

Mission Overview

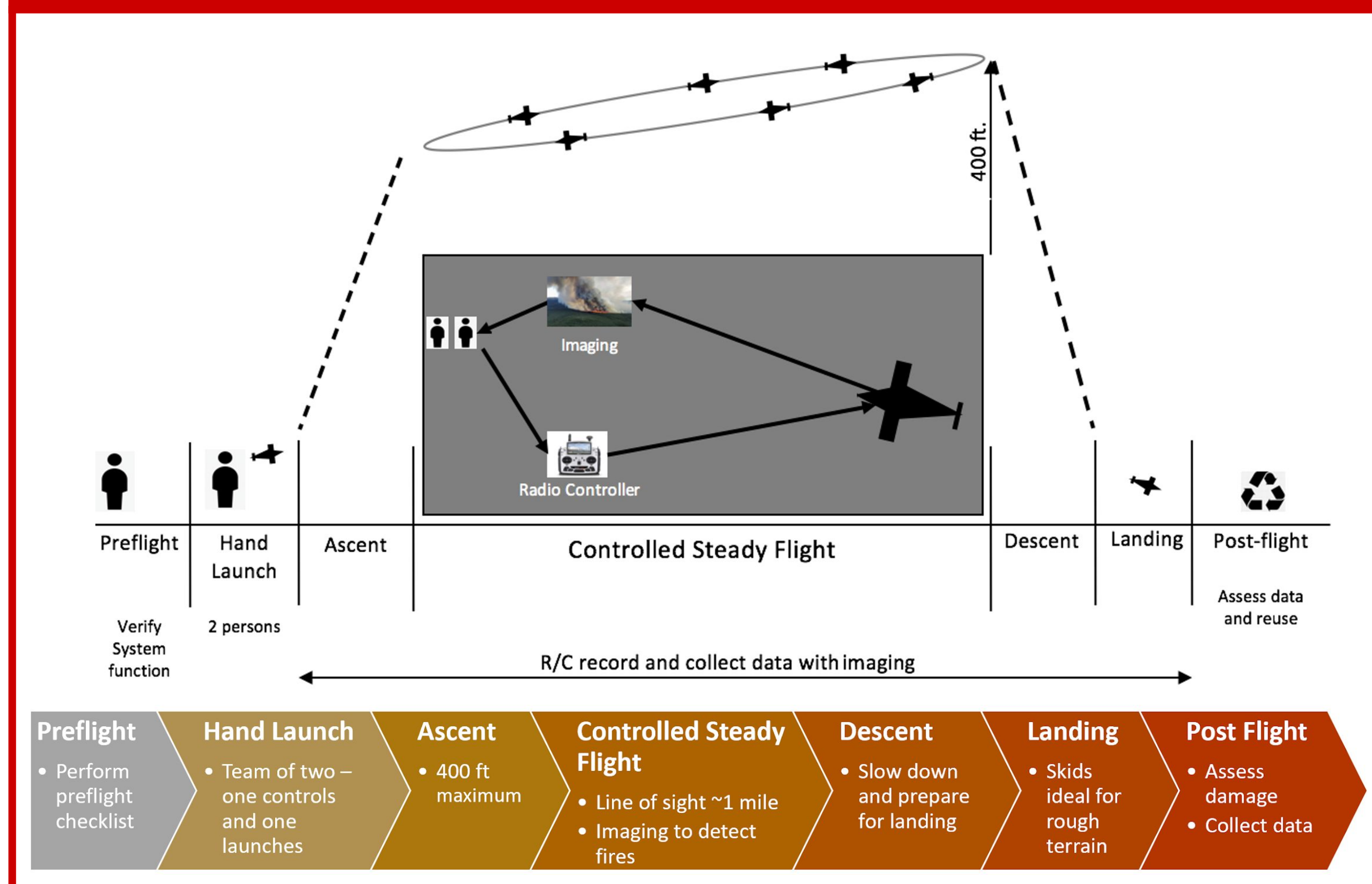
Purpose: Design, build, and test a remote controlled aircraft that can be used for identifying and monitoring wildfires.

Customer Requirements: Under 20lbs, ability to hand launch by team of two, 5x3x2ft max dimensions

Objective: The objectives are outlined below:

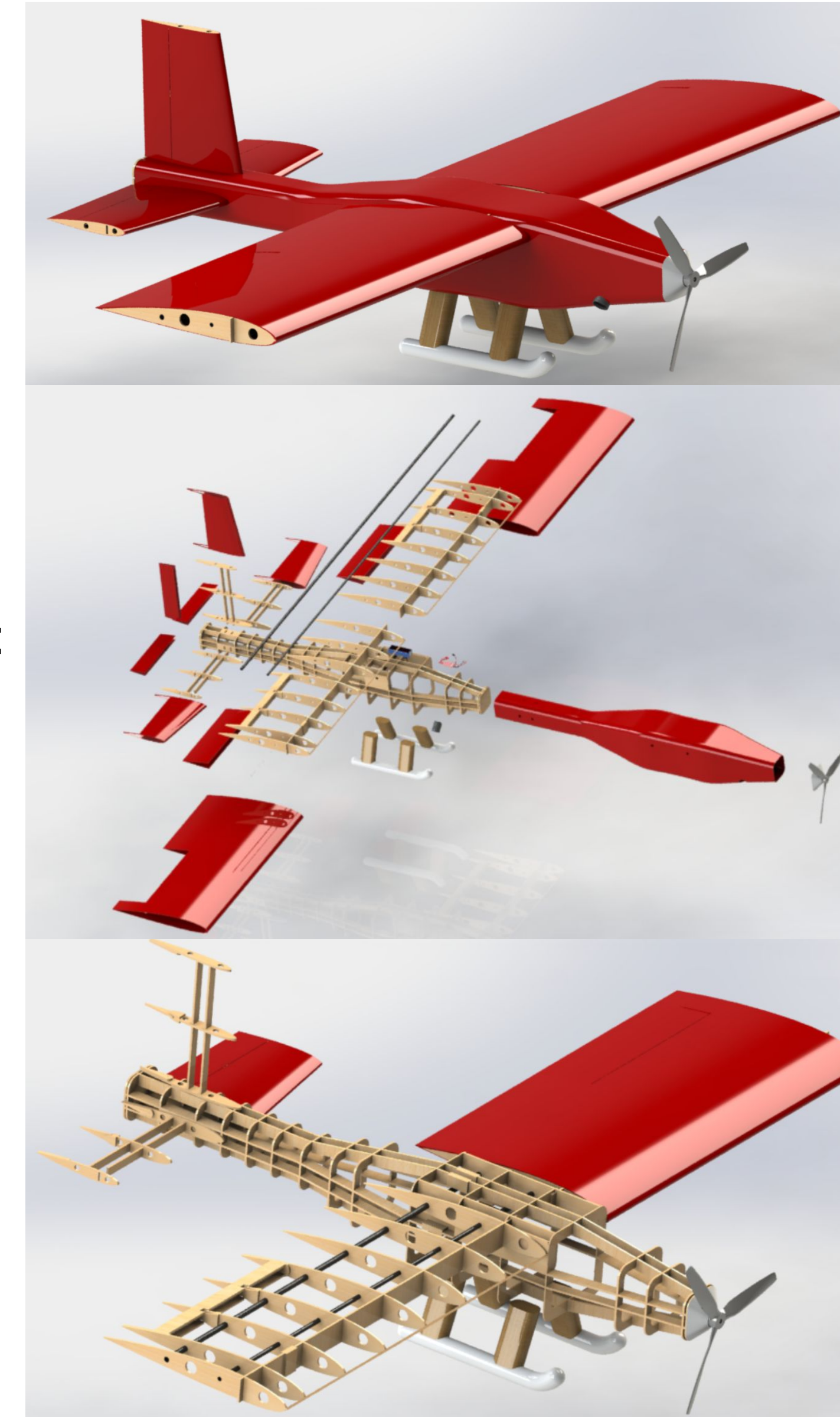
- Achieves controlled flight immediately after launch and is immediately able to climb
- Operational immediately after recovery, all systems intact and undamaged
- Loiter for at least 30 minutes at an altitude of 400 feet
- Operators retrieve accurate recorded video and signal strength is consistent throughout entire operational range

CONOPS



Design Solution

Design Solution Specifications	
Flight Time	103.4 minutes
Estimated Weight	11 lbs
Takeoff Thrust	12.1 lbs
Cruise Speed	30 mph
Operational Altitude	400 ft



Electrical/Propulsion Components:

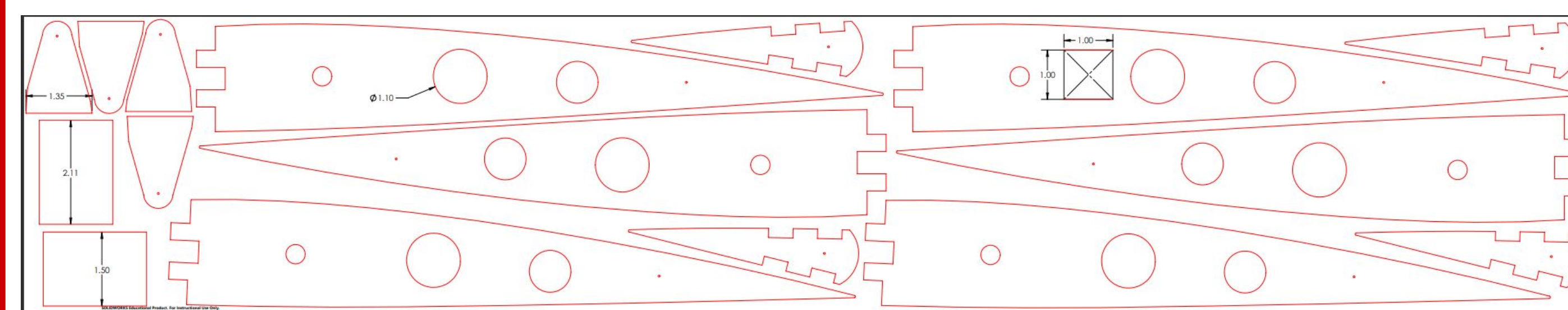
- Hacker A50-12L Brushless Motor
- HobbyKing 80A (2~6S) ESC 4A SBEC
- Turnigy High Capacity 10000mAh 6S 12C Lipo Pack w/XT90
- Master Airscrew 3-Blade Propeller 16x10
- Spektrum AR620 6-Channel RC Sport Receiver
- Raspberry Pi Model 4B
- SG90 Micro Servo Motor
- UbiBot DS18B20 Temperature Probe
- Raspberry Pi 4 HQ Camera
- Buck Converter

Final Prototype

Prototype Specifications	
Flight Time	103.4 minutes
Weight	14 lbs
Takeoff Thrust	12.1 lbs
Cruise Speed	30 mph
Landing Speed	22 mph
Operational Altitude	400 ft
Total Length	58 in
Total Span	80 in
Minimum Static Margin	8.33% at cruise



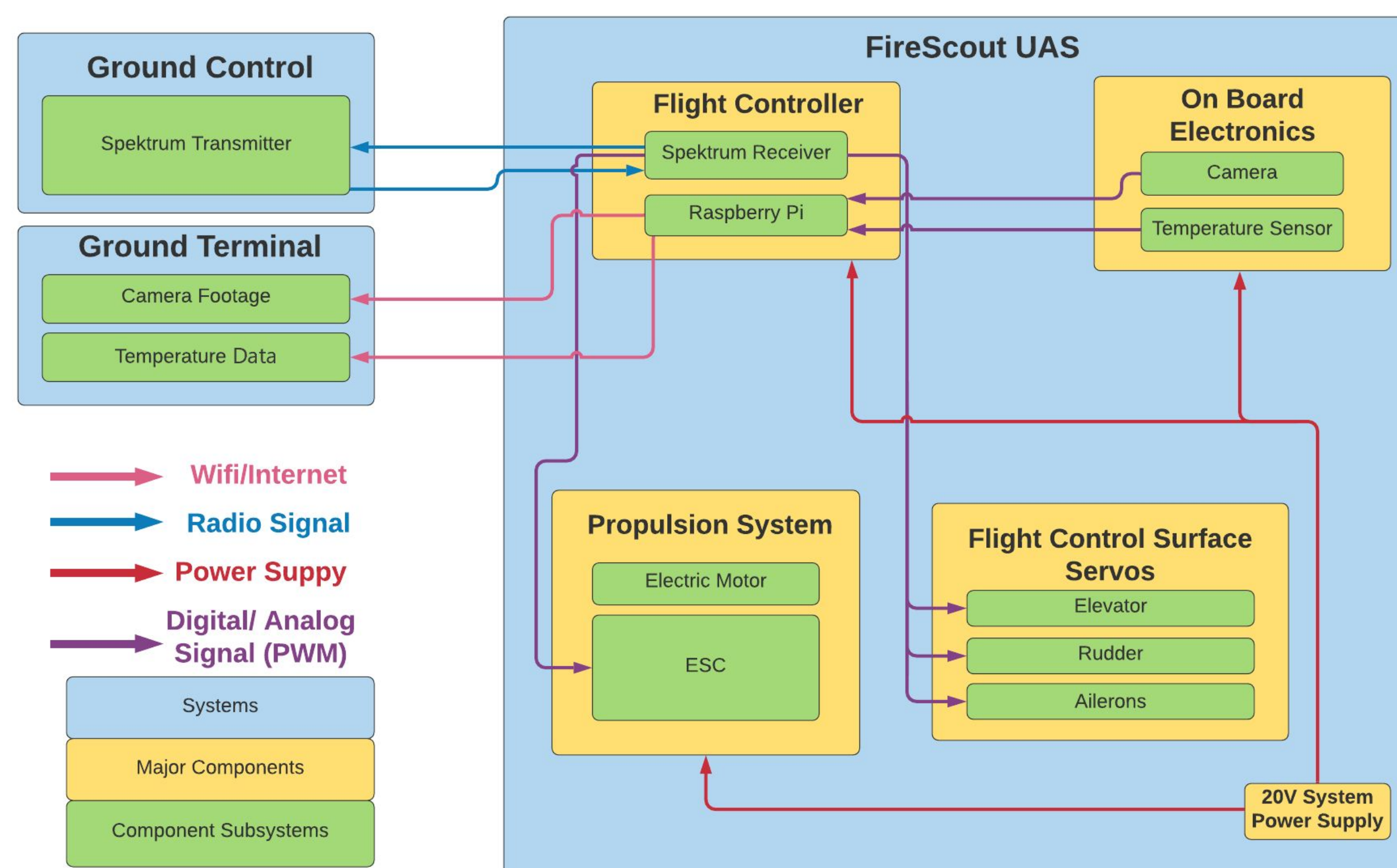
Manufacturing



- Internal structure of the aircraft composed largely of balsa wood
- The outer skin of the aircraft is composed of ultracote
- The motor is bolted to the nose and all wiring runs from the battery at the CG throughout the rest of aircraft
- The landing gear sits on PVC pipes that are designed to slide across multiple types of terrain
- Wing spars and spar attachment point were made of pultruded carbon fiber
- Wing attachment points were cut from light plywood



Functional Block Diagram



- Controller sends signals to receiver, which interprets them and moves servos
- Camera and temperature sensor connect to the Raspberry Pi, which stores collected data
- 20V battery supplies power to all onboard systems

Flight Testing

- 8 minutes and 3 seconds of total flight time between two flights
- 18 mph wind with gusts of up to 30 mph
- Internal camera footage from flight was recovered
- Suffered damage to frontal landing gear connection point during first landing, replacement servo needed in right wing, minor ultracote repairs needed around fuselage damage and new servo
- All repairs completed in less than 30 minutes
- Second landing caused no further damage

