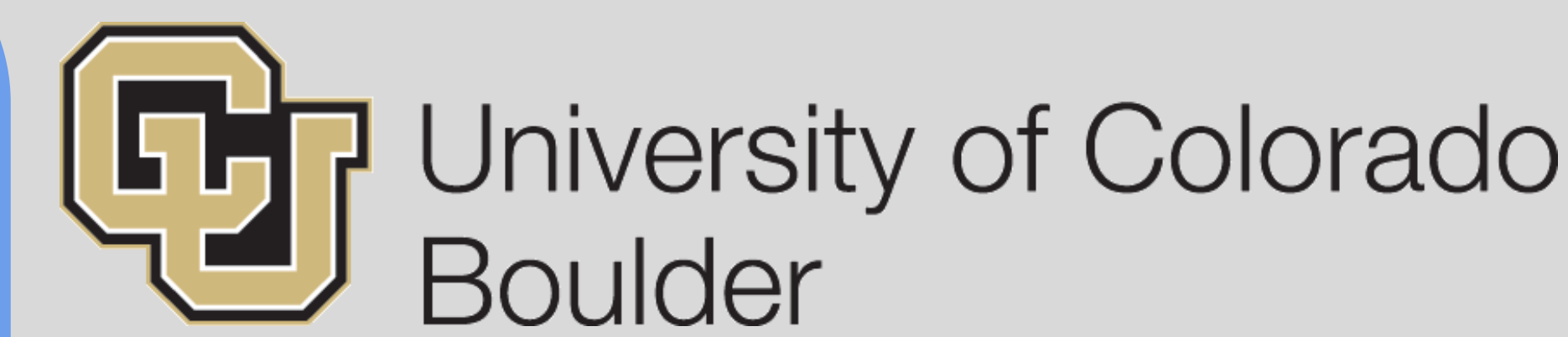




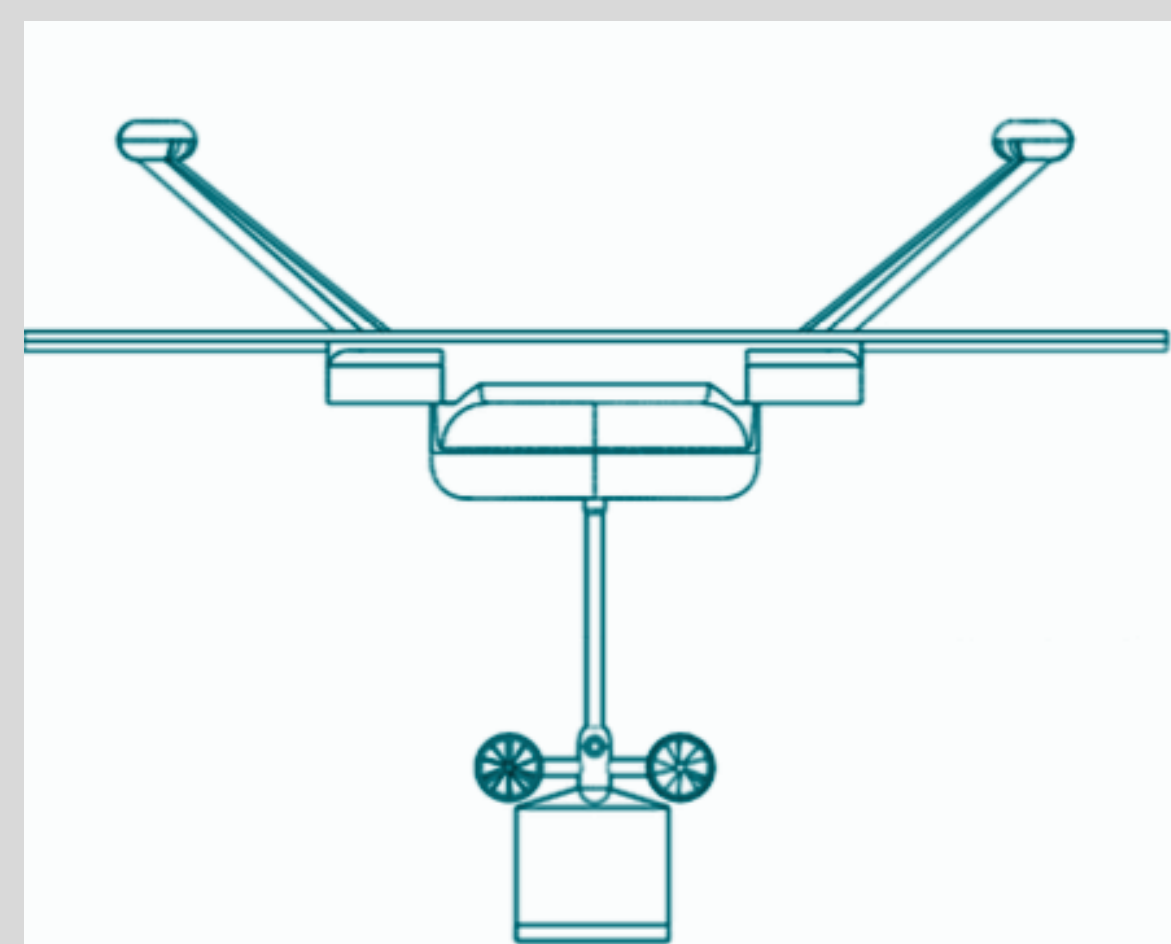
# Self-Powered Aerial DELivery Stabilizer (SPADES)

## Team Out of Control Systems

Cory Childs, Aubrey Kroger, Alex McLaren, Andrew Spitzer, Jeremy Webb, Sam Zimmer



### Background



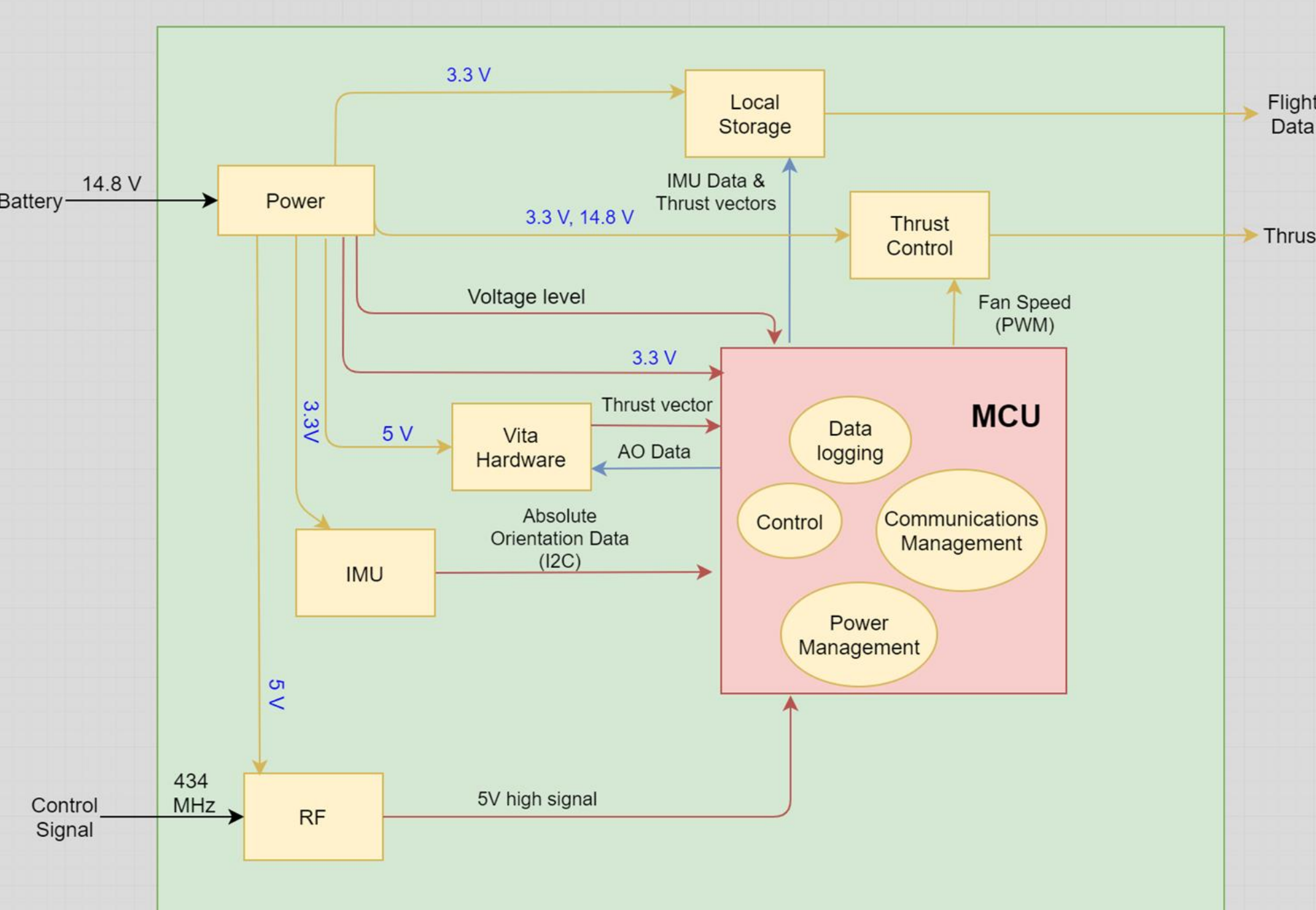
- Drones are becoming more prevalent for package delivery
- Unable to land in densely populated areas, must lower the package
- Lack of stabilization causes increased flight time, inaccurate delivery, increased costs

**SPADES provides a platform agnostic, RF controlled system that stabilizes a package delivered by a drone.**

### Overview of Operation

This functional diagram shows how these modules work together to perform the stabilization.

1. RF → Turns on MCU
2. MCU → Initialize ESC
3. ESC → Starts Fans from rest to idle RPM
4. IMU → Reads flight data
5. Flight Data → Interpreted by VitaChip
6. VitaChip → Outputs Control Logic to MCU
7. MCU → Outputs Thrust Vectors to ESC
8. Repeat the Loop



#### Modules

- MCU
- Inertial Measurement Unit
- Electronic Speed Control
- RF Connection
- Power Circuit
- Vita Hardware

### Acknowledgements

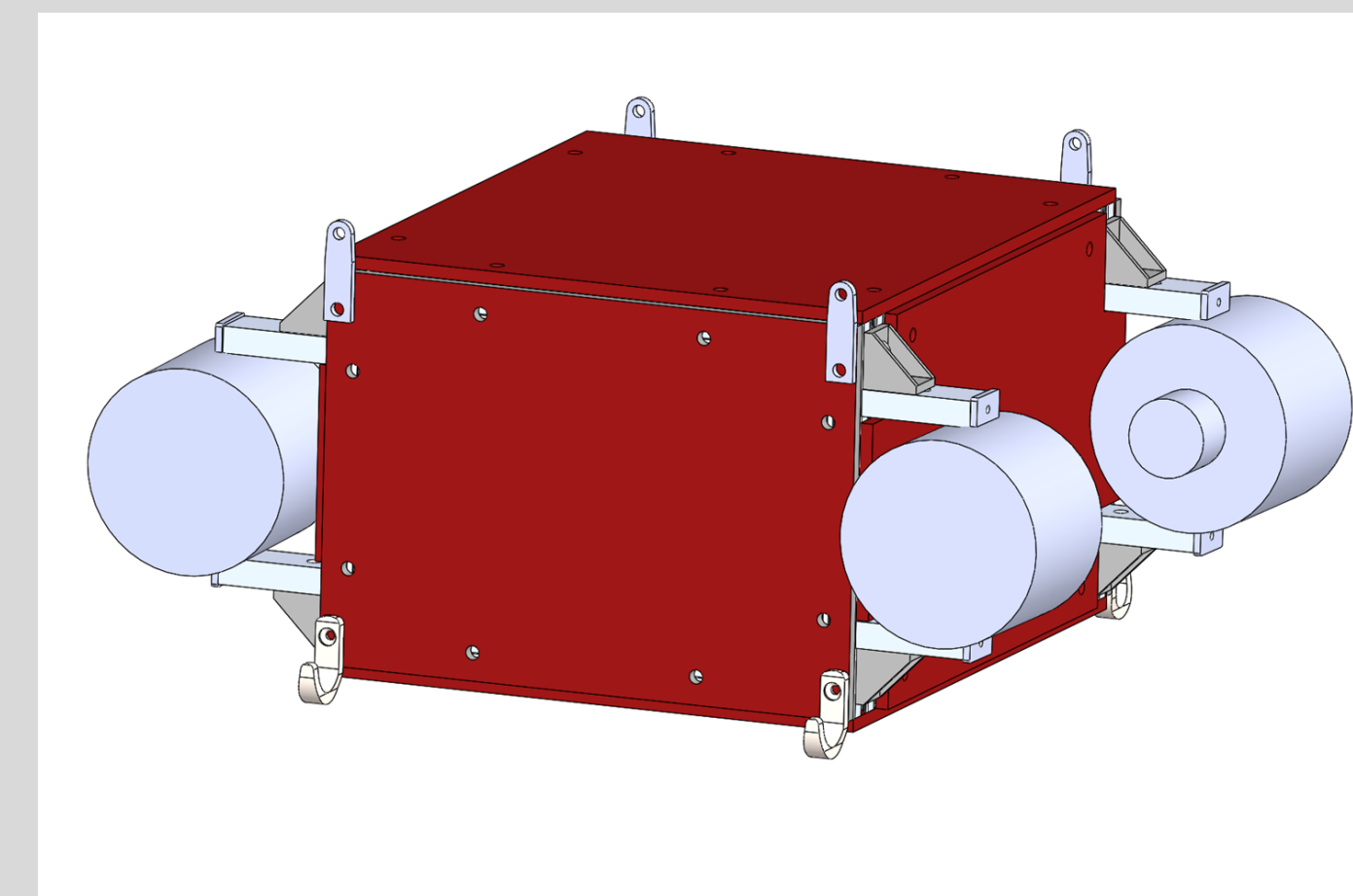
Special Thank You to Professor Femrite, Larry Manalo, and Shaylah Wood, as well as all of Vita Inclinata and the Senior Design Staff for their guidance and support throughout this project



Cory "Padlock" Childs, Aubrey "Queen" Kroger, Alexander "Pope" McLaren, Drew "Blood" Spitzer, Jeremy "Spider" Webb, Samuel "Couch" Zimmer

### Housing

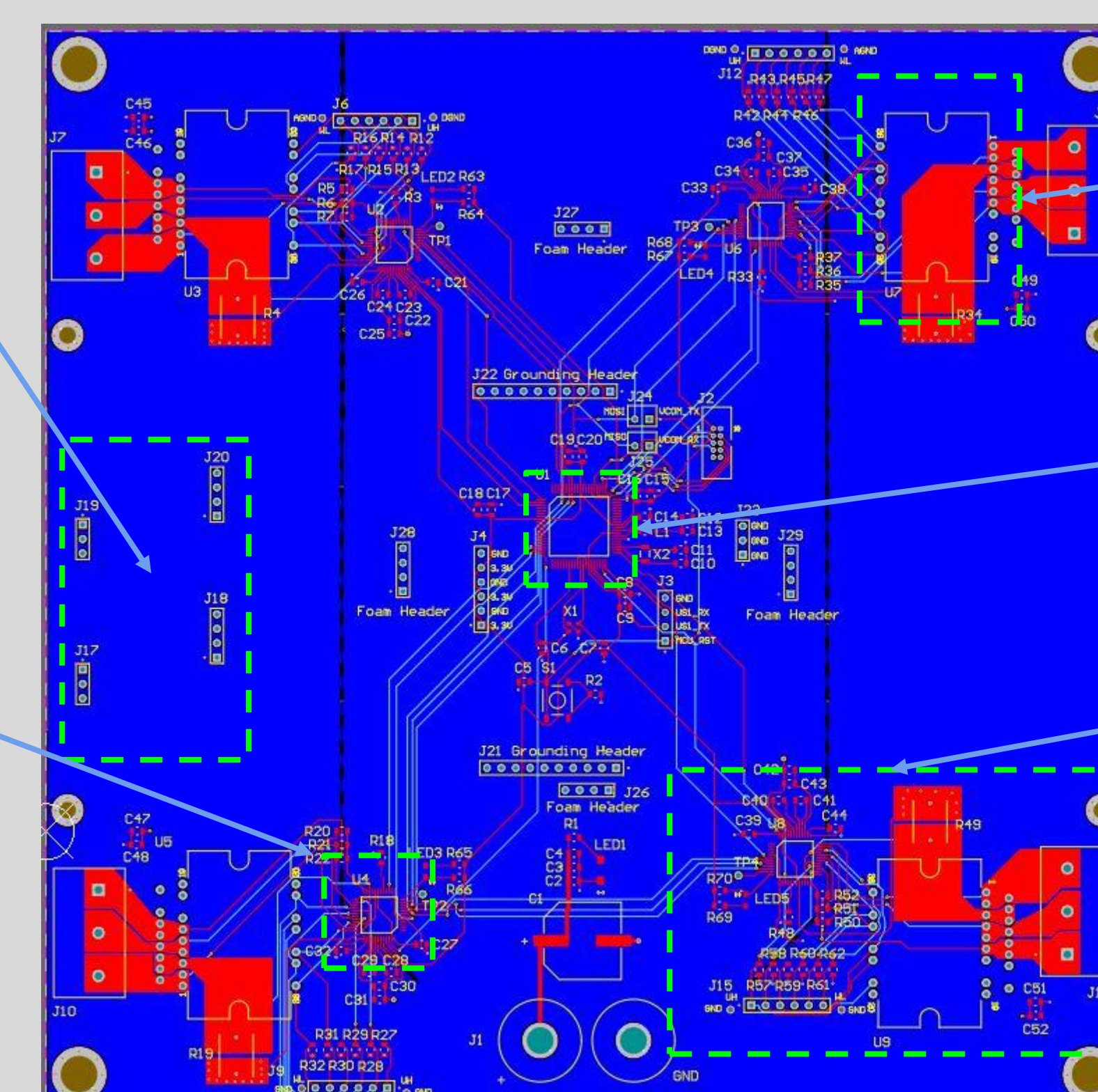
- 80/20 Aluminum Frame
- Custom Machined Motor Mounts
- Hook and net system to carry a variety of packages
- High density polyethylene protective paneling



### Electronic Speed Controller

Control Board Headers

LV8907 MOSFET Driver



STK984 Motor Driver

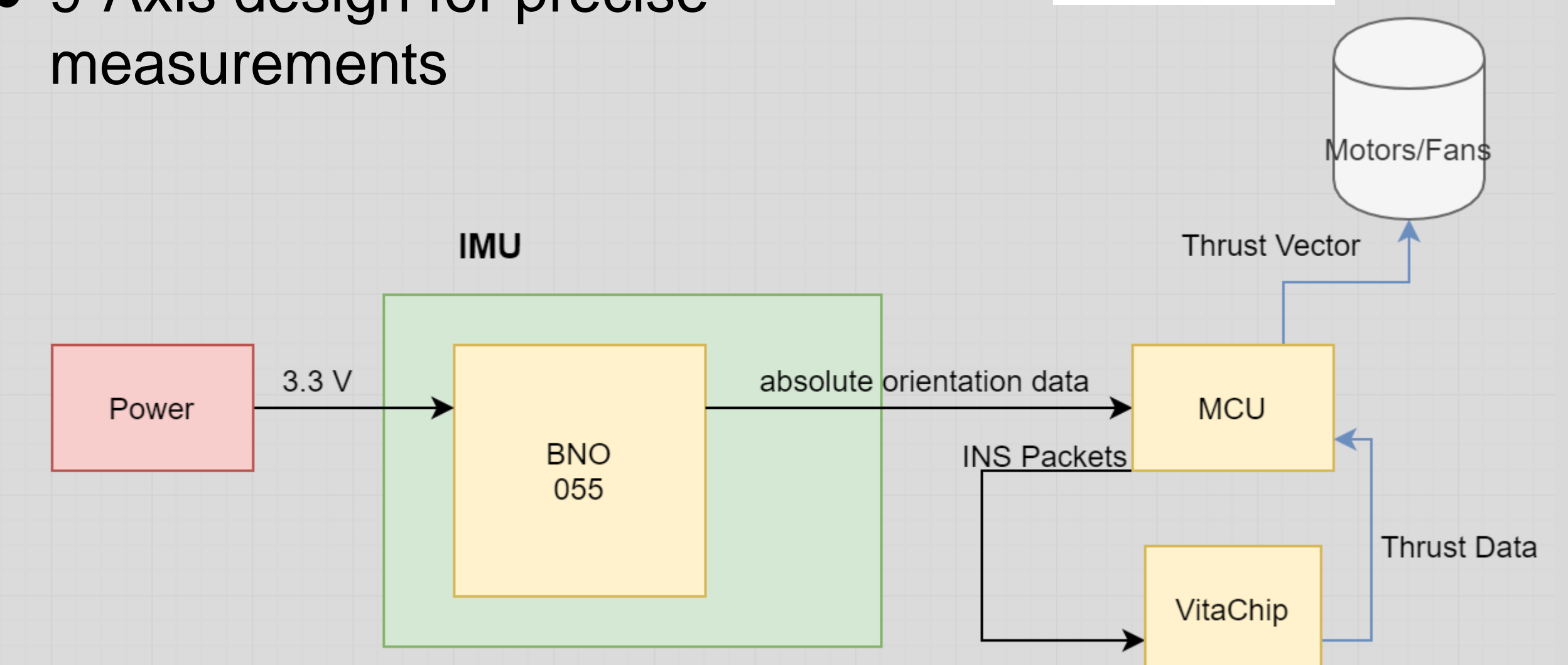
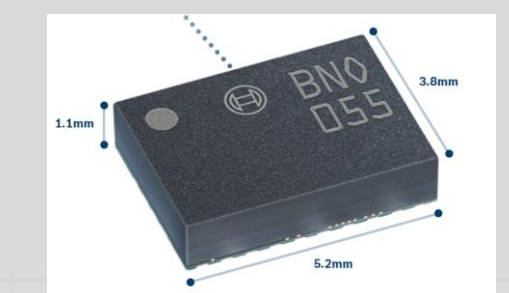
Tiny Gecko MCU

ESC sub circuit for a single motor

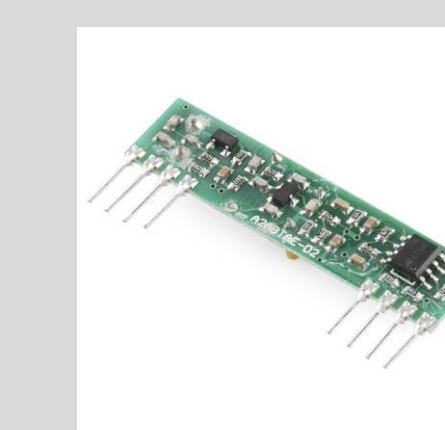
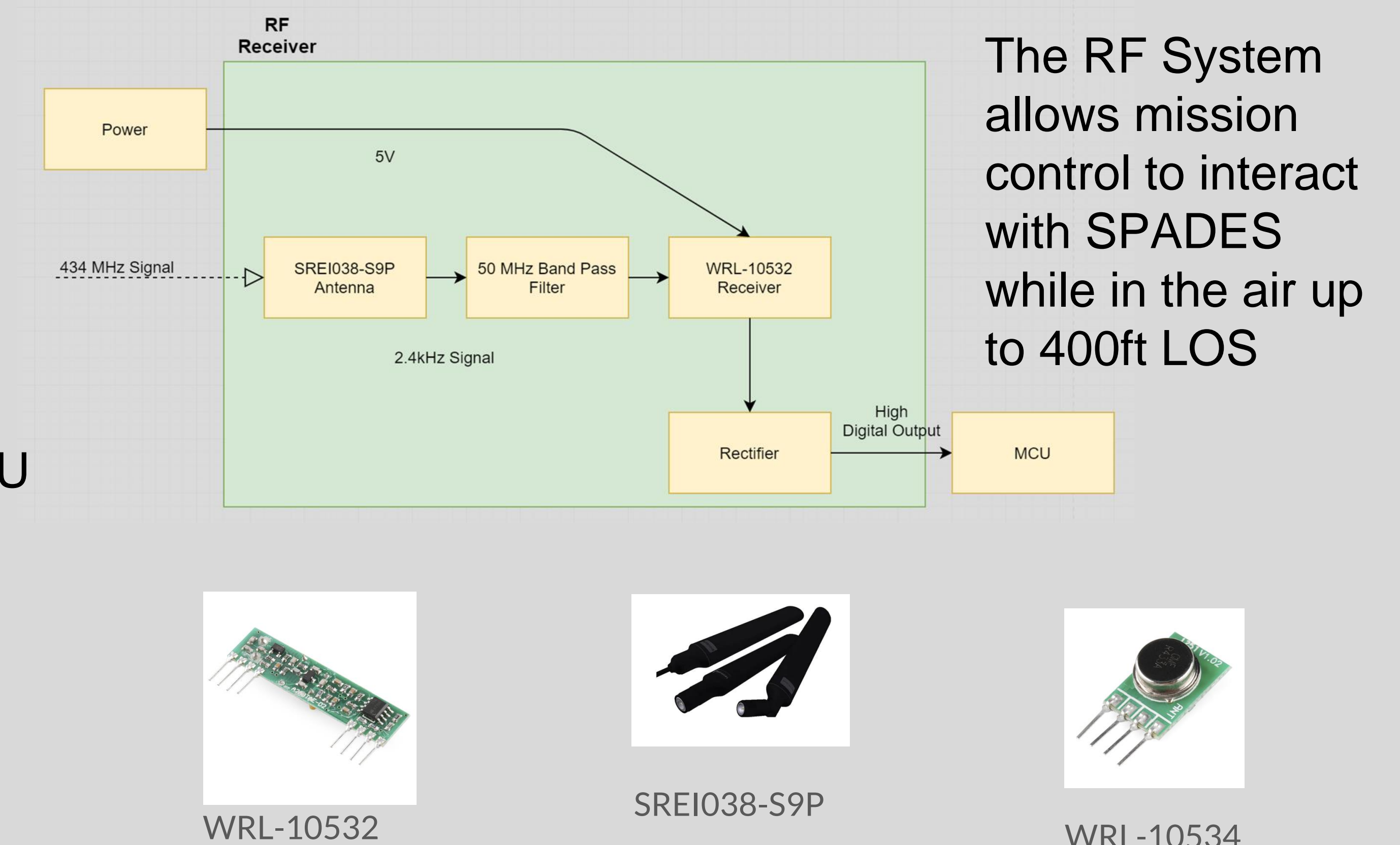
The final ESC design for our project included 4 separate circuits for the 4 motors. The ESC utilizes 4 LV8907 & STK984 motor driver IC combinations in order to control the DC Brushless motors. These ICs are controlled by the Tiny Gecko from Silicon Labs. Our power management and main control board is mounted on top of the ESC in order to conserve space within the system.

### Control System

- BNO055 Sends orientation data at 100Hz
- 9-Axis design for precise measurements



### RF System



WRL-10532



SREI038-S9P



WRL-10534

### Conclusion

This is an ongoing project aimed at making airborne package delivery a reality. Future teams are meant to take the progress made this year and improve upon it in future designs. With this technology on the market, drone delivery will become a pervasive reality, yielding quicker and more efficient package reception.