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# UAV FORGE

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**UCI Samueli**  
 School of Engineering  
 Winter Design Review 2020

## COMPETITION

UAV Forge is a multidisciplinary engineering senior design project dedicated towards creating a fully autonomous, competitive, mission-based UAV. Since Fall 2017, UCI UAV Forge has been pursuing the SUAS competition held by the Association for Unmanned Vehicle Systems International (AUVSI) Seafarer Chapter. This year, the competition will be held at **Webster Naval Air Station, in Patuxent River, Maryland** from **June 17<sup>th</sup> to 20<sup>th</sup>**.

## OBJECTIVES

Determine the most optimal UAV design that satisfies the AUVSI SUAS requirements and complete the following:

- Mission Demonstration tasks
  - Autonomous Flight and Waypoint Capture
  - Object Detection, Classification, and Localization
  - Air Delivery: Drop UGV
  - Interoperability: Real-time data transfer to and from judges
- Technical Design Paper
  - Payload Design
  - Autonomous Flight Design
  - Safety, Risks, & Mitigations
- Flight Readiness Review
  - System Overview & Planned Tasks
  - Developmental Testing
  - Mission Testing

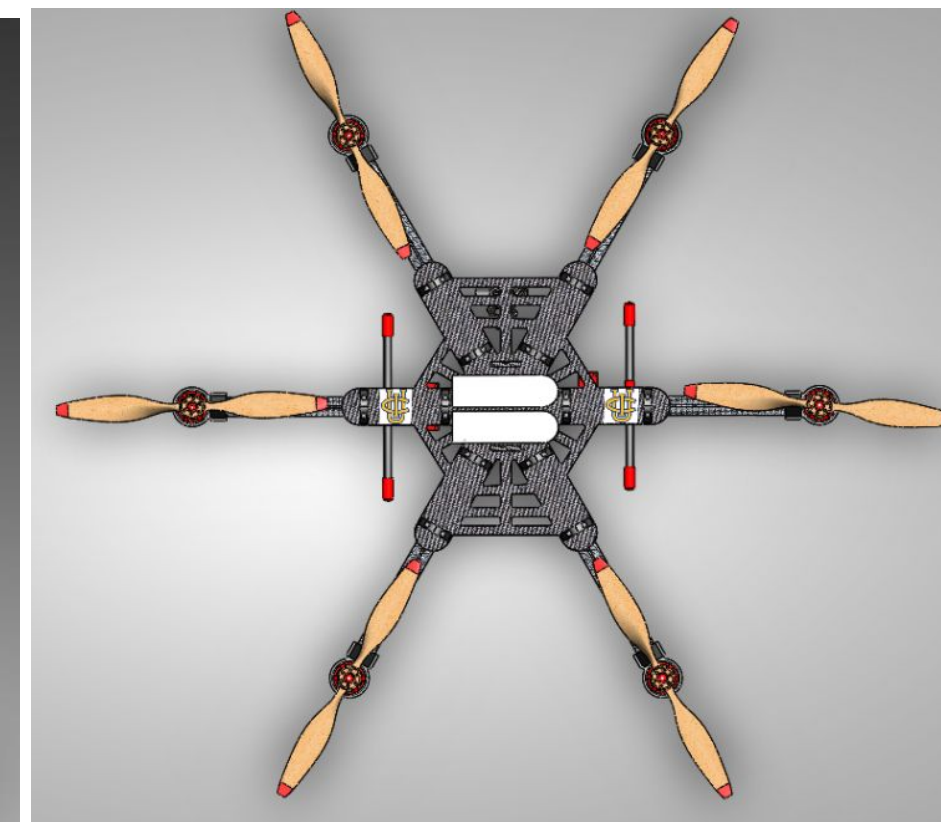
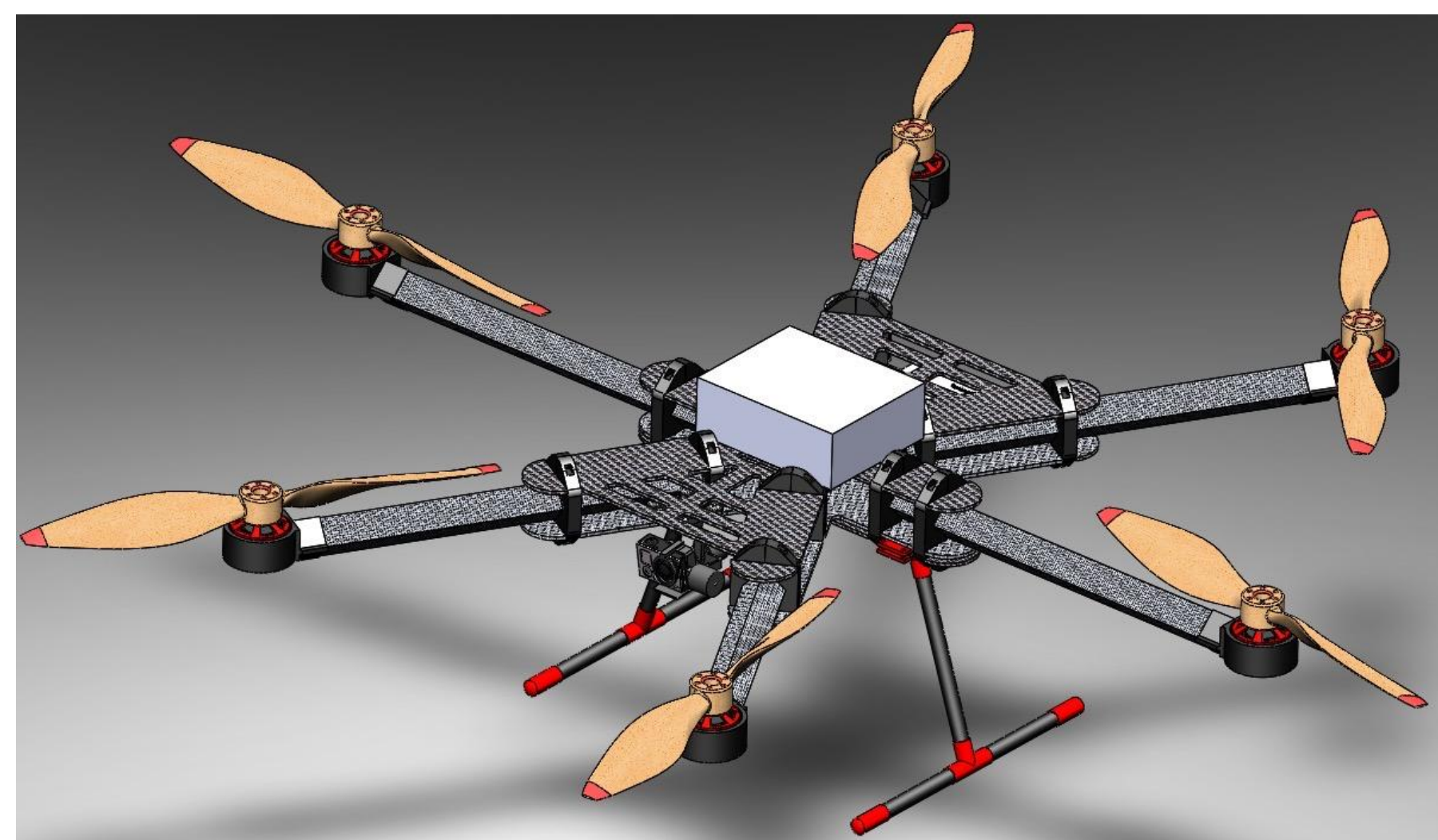
## DESIGN REQUIREMENTS

To accomplish the Mission Demonstration tasks, the design specifications for our UAV are the following:

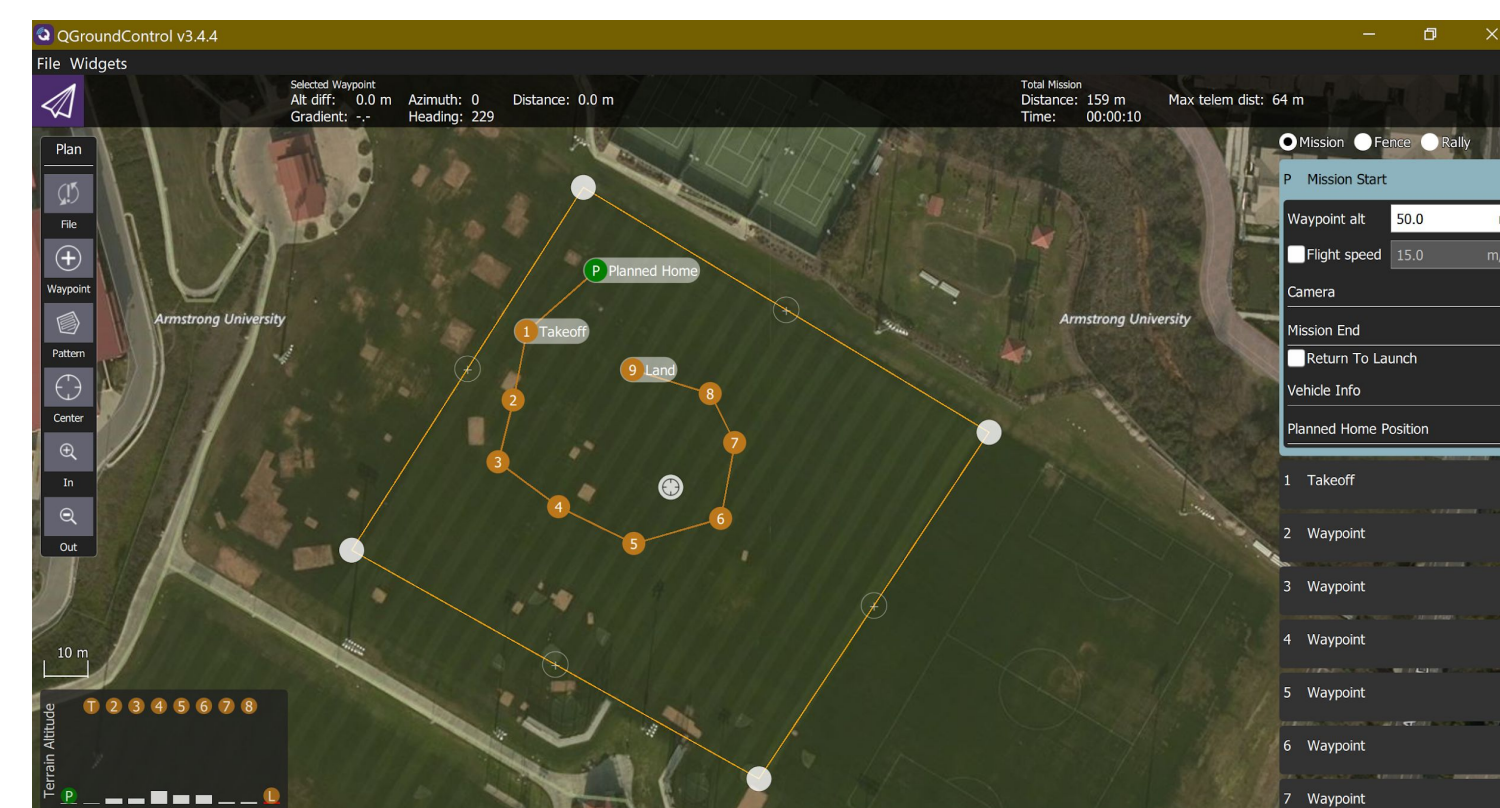
- Max takeoff weight is **55 lbs**
- Aircraft must be able to operate in **15 to 20 knot winds**
- UAS must fly **autonomously** for at least **3 minutes**
- Entire payload can weigh **up to 64 oz**
- Operate at **1 Hz** for aircraft telemetry
- Flight time: 30 minutes maximum
- Avoid** cylindrical objects with radius between 30 ft and 300 ft and height between 30 ft and 750 ft
- Teams must be able to operate **without** competition provided electrical power for up to 10 minutes

## ENGINEERING APPROACH

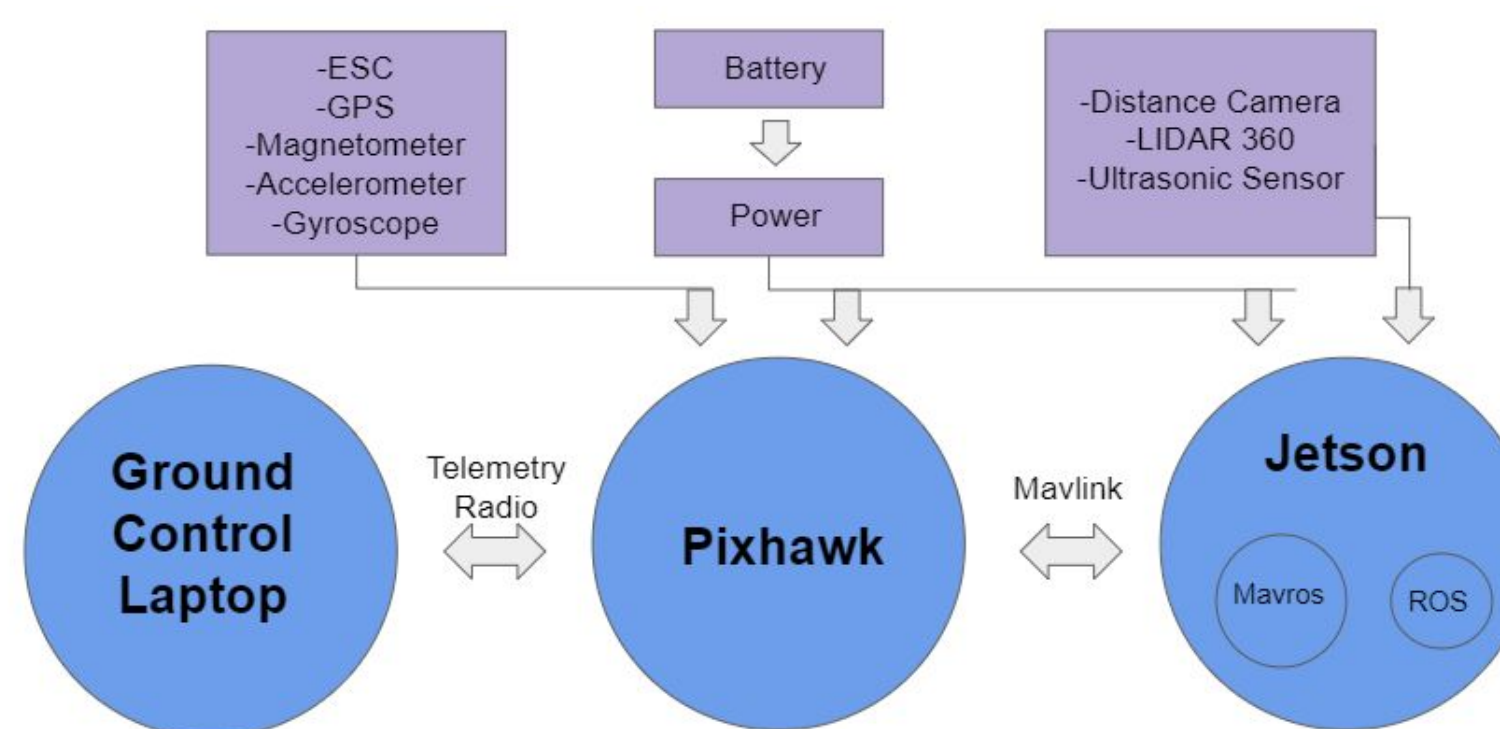
### Competition Aircraft: Zotcopter



### Ground Station User Interface with Geofence

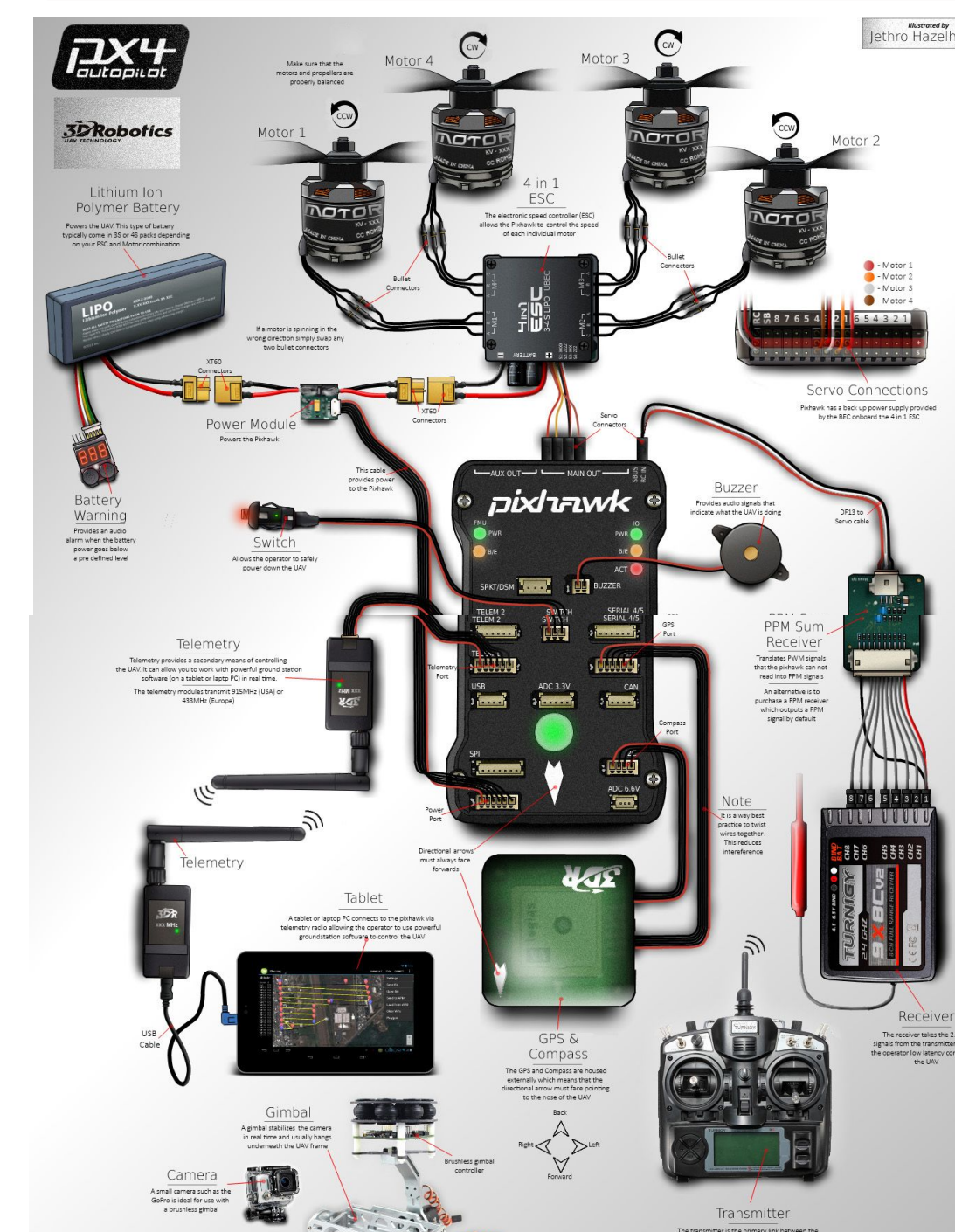


### Avionics Systems Block Diagram



- Lidar
  - 8 Lidars Oriented To Maximize Range
  - Mirrors to Cover Blind Spots

Hazelhurst, J. (2019, July 22). Retrieved from <https://pixhawk.org/>



- Pixhawk Interface
  - Flight Controller Setup
  - RPi Configuration
    - Serial Port Config
    - Config Pi as an Access Point
    - Connect to Mission Planner

## TIMELINE

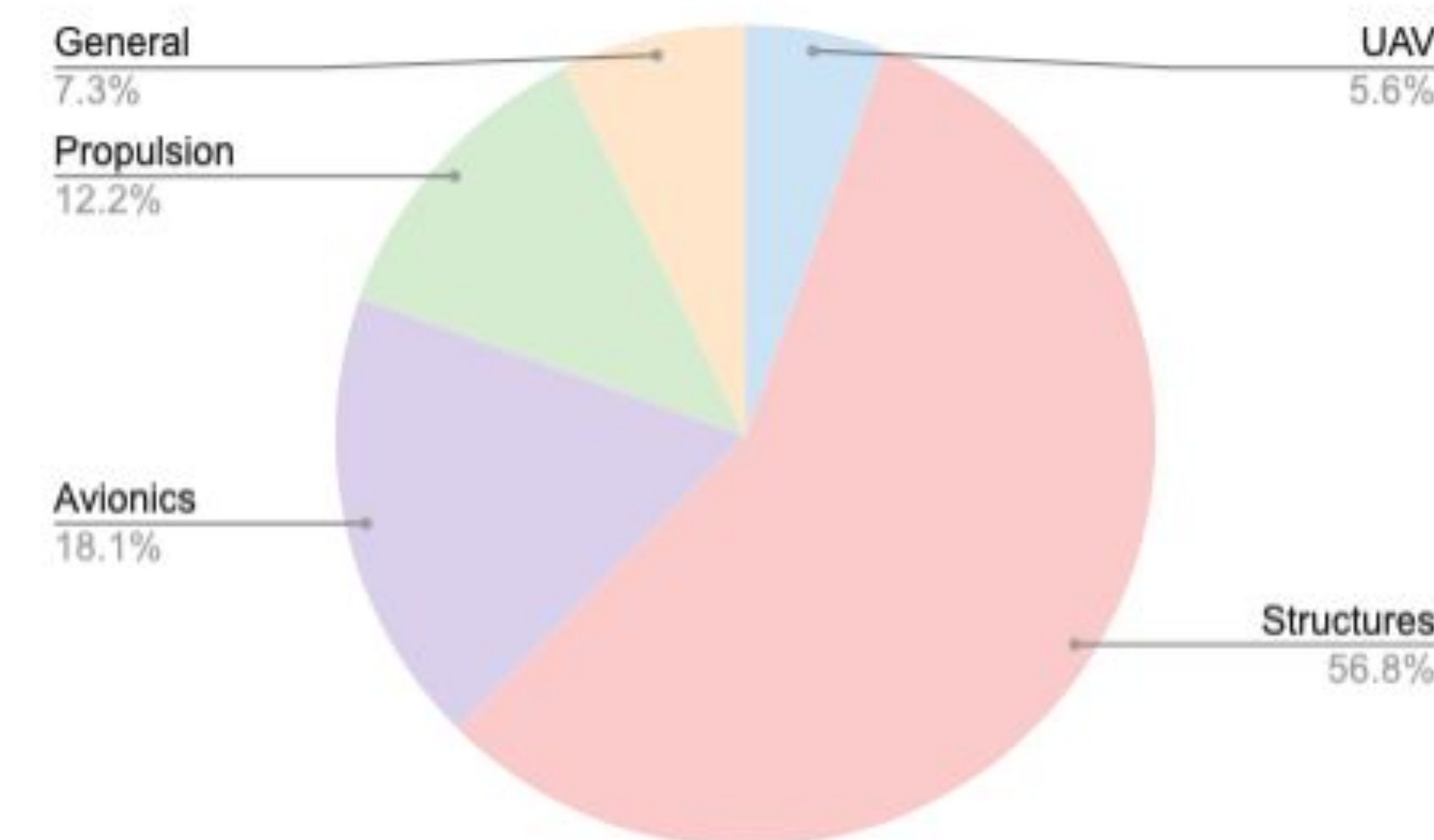
### Winter Quarter Progress:

- Completed the thrust stand and experimentation began
- Carbon fibre layers were completed, only the balsa core remain
- Autonomous features were prototyped on the test quadcopter

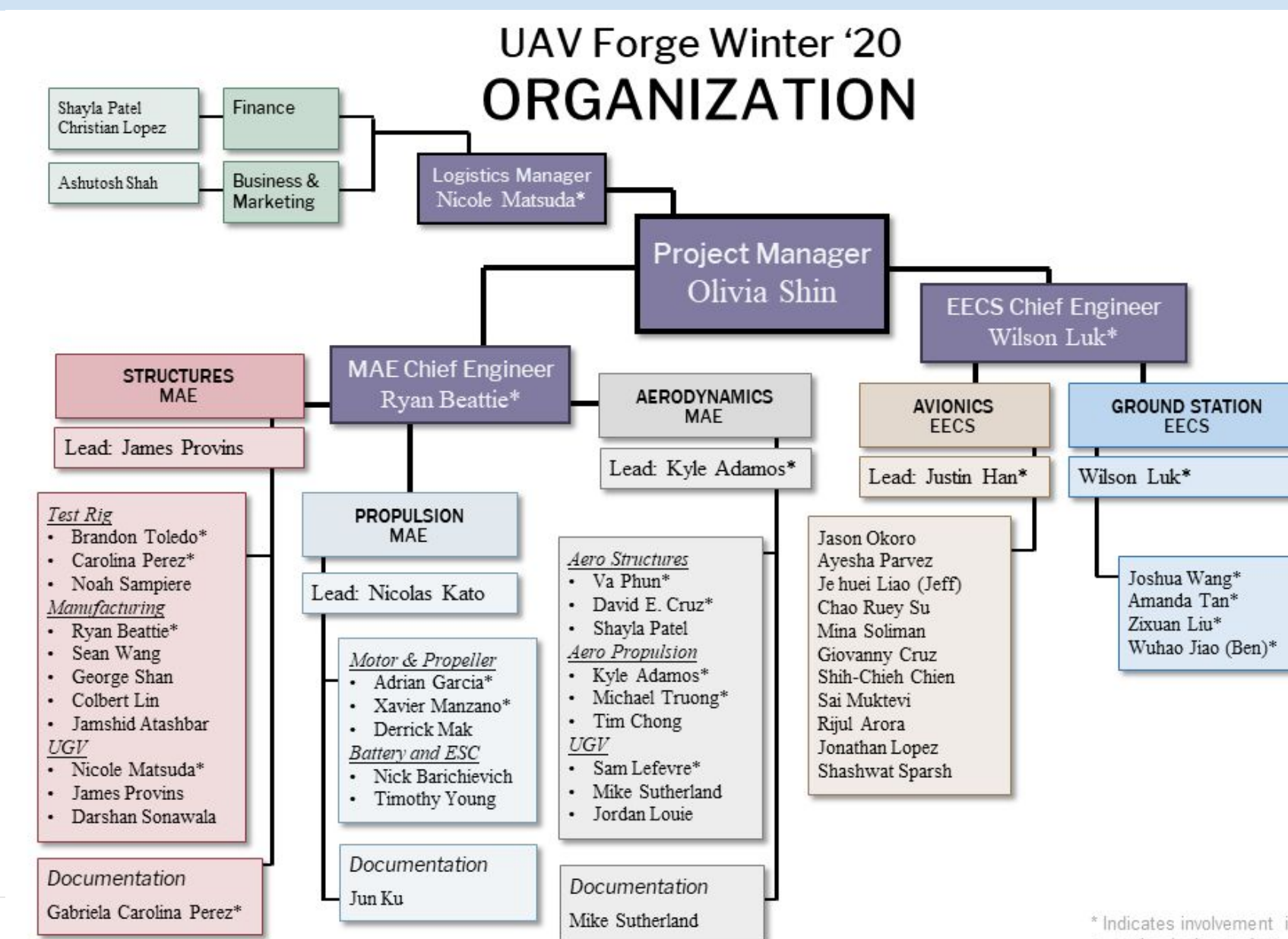
### Spring Quarter Goals:

- Complete motor and propellor testing
- Complete assembly of entire hexacopter
- Integrate autonomous features
- Complete UGV and its' deploring mechanism

## BUDGET



## TEAM STRUCTURE



\* Indicates involvement in a senior design project.