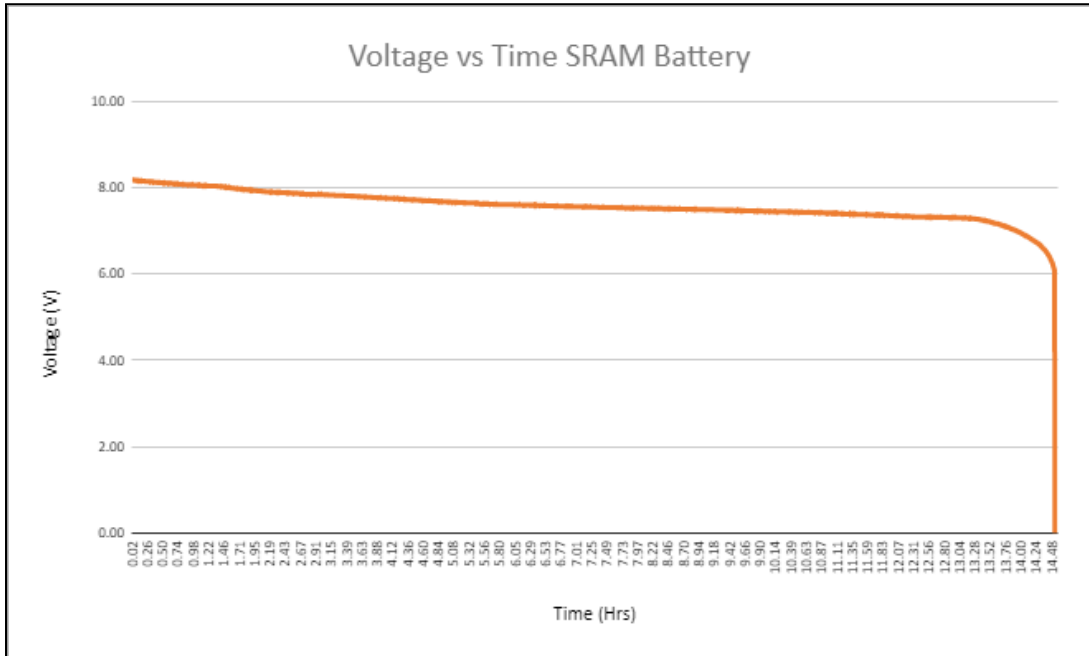


Figure 1

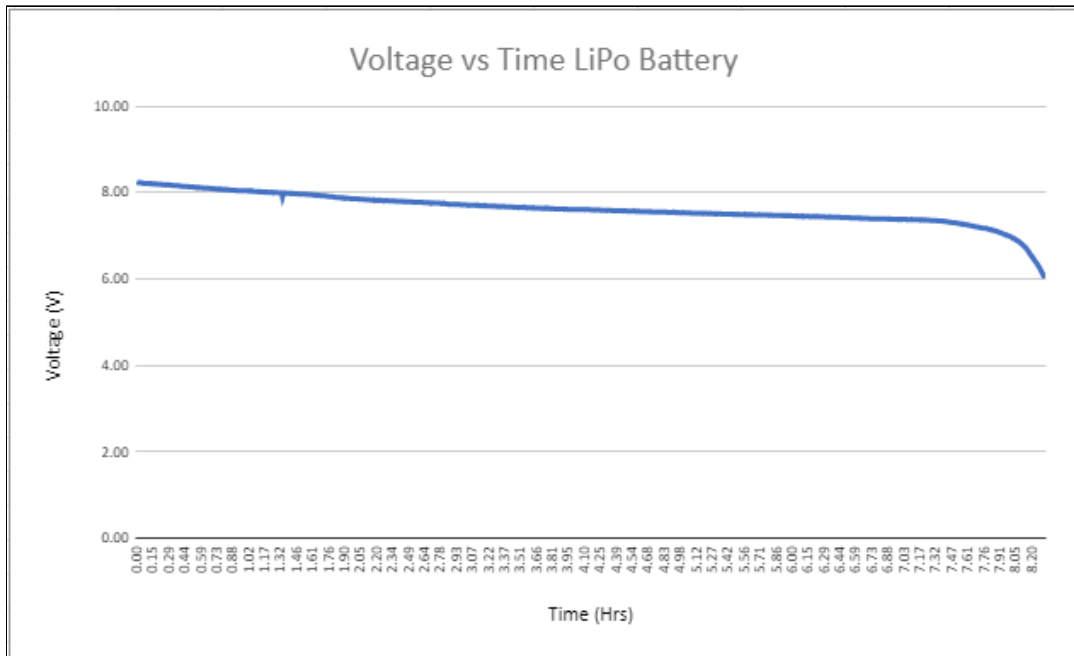


Figure 2

Group 2: Jack and Seth

1. Jack implemented the charge controller design. Tested and verified the charge controller worked appropriately.
2. Tested the new solar cell, which delivered 6 - 6.12 V and 100 - 190 mA in direct sunlight. When connected to the rest of the components, it outputted 6 - 6.12 V and 120 mA.
3. Completed electronic system, so all the components are working together properly, a schematic of the electronic system can be found in *figure 3*.
4. Seth designed and printed a 3D model to mount the solar panel to the bike. *Figure 4* is the 3D model, *figure 5* is the printed case, and *figure 6* the case attached to the derailleur.

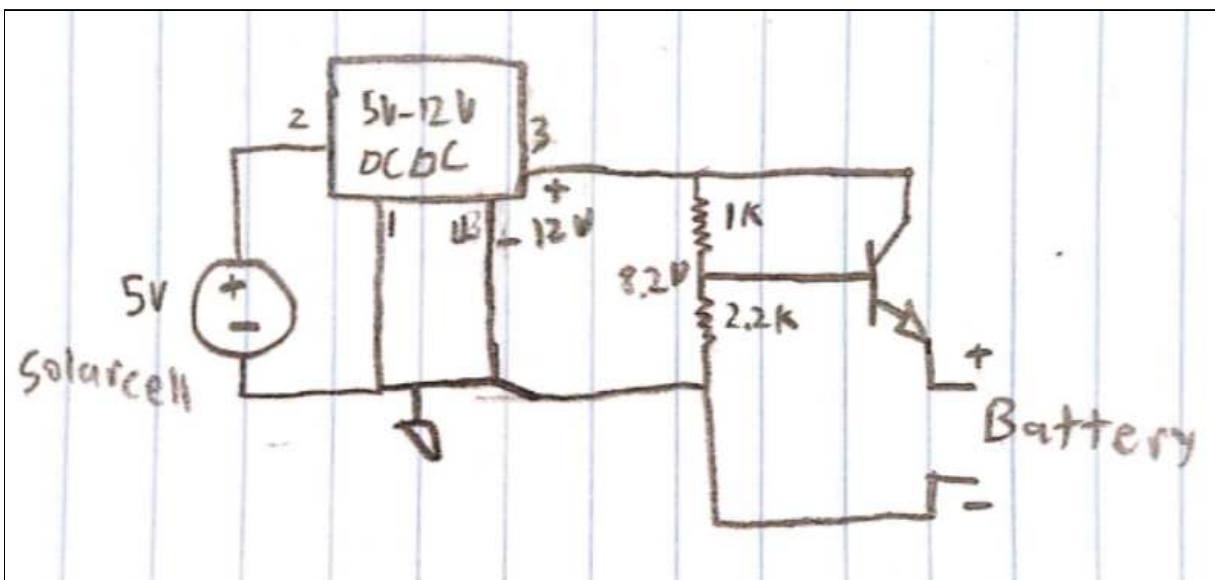


Figure 3

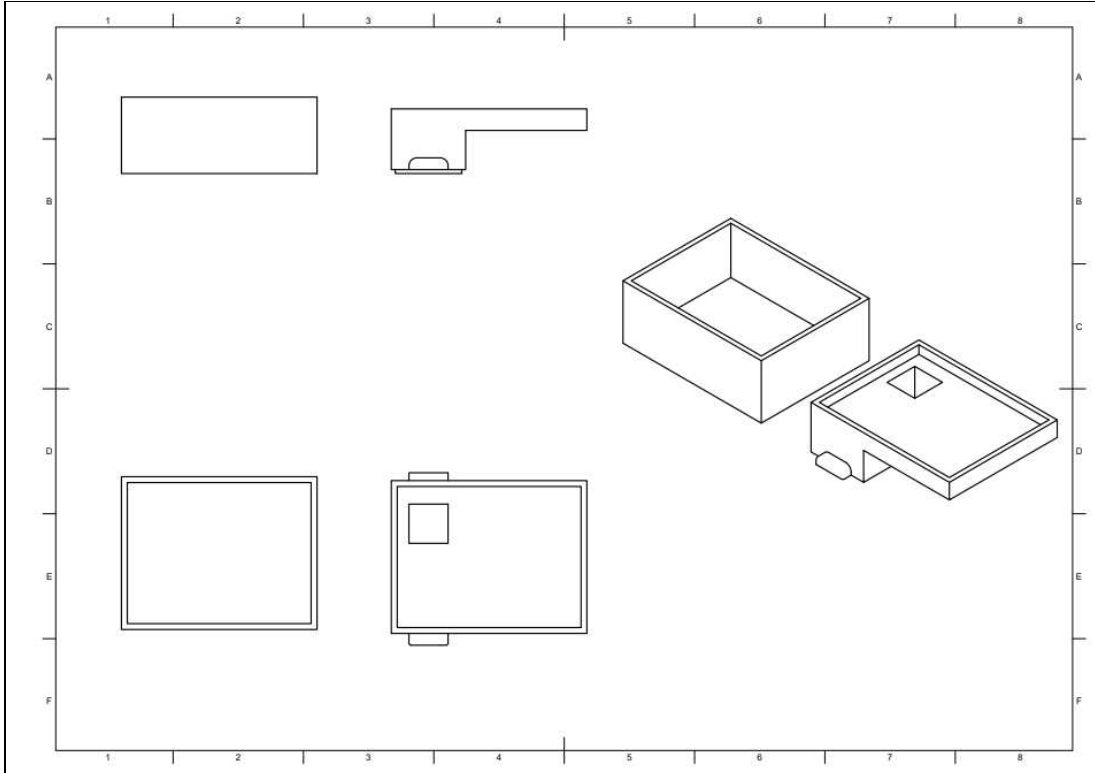


Figure 4



Figure 5



Figure 6

Group 3: Rachel and Elba

1. Determined LTSpice would not be useful to model the system. Due to the complexity of modeling the system, it was determined LTSpice would not be accurate. The team determined the comparison of the SRAM battery to the LiPo battery would be the most useful comparison for the project.
2. Continued updating the design document based on new parameters provided on canvas. The following parts of the design document have been finalized: team information, introductory information, project plan, design, and professionalism. The following parts have been started, but not finalized: testing, implementation, closing, and operational manual.

- **Pending issues** Currently, we have not had an opportunity to test the solar panel under good lighting conditions, so the current is not 100% accurate.
- **Advisor Input/Signature:** It is very important that you meet regularly with your advisor. Please have your advisor select one of the options below.

XXXXX I am pleased with the progress the team is making.

_____ The team's progress could use some minor improvements.

_____ The team's progress has some major concerns.

Your advisor's selection must be confirmed by either an email attached to this report (merge files into a single pdf) or a physical signature obtained from an in person

meeting. Please provide this report to your advisor at least 1 week before the due date so that they have time to respond.

Signature: _____ *D. Raj Raman*



Raman, D R [A&BE]

to me ▾

Thank you - good changes. Signed copy attached - pls verify ok. drr

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