Week 4

Situation

The lab was focused on drafting possible designs for the AEV by having each group member design a rough draft. For the first fifteen minutes of lab, each team member must draw an AEV design. Before doing this, previewing the design considerations. Once completed, the team should come together and design a final AEV drawing to use as a jumping-off point for building and testing in future labs. The weight and cost can be estimated using the final design.

Results & Analysis

The first design, figure 1, was based off a sunfish and a monorail car. This can be seen in Appendix B. The main idea in designing this AEV was energy efficiency and agility. Opposing the rest of the team's sketches; this AEV is much thinner and utilizes vertical "wings". The wings consist of flattened shell pieces lining the outside of the body. This will allow the vehicle to turn easier without the flying off the monorail track. This design is also designed to be minimalistic, reducing the weight and increasing power efficiency. In addition, the design can move forwards and backwards interchangeably. This design should cost about $137 and weigh about less 250 grams. The shell will be 3D printed, but the arm is laser cut. The rest of the materials are provided initially.

The second design, figure 2, was based off of a blimp. This can be seen in Appendix B. The idea behind it was using limited materials, while keeping it in a shell. There would need to be a T-shaped arm where the battery and Arduino will be placed on either side. A tail would be placed on the back, almost like a helicopter, and the propellers will come off on both sides. So that the AEV maintains shape and weight distribution, a shell casing will be printed and cover the whole arm and tail of the AEV. The case will be two halves of a shell that will come around and connect at the top and bottom of the AEV. The estimated cost would be approximately $135. For the second design, the parts that need to be 3D printed would be the two halves of the shell that will come together to be the casing of the AEV. This casing will be used in the final design, however, possibly with a much lighter material such as paper. The tail and the T-shaped arm would both be laser cut out of plastic and will likely weigh about 250 grams.

The third draft, figure 3, was a narrow design focused on balance and a small form factor. This can be seen in Appendix B. The main feature is a single body piece that holds both the battery and the Arduino on either side of it and extends out to hold the 3d printed propeller mounts that are placed one above the other. The main body piece is custom laser cut and the final version would have cutouts to limit total material and weight. An outer shell will be printed to fit tightly over the components and make the craft more aerodynamic while not ruining the small form. The approximate total cost of this design is $130 and will weigh less than 250 grams.

As seen in figure 4, the fourth design was a long, thin, T shape. This can be seen in Appendix B. The purpose of this design was to provide a lot of balance to the AEV. The battery is at the bottom on the back side and the Arduino is located at the top of the AEV on the front side. This would allow for the battery and the Arduino to cancel each other out in terms of applying weight to the vehicle. The arm is located on the back end of the vehicle because this would allow the front wheel to align in the center of the AEV. The overall dimensions of the vehicle are 18" x 12" x 12" (Length x Width x Height). The estimated weight of the vehicle is 300 grams, and the estimated cost of the vehicle

is about $140 based off of the cost to replace sheet that can be found in the AEV kit. The main body piece will be the laser cut from the plastic that is currently being used on the generic AEV that was provided for the group. This would allow for proper sizing to balance the weight once the Arduino and the battery are placed in the correct location. The whole purpose of this design is to be thin and lightweight.

Takeaways

1.) The AEV should be as light as possible to maximize energy proficiency.
2.) It is important to discuss as a team the designs each member came up with to provide a final enhanced design.
3.) Preview the design considerations before brainstorming a design to maximize time usage.

Week 5

Situation

The first part of the lab this week will be based on converting data collected by the Arduino into a MATLAB program. The MATLAB will then take the data from the Arduino and turn it into physical values that can be used to determine how well that the AEV is performing. The MATLAB program can return values for the AEV's time on the track, current, voltage, distance, and position. All of these values can then be graphed to determine how well that the vehicle is performing in a multitude of different categories. The second part of the lab will primarily be focused on uploading, graphing, and analyzing the data in MATLAB. Once the data is uploaded to the MATLAB program, it will be graphed to determine what the most efficient code and design will be moving forward.

Weekly Goals

1.) Be able to download data from the automatic control system.
2.) Be able to convert Arduino data to physical parameters.
3.) Calculate performance characteristics using formal parameters.
4.) Become familiar with MATLAB design analysis tools.
5.) Be able to upload Arduino and wind tunnel data to MATLAB.
6.) Be able to conduct plots that can be used in reports.

Weekly Schedule

Task	Teammates	Start Date	Due Date	Time Needed
Week 4Progress Report	All	1/4/2017	2/8/2017	2 Hours
Testing Efficiency of Designs	All	2/8/2017	2/8/2017	1 Hour and 20 Minutes
Week 5Progress Report	All	2/8/2017	2/15/2017	2 Hours

Appendix A
Date: 2/6/17
Time: 12:40pm
Members Present: Lizzie Rumford, Josh Penko, Collin Barack, Madison Hudak

---

Topics Discussed: Lab 3 Progress Report and AEV designs

Objective:
The focus of today was to complete the Lab 3 Progress Report due on the 2/8/2017 and to further work on the orthographic design for the AEV.

To Do:
1.) Lab 3 Progress Report.
2.) Orthographic AEV design.
3.) Decide on working final design.

Decisions:
1.) The AEV will be tall and thin.
2.) The AEV will have a shell, which will contain the Arduino and the battery.
3.) The arm will be replaced with a "T" model, allowing for better weight distribution.
4.) In order to reduce weight, the base will be removed and parts will be secured to the arm.

Reflections:
1.) Have individual orthographic drawings done on time.
2.) It is preferable to include details and labels in the orthographic drawing.

Appendix B

Figure 1: AEV Sunfish Design

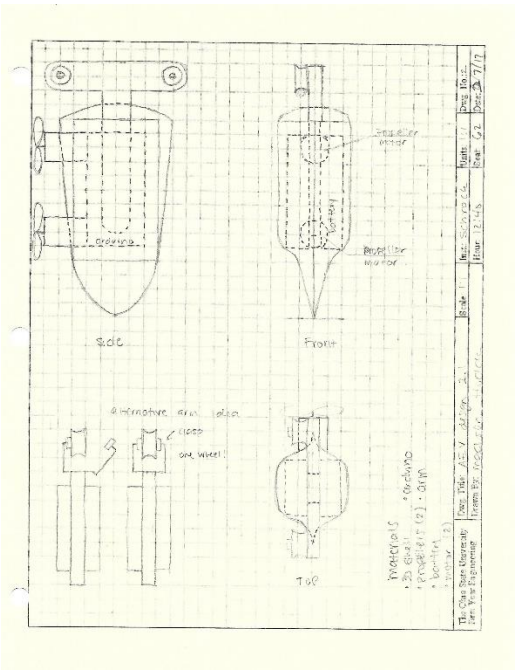

Figure 2: AEV Blimp Design

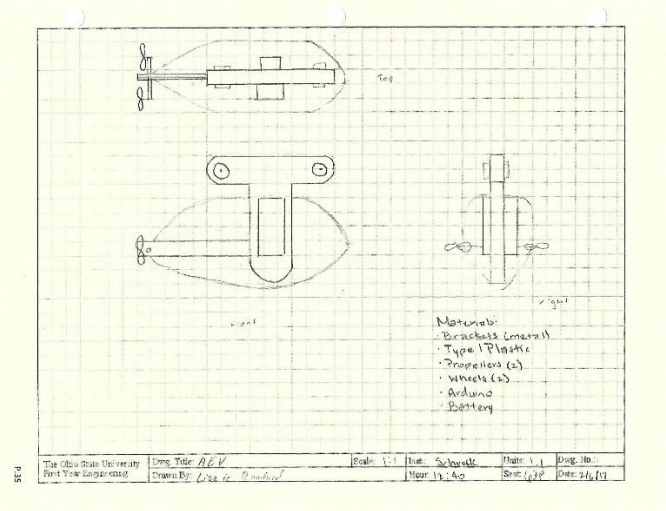

Figure 3: AEV Narrow Design

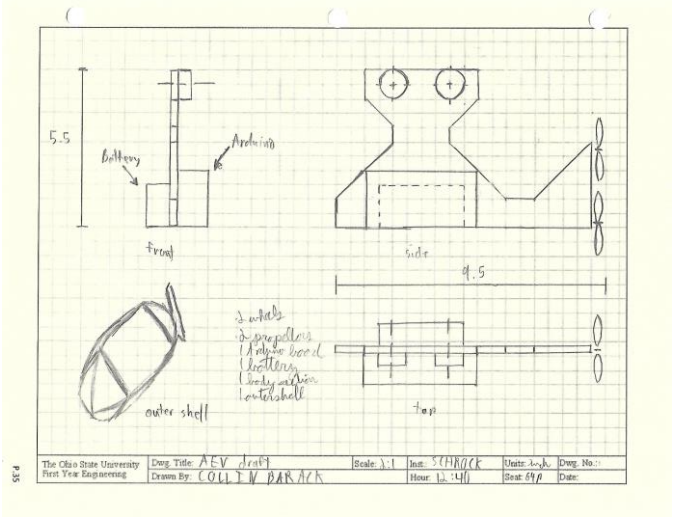

Figure 4: AEV Teen Titans Tower Design