

## Week 10

### Situation

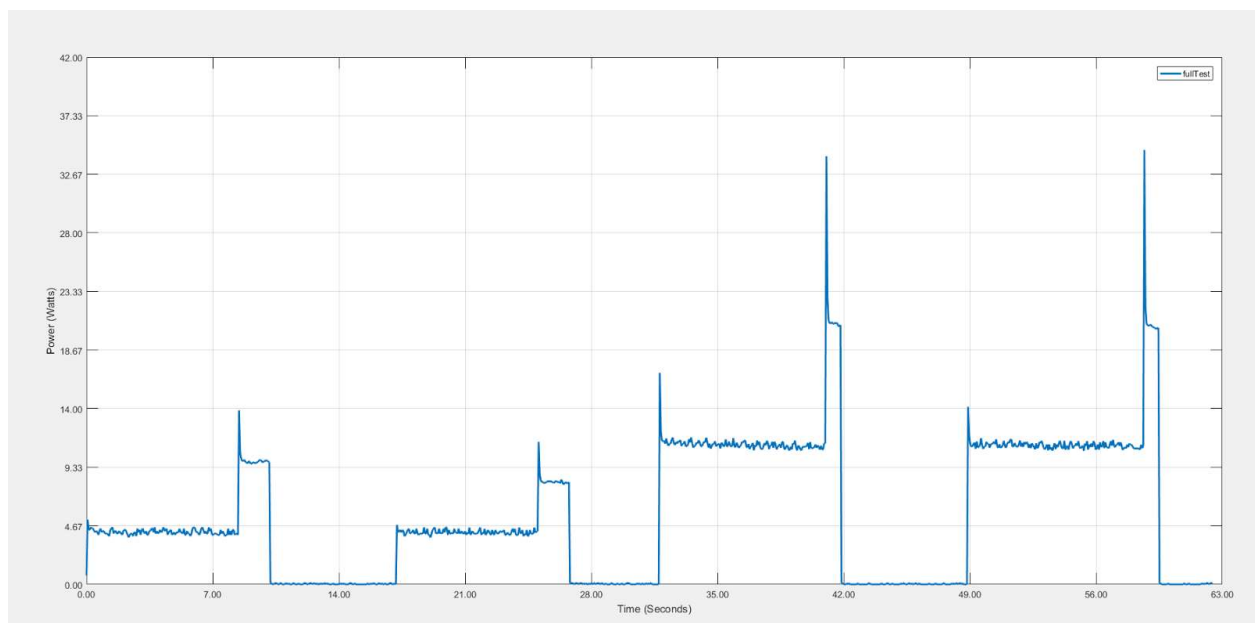
This week's lab procedure gave the team the opportunity to work on finalizing the AEV design while making optimizations for energy usage. With the final test date impending, this week's lab time was one of the group's final opportunities to ensure the AEV design was fully capable of completing all aspects of the Mission Concept Review successfully. As the previous lab procedures involved processes to finalize the group's choice of design and code sequence, this lab was more focused on minor adjustments and small variations in the code in order to ensure and enhance the success of the AEV's runs. At the end of this week's lab time, the group sought to have their AEV ready for final testing under the observation of the instructional team.

### Results & Analysis

The team came into this lab with the AEV capable of successfully travelling to the first gate, waiting for it to lower, and continuing on to the final cargo area. However, once picking up the cargo, the team had not yet perfected the AEV's second stop at the gate. Due to the increased weight the cargo added, more testing and fine-tuning was required to find out how to get a good, consistent stop at the gate. At first, the AEV was continually going too far and would have crashed into the gate if not stopped by a team member. After multiple runs of this fashion, the team sought to converge on the correct value by trying a much smaller distance in order to determine a lower bound. With this method, the team were able to eventually obtain the proper combination of power, distance, and time to get the AEV consistently stopping at the gate with its cargo.

Next, the group moved on to the final step of the MCR. This required the AEV to bring back the cargo from the gate to the start position. Programming this section of the code moved fairly swiftly as the AEV simply had to return to where it began and stop properly in between the beginning of the track and Mark 1. As the group had written code to stop the AEV multiple times at this point, achieving a good stop at this stage did not take long. In this stage, the team had an opportunity to perform some energy optimization to ensure the AEV would perform ideally and consume as little energy as possible. As the vehicle had a relatively wide range of space it was acceptable to stop in, the team could have it stop earlier than usual and allow the AEV to use more of its coasting energy to reach an acceptable stopping point. A few trials proved the method was consistent, and the group had thus successfully completed the MCR.

If the team has ample time before testing occurs, more energy optimizations can be put into place in order to achieve a more efficient run. For instance, the team can attempt to optimize the points at which the AEV needs to stop by reversing the motors earlier and spinning them at a lower power, giving them more time and distance to complete an equal amount of braking. This would decrease energy use significantly, as a large portion of the AEV's energy use is in the reversing and braking phases. However, it will likely be difficult to perfect within the amount of time available before testing must commence, as trial and error would be required what distance the AEV should start braking at. The following graph of power vs. time of a successful test AEV run will be used as a reference point to determine which areas are most in need of adjustment.



*Figure 1: Power vs. Time of Test AEV Complete Run*

## **Week 11**

### Situation

In the coming week, the group will test their AEV's ability to complete the MCR. Ideally, the AEV will traverse to the first gate, wait, and then pick up the caboose at the other end of the track. Then, the AEV will travel back to the gate, wait, and advance back to the start, with the caboose in tow. The group will be allotted two different runs, in which the better run is scored. The group will be free to utilize the class periods next week to their liking. The group plans to first confirm the AEV's capability in performing the MCR and then notify the instructional staff that the group's AEV is ready to be evaluated.

## Weekly Goals

- 1.) Complete the Progress Report for Lab 11 by the deadline of Monday, April 10th and submit it on Carmen.
- 2.) Begin to prepare for the final presentation of the team's AEV.
- 3.) Add the Progress Report for Lab 11 to the project portfolio on U.osu.edu.
- 4.) Organize the Project Portfolio on U.osu.edu after the addition of all completed lab documentation.

## Weekly Schedule

<b>Task</b>	<b>Teammate(s)</b>	<b>Start Date</b>	<b>Due Date</b>	<b>Time Needed</b>
<b>Complete Progress Report for Lab 11</b>	All	4/7/17	4/10/17	2 Hours
<b>Add the Progress Report for Lab 11 to the Project Portfolio</b>	All	4/7/17	4/21/17	15 Minutes
<b>Organize the Project Portfolio on U.osu.edu</b>	All	4/7/17	4/21/17	15 Minutes
<b>Begin Preparation for the final AEV Project Presentation</b>	All	4/7/17	4/18/17	1 Hour

## Appendix A

**Date:** 4/10/17

**Time:** 10:45 A.M.

**Members Present:** Tarun Pilli, Matthew Caldwell, Jacob Phillips & John Kim

**Topics Discussed:** The Progress Report for Lab 11, the Project Portfolio on U.osu.edu, and the final presentation for the AEV Project.

---

**Objective:** Team J met in order to start work on the Progress Report for Lab 11, to update the Project Portfolio on U.osu.edu, and to begin preparation for the final presentation of the AEV Project.

---

### Tasks:

-Progress Report for Lab 11

The Progress Report for Lab 11 was started during the team meeting and was ultimately completed at a later time before the deadline it was due.

---

### To Do/Action Items:

-Complete the Progress Report for Lab 11 before the deadline (All Members)

-Add the Progress Report for Lab 11 to the Project Portfolio on U.osu.edu (All Members)

-Organize the Project Portfolio on U.osu.edu (All Members)

-Begin preparation for the final presentation of the AEV Project (All Members)

---

### Reflections:

Team J worked well together during the team meeting and was able to complete most of the Progress Report for Lab 11. Thus far the team has had no problems working together and it has begun preparation for the final parts of the AEV project weeks before the deadlines for the Project Portfolio and the final AEV Project presentation. Group J continued to use the same system it has been all semester to complete assignments and continue to work past any minor obstacles it has encountered.

## Appendix B

### Arduino Code

```
//get to first gate
```

```
reverse(4);
```

```
motorSpeed(4, 20);
```

```
goToAbsolutePosition(-332);
```

```
//slow down and stop
```

```
reverse(4);
```

```
motorSpeed(4, 40);
```

```
goFor(1.7);
```

```
brake(4);
```

```
//wait for the gate
```

```
motorSpeed(4, 0);
```

```
goFor(7);
```

```
//go to the end gate
```

```
reverse(4);
```

```
motorSpeed(4, 20);
```

```
goToAbsolutePosition(-741);
```

```
//slow down and stop
```

```
reverse(4);
```

```
motorSpeed(4, 35);
```

```
goFor(1.7);
```

```
brake(4);
```

```
//wait for cargo to be loaded
```

```
motorSpeed(4, 0);
```

```
goFor(5);
```

```
//go back to gate
```

```
motorSpeed(4, 45);
```

```
goToAbsolutePosition(-468);
```

```
//slow down to stop
```

```
reverse(4);  
motorSpeed(4, 80);  
goFor(0.8);  
brake(4);
```

```
//wait for the gate  
motorSpeed(4, 0);  
goFor(7);
```

```
//go back to the start  
reverse(4);  
motorSpeed(4, 45);  
goToAbsolutePosition(-45);
```

```
//slow down to stop  
reverse(4);  
motorSpeed(4, 80);  
goFor(0.8);  
brake(4);
```