Preliminary R&D



Elijah's

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lan's



John's

Each member had to create their own design, which would then be compared against each other and a team design would be made

| Success Criteria | Weight | Rating | Weight | Rating |
|------------------|--------|------------|--------|---------------|
| Weight | 15% | 3 | 0.45 | 4 |
| Cost | 25% | 3 | 0.75 | 2 |
| Power Efficiency | 25% | 2 | 0.5 | 3 |
| Creativity | 20% | 1 | 0.2 | 4 |
| Aesthetics | 15% | 3 | 0.45 | 3 |
| TOTAL | SCORE: | | 2.35 | |
| Continue? | | | No | |
| John Design | | lan Design | | Elijah Design |
| Weight | Rating | Weight | Rating | Weight |
| 0.6 | 4 | 0.6 | 4 | 0.6 |
| 0.5 | 5 | 1.25 | 2 | 0.5 |
| 0.75 | 3 | 0.75 | 3 | 0.75 |
| 0.8 | 3 | 0.6 | 4 | 0.8 |
| 0.45 | 2 | 0.3 | 3 | 0.45 |
| 3.1 | | 3.5 | | 3.1 |
| Develop | | Develop | | Develop |



- The team decided to implement a single direct drive system similar to lan's design.
- A custom wheel was needed to directly attach to the motor.
- To hold up the motors for the wheels a second arm was also needed.
- A larger base was made to account for the weight difference from the second arm.

Group B AEV Project

By:

Elijah Yates, Ian Dye, John Bonds III, Benjamin Freeman

| | Perfe | ormance |
|--------|--|---------------|
| P • | erformance test 1: Group B used a temporary design that | Perfe • Us |
| | implemented propellers and featured the large base, but lacked the second arm | • Im ac |
| • | The code we used had the AEV run to a certain number of marks before reversing the motors to slow down its velocity. | • W |
| | | • Se |
| • | This allowed us to have a controlled coast into the gate and not pass the second sensor. | • Fir |

Final Design and Test

Final Design:

- The final design is light, compact, and energy efficient because it cuts down the energy needed to run the AEV.
- Group B's AEV runs on one motor at 20-30 percent power.
- The team decided to create custom wheels that allow the motor to attach directly to them.
- The final design has the custom wheel in the back, and an original wheel in the front to read the reflective sensors.

Final Test results:

- Final test run used 42 Joules of energy
- The run took 40 seconds to complete



e Tests

formance test 2: sed the final design with direct wheel drive

nproved braking system which increased curacy

'heel malfunctions in the first run

econd run failed to open the gate

nal run attached to the caboose with too uch force





Motor configuration: For AR&D 1 the team tested if push or pull propeller systems are more efficient. Push vs Pull Efficiency Push run

| Distance decreme |
|----------------------|
| 1 |
| .95 |
| . <mark>907</mark> 0 |
| .6540 |
| .3520 |
| .1510 |



Advanced R&D



Reflective sensors:

AR&D 2 testing focused on finding the optimal distance the reflective sensors need to be away from the reflective tape.

| Reflectance Measured? | |
|-----------------------|---|
| None | |
| None | |
| None | |
| None | |
| Weak | |
| Strong | |
| | Reflectance Measured?NoneNoneNoneNoneWeakStrong |

Motor Energy Consumption:

AR&D 3 testing focused on how energy efficient regular motor polarity was compared to reverse motor polarity.

Reversing motor while connected to caboose



Reversing the motor before connected to caboose



Department of Engineering Education