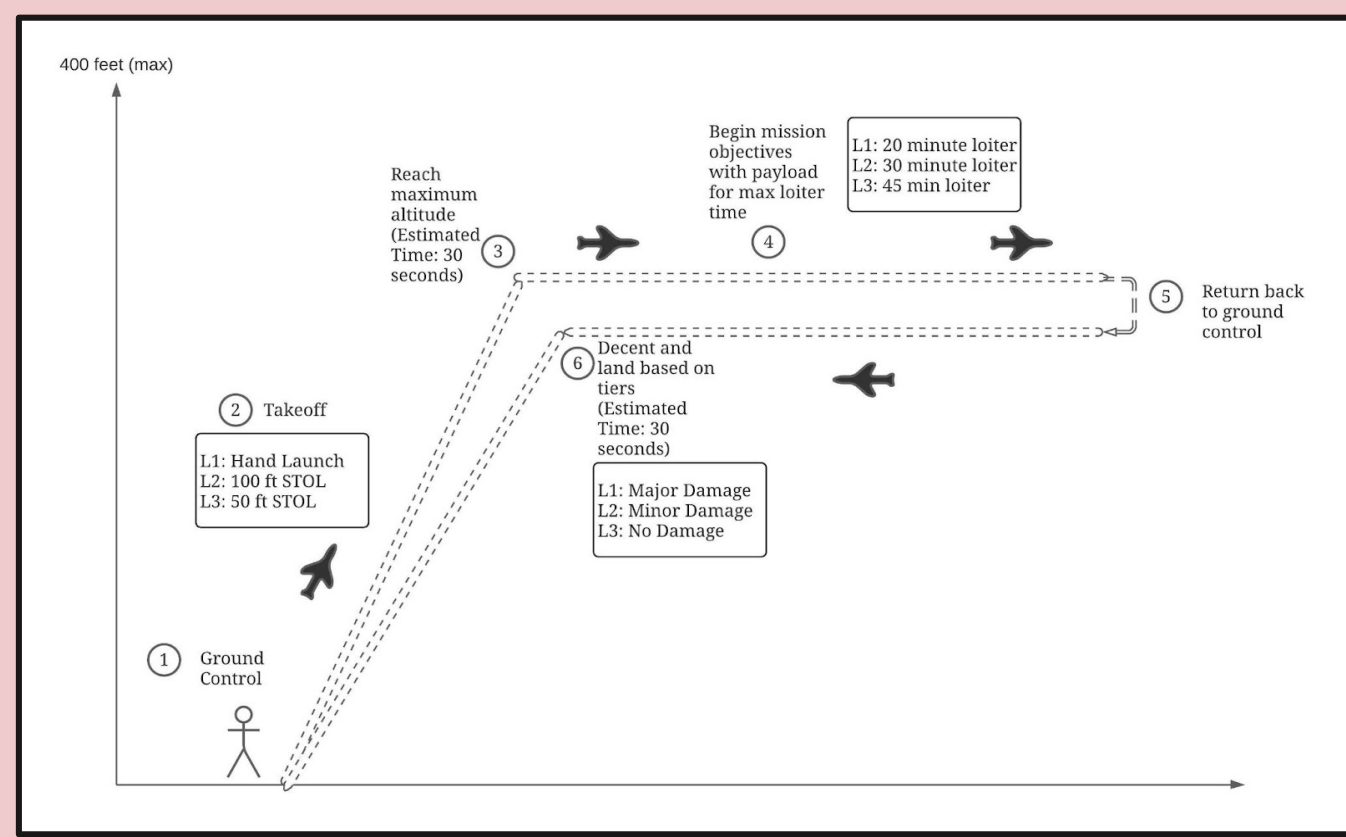


## Mission Overview

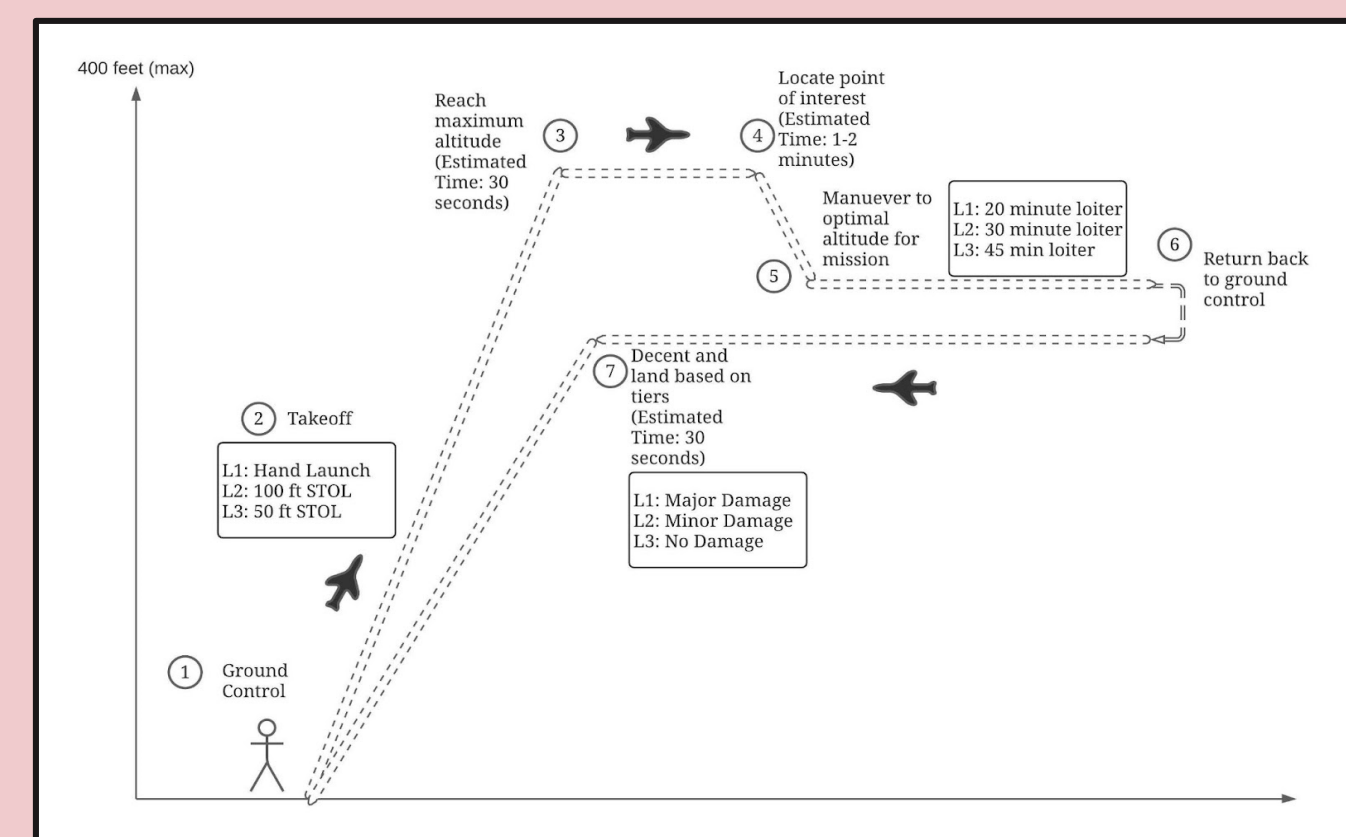
**Purpose:** The purpose of this project is to design and fabricate a modular scalable fixed-wing Unmanned Aerial System (UAS) that will satisfy the NC Forest Service's needs which include forest condition monitoring and mapping, and emergency burn response.

- Objective:**
- The Aircraft must be capable of hand launch
  - Operational after recovery
  - Capable of 30 min loiter
  - Setup time of 20 min
  - Aircraft capable of live flight video streaming
  - Aircraft capable of controlled landing

## CONOPS

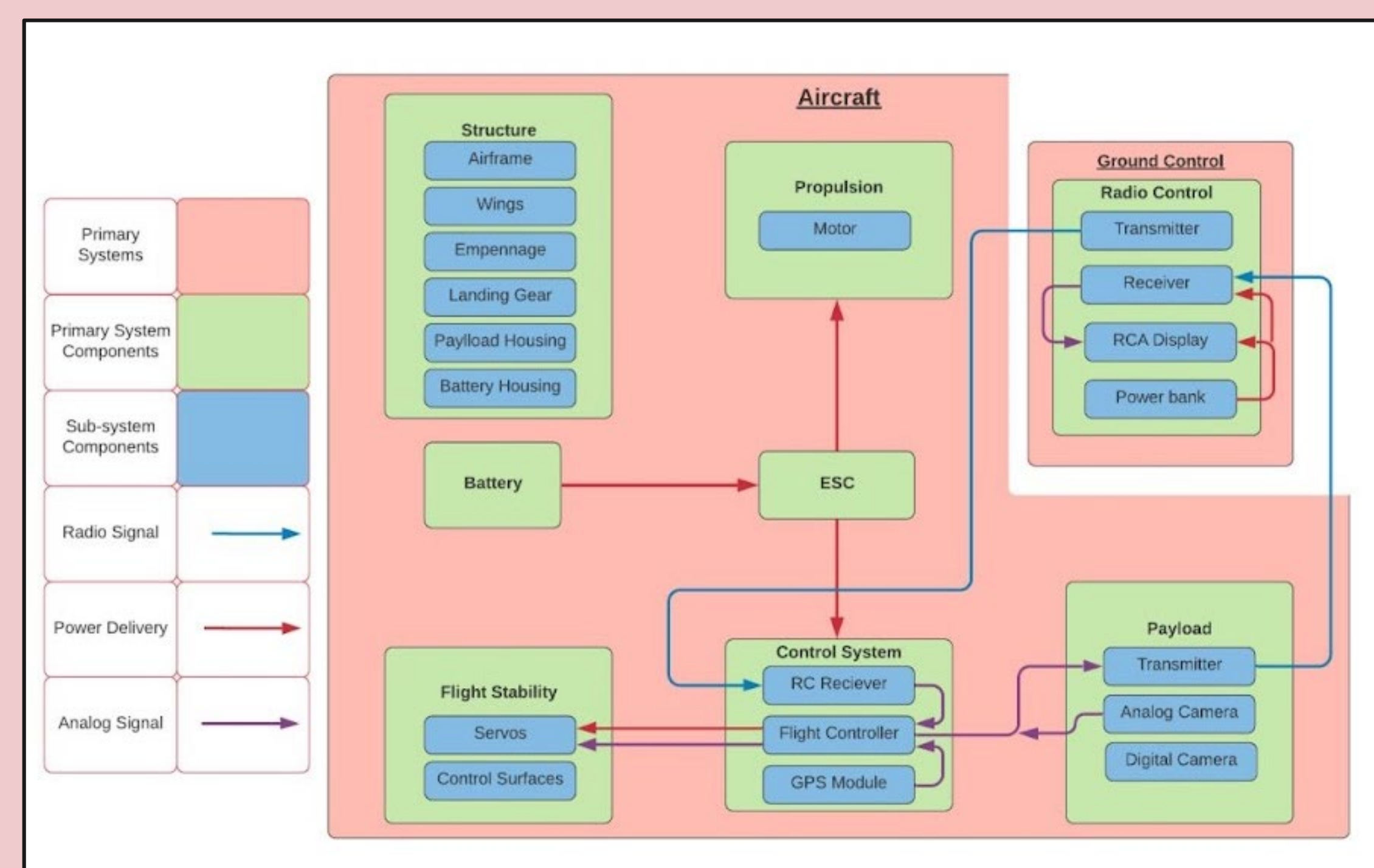


Forest Management



Burn Area Emergency Response

## Functional Block Diagram



- Each component that was used is shown above, broken down into its respective subsystem.
- The connections between each subsystem/components are displayed as arrows, colored coded by connection type.

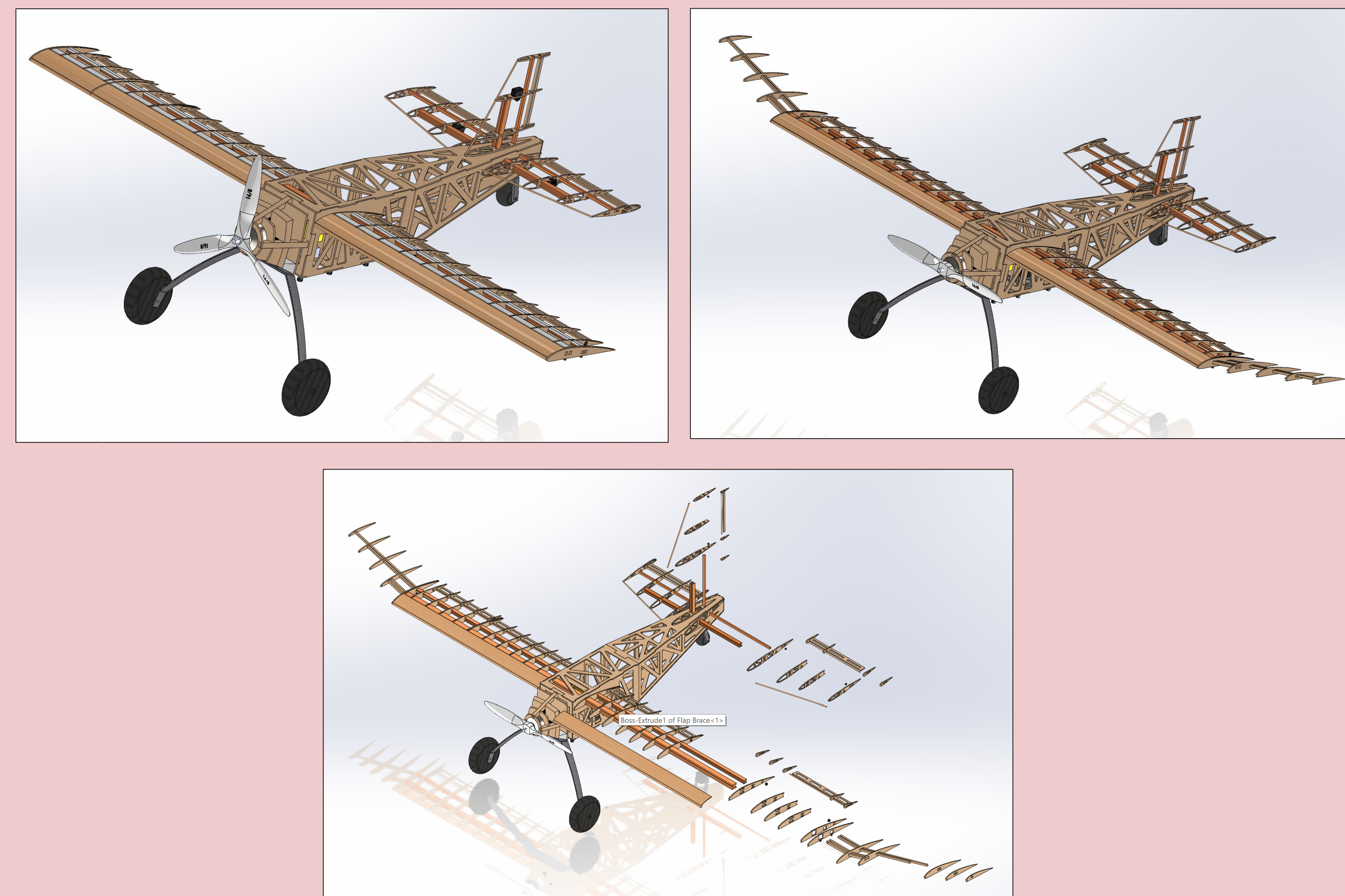
## Final Prototype

The HC-22 in is shown below with dihedral wing sections mounted.



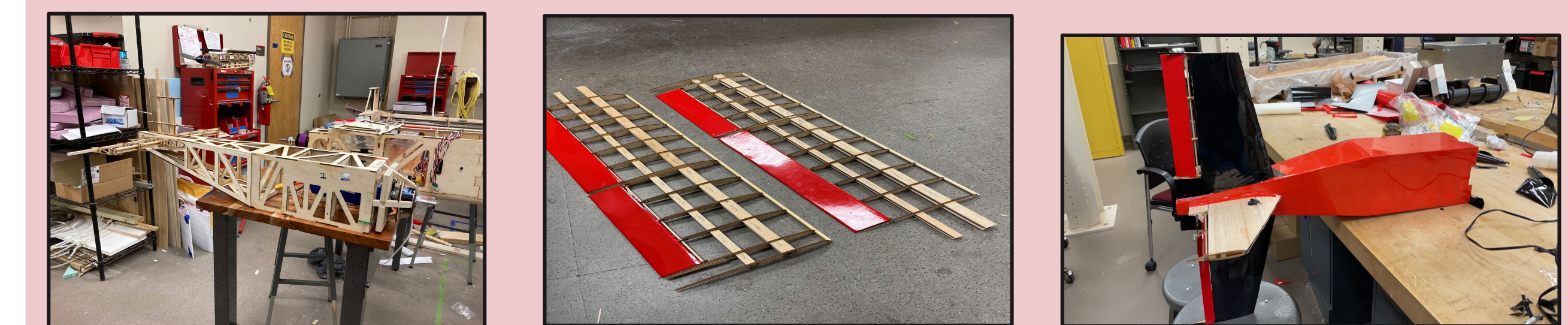
Forest Management	Parameter
Alpha Trim	2.95579 deg
Coefficient of Lift	0.5357
Coefficient of Drag	0.0314
Static Margin	22.8066%
Center of Gravity Location	3.27 in from the leading edge
Neutral Point Location	5.204 in from the leading edge
Operating Empty Weight	~6.358
Takeoff Weight	~9.268
Total Payload Volume	42.2 in or 0.6948 U

## Design Solution



## Manufacturing

- Manufacturing began in January 2022.
- The UAS consisted mostly of plywood, with balsa wood sheeting over airfoil surfaces.
- The wing spars were I-beams made from wooden dowels.
- The nose pieces were cut with the waterjet.
- The UAS was then ultra-coated.
- Dihedral panels were made to complete the forest management mission.



## Testing

- The aircraft was prepped and flown on two separate days of test flights.
- The first trial resulted in about 45 seconds of flight, but aircraft was forced to land due to failures in one of the ailerons.
- Repairs were needed on the nose of the aircraft, landing gear, and control surfaces.
- In the second test flight, two minutes of flight was recorded but failure in the servos resulted in a crash.
- The aircraft performed as intended, allowing for full control of the vehicle.
- Further iterations of the plane would include improvements to the digital function of the servos and full autopilot features.

