

Week 4 (Backwards Looking Summary)

Situation

In today's lab the team began to brainstorm ideas of how the AEV should be designed. There were ideas of building a futuristic-looking design that is extremely aerodynamic. Some of these ideas included the Star Wars X-Wing, an SR-71, an U2 and a stealth bomber. The group then narrowed down the options and began to develop individual sketches of the different ideas. When designing the AEV models the group had to keep in mind some of the constraints set in place. These constraints include the limited number of components within the AEV kit and the groups limited experience with 3D modeling and printing new pieces. Some other constraints come from the track itself and some of the tasks the AEV must complete. The group then took each person's sketch and chose some of the best features to create the final sketch. The final sketch resembles an X-Wing. This option was chosen because it looks to be relatively simple to construct while also being lightweight and efficient.

Results & Analysis

Each group member did his own design of the AEV and completed a concept sketch in an orthographic view. All sketches are attached to the appendix and they are labeled as Sketch 1, Sketch 2, Sketch 3 and Sketch 4 in order. Sketch 1 had a triangle shape as its plastic base board and placed the L-shape arm at the center of the base board. There were two little arms stretched out the L-shape arm and two propellers are fixed on them. Most part of Sketch 1 was made of plastic which could make the whole vehicle lighter and also the frontal part of AEV was made of a triangle cover which could overcome air resistance when running on the track. In addition, putting the propellers on the L-shape arm could concentrate the propulsion power. Sketch 2 was shaped like an SR-71. It had large wings located towards the back of the AEV, with forward facing propellers attached. The front of the body was slim and came to a tip. There was room on the base of the body for the arduino and arm attachment for the track. Parts of the wings were cut out to allow for less weight and possibly higher efficiency. Sketch 3 was inspired by U2, with the wings flattened instead of curved to minimize the drag force. The front of the body and the tip of the wings were made sharp as well, as it can improve the aerodynamics. The body however was left unmodified in order to reduce the weight just so it could travel more effectively. The materials used are mainly plastics as these materials are not only cheap but light in terms of weight. Sketch 4 was designed to look like a falcon. The propellers are to be positioned underneath the wings of the design which would allow for optimum use of the space. The wings will be created to have the best use of aerodynamics while having a slim tail, which will allow the AEV

to get the best performance. The final sketch was based on Sketch 3. The base board was like cone shape. The L-shape arm was fixed at the center of the base board. Two propellers were placed at the end of the base board. The frontal part was a triangle shape and it could overcome air resistance. There were two plastic wings on the both side of the base board. Most part of the final design would be made of plastic material because it could be lighter.

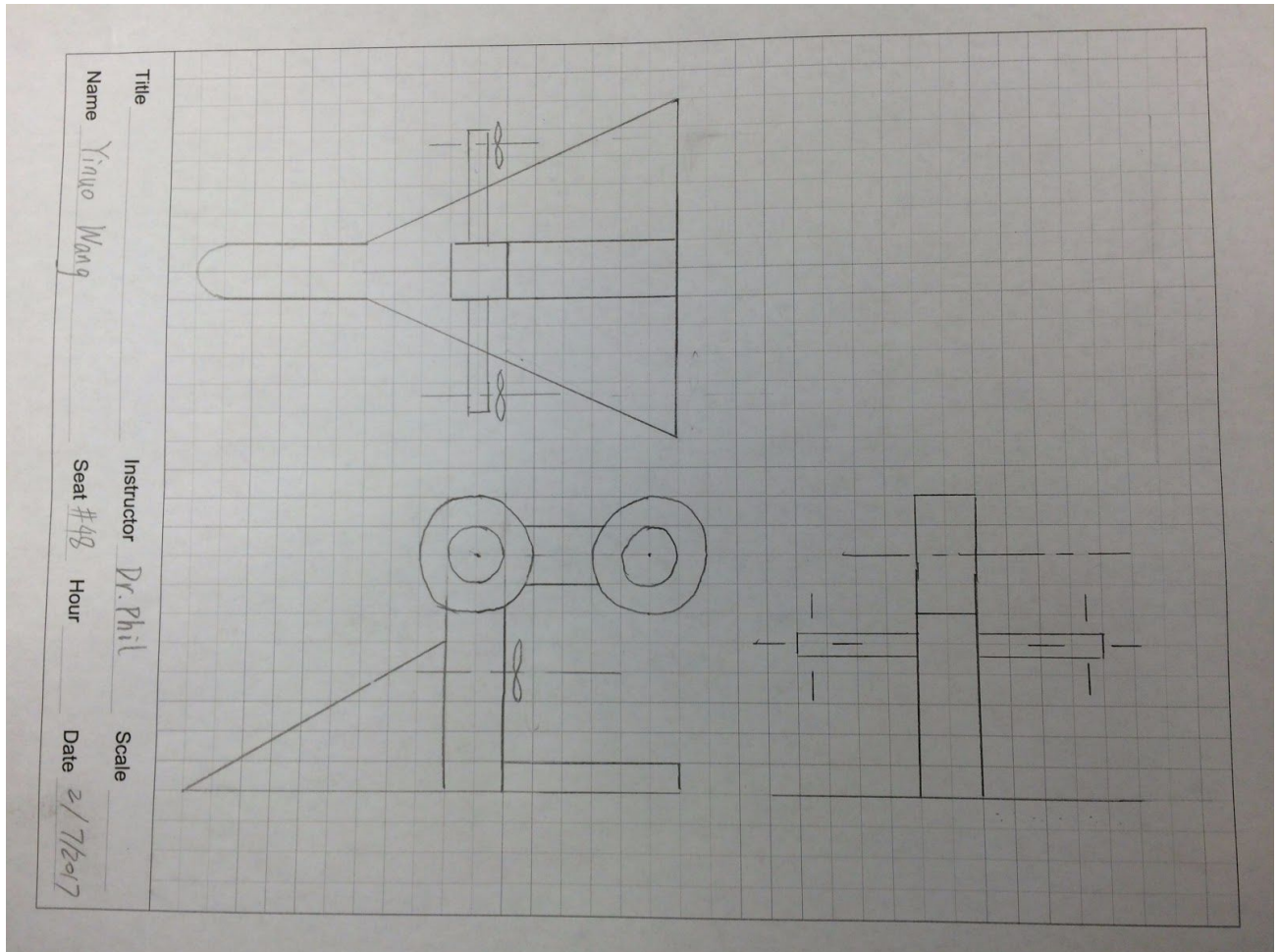
Takeaways

The first takeaway the group learned from the Lab 03 was learning two techniques use for creative design thinking. This helped us to know that the objective of design was to increase the efficiency of propeller system. The second takeaway was to get to know about some creativity aids and some obstacles that inhibits creativity. One of the tips listed in the lab manual was to keep a daily journal or notebook. Therefore, every group member wrote down his own thoughts and design about how to increase the AEV propellor system efficiency. It helped the group to learn how to become more creative and meanwhile avoid getting stuck. And also discussed about all the ideas, which was also a very important part of being more creative. Finally the group summarized some useful ideas about the AEV design. Firstly, the exterior design could base on the handpiece of the planes. Secondly, the exterior design could refer to some sports cars. What's more, T-shape monorail could be placed somewhere on the rectangle board to make the vehicle run more smoothly on the track. The third takeaway was to learn from the sample AEV concept sketch in the lab manual. It let the whole group know how to draw the sketch correctly. The general project learning from this lab was that the group discussion could help group members to know other members' ideas better. In addition, the group should create a very relaxing atmosphere without high pressure so that everyone would be more eager to discuss with other people and also improve work efficiency.

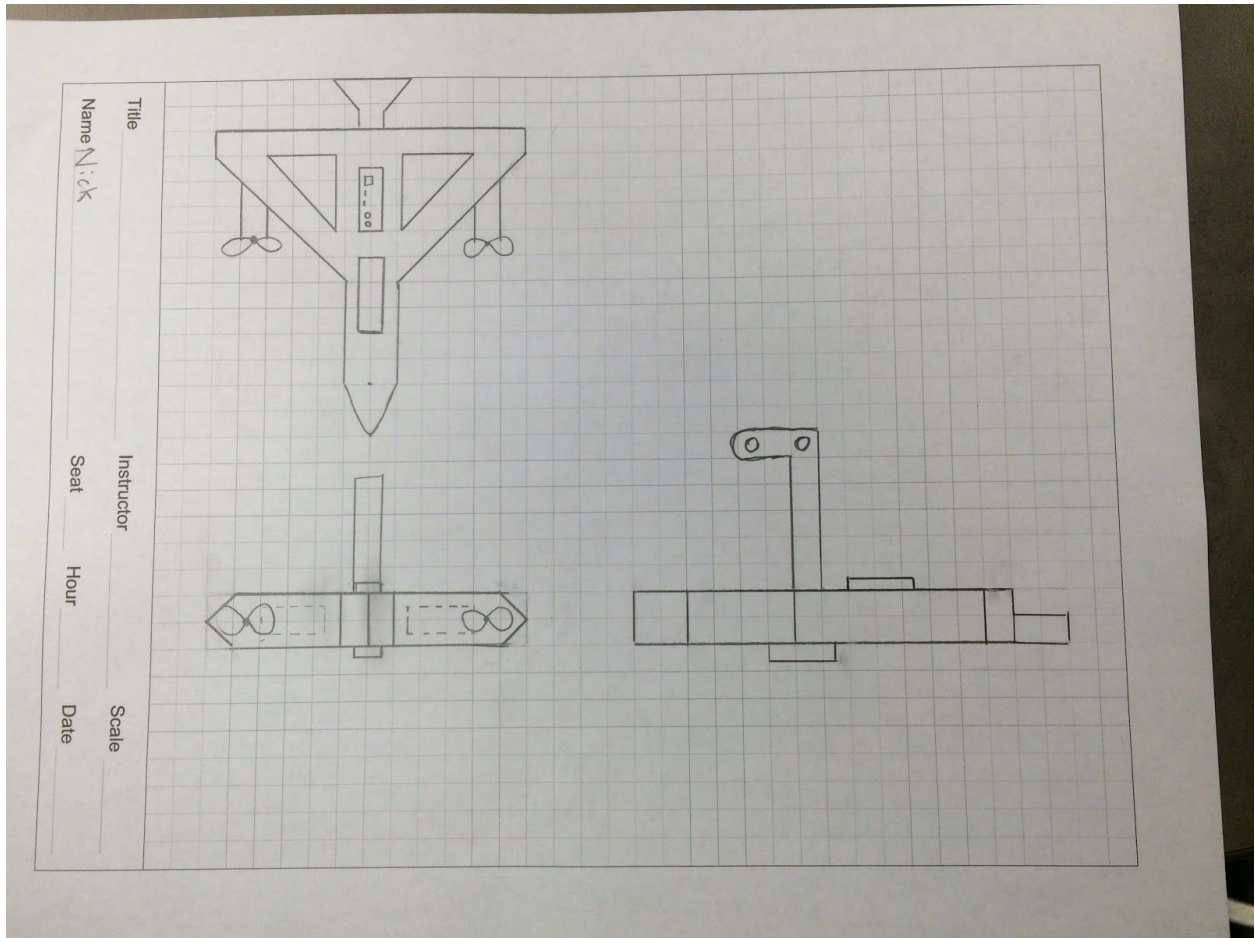
Tables & Figures

ATTACHED(Individual Sketches)

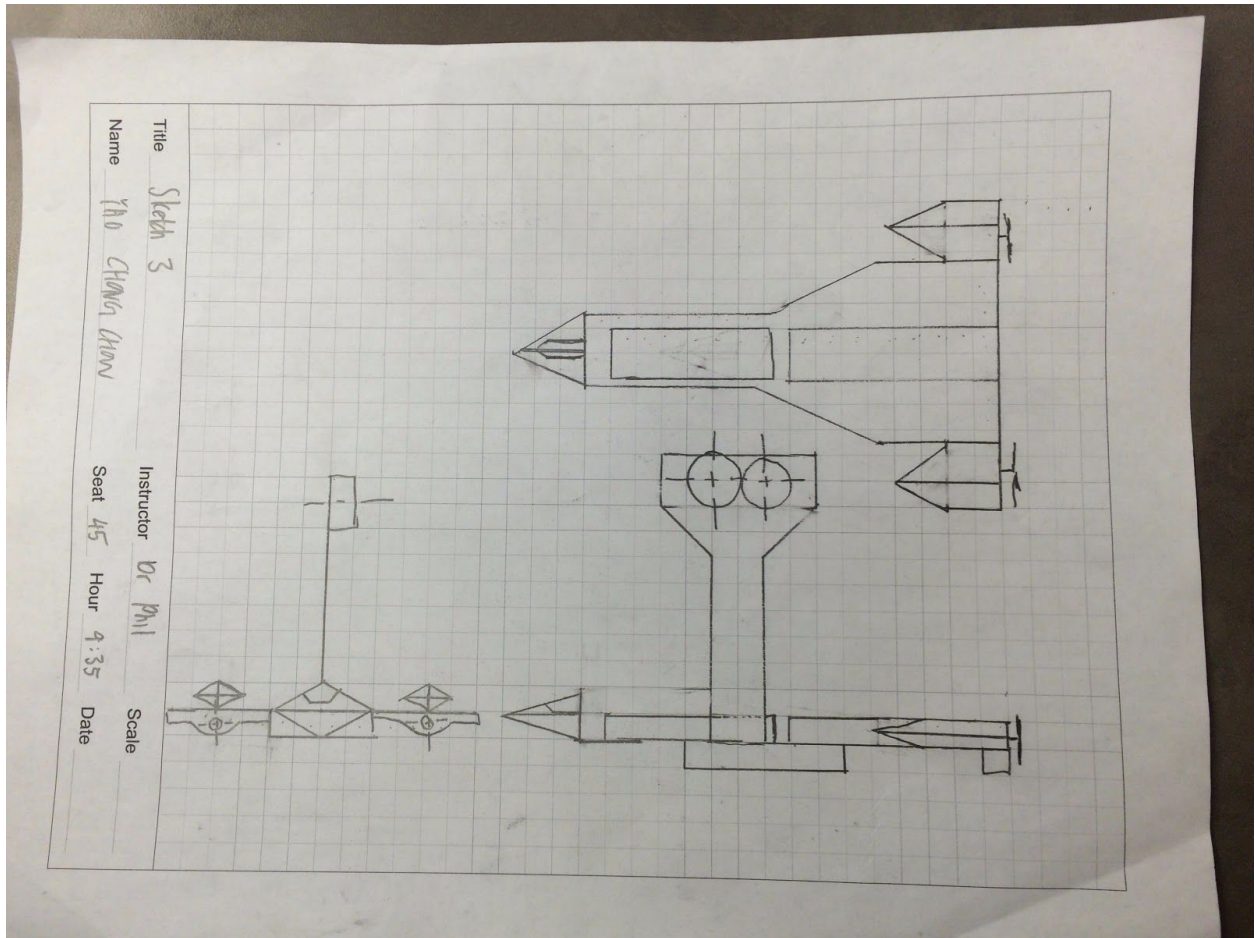
Sketch 1



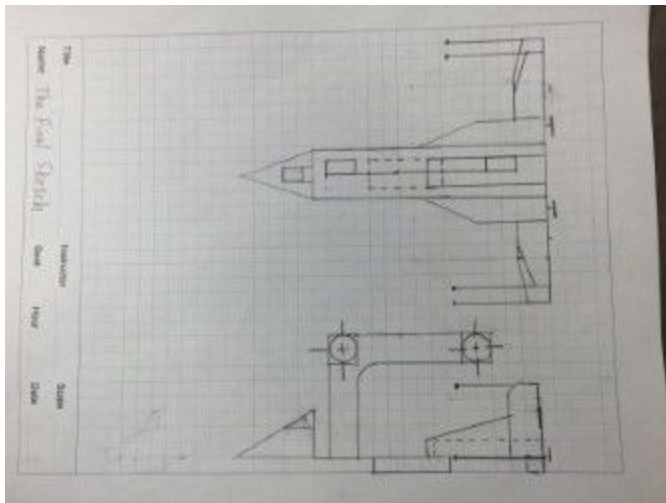
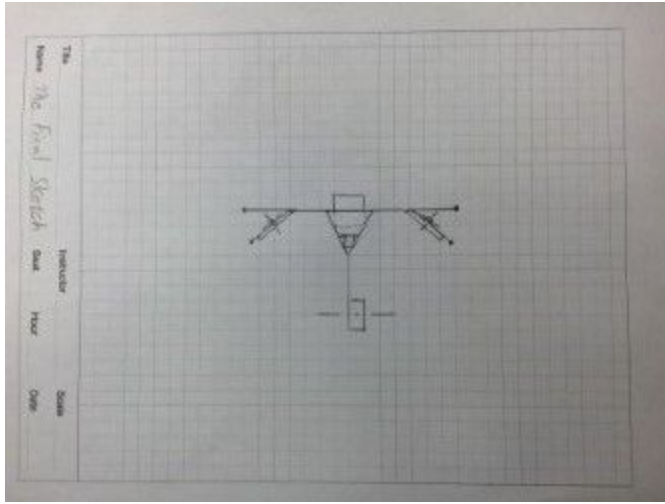
Sketch 2



Sketch 3



The Final Sketch



Week 5 (Forwards Looking Plan)

Situation

In the upcoming week the team will learn how to download data from an automatic control system. This is an important skill for the team to have during the project because it will allow the team to be able to get essential data about the AEV and provide with ways the AEV can be improved. The team will accomplish this by making a program that will make the AEV run from the starting point and stop at the first gate. The team will then take the data that was recorded about the AEV and download it into MATLAB for further observation. Also in the upcoming week the team will convert EEPROM Arduino data to physical parameters. This skill is important to the project because it will allow the team to be able to see concrete data of how the AEV is running and if there can be any improvements made on the AEV that would allow it to operate at an optimum level. The team will accomplish this by taking the data that is recorded from the test run from the starting point until the end point at the first gate and upload it into the MATLAB software to inspect the physical parameters. Also in the upcoming week the team will learn how to calculate performance characteristics using physical parameters. This is important because it will allow the team to be able to run a performance check and determine where improvements could be made to allow the AEV to have better performance. The team will accomplish this by using the information recorded by the EEPROM Arduino and converting it in the MATLAB software, then proceeded convert the information to display the performance element in MATLAB.

Also in the upcoming week the team will become familiar with the MATLAB based design analysis tool. This is important for the group to become familiar with because it will allow the team to be able to make improvements on the AEV by delivering physical data. The team will accomplish this by loading in the data that is recorded by the Arduino and using the app provided in the MATLAB software and observe the physical parameters of the AEV. In the upcoming week the team will also upload wind tunnel data into the design analysis tool. This is important for the project because it will allow the team to get practice at uploading data and become more comfortable with the MATLAB software, such that loading the data from the AEV would become flawless. The team will accomplish this by loading the data that was collect in the wind tunnel and using the MATLAB analysis tool to make observations. Also in the upcoming week the team will learn how to upload Arduino data into the design analysis tool. This is important to the team because it is vital to the project that the team be able to know the performance of the AEV. This will be accomplished by the team using data that was recorded in the Arduino during a test run and uploading it into the MATLAB software. In the upcoming week the team will also be able to export plots for reports. This is important because it will allow the team to compare different designs of the AEV and see how physical changes to the design impact the AEV's performance. The team will accomplish this by using the MATLAB software and keep record of the AEV's performance throughout the rest of the project.

Weekly Goals

1. The team will create the components that must be 3D printed for the AEV design. This will allow the team to complete the physical model of the AEV. The team will meet twice this week each day working on one location of the AEV that needs 3D printed parts until the parts are completed.
2. The team will test the AEV and make an improvement to the performance. This will allow the team to make steps toward the AEV having the best performance that it can. The team will test the AEV in lab and make the improvements as needed until the end of the project.

Weekly Schedule

TASKS	TEAMATES	START DATE	DUE DATE	TIME NEEDED
Complete Lab 4	All	2/8/17	2/8/17	1 ½ hours
Lab 4 Progress Report	All	2/8/17	2/15/17	2 hours
Improve on design	All	2/8/17	2/22/17	N/A
Determine how to obtain all building materials	All	2/8/17	2/15/17	1 hour

Appendices

Team Meeting Notes

Prior week meeting(s), identifying when and where, who discussed what, why decisions were made, and when items are to be completed.

Time: 4:00 PM -- 6:00 PM

Date: 2/3/2017

Location: Room 324, Hitchcock Hall

This week meeting was aimed to summarize the work the group did on the Lab 03 and schedule a plan for the next week. First of all, Enoch brought up the ideas about the exterior design of the AEV. He held the view that the design of the jet handpiece could be applied to the AEV design because it overcame air resistance in some ways. Nick thought the group could refer to the design of sports cars because it was also designed to overcome air resistance and increase motor efficiency. Marcus wanted to change the position of T- shape monorail to let it hang on the track more steadily. Charles pointed out that the group could attach the battery to the T-shape monorail instead of putting it on the bottom of the board. Every group member was expected to draw a sketch based on his own ideas and then the group should figure out a final sketch based on the individual sketches. It should be done by 2/7/2017. The group was supposed to finish the Lab 03 progress report by 2/8/2017.