

## **sdmay19-15: Capacitor Gun**

Week 1 Report

February 4 - 15

Client: Max Balzer

Faculty Advisor: Mani Mina

### **Team Members**

Grant Larson — *Test and Design Engineer*

Max Balzer — *Meeting Facilitator and Production Engineer*

Bret Tomoson — *Projectile and Power System Designer*

Brett Nelson — *Documentation, Engineer Designer*

Mark Fowler — *Test Engineer, scribe*

Zachee Saleng — *Engineer designer*

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### **Summary of Progress this Report**

We reflected on what we accomplished last semester as a group and what we need to improve on and change. We split into three groups to effectively divide up the work which Mani recommended in our bi-weekly meeting.

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### **Past Week Accomplishments**

- Split into three groups to divide work
  - Group 1: Max and Bret will work on creating a small, demo model of an electromagnetic propulsion device to help convey engineering theories and technology.
  - Group 2: Mark and Grant will work on the charging circuit either by fixing the current one or making a new one.
  - Group 3: Brett and Zachee will create a document clearly outlining the theory of operation of an electromagnetic propulsion device.
- Looked into fixing current circuit and circuit alternatives - Mark
  - Read LT3751 datasheet to get more insight into how chip works in our circuit and how to fix our already built circuit.
  - Met with Dr. Geiger to discuss problems with our circuit and look into alternatives.
- Materials and small scale design research and production- Max
  - Got some parts in for the small design. We have an idea in mind for the small design prototype that is a little different than our larger model.
  - Bret and I are working to make our charging circuit work enough to test charge our capacitor. There may be another way to charge it but we will have to look more into that.
- Theory of Operations - Brett
  - Zach and I continued to work on the first version of the Theory of Operations

- We sent it to our advisor, Professor Mani, to have him look over and provide feedback on it
- Acquired materials for small-scale design - Bret
  - Max and I have been working on getting the correct materials to machine and test the small-scale design.
  - I am currently looking into the most cost-effective way to machine the materials.
- Began the beginning stages of designing a new charging circuit -Grant
  - Researched ways to amplify voltages
  - Learned about diode voltage multipliers and rectifiers
  - Created a preliminary design to create 450V
  - Verified the design with Prof. Geiger and got suggestions
- Theory of Operations - Zachee
  - Brett and I worked on the theory of operations, focusing on references and the safety aspect
  - We sent it to the advisor, Dr Mina to have him look at it and provide us feedback
  - Worked on the theory of operations (on going)

**Pending Issues**

- Analyzing the charging circuit that we have already created with the help of professors to better understand and fix what is wrong with it.

**Plans for Upcoming Reporting Period**

We will all continue working in our groups on our specific tasks.

**Individual Contributions**

| Team Member  | Contribution  | Weekly Hours | Total Hours |
|--------------|---|--------------|-------------|
| Grant Larson | I met with Professor Geiger with Mark and discussed ways to charge a 450V capacitor. He looked at my design and gave me things to think about to make it work. He also suggested we use a step up transformer.  | 4            | 8           |
| Max Balzer   | Some parts for the small design came in but we need to find some place on campus to machine the metals. It looks as if the best solution would be to do it ourselves but we will see what other options are out | 4            | 8           |

|               |  |   |    |
|---------------|--|---|----|
|               | there. The charging circuit must still be implemented for the small scale design to charge the capacitor. Once it is working we will test charge our capacitor to make sure it works properly. |   |    |
| Bret Tomoson  | Some parts have come in for the small scale design but must be machined for the design requirements. Calculations for small-scale charging circuit are being tested to verify requirements     | 4 | 8  |
| Brett Nelson  | Continued to do work on the Theory of Operations. Finished the first version of this and sent it to our advisor for feedback. Once we get feedback, then address those points.                 | 6 | 10 |
| Mark Fowler   | Look into ideas Dr. Geiger suggested, either building circuit Grant drew up or using the transformers from lab. Continue investigating solutions to circuit we have already made.              | 3 | 7  |
| Zachee Saleng | Continued working on the theory of operations, according to the feedback that was provided by the advisor.   | 6 | 10 |

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### Plans for the Upcoming Week

- In the coming weeks we will be working on Theory of Operations: “on going” - Zachee
  - Will keep on adding valuable information and references
  - Continue to clean up the document.
- Begin creation of new circuit - Mark
  - Take insight from Dr. Geiger and work to create charging circuit that can work for testing current railgun design.
  - Continue to run search fixes to circuit we already have.
- Small scale prototype design and calculations - Max

- Bret and I have to find a cheaper way to machine our metals. Some ways to do it on campus are too expensive.
  - We have to find a way to charge our capacitors to make sure those will work properly and allow us to see results.
  - Once we have a means of machining the metals we will be able to build the project hopefully by the end of next week.
  - Theory of Operations- Brett
    - Go through the feedback that was given on the first version on it and work to improve it
    - Addressing all the comments our advisor gave us
  - Small-scale design and assembly - Bret
    - Max and I will be working to complete the design and assembly of our small-scale design to demonstrate the theory of operation.
    - We will find the correct equipment to machine the materials to specifications.
    - Also, we will find a way to charge the capacitor to a smaller voltage for low-energy testing.
  - Draw up the circuit design and do calculations for all voltages and currents running through it - Grant
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**Gitlab Activity Summary**

Nothing to report.

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