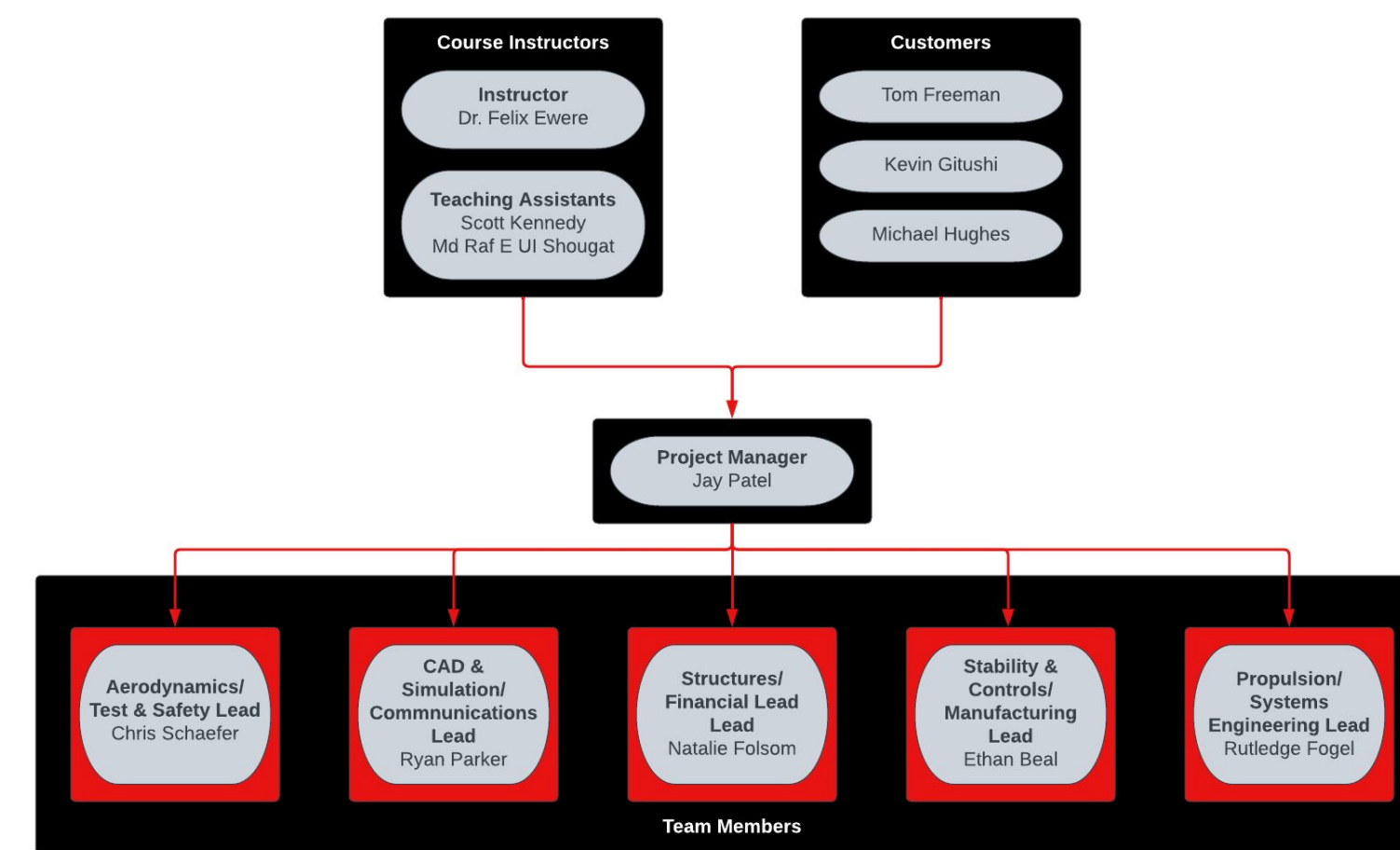


# The X-250 Phoenix

**Aerospace Engineering Capstone Senior Design 2022-2023**  
Team Forest Fliers: Ethan Beal, Rutledge Fogel, Natalie Folsom, Ryan Parker, Jay Patel, Chris Schaefer

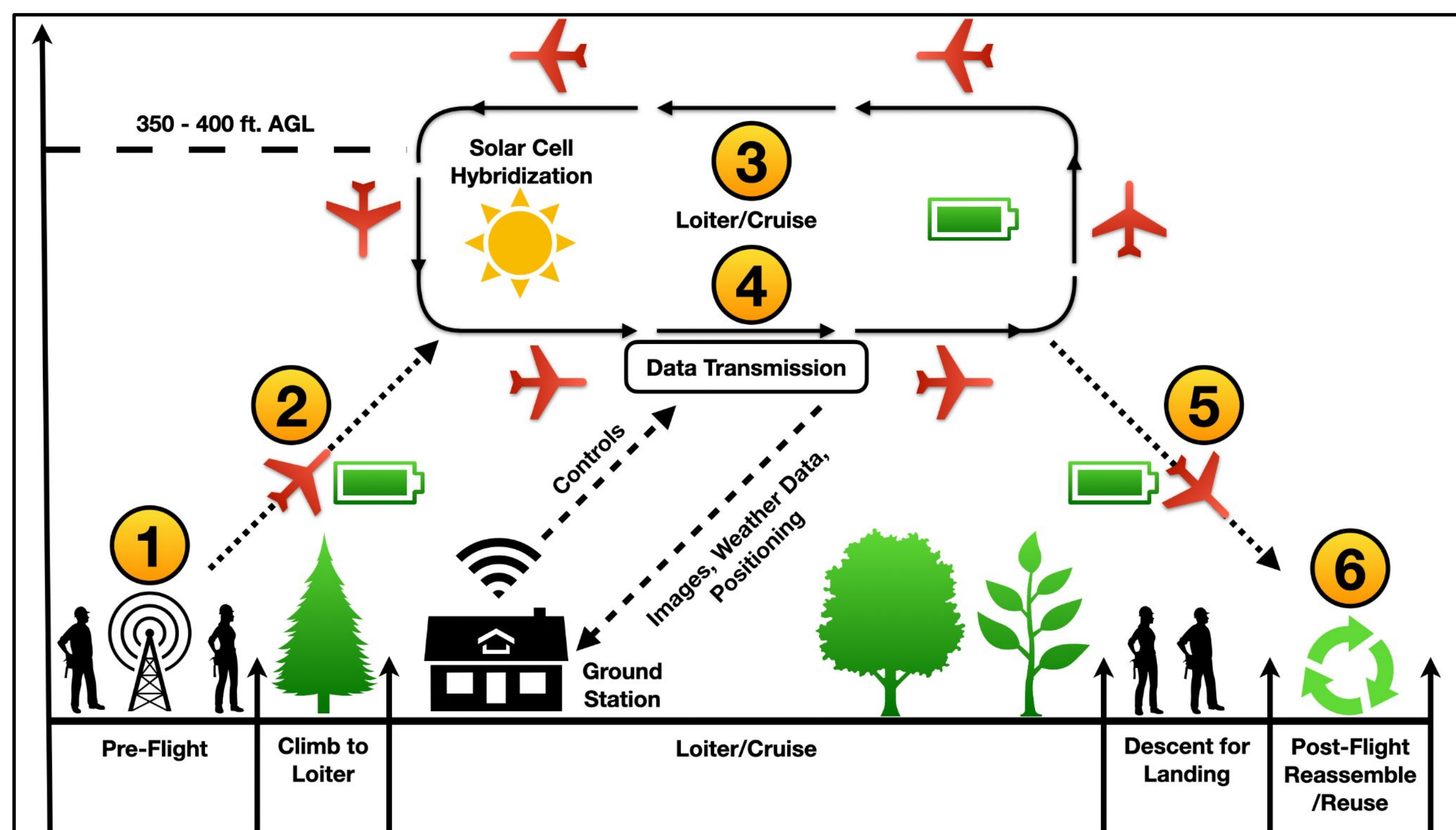


## Team Organization

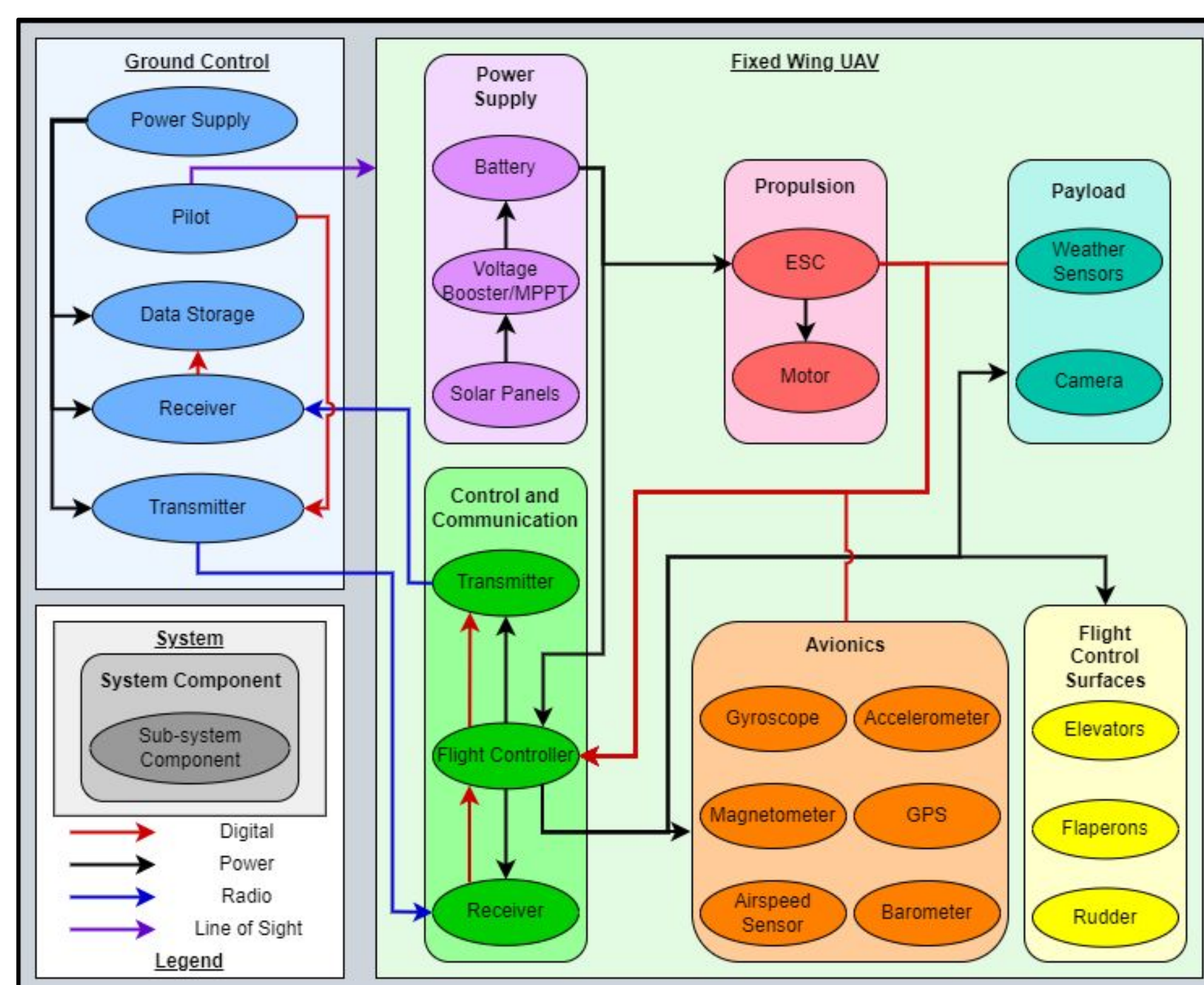


## Mission Overview / CONOPS

**Mission Statement:** The X-250 Phoenix will mitigate the dangers of wildfires through the assessment of fire potential, controlled burns, monitoring fire behavior, and assessing post-fire damage and recovery in a more efficient and cost-effective way.

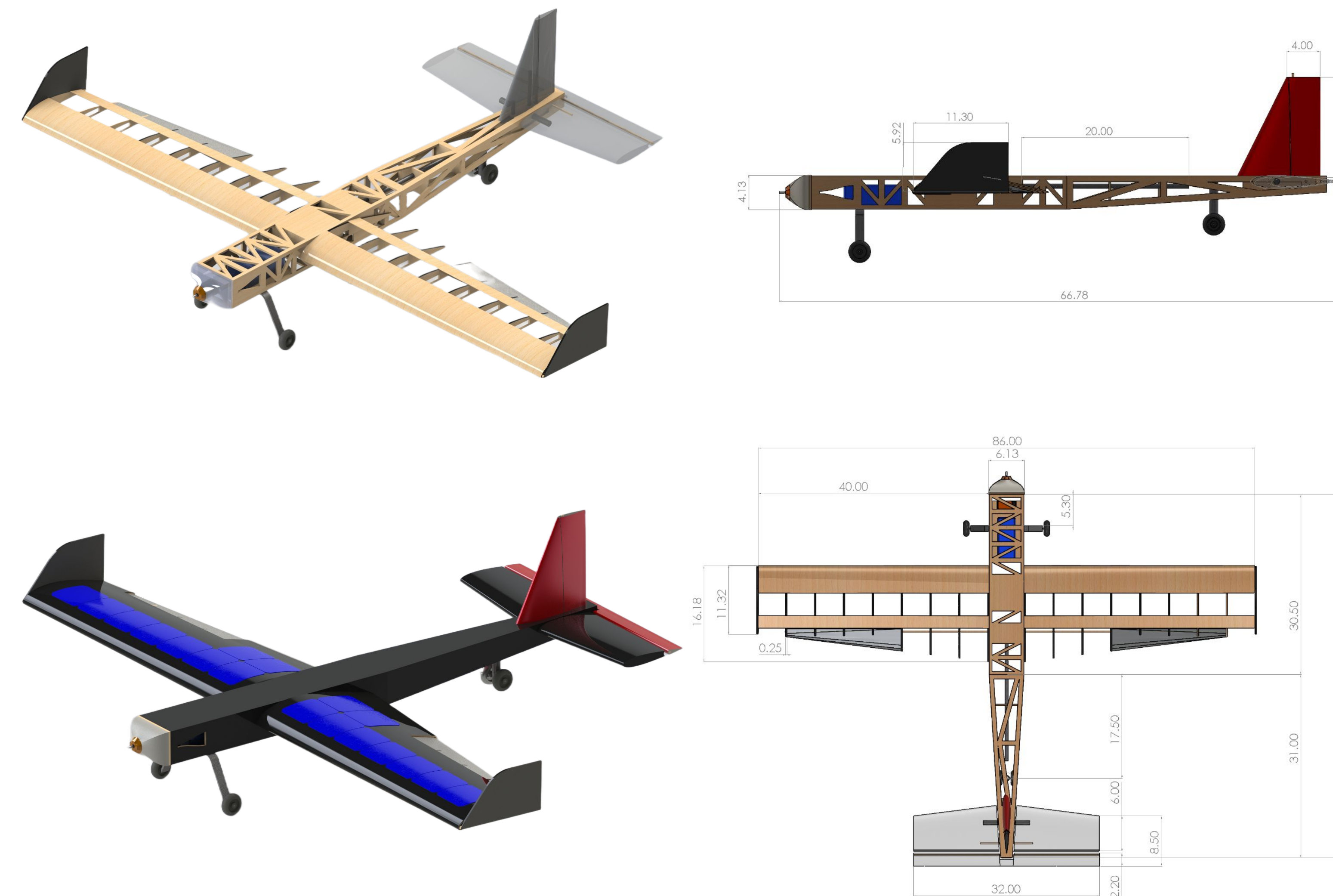


The UAS will be assembled, deployed, flown to desired loiter, transmit data and images to the ground station, descend to landing, and be reused post-flight.



## Design Solution

**Design Overview:** The X-250 Phoenix features a traditional aircraft design with a conventional tail configuration and a high mounted tapered wing. The tail dragger landing gear configuration allows for easy landings and enough ground clearance for the propeller.



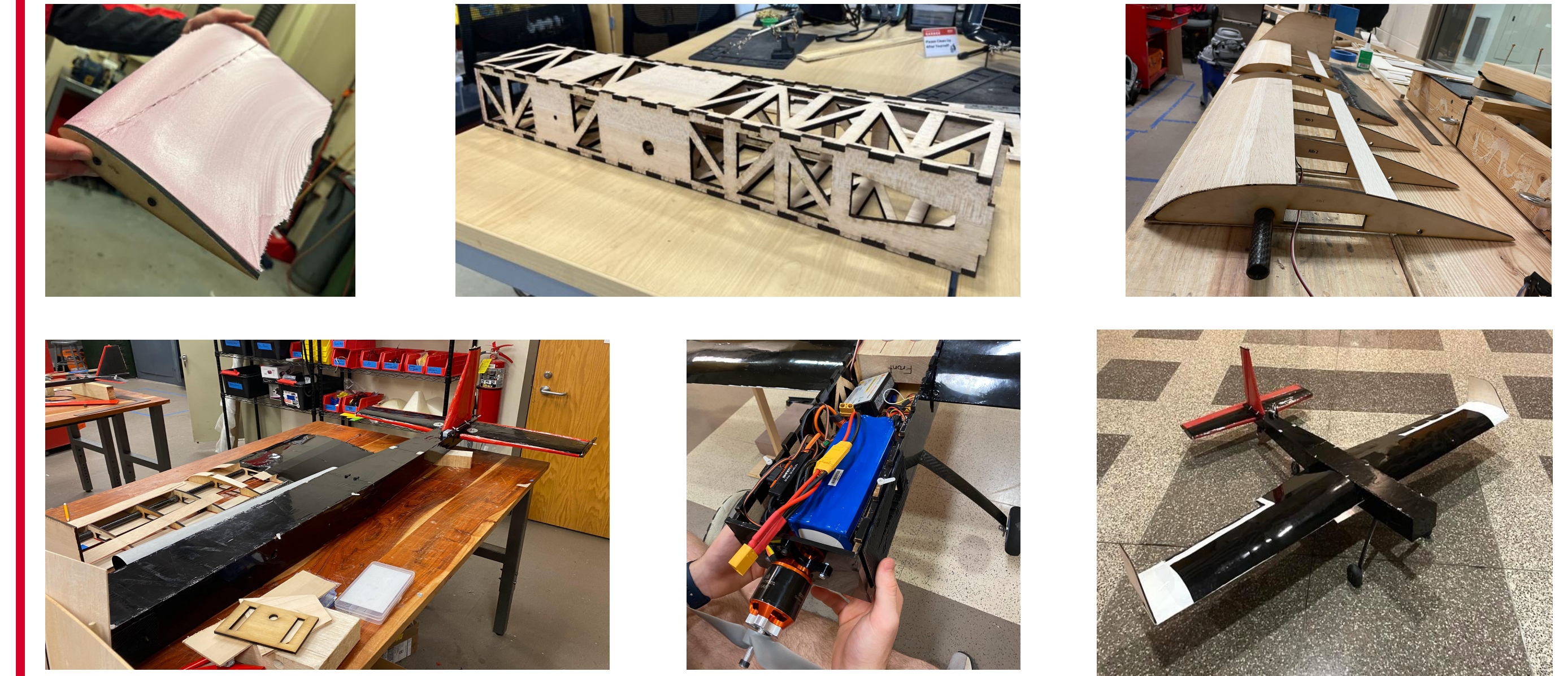
## Specifications

Several important aspects of the UAS are listed below, including aerodynamic surface and fuselage dimensions, and performance parameters.

Wing		Horizontal Tail		Vertical Tail	
Area	1100 in <sup>2</sup>	Area	288 in <sup>2</sup>	Area	96 in <sup>2</sup>
Aspect Ratio	5.82	Span	32 in	Span	12 in
Taper Ratio	0.7	Tip Chord	8 in	Tip Chord	4 in
Span	80 in	Root Chord	10 in	Root Chord	10 in
Airfoil	GOE 611	Airfoil	NACA 0015	Airfoil	NACA 0015
Fuselage		Performance		Stability Parameters	
Total Length	61.5 in	Cruise Velocity	47 mph	C <sub>mα</sub>	-1.392
Width	6 in	Cruise C <sub>l</sub>	0.41	C <sub>lβ</sub>	0.0402
Height	4 in	Max C <sub>l</sub>	1.09	C <sub>nβ</sub>	0.0786
Propulsion		Cruise Reynolds #	502,000	Wing LE to NP	4.47 in
Model	Spektrum Avian 5065-450	Takeoff Distance	~30 ft	Wing LE to CG	3.07 in
Propeller	16 in x 18 in	Takeoff Weight	16.2 lb	Static Margin (k)	10%
Battery	12000 mAh Turnigy	T:W Ratio	0.85	Left Side of Fuselage to CG	2.8 in
ESC	Spektrum Avian 80 AMP	Flight Time	~15 min	Wing MAC	13.89 in

## Manufacturing

The UAS was manufactured from late January to early March in the Aerospace Senior Design Lab. Pictures presented in order of fabrication.



**Rebuild Process:** Rebuild occurred from late March to early April. Wingbox was redesigned to be stronger and fuselage rebuilt.



## Flight Testing

**Testing Conditions:** Clear skies, with moderate to high temperatures. Mostly windy with 10-15 mph sustained winds and 25 mph wind gusts.

**Testing Summary:** The X-250 Phoenix took off with ease and successfully climbed to its cruising altitude of 200 feet in 10-15 seconds. Unfortunately a failure in the wingbox caused the right wing to disconnect which rendered the UAS uncontrollable.

**Testing Plan:** The X-250 Phoenix has been fully rebuilt in a more structurally sound manner and is ready for future flights.

