

Search & Rescue / Terrain and Environmental Mapping (STEM) Drone



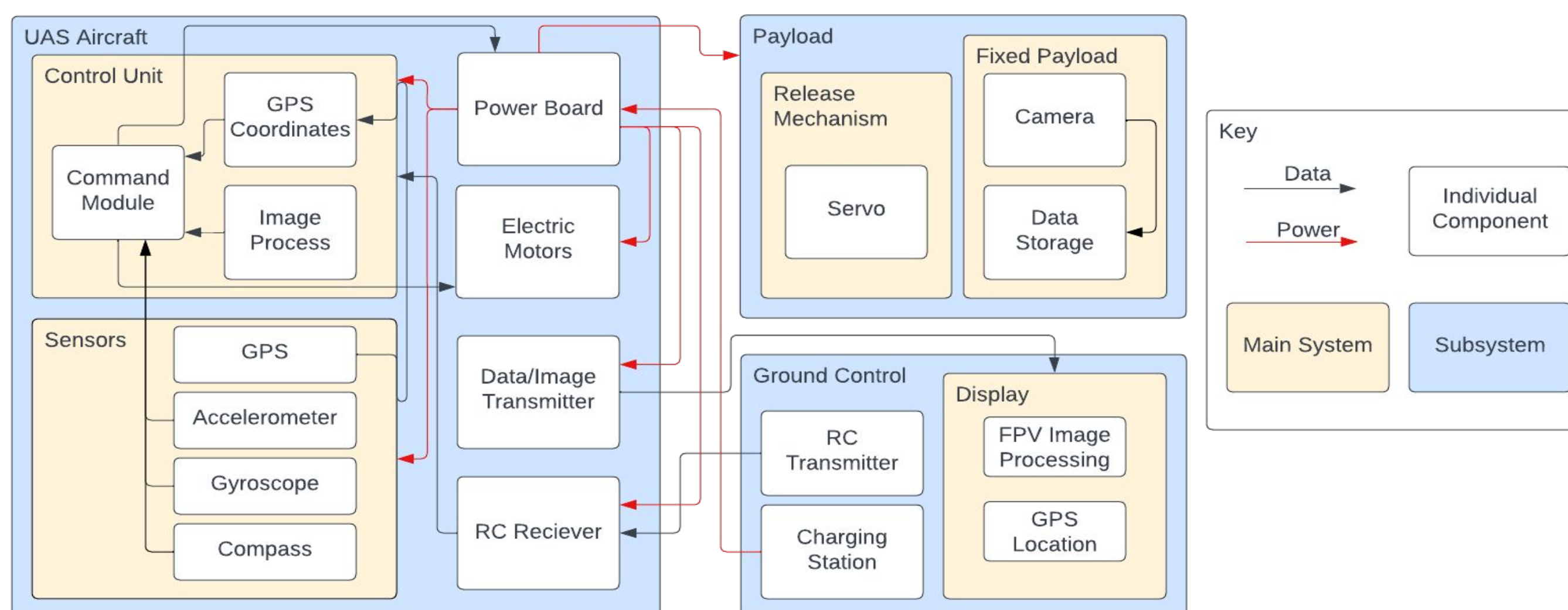
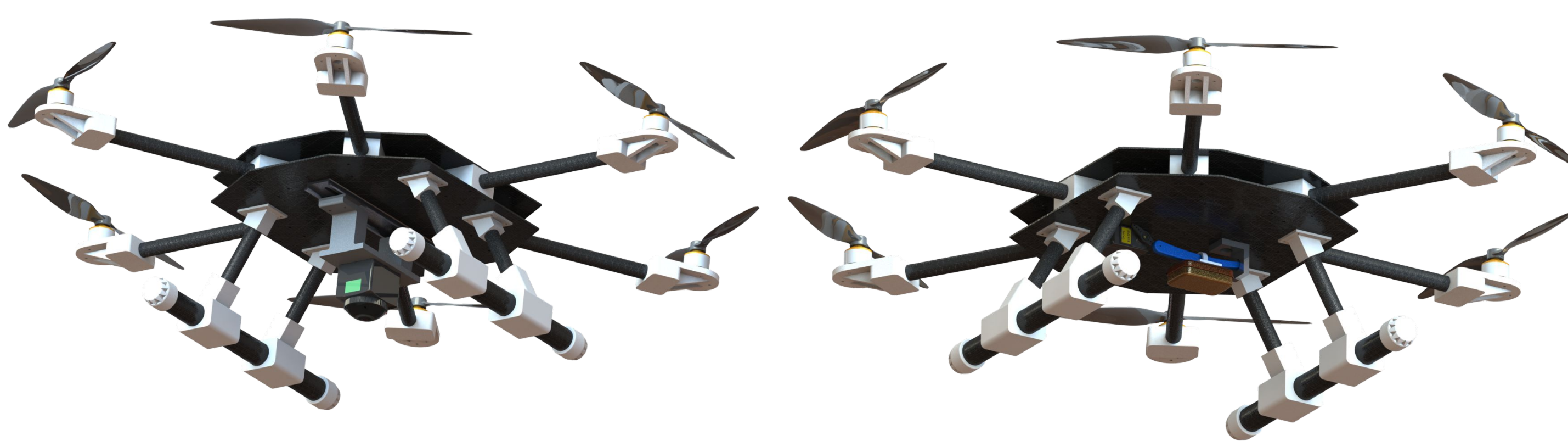
Aerospace Engineering Capstone Senior Design 2022-2023

Team Members: Andrew Gantt, JD Shropshire, Chris Bain, Fernanda D'Agostini Barsanti, and Sam Wood

Course Instructor: Dr. Felix Ewere | TA: S M Abu Naser Shovon | Sponsor: Engineering Trust Fund | Customers: Kevin Gitushi, Michael Hughes and Tom Freeman

Design Solution

Subsystem	Components
Structures	Carbon Fiber 3D Printed Plastic
Propulsion	SunnySky X2212 980kV Motors Quantum 11x5.5 Carbon Fiber Propellers
Controls	DJI NAZA-M V2 Flight Controller FEICHAO 40A Brushless ESC
Power	Lumenier 16000mAh 4s LiPo Battery Voltaic Systems 1.2W Solar Panel
Payload	PIXPRO SP360 4K Camera Coleman All-Purpose First Aid Kit

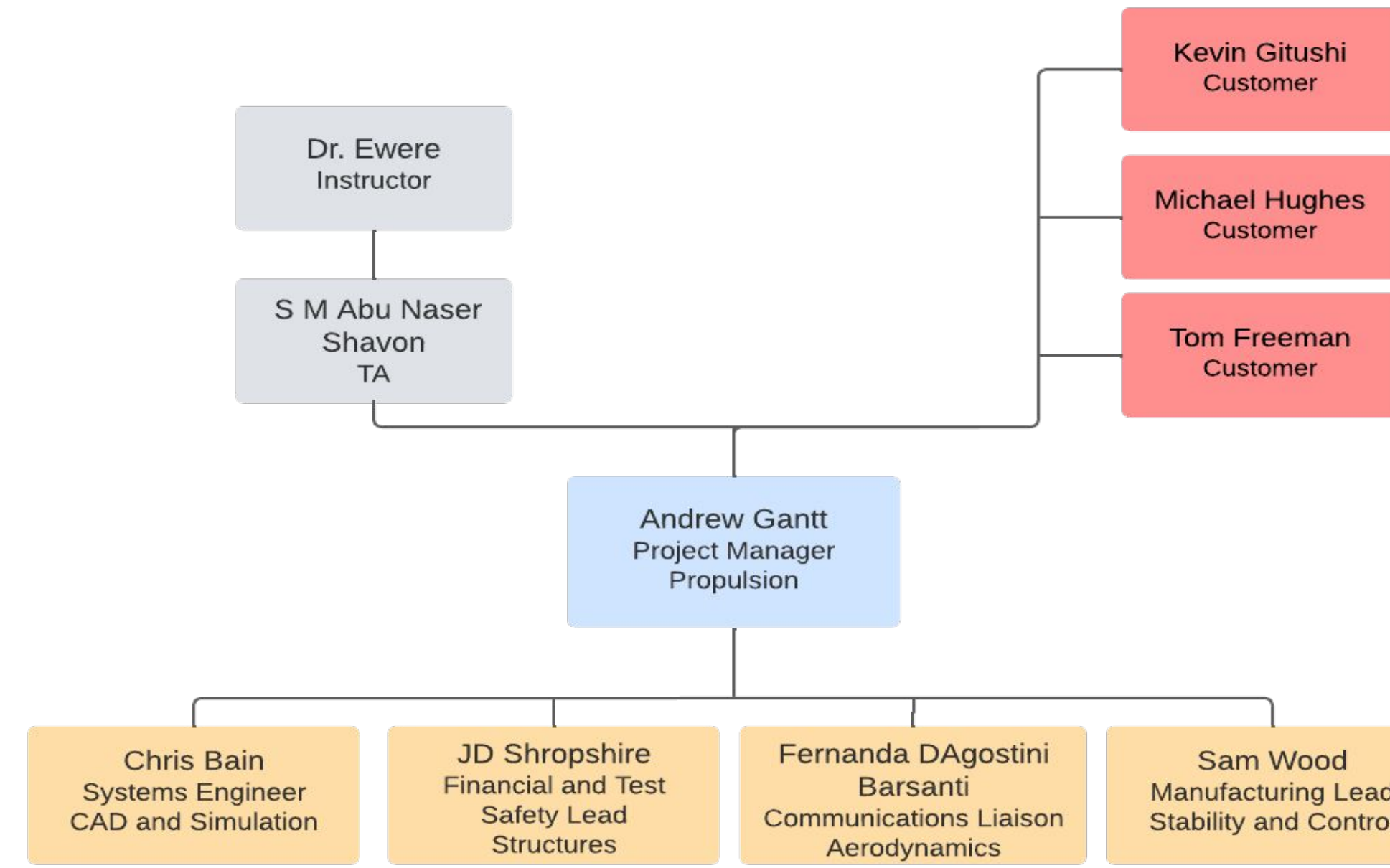


Functional Prototype



Parameter	Mapping Payload	Release Payload
Endurance (min)	24	15
Thrust to Weight Ratio	2.5	3.0
Weight (lbs)	9.7	7.6
Dimensions LxWxH (in)	26.9" x 30.5" x 7.7"	

Team Organization



Project Overview

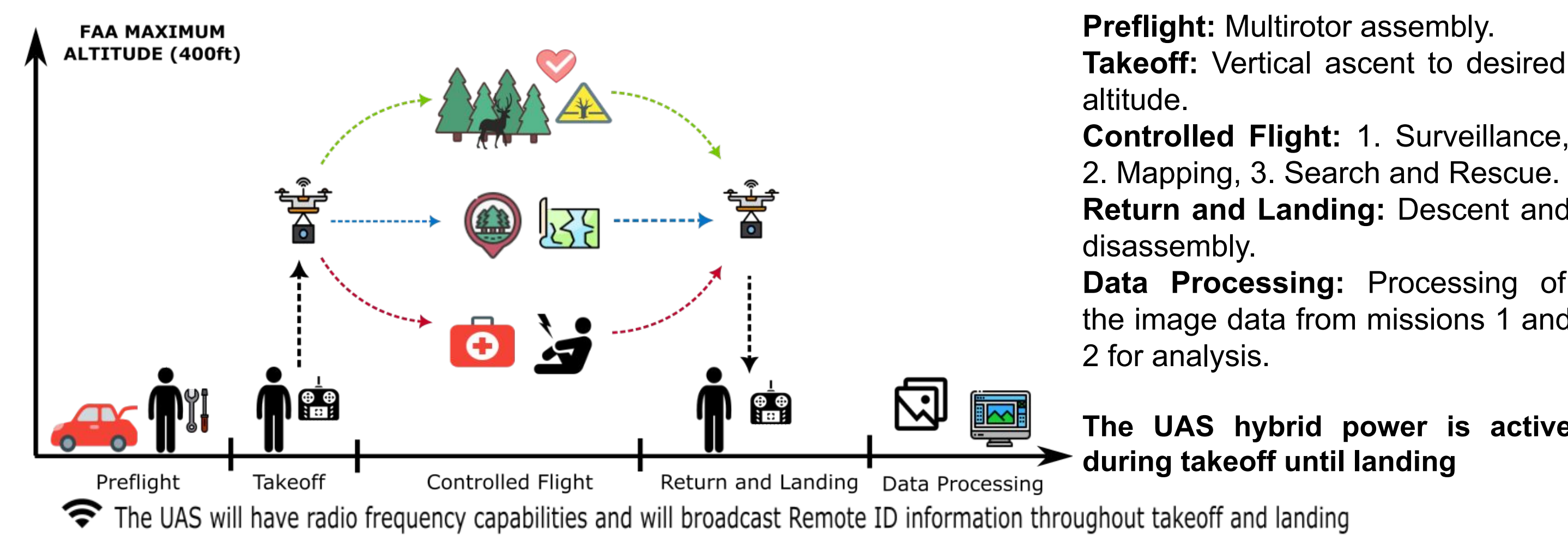
Need Statement: There is a need to develop and produce technologies that can provide rescue/first aid support and achieve the task of conservation and management through monitoring and mapping of landscapes.

Mission Statement: Team Hexadion will construct a multicopter equipped with 2 or more **electronic power sources, mapping and surveillance capabilities** for assessing the health of North Carolina's natural forests, as well as **provide emergency assistance** to individuals in need.

Mission and CONOPS Overview

Mapping and Surveillance Mission: Terrain mapping and environment surveillance using a 4K payload camera for monitoring wildlife, plant health, and environmental terrain.

Search and Rescue Mission: Provide emergency medical care by delivering a first aid kit to an injured recreationalist until the rescue team arrives at their location.

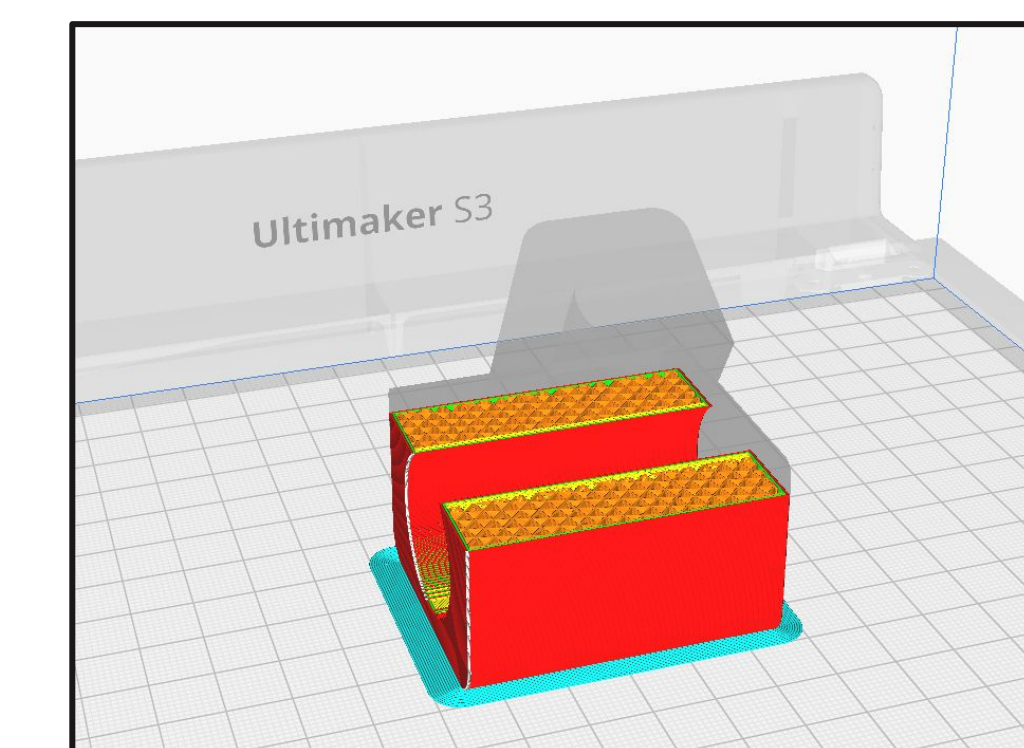
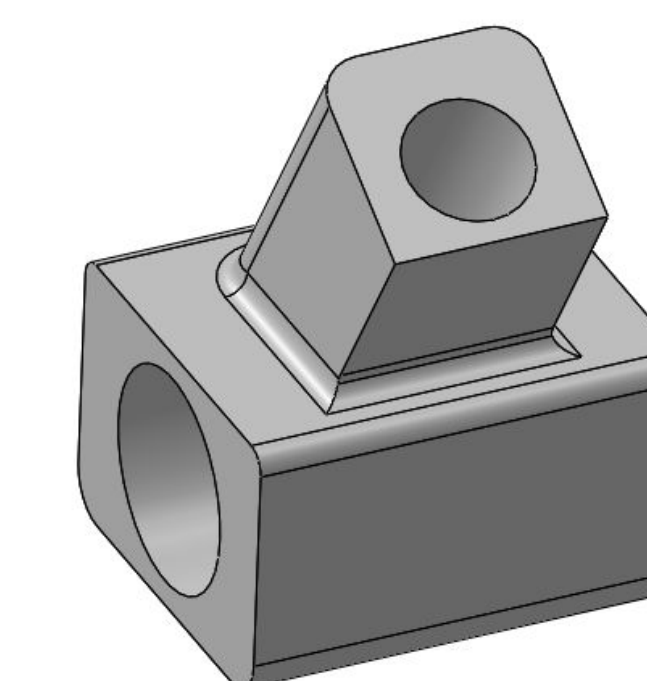


Cost Breakdown

Subsystem	Cost
Structures	\$184.43
Propulsion	\$230.17
Controls	\$272.00
Power	\$15.50
Payload	\$159.50
Total	\$861.60
Allotted	\$1000
Surplus	\$138.40

Manufacturing

The manufacturing process for the STEM drone began in January of 2023 at the beginning of the spring semester and was completed before the Flight Readiness Review Report on February 24th. This manufacturing process primarily consisted of cutting and sanding the composite base, arms, legs, and sleds, as well as 3D printing all of the connection pieces. Soldering and wiring of the electrical components was also completed before the adhesion and assembly of the structural and controls subsystems. After assembly, the propulsive and payload systems were added to complete the STEM Drone.



Flight Test and Mapping

On March 24, 2023, the HEXADION UAS conducted its final flight tests to verify the drones ability to complete both of its designed missions.

Both missions were a success and video footage was recorded and post processed to create the 3D map of the flight test area shown below.

