

Group I AEV CDR Oral Presentation

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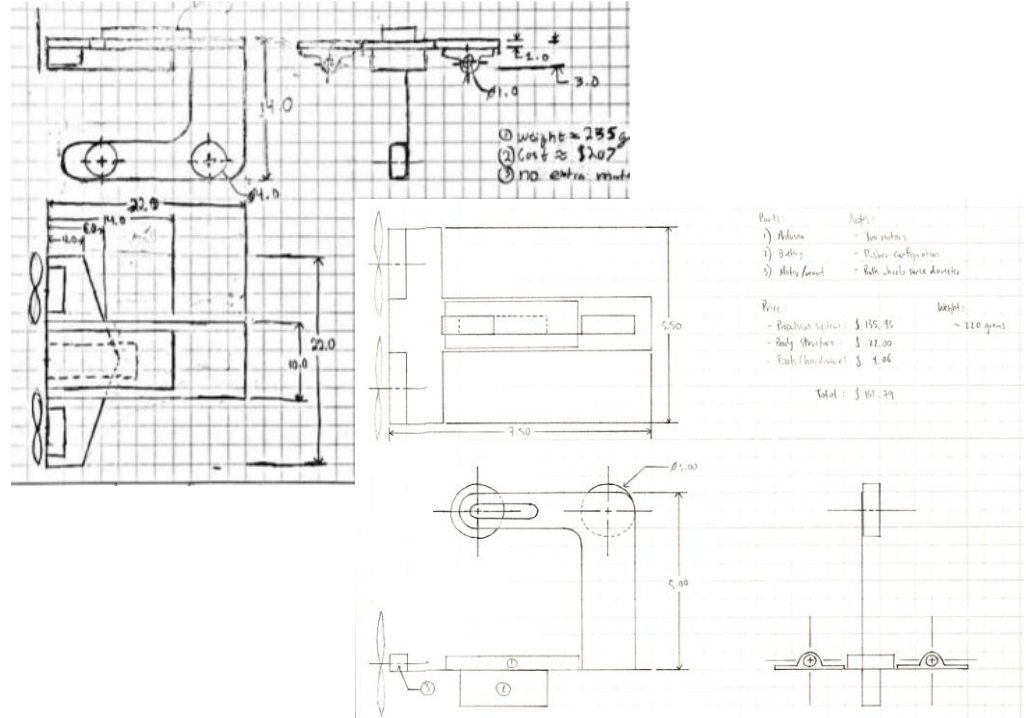


Overview Slide

- Initial design
- Concept screening and scoring
- Performance testing
- Sources of error
- Improvements and optimization
- Final testing

Initial Design Phase

- Determine which configurations fit all parts
- Best compromise of weight and balance
- Used concept scoring and screening to determine best design



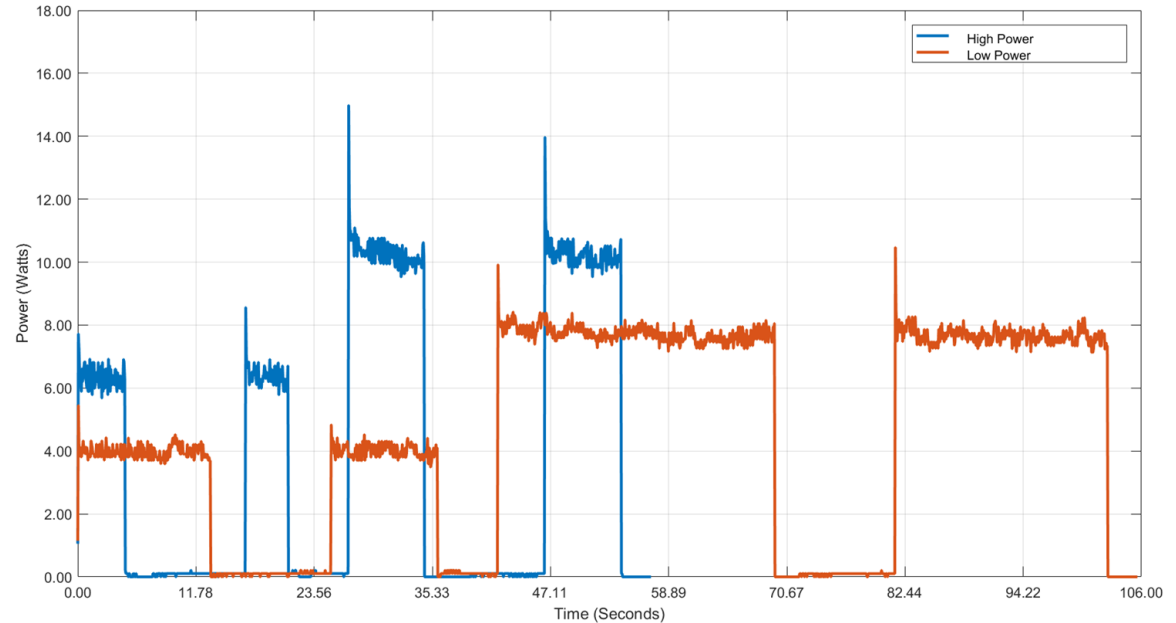
Concept Scoring and Factors Emphasized

- Consistency was the goal, want reproducible results
- Weight most significant factor
- Proper weight distribution reduces swaying on curve
- Aerodynamic effects negligible

$$F_D = \frac{1}{2} \rho v^2 C_D A$$

First Performance Test

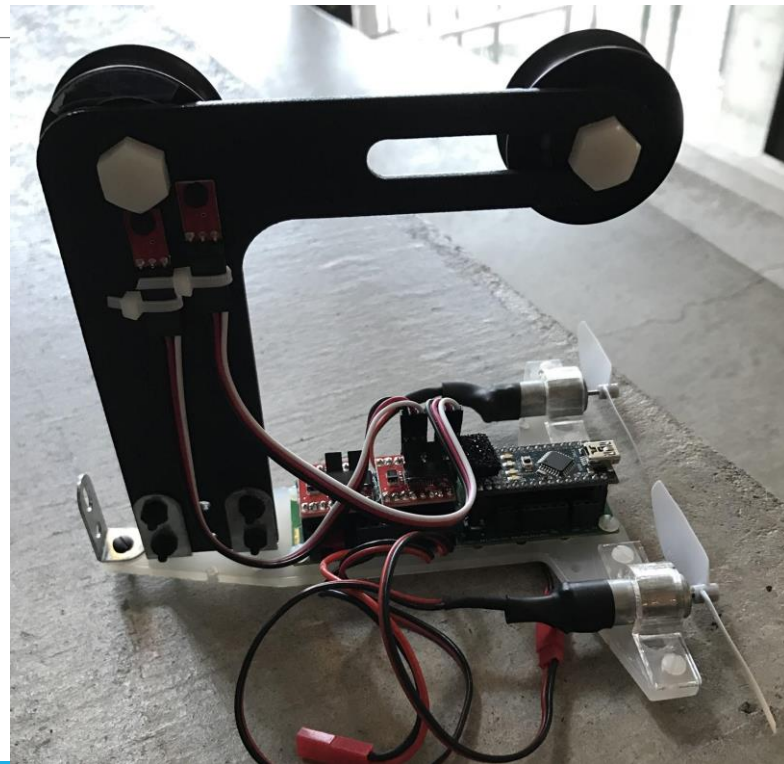
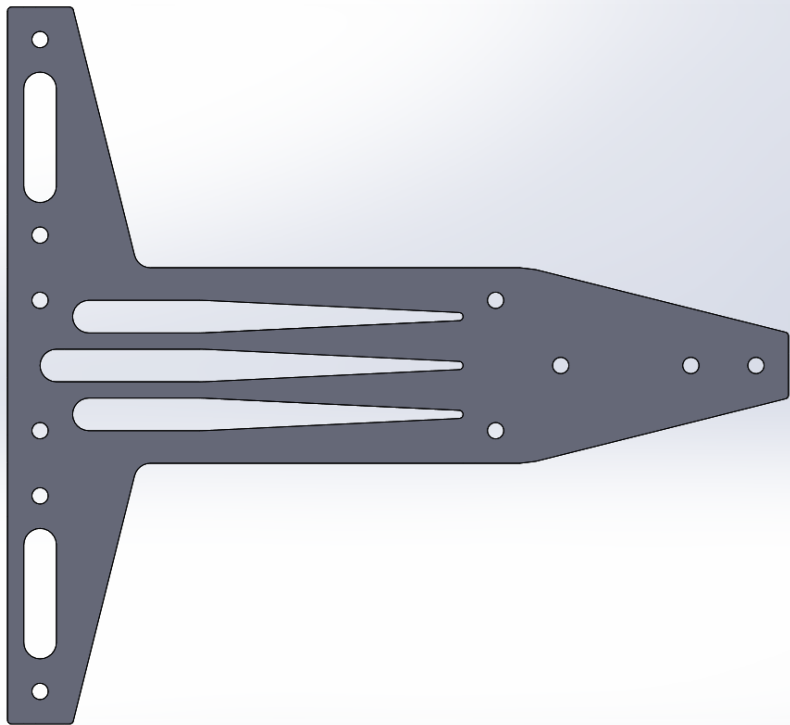
- Two code structures
- Energy used
 - Blue – 215 J
 - Orange – 473 J



Takeaways from First Performance Test

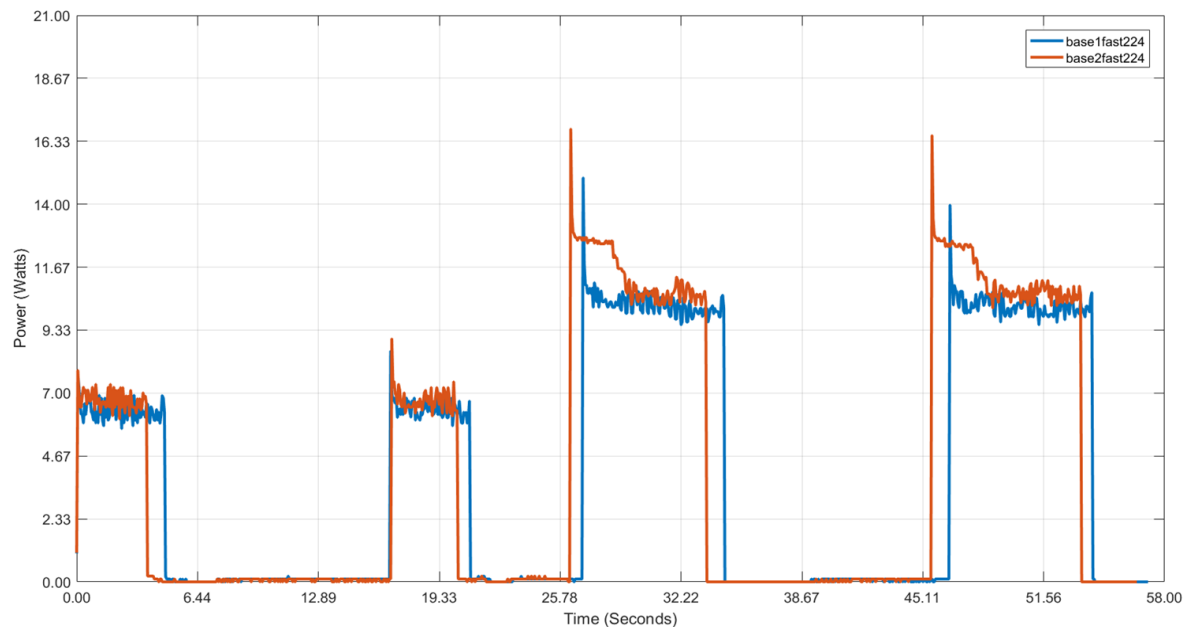
- Higher power for less time uses less energy
- Slow acceleration when returning with cargo
 - Added initial high powered boost for return trip
- New AEV base 49% lighter and more compact
 - Weighs 16.21 g down from 31.79 g

Custom AEV Base



Second Performance Test

- Third code format tested
- Energy used
 - Blue – 215 J
 - Orange – 225 J

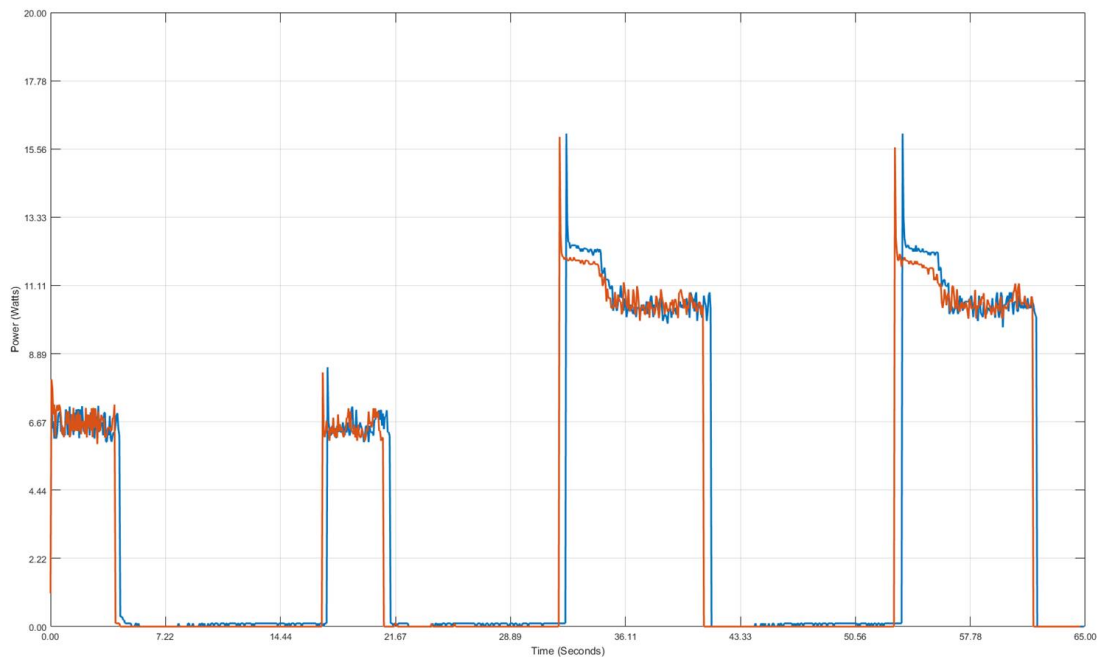


Efficiency Optimization

- Lighter base used more energy
- Removed return boost to reduce energy usage
- Tested while loops to increase consistency
 - i.e: `while(aevmarks < 330)`
- Tested coasting to curve and powering through curve

Optimization Test

- Used third code format tested
- Energy used
 - Blue – 250 J
 - Orange – 248 J

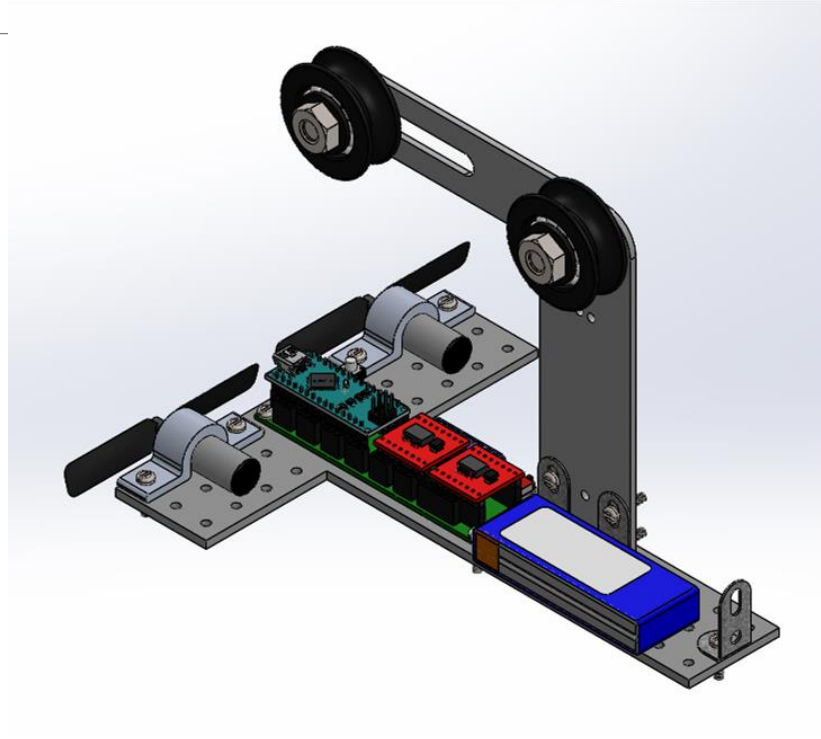


Sources of Error

- Propellers too close to AEV base
- Zip ties came in contact with track
- Unbalanced AEV increased swaying
- Rear wheel had contaminated bearings

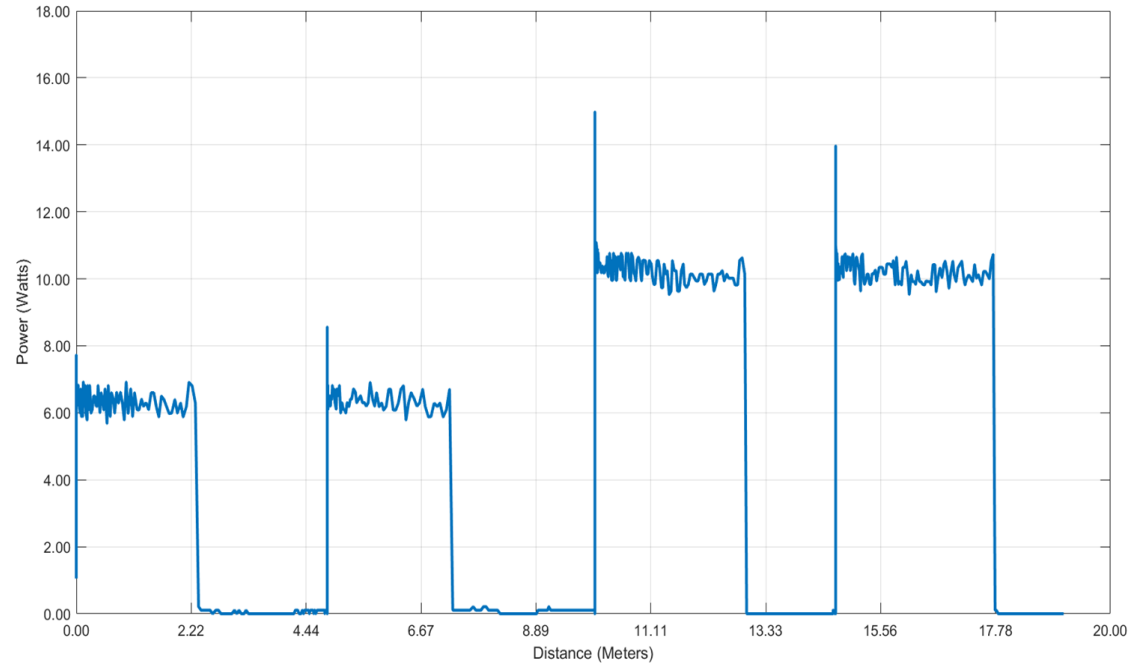


Final Design Tested



Final Test

- Returned to original code format and base
- Used 200 J of total energy



Final Test Results

- Energy used: 200.31 Joules
- AEV weight: 251 grams
- Run time: 45.5 seconds
- Motherboard suffered catastrophic failure

Testing Summary

- Inconsistent results
- Energy increased with each test
- Several sources of error when testing

Test	Total Energy Used (J)
Performance 1.1	215
Performance 1.2	473
Performance 2	225
Optimization	250
Final	200

Takeaways from Project

- Teamwork very important to keep project on schedule
- Concept scoring matrices efficient for narrowing choices
- Weight distribution was larger factor than initially thought
- Making project overly complex can be detrimental
 - i.e: trying to implement while loops

Questions

