

sdmay19-15: Capacitor Gun

Week 1 Report

January 28 - February 4

Client: Max Balzer

Faculty Advisor: Mani Mina

Team MembersGrant 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*

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.

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.
 - Looked into alternatives that can be built cheaply in order to test our rails sooner.
- Materials and small scale design research and production- Max
 - I helped finish some calculations we missed last semester such as force outward on our rails. These calculations will help to design our small scale design so that we have numbers and findings from a working prototype.
 - Bret and I have put together a list of materials we will need to build this small design.
 - I split the team up into 3 different groups to work on making a working prototype as efficiently as possible. The 3 groups are: 1. Grant and Mark will work on our built but non-functional charging circuit to get that to work properly. 2, Brett and Zach will work on a document of the theory of operation of a railgun. 3, Bret and I will work on making

a small scale prototype so that we can have findings to better build our project.

- Started early stages of Theory of Operations - Brett
 - Here I went though the different documents from last semester and compiled the important information into a single document
 - Getting together with our advisor, and figuring out what is important and what things we as the team are missing and making sure those are being included.
 - This document will be eventually worked towards the final report

- Established plan for the semester and began small-scale design - Bret
 - This semester I will be working with max to get our first small-scale design completed and we started by creating a parts list and theory of operation.
 - Ordered first parts to be used in small-scale design

- 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

- Research information about safety according to the feedback that we had during the presentation of senior design 491 in close collaboration with the advisor to make sure that the requirements are met. - Zachee
 - Went through design document template and worked though different questions that we had, and make sure that it meets the requirement about the questions that was asked during the presentation last semester.
 - 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
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Grant Larson	I created a charging circuit design based off of research I did during our meeting. The design will include a diode voltage multiplier that will boost our DC voltage. The next step in the circuit is a Full Wave Rectifier that will create an AC voltage that will allow our capacitor to be charged. I will have a meeting with Professor Geiger to discuss our charging circuit and the new one I designed. He will help me understand the model we already have as well as give me insight on my own design.	4	4
Max Balzer	I helped Bret come up with a small design to show the effects of EM propulsion. We were given instructions to build a super small scale design so that we can see the project in action on a small scale and update our existing project based on our results. The small scale design will have the same design as our larger one just smaller dimensions.	4	4
Bret Tomoson	Started work on the new small-scale design that will be used to demonstrate the theory of operation. Parts will be coming in that can be tested and assembled in the coming weeks.	4	4
Brett Nelson	Worked on the early stages of the Theory of Operations. Went through last semesters documents and started to take the important information from them.	4	4
Mark Fowler	Read LT3751 datasheet and researched ways to fix current circuit design. Researched ways to easily charge capacitors to test our railgun design. Discussed circuit design with professor.	4	4

Zachee Saleng	<p>Researched on the various aspects to be taken to ensure that people and property are safe in all circumstances.</p> <p>We were assigned to work on the theory of operations.(on going)</p>	4	4
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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
- Small scale prototype design and calculations - Max
 - I will email Lee our materials list to get the materials needed to build our prototype.
 - I will have to get in touch with Mike to machine our metal with him.
 - I will have to continue on the calculations to find the shear and tensile strength of our fasteners along with the UHMW plastic we will use for structural support.
- Keep working on Theory of Operations- Brett
 - Continue to clean up this document
 - Start adding some components of the final report in
- 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.
- Have the meeting with Professor Geiger about the charging circuits - Grant
 - Continue to research and analyze the circuit I created

Gitlab Activity Summary

Nothing to report.
