

To: Dr Janiszewska

From: Ian Claggett, Ed Doerring, Stuart Fanko (Group Jasper)

Subject: ENGR 1182.01

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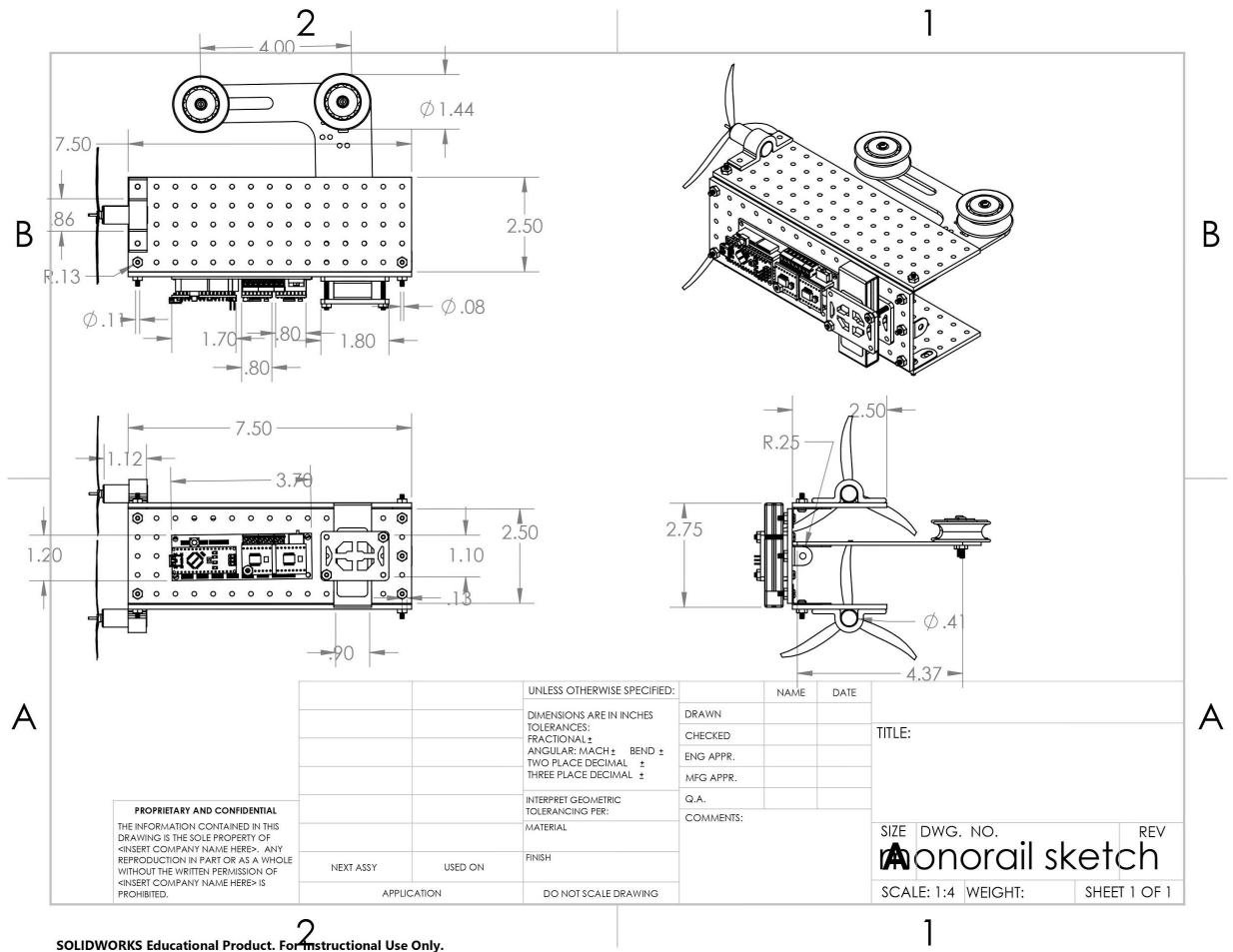
Introduction:

The purpose of the AEV lab was to utilize the critical design review (CDR) to construct a working design of an AEV to transport itself across a railway propelled by a motor system. This motor system would receive commands from an Arduino chip programmed by the users to run accordingly to its input from the code written. Through experimental research and design, the group would create working concepts of an AEV to be decided upon by the group to construct. When their design has been selected, they would then create the AEV and program it to follow along the track. The monorail itself would have its own stops and inclines that the code would have to account for through trial and error research, as well as integral AEV design choice which could affect the distance traveled and speed the monorail vehicle would travel.

Through creative design thinking, the group was able to construct an AEV design that would be used in future experiments throughout the semester. The design would account for travel backwards and forwards, Energy use minimization, motor placement, propeller quantity, and track terrain and interference. This can be attributed to either uphill/downhill inclines that could affect the speed and efficiency of the AEV

Design 1: Ed Doerring:

My design consists of a large rectangular platform with an L bracket used to connect it to the track. I built large sides to the vehicle to mount the two electric propellers to. In the center of the rectangle mounted to the bottom is the Arduino and in front of it is the battery pack placed perpendicularly. It is held in place by two brackets. Inside the vehicle is extra room to hold any extra supplies or people that need to be pulled along.



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Figure 1: Ed Doerring's design of the AEV

Design 2: Ian Claggett, Indefatigable

The concept design behind Indefatigable was for a biplane-like structure, utilizing propeller on both sides to maintain an equal weight distribution and propulsion when on the track. This balance of weight would allow it to have a much more predictable and distinct travel on the monorail, making coding much more efficient and easier since the change will be much more evident and accessible. Another key facet to the design would be the placement of the arduino on the front center, to maintain a balance of both the battery and the weight distribution of the wings, where most of the wing tends to be towards the backside of the design. Having the weight parallel with the monorail pulley makes for a much more firm and stronger hold on the track, which will help prevent the AEV from falling or losing its holster on the monorail track. It was also designed that the propellers would face the flat side of the wings on the wings, to prevent any form of external interference with the spinning. The battery pack was also placed on the side of the monorail pulley opposite of the wheels, to prevent it from getting caught in the wheel and possibly stopping and dislodging the AEV from the track. Overall, the focus of the design was on an even structure which could account for both the distribution of weight upon the vehicle, as well as control over the placement of the pulleys on the track to ensure an even route of travel for a more efficient and productive way to prepare code for the monorail.

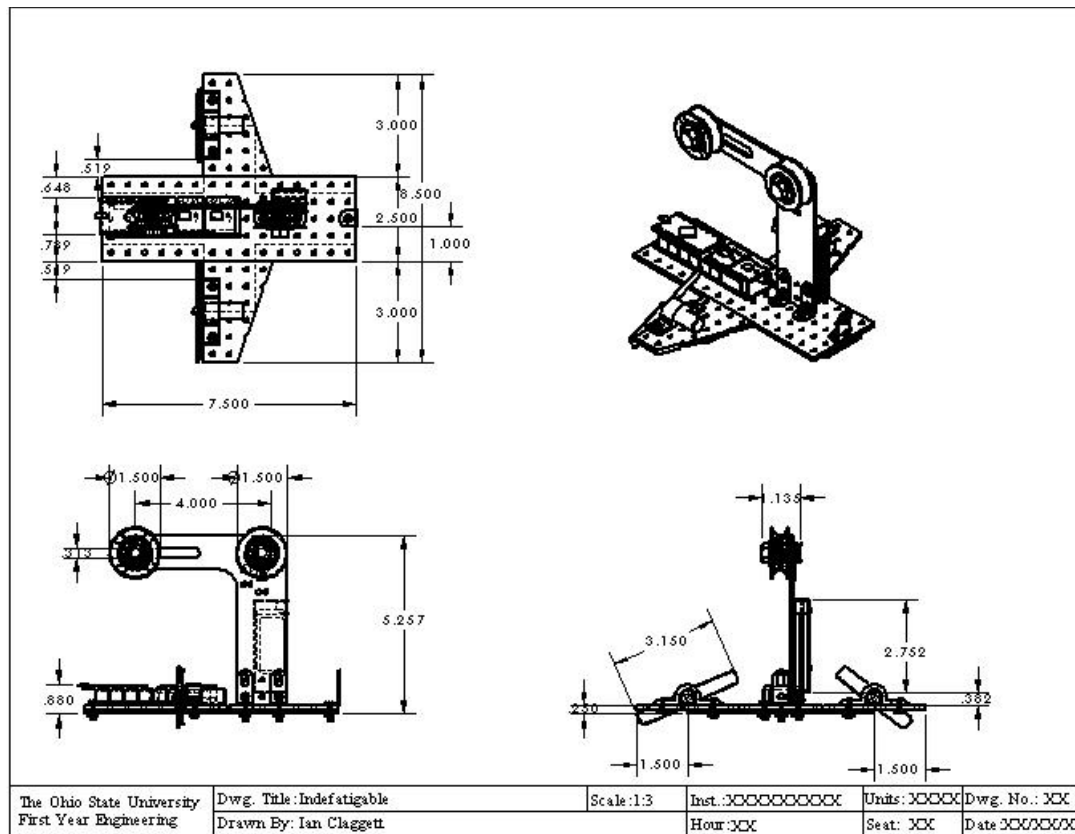


Figure 2, sketch of Indefatigable with measurements

Design 3: Stuart Fanko

With this design, I tried a smaller, lighter weight design. This was with the intent to make it easier for the single motor to push the vehicle along. Without any extra appendages to weigh it down, the idea is to let a single motor and propeller push it along, using less power as well. With the arduino assembly on the back end and the motor on the front, the battery underneath and counter balancing the arduino, along with the arm attachment for the pulley system being centered as well, there should be no balancing issues that would cause it to be slower. A possible improvement that could be made is a larger propeller, but that would be decided with testing. The idea of a smaller vessel is to keep it as light as possible, but a larger propeller may be more ideal for the design. There is only one extra platform on the vessel to keep it as light as possible, but it was necessary because without it, the motor would be off centered and possibly hinder the efficiency of the propeller.

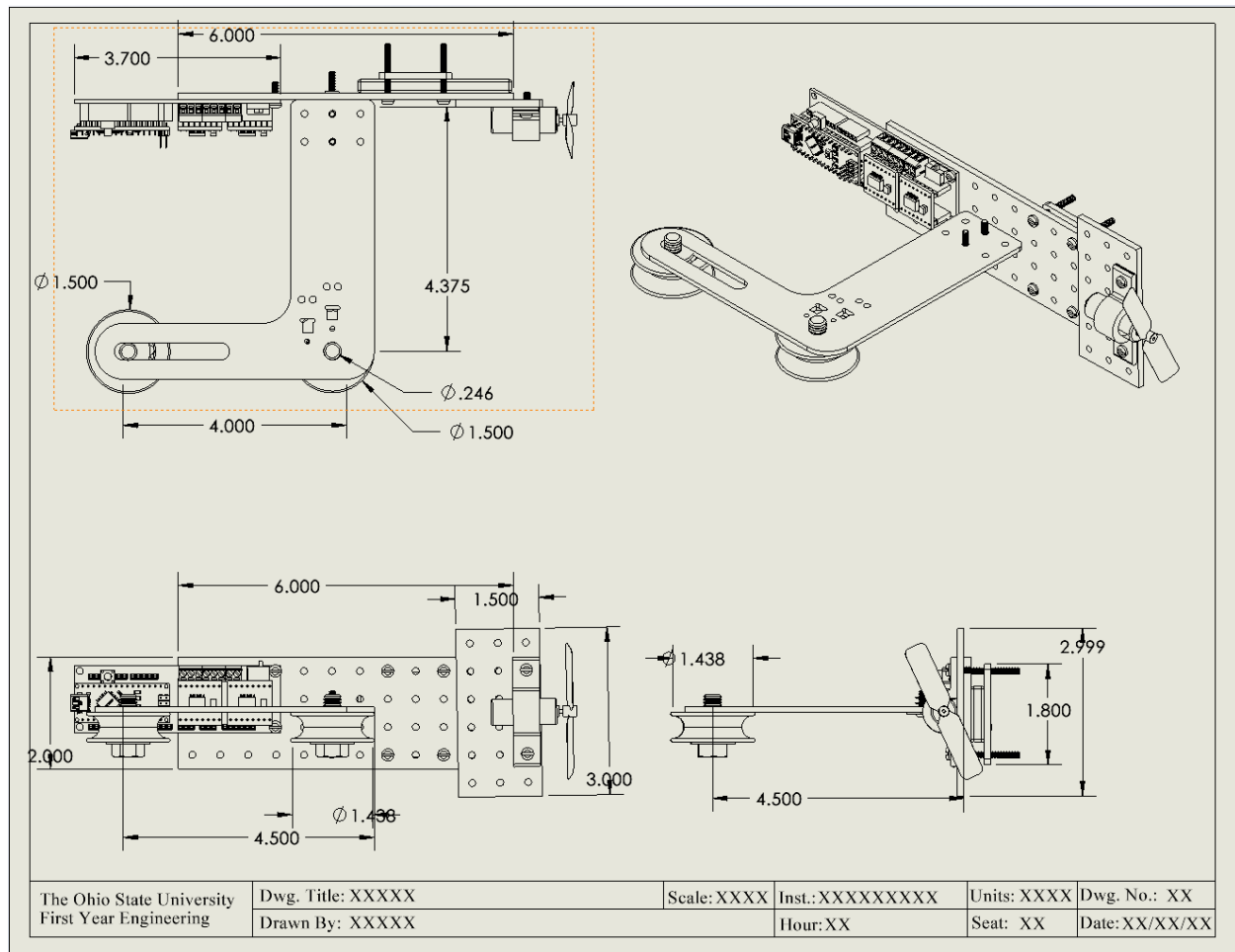


Figure 3: Stuart Fanko's design

Conclusion:

Group Jasper has decided upon the design 2, Indefatigable, to be the AEV design for the monorail. After creating their own designs, the best design was selected in full agreement with the three members of the jasper group. It was decided that the winged design with the two double bladed rotors would be the best choice to complete the mission. The vehicle will carry passengers along the monorail along its path through the national park. It will allow the passengers to get a good view of the more popular places in the park as well as make multiple stops along the way to allow the passengers to get off and explore the areas on their own. Finally, the vehicle will turn around and return to the beginning station.



| Lab 1: Creative Design Grading Rubric | | |
|---------------------------------------|--|-----|
| Memo Content | | |
| Introduction | | 10 |
| | Purpose | |
| | Background | |
| Results | | 50 |
| Individual | Objective presentation of designs (see Note below) | 30 |
| | Analysis of concepts | |
| | | |
| | | |
| | Individual Concept Description | |
| | Sketch | |
| | Design Considerations | |
| Conclusions | | 5 |
| | | |
| | | |
| Writing Total | | 35 |
| | Spelling/Grammar | |
| | Language Usage | |
| Total | | 100 |

NOTE: *Objective presentation* and *Analysis of results* are not an item you need to discuss but refers to the way, you present the information that is required. The questions on the previous page should be used as a guide to the information needed.

Also remember that *Language Usage* is a big part of you grade for the memo. (Look at the table on the following page for details.) Make sure you proofread and check both grammar and spelling. Errors in both may be marked but not corrected by the instructor. If you have questions ask.

Instructor signature _____

Work division for this summary

Student Name:

Description of work

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