Advanced Energy Vehicle (AEV)

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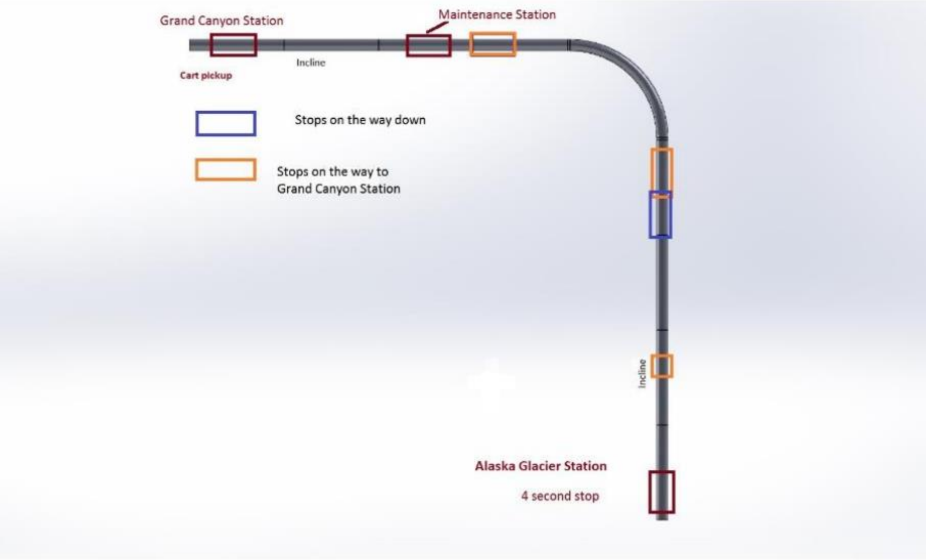
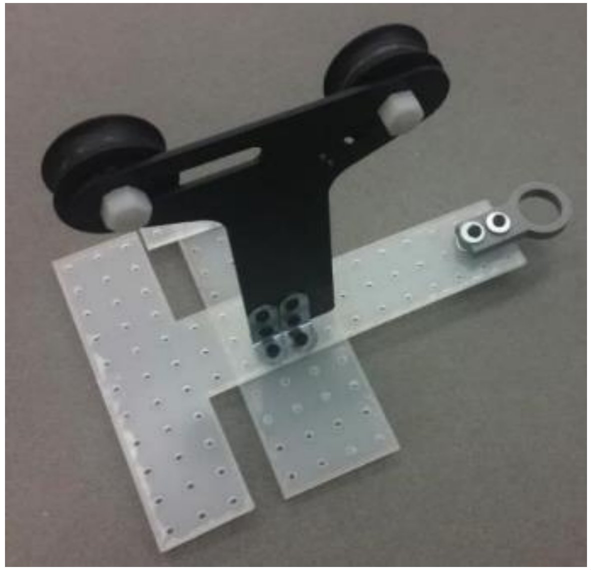


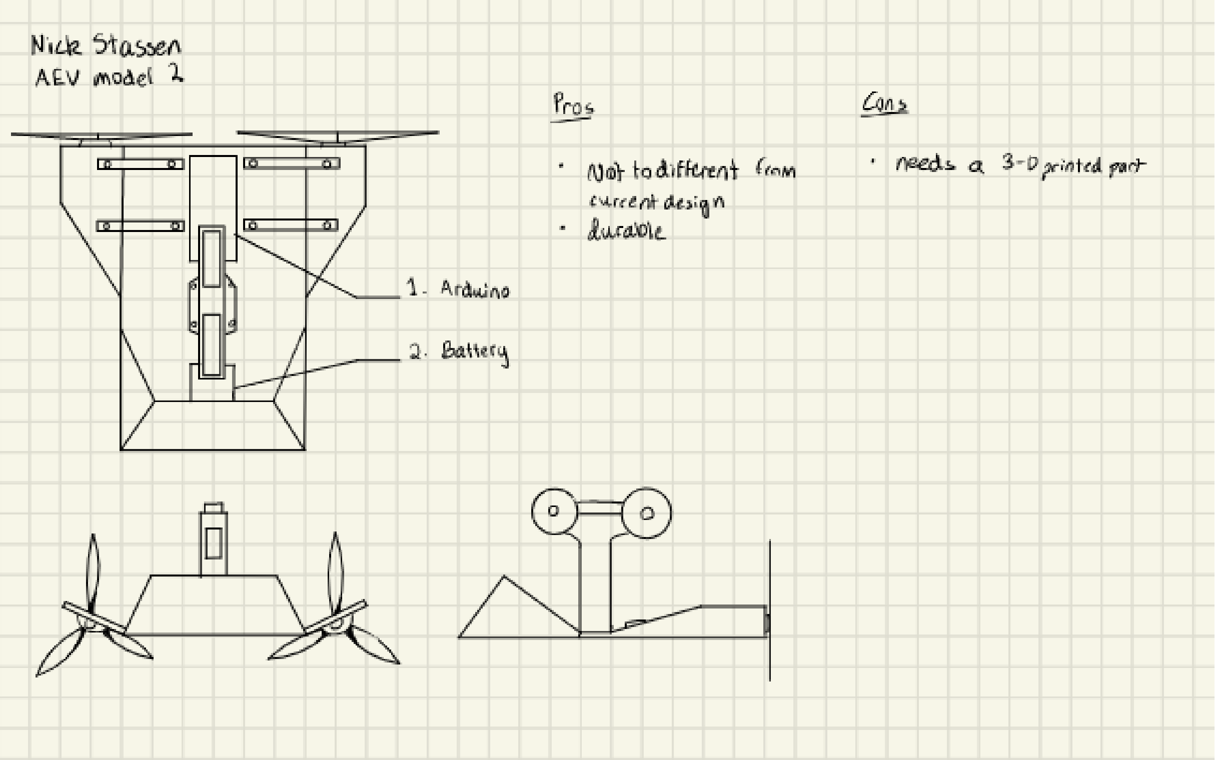


Mission Concept Review

- The purpose of the AEV is to transport people and cargo through a park. It needs to be energy efficient because electricity at the park is limited. It must go slow so that people or cargo will not fall off.

Concepts continued

Design B



Nick Stassen
AEV model 2

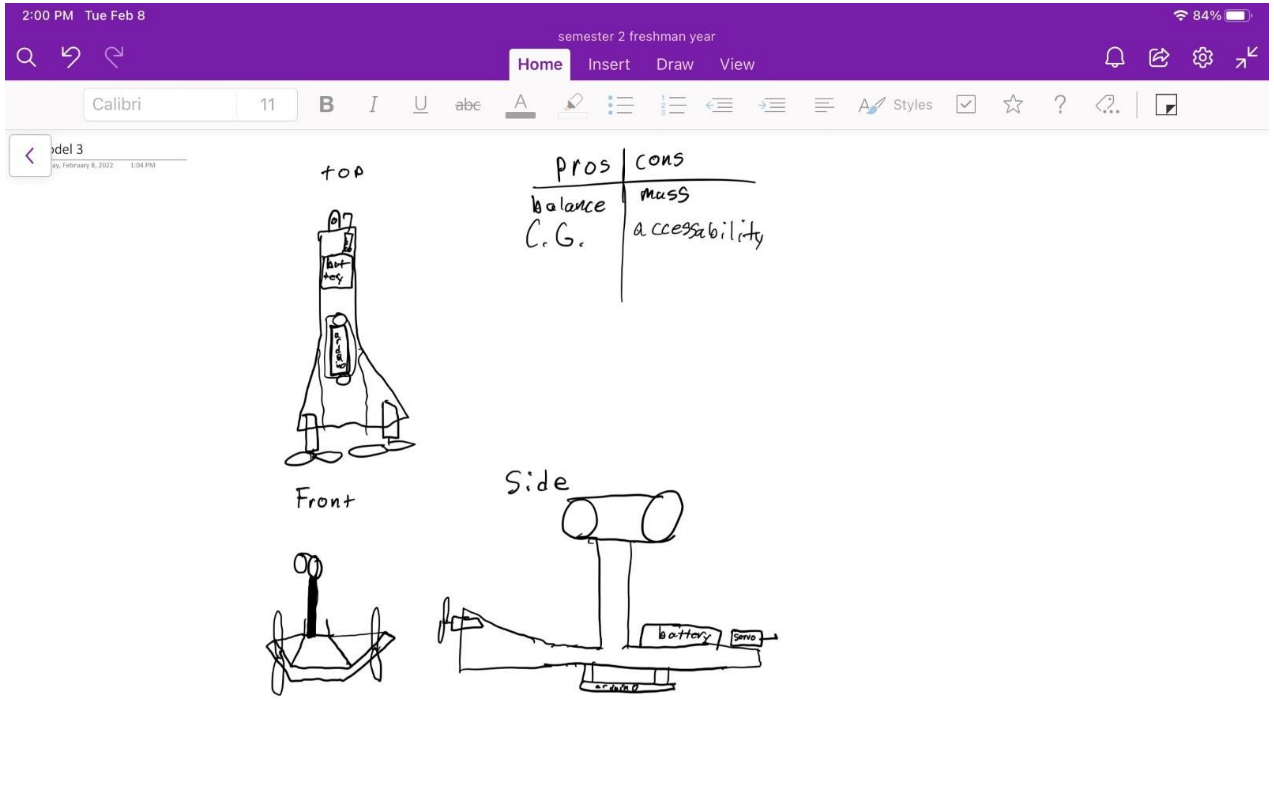
Pros

- Not to different from current design
- durable

Cons

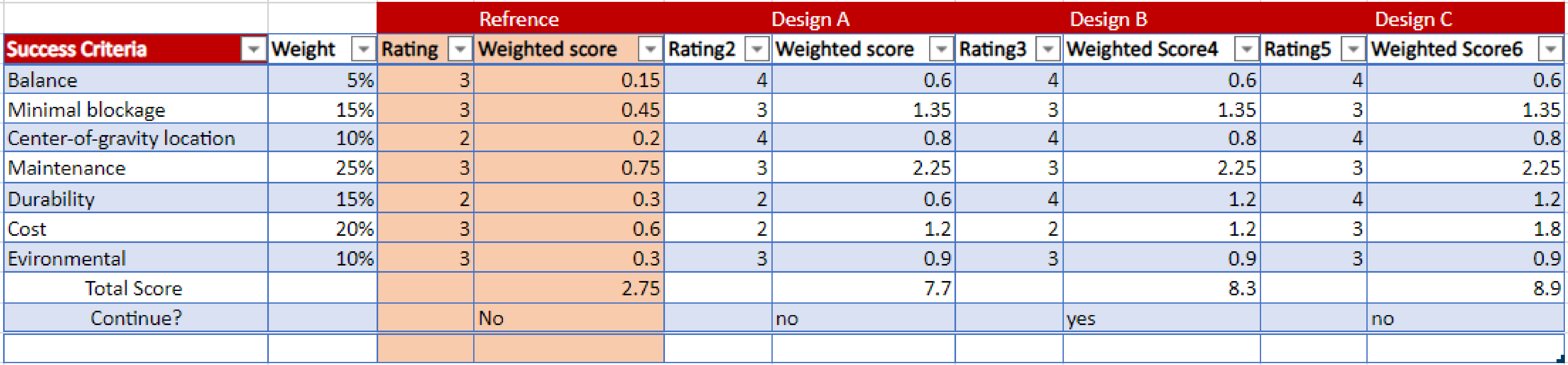
- needs a 3-D printed part

Design C



pros	cons
balance	mass
C.G.	accessability

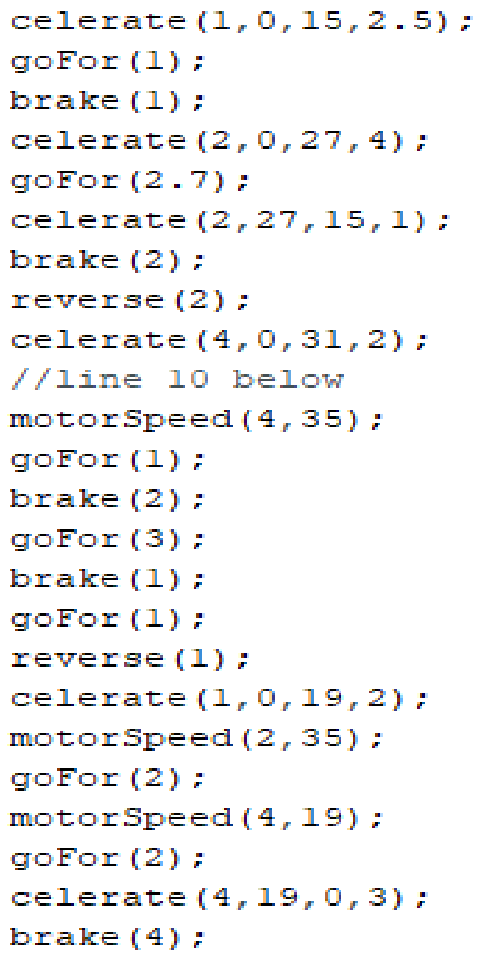
Concept Screening and Scoring for initial models



		Refrence		Design A		Design B		Design C	
Success Criteria	Weight	Rating	Weighted score	Rating2	Weighted score	Rating3	Weighted Score4	Rating5	Weighted Score6
Balance	5%	3	0.15	4	0.6	4	0.6	4	0.6
Minimal blockage	15%	3	0.45	3	1.35	3	1.35	3	1.35
Center-of-gravity location	10%	2	0.2	4	0.8	4	0.8	4	0.8
Maintenance	25%	3	0.75	3	2.25	3	2.25	3	2.25
Durability	15%	2	0.3	2	0.6	4	1.2	4	1.2
Cost	20%	3	0.6	2	1.2	2	1.2	3	1.8
Evironmental	10%	3	0.3	3	0.9	3	0.9	3	0.9
Total Score			2.75		7.7		8.3		8.9
Continue?			No		no		yes		no

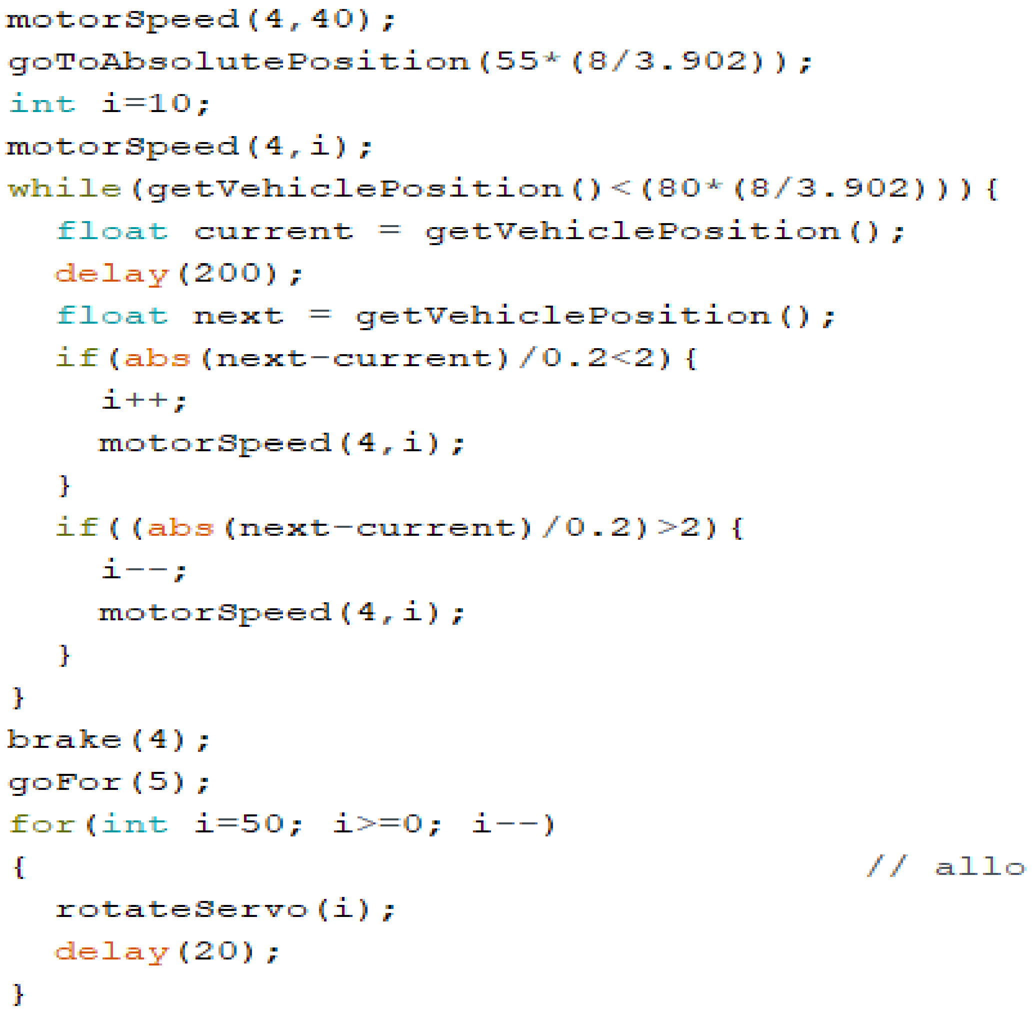
Evolution of programming

Beginning

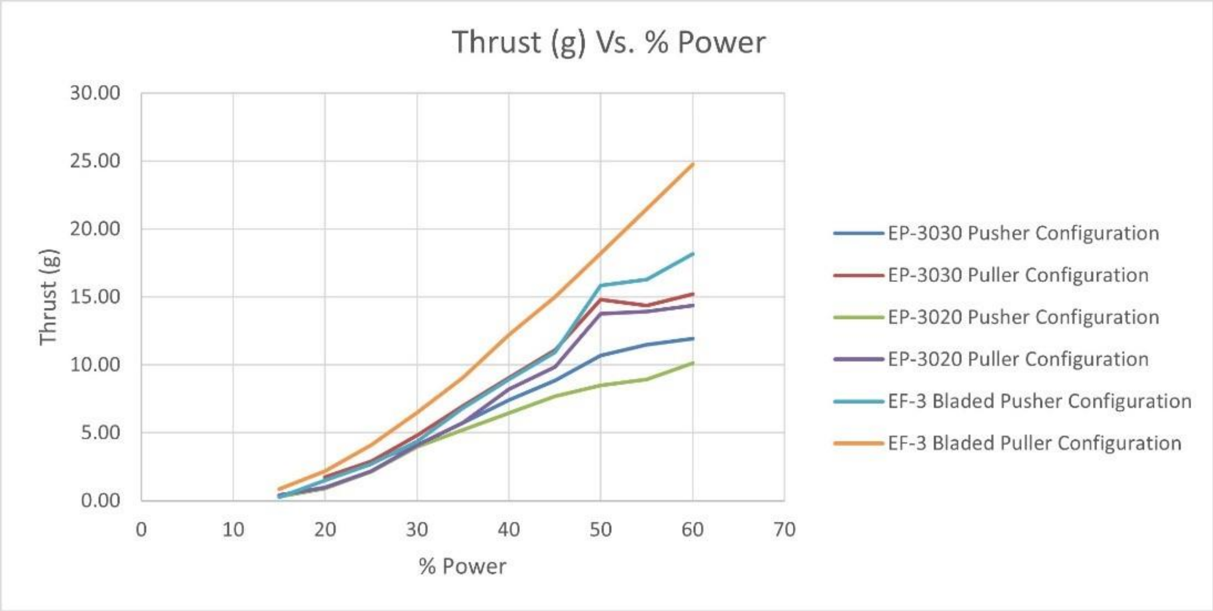


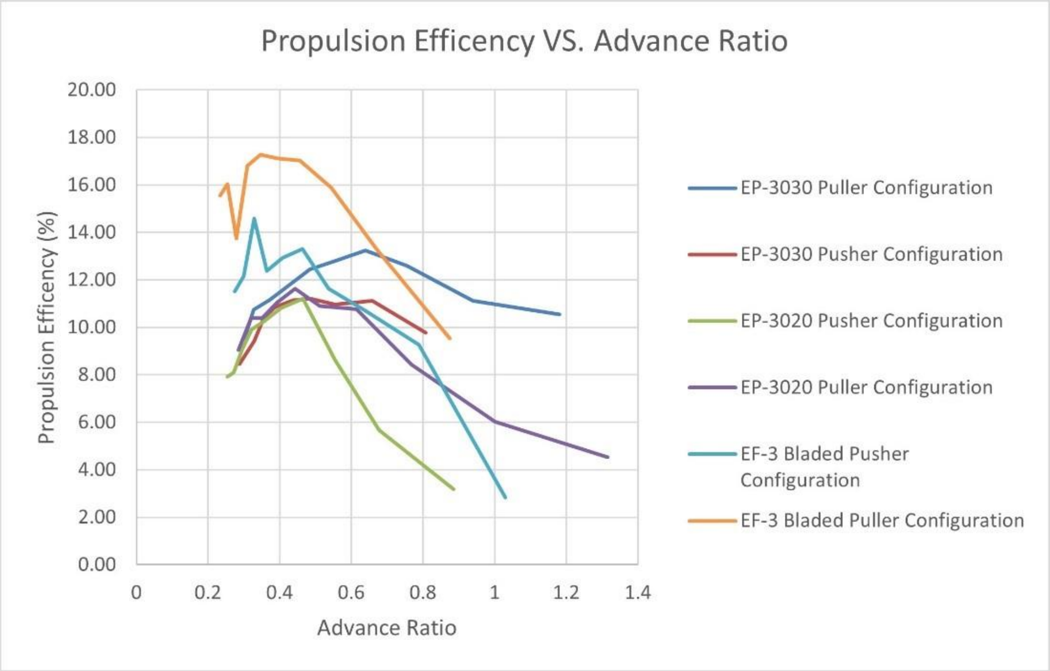
```
celerate(1,0,15,2.5);
goFor(1);
brake(1);
celerate(2,0,27,4);
goFor(2.7);
celerate(2,27,15,1);
brake(2);
reverse(2);
celerate(4,0,31,2);
//line 10 below
motorSpeed(4,35);
goFor(1);
brake(2);
goFor(3);
brake(1);
goFor(1);
reverse(1);
celerate(1,0,19,2);
motorSpeed(2,35);
goFor(2);
motorSpeed(4,19);
goFor(2);
celerate(4,19,0,3);
brake(4);
```

The end



```
motorSpeed(4,40);
goToAbsolutePosition(55*(8/3.902));
int i=10;
motorSpeed(4,i);
while(getVehiclePosition()<(80*(8/3.902))){
  float current = getVehiclePosition();
  delay(200);
  float next = getVehiclePosition();
  if(abs(next-current)/0.2<2){
    i++;
    motorSpeed(4,i);
  }
  if((abs(next-current)/0.2)>2){
    i--;
    motorSpeed(4,i);
  }
}
brake(4);
goFor(5);
for(int i=50; i>=0; i--)
{                                       // allo
  rotateServo(i);
  delay(20);
}
```





System Analysis: Propulsion

System analysis: Performance

Half Track run

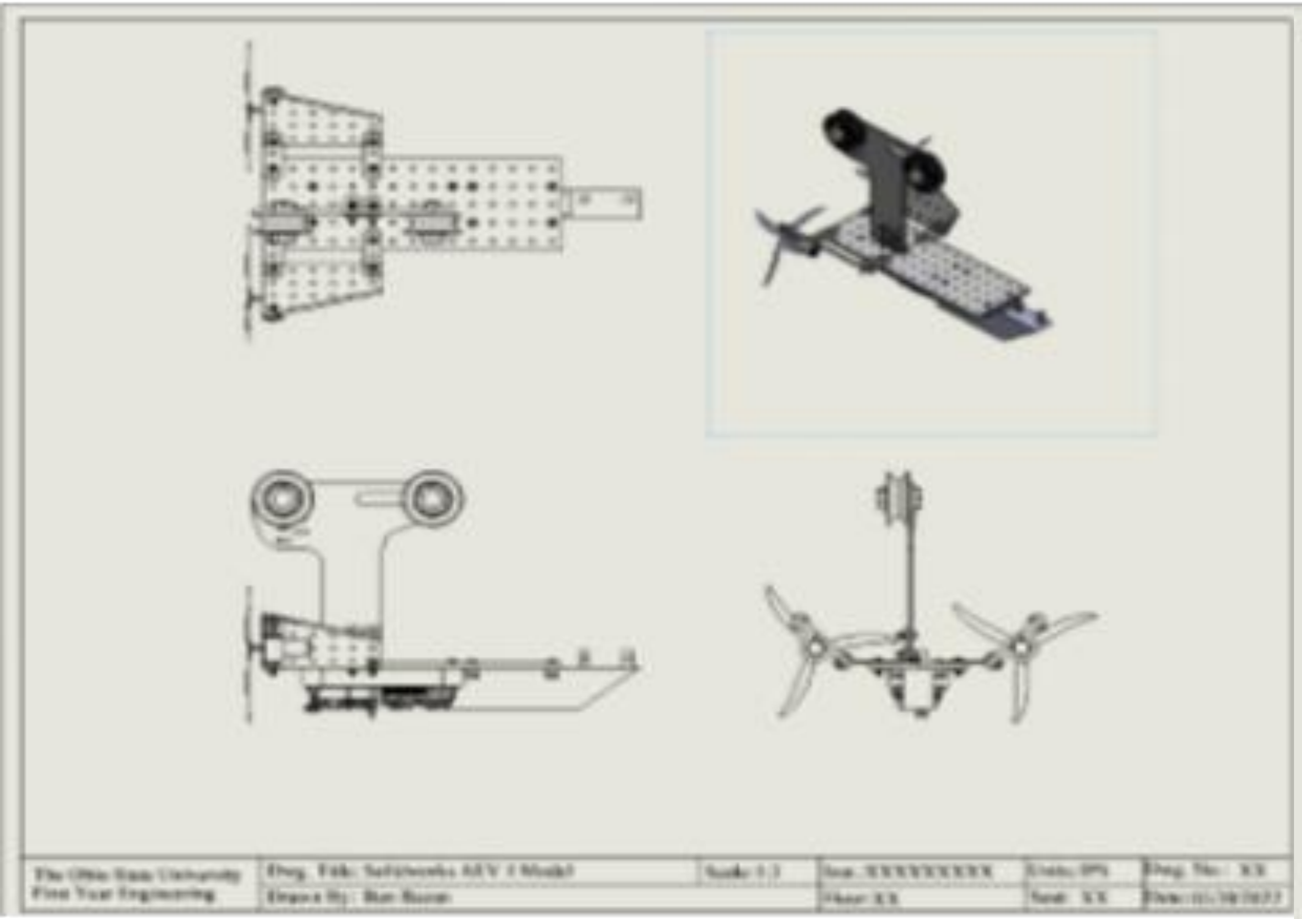
Phase	Arduino Code	Time (seconds)	Total Energy (Joules)
1	motorSpeed(4,22)	4.7	26.917
2	motorSpeed(4,12)	1.3	3.299
3	motorSpeed(4,22)	1	4.6024
4	brake(4)	5	6.101
5	motorSpeed(4,20)	3.5	16.695
6	motorSpeed(4,13)	1.5	3.459
7	motorSpeed(4,20)	4	8.275
Total		21	257.8 J per Kilogram

Full Track run

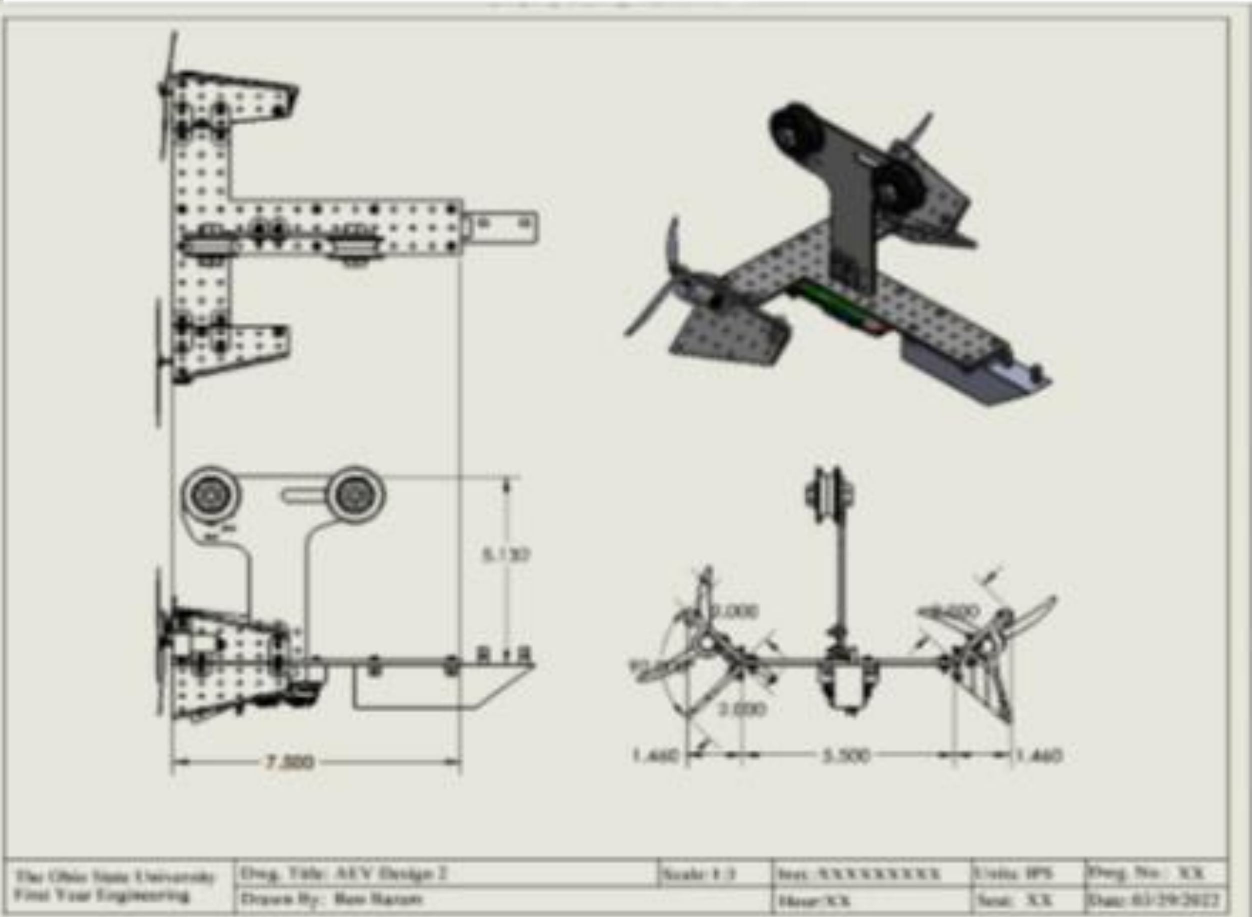
Phase	Arduino Code	Time (seconds)	Energy per Phase (J)	Distance traveled (m)
1	motorSpeed(4,45)	2.401	37.86	0-1.26
2	motorSpeed(4,14)	0.901	3.0633	1.26-1.81
3	brake(4) goFor(4)	3.96	0.949	1.81-2.29
4	motorSpeed(4,22)	4.2	22.47	2.29-3.37
5	motorSpeed(4,16)	4.56	13.92	3.37-7.58
6	celerate(4,15,12,1) motorSpeed(4,22)	0.72	3.64	7.58-8.65
7	brake(4) goFor(4)	4.02	0.492	8.65-9.28
8	motorSpeed(4,30)	2.64	23.115	9.28-10.65
9	motorSpeed(4,16)	9.06	30.894	10.65-11.91
		32.462	Total energy per kilogram 507.07	0-11.91

Preliminary Design Review

Design 1



Design 2



PDR continued

Design 2

Phase	Arduino Code	Energy per Phase (J)
1	motorSpeed(4,45)	37.86
2	motorSpeed(4,14)	3.0633
3	brake(4) goFor(4)	0.949
4	motorSpeed(4,22)	22.47
5	motorSpeed(4,16)	13.92
6	celerate(4,15,12,1) motor Speed(4,22)	3.64
7	brake(4) goFor(4)	0.492
8	motorSpeed(4,30)	23.115
9	motorSpeed(4,16)	30.894
		Total energy per kilogram 507.07

Design 1

Phase	Arduino Code	Energy per phase (J)
1	motorSpeed(4,50)	34.303
2	motorSpeed(4,20)	4.6043
3	brake(4) goFor(4)	0.022
4	motorSpeed(4,22)	39.727
5	motorSpeed(4,16)	5.8493
6	celerate(4,15,12,1)	2.435
7	motorSpeed(4,22)	2.281
8	brake(4) goFor(4)	24.14
9	motorSpeed(4,35)	3.4416
10	brake(4)	0.09102
		326.232 Total energy per kilogram

Performance test 2 and 3: energy optimization

- Before Optimization Total Energy used per kilogram (J/Kg) was 1403.5

- After Optimization Total Energy used per kilogram (J/Kg) was 1408

Final Test

- Total Energy used per kilogram with the unweighted cart was 1408 J/Kg

- Total Energy used per kilogram with the weighted cart was 1346.28

Conquering Error

[AEV around bend]