Caleb Nelson
Chrisner Garcesa
ENGR 454
5/3/2021
Motor and Thrust Modeling

| | | | Voltages measured with ADC onboard ESP32 | | | |
|---|---|---|---|---|---|---|
| | | | Cold motor | | Warm motor | |
| PWM % | Thrust (g) | Voltage to motor (V) | Motor Voltage (V) | Motor Current (A) | Motor Voltage (V) | Motor Current (A) |
| 0% | 0 | 0 | 0 | 0 | 0 | 0 |
| 10% | 6 | 1.03 | 0.19 | 0.39 | 0.23 | 0.48 |
| 20% | 15 | 1.5 | 0.36 | 0.75 | 0.38 | 0.77 |
| 30% | 22 | 1.9 | 0.51 | 1.02 | 0.52 | 1.04 |
| 40% | 28 | 2.22 | 0.68 | 1.34 | 0.65 | 1.32 |
| 50% | 37 | 2.51 | 0.79 | 1.58 | 0.74 | 1.53 |
| 60% | 43 | 2.78 | 0.88 | 1.75 | 0.88 | 1.75 |
| 70% | 50 | 3.04 | 0.96 | 1.92 | 0.99 | 1.96 |
| 80% | 57 | 3.27 | 1.04 | 2.08 | 1.06 | 2.12 |
| 90% | 62 | 3.53 | 1.02 | 2.04 | 1.03 | 2.06 |
| 100% | 63 | 3.68 | 1.01 | 2.03 | 1.02 | 2.05 |

For this milestone we used a thrust stand to measure the thrust produced by our motor at various duty cycles/PWM values and therefore different input voltages. We stepped the PWM value in 10% increments and recorded the thrust, voltage to the motor, and voltage across a resistor (specially used to measure the current being supplied to the motor) at each increment. We then graphed that data and compared with other groups. The last data point seems to be slightly off for us, but the rest of our data is consistent with the majority of the other groups who conducted these tests. There are a number of possible reasons for the last data point deviating from the expected linear trend. For example, the motor was not super securely secured to the armature and could rotate about it slightly, which may have happened when the thrust was increased to its max value. There are also possiblities that the PWM behaved differently near its max value when loaded, or perhaps the motor was getting warmer and behaving differently. In any case, the overall trend is quite linear, especially vs duty cycle.

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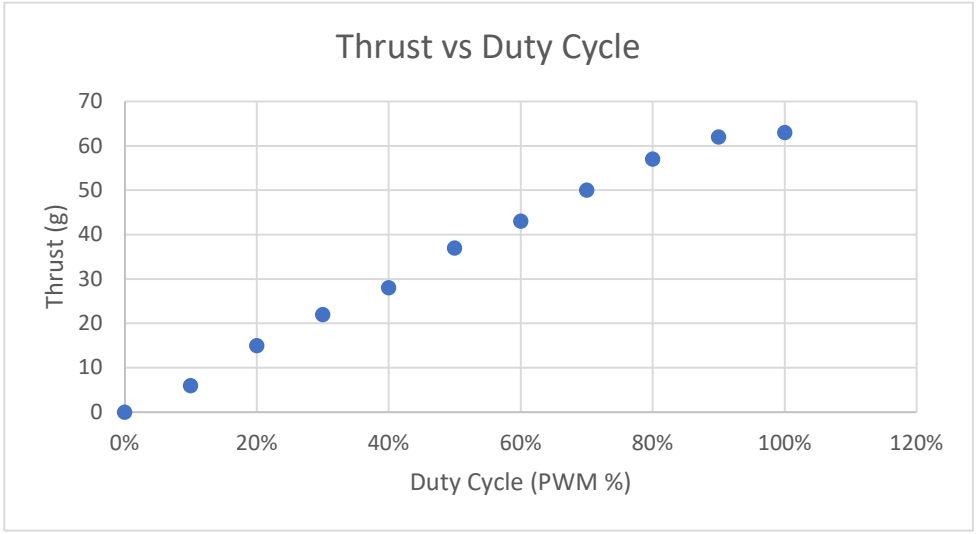


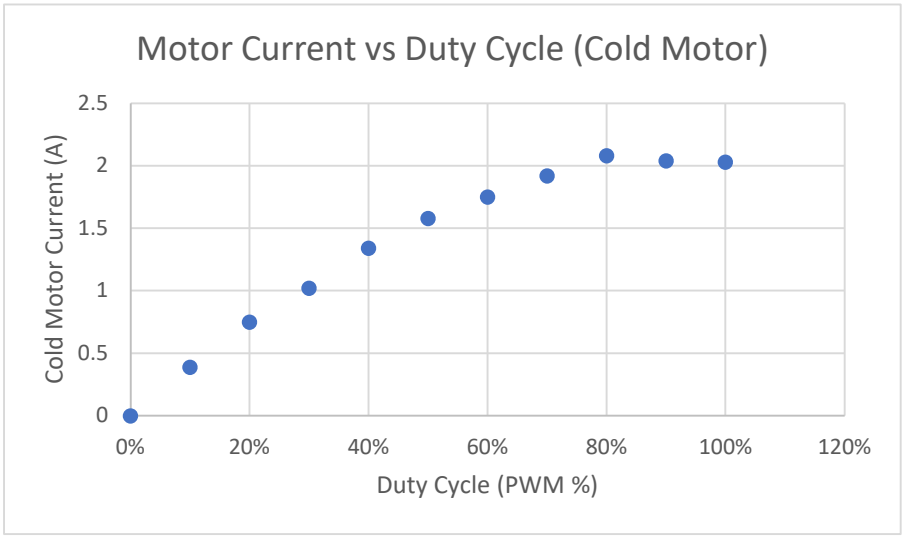


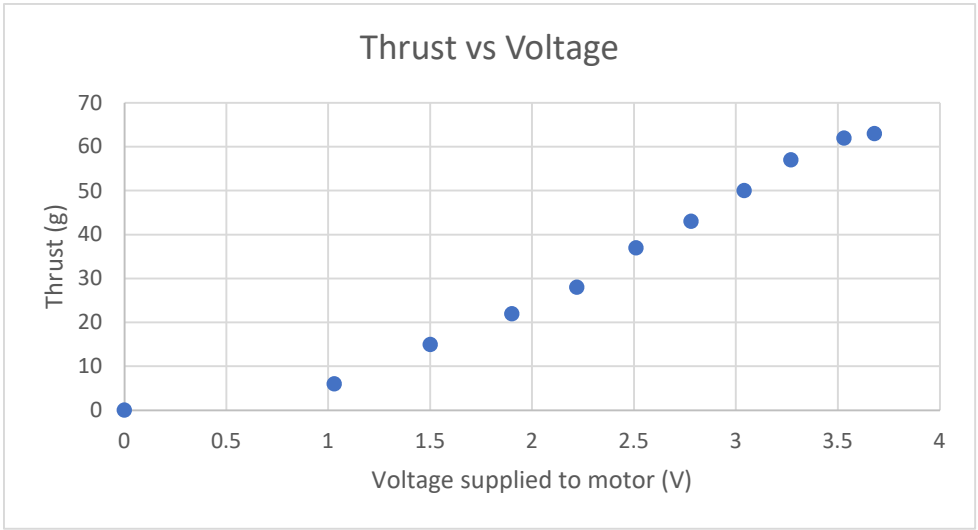


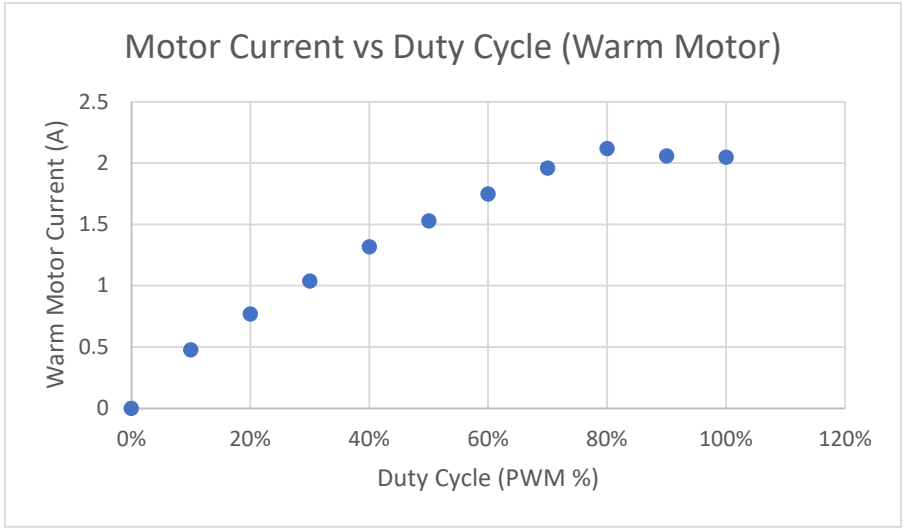

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