

SAE AERO Propulsion Design

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What is SAE AERO?

SAE AERO is an event where engineering students design RC aircraft to compete in competition. Competition this year includes carrying and dropping payload and dropping autonomous gliders. The senior team consists of myself and four other mechanical engineering students.

Design Specifications:

1. Motor must be electric.
2. Power limited to 750watts
3. Multiple motors are allowed but are still limited to a total of 750watts.
4. Battery must be at least 6 cell 3,000mah

Target Performance:

1. Loaded aircraft weight ~25 lbs
2. ~10+lbf of static thrust
3. Minimum takeoff speed of 23.5 mph
4. Minimum speed for maximum bank angle is 25.3 mph
5. As lightweight as possible

Design and Motor Selection

1. Figure 1 shows the wiring diagram used in the current iteration of the aircraft.
2. Figure 4 shows the motor selected and Figure 3 shows the back-up motor selected.

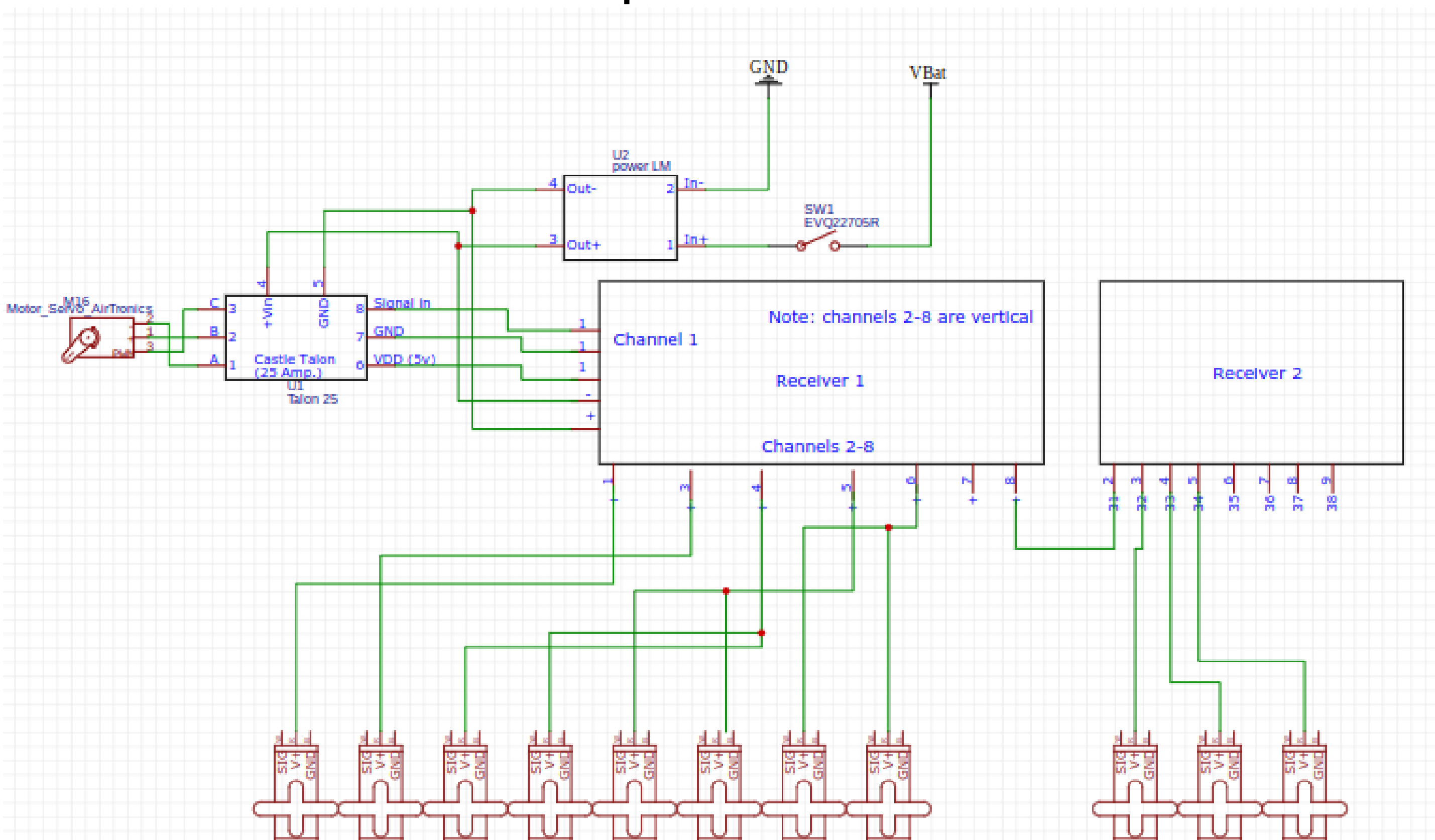


Figure 1: Wiring Diagram

References:

- [1] T-Motor U8 Lite 190KV, Accessed on: Nov. 24, 2019. Available: <http://store-en.tmotor.com/goods.php?id=470>
- [2] Cobra C-4130/20 Brushless Motor 300KV, Accessed on Nov. 24, 2019. Available: <https://www.cobramotorsusa.com/motors-4130-20.html>
- [3] RCbenchmark Series 1580 Thrust Stand, Accessed on Nov. 24, 2019. Available: <https://www.rcbenchmark.com/products/dynamometer-series-1580?variant=13071468527728>



Figure 4: T-Motor U8 Lite, KV 190 [1] Figure 3: Cobra 4130/20 KV 300 [2]

Cobra 300KV	Total Weight (oz)	Thrust (lbf)	Total Cost (\$)
20 x 8 in	17.36	~ 11.1	104.00
20 x 10 in	17.36	~ 11.5	104.00

T-motor U8 Lite	Total Weight (oz)	Thrust (lbf)	Total Cost (\$)
26 x 9.4 in	13.01	~ 12	370.00
28.4 x 10.1 in	14.35	~ 13 - 14	380.00

Table 1 and 2: Cost to Performance

Ground and Flight Results

During ground testing we measured a max thrust of ~14 lbf with our current setup. To do this we used a test stand from RC Benchmark and Figure 4 shows those results.

For flight testing we successfully flew the aircraft unloaded on 3/8/20. We measured the takeoff speed to be 20.4 mph.

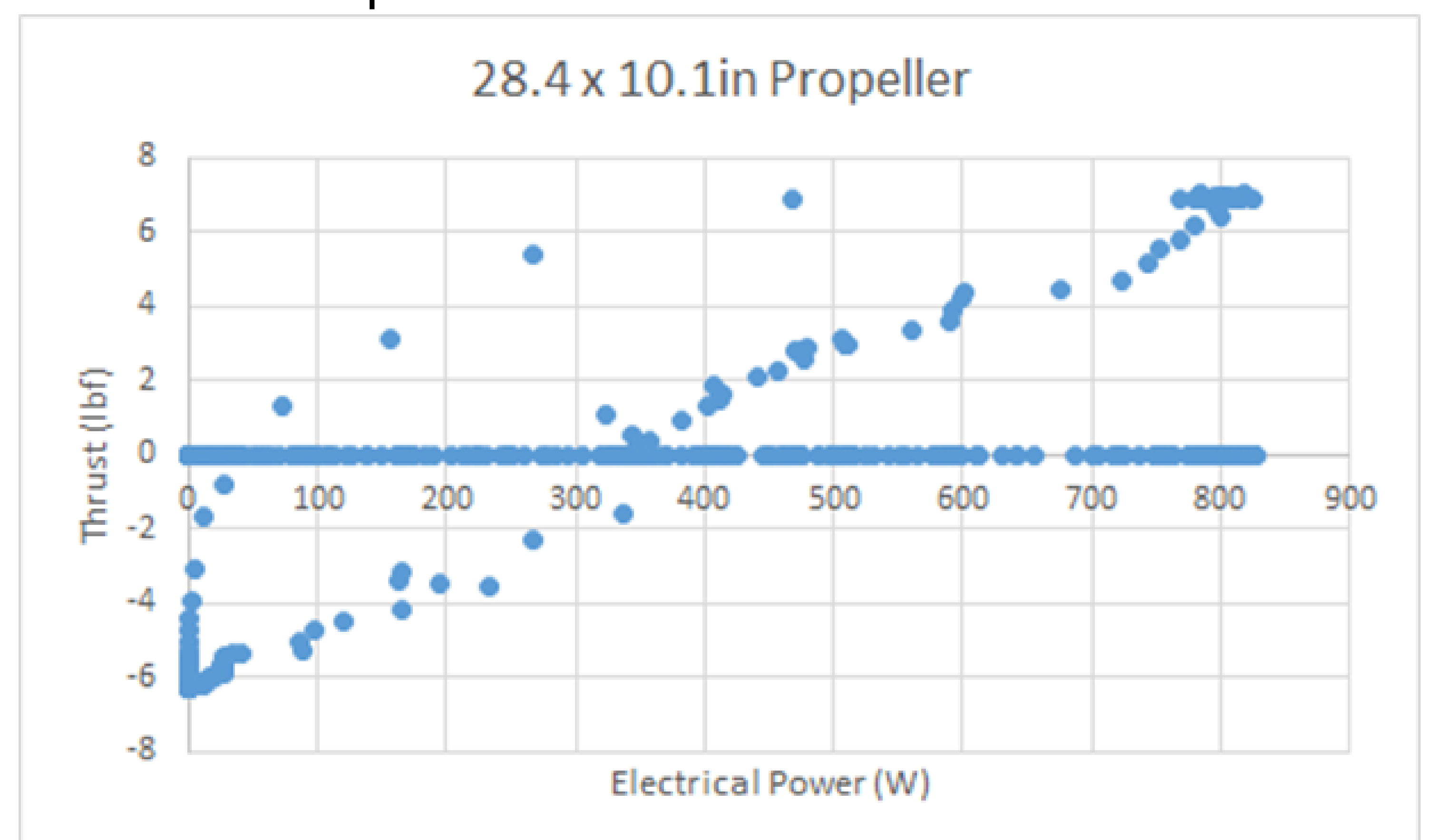


Figure 4: Thrust Data

Acknowledgements:

Union College, Prof. Bruno, Prof. Wehe, Prof. Spinelli, Prof. Dosiek, Arron Rapaport