Helium Micro Air Vehicle (MAV)

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Introduction

- Dr. Srinivas Kosaraju requested a Helium Micro Air Vehical (MAV) device to fly over fires and contaminated areas
- Constraints include that the budget is $2000, remote control guidance system, reach a minimum height of 31 m
- Comparable advantage to commercial designs
- Our objectives include are to optimize weight payload limit, minimize the response time, double the distance of quadcopters and is durable

Objectives

Table 1: Objectives, measurements, and types units

Objective	**Measurement**	**Units**
Limit Weight/Payload	Mass	kg
Optimize Response Time	Time	Seconds
Minimize Cost	Currency	$
Double distance of standard quadcopters	Length	m
Durable	Time	Seconds
Easy to Store	Volume	m^3

Testing Procedure

- Installed the Helium tank against the back wall.
- Connected the regulator and the hose.
- Attached the hose to the back entrance of the blimp.
- Used all 217 ft^3 of helium.
- Attached enclosure to the bottom of the blimp.
- Added weights in increments.
- Measured dimensions of the blimp.

Blimp Testing

Length: 4.88 m

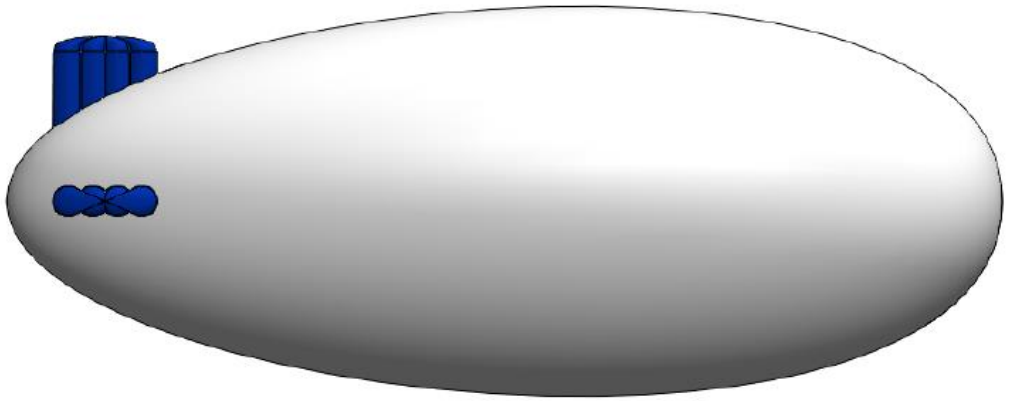
Front Blimp Diameter : 0.87 m

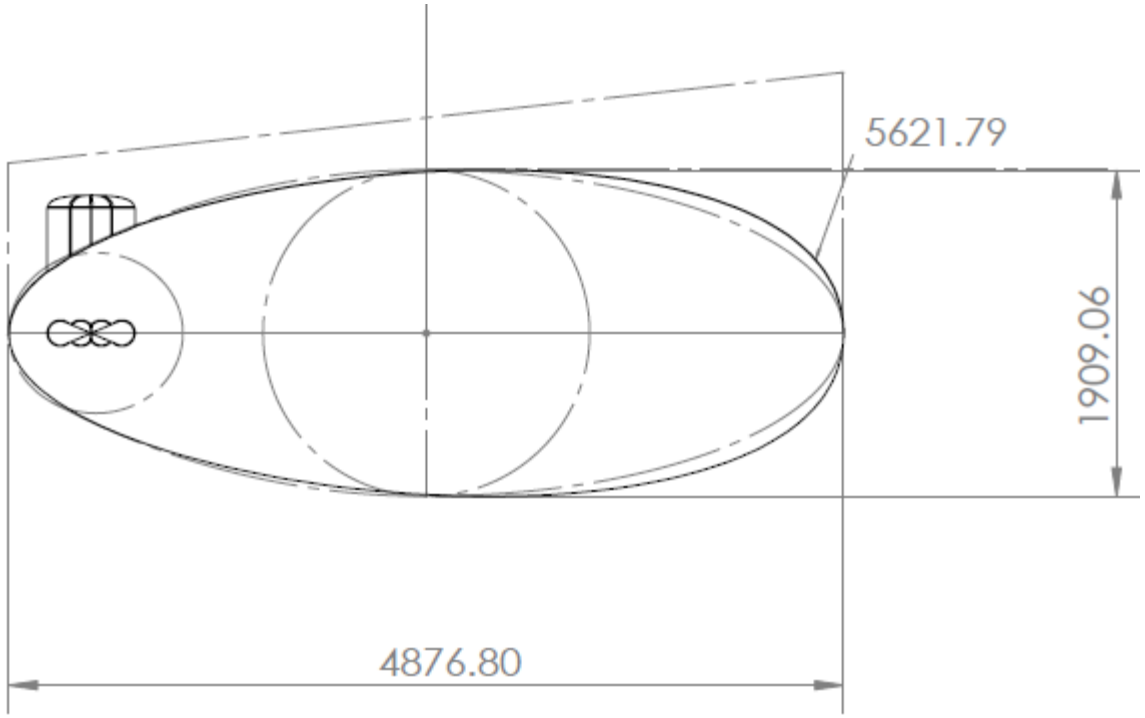
Back Blimp Diameter : 0.94 m

Middle Blimp Diameter : 1.91 m

Carry : 3.11 Kg

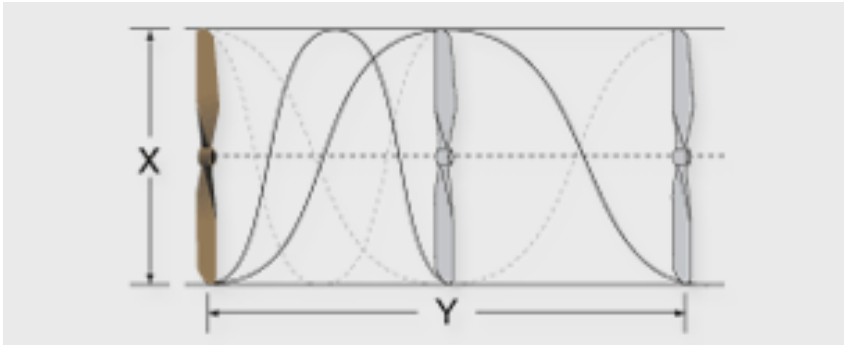
Dimensions - CAD





Propellers

- High thrust is needed to counter the Helium lift force
- Large diameter Propeller with a low pitch is required to maximize the thrust
- Using Dynam Carbon Fiber Propellers



Diameter:30 in.
Pitch:5.5 in.

Motors and Battery

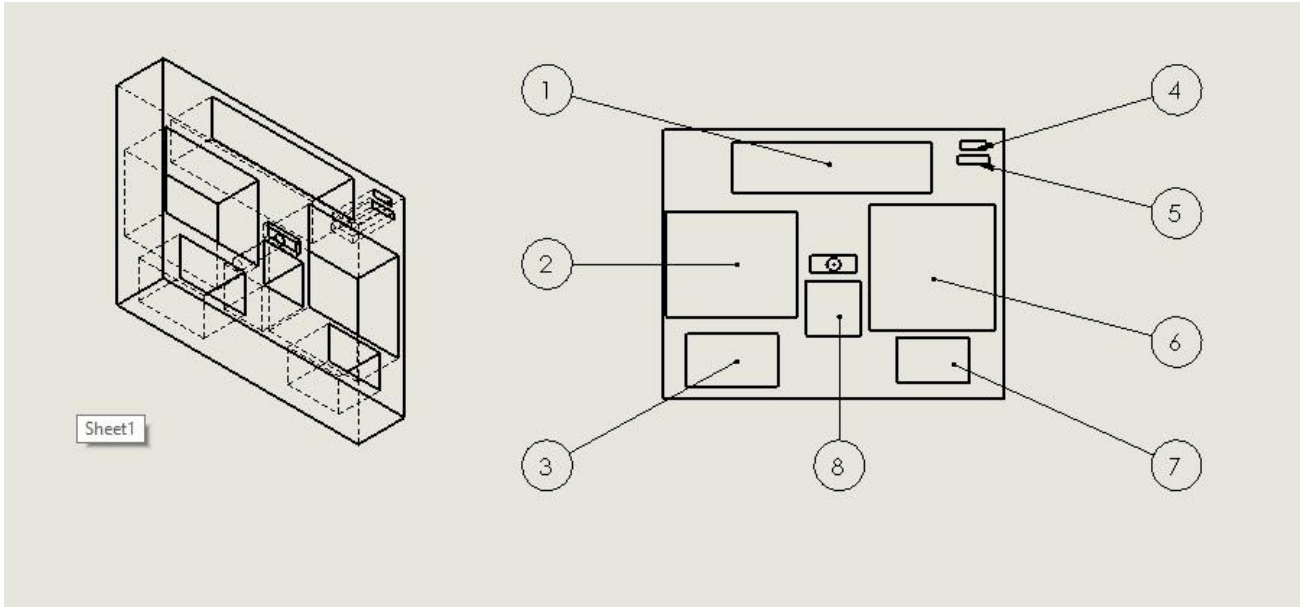
- Motor with a low KV provides optimal thrust
- Using LDPOWER M4114-320KV Brushless Motor (CW)
  - 999W
  - 320KV
  - 14.8V-22.2V (4S-6S)
  - 4S Thrust:3.19kg / 6S Thrust:6.28kg

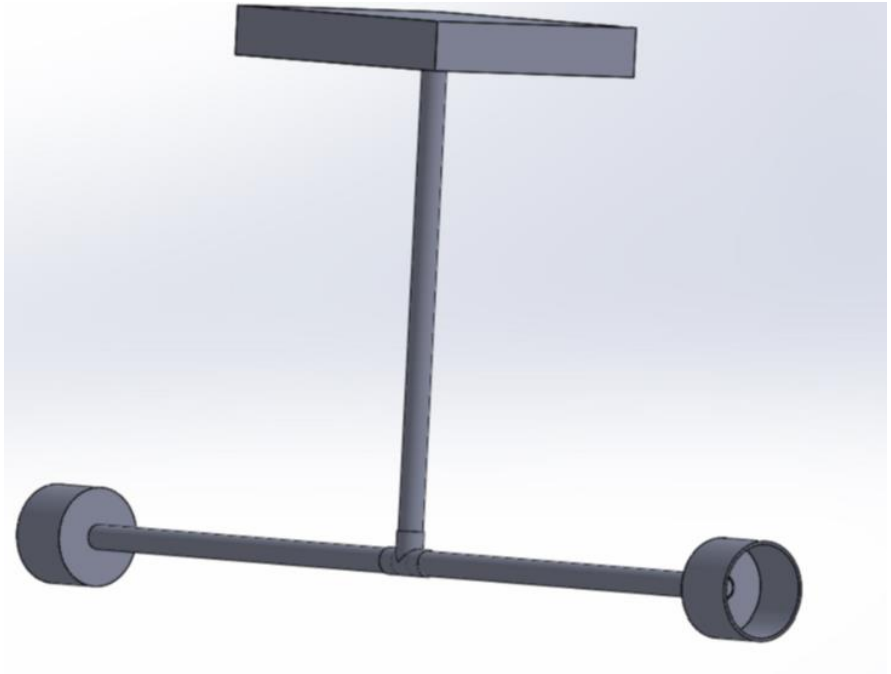
- Battery with 6S has been chosen to maximize the thrust
- Using Turnigy nano-tech 8000mAh 6S(22.2V)

Servos

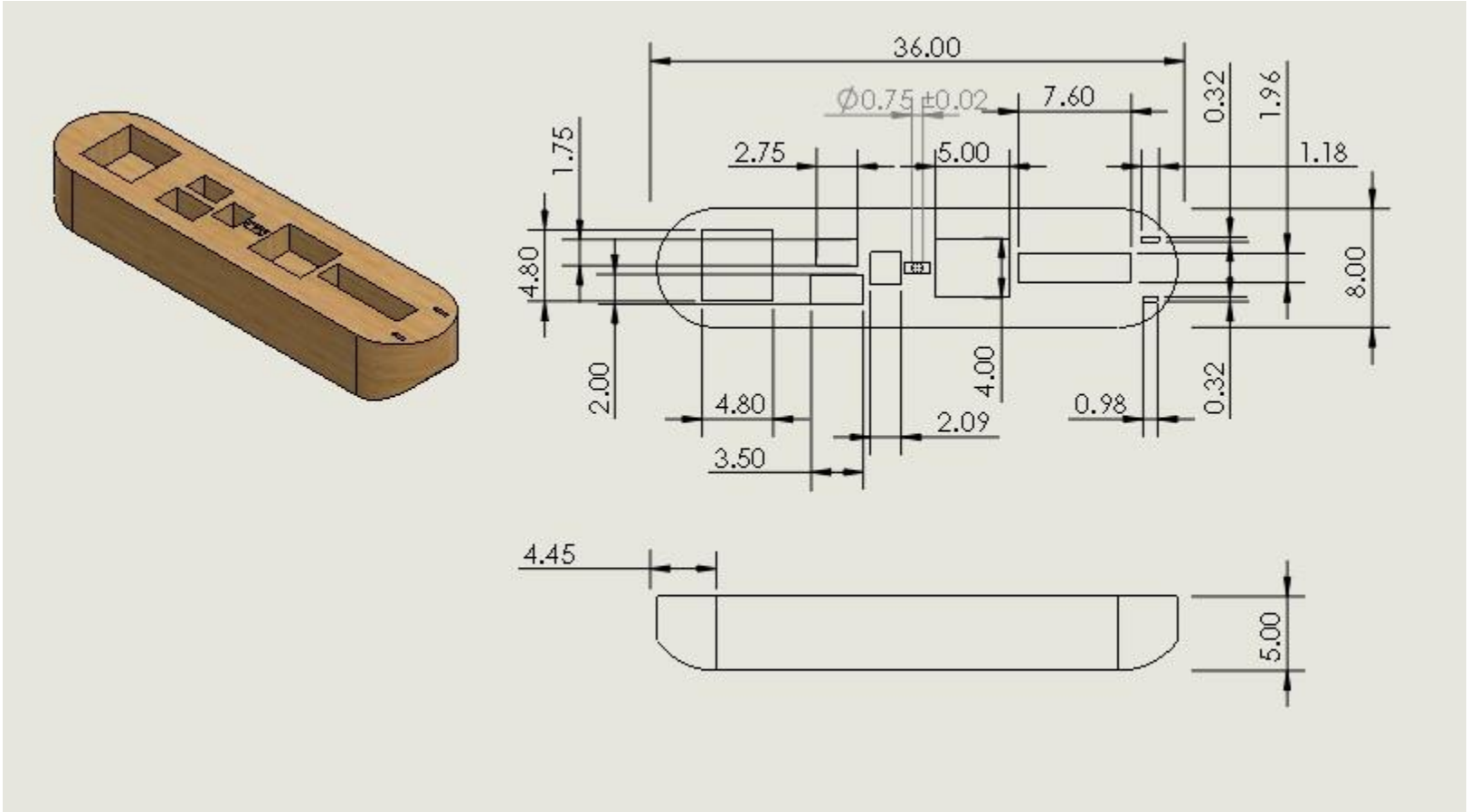
- Lightweight servo with high torque
- Using Turnigy™ TGY-20C
- 40 kg/cm of torque
- 78 g

Enclosure Designs - CAD

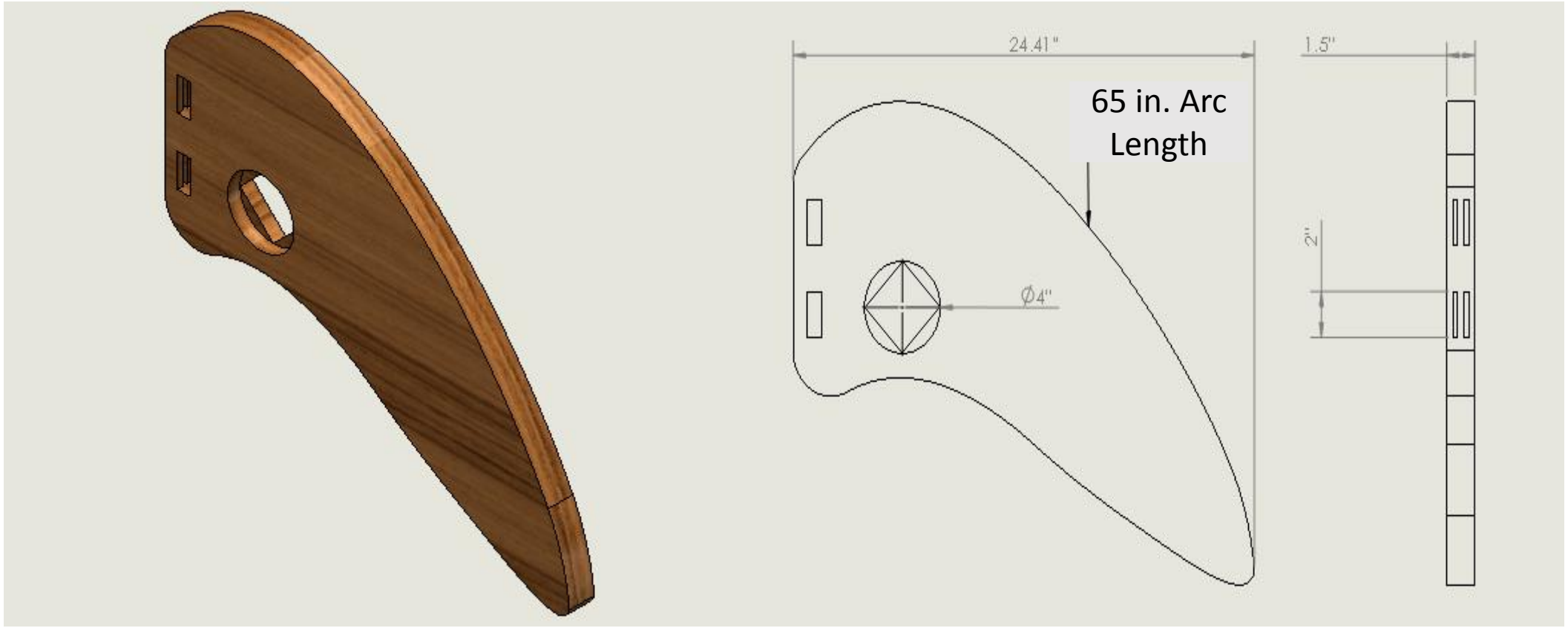




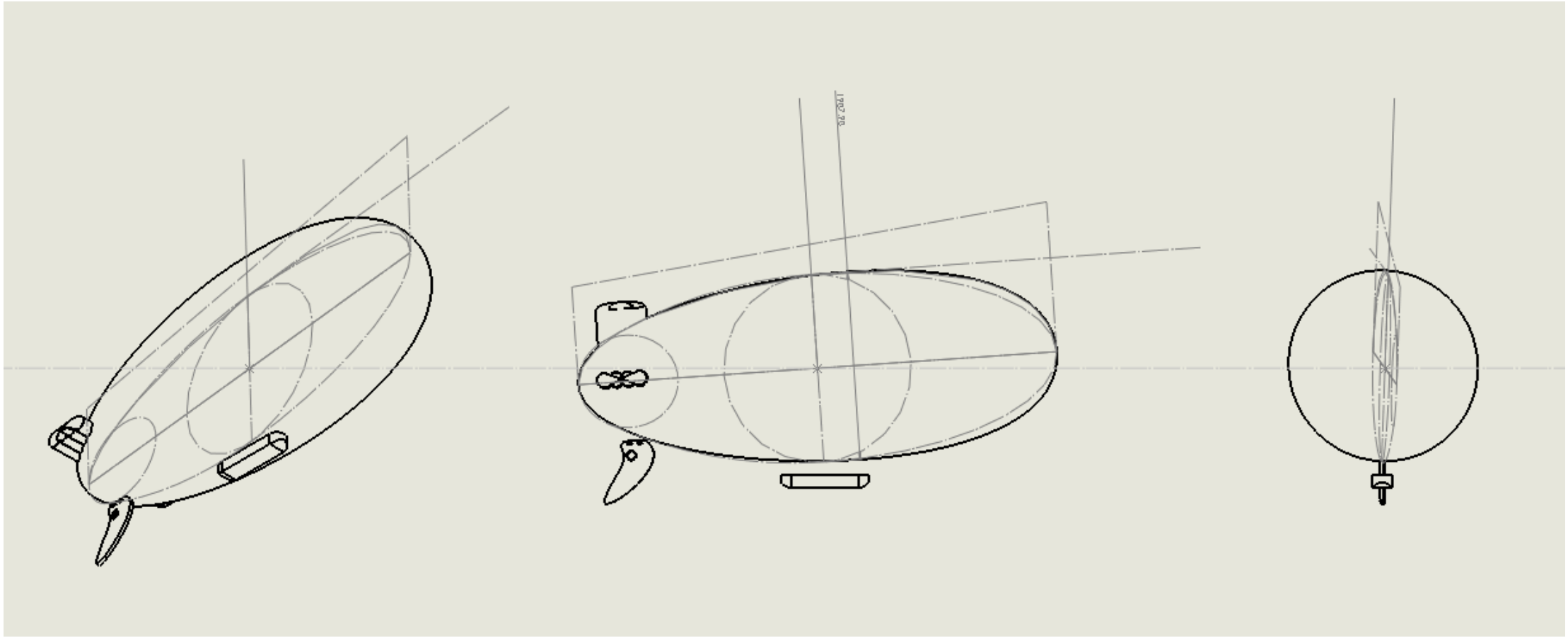
Final Enclosure



Steering



Attachments



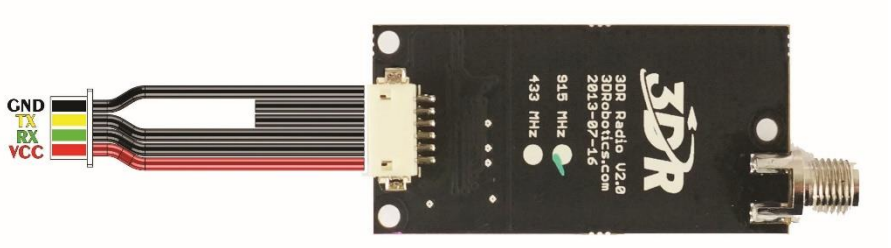
Camera Setup

- Using LYNX compatible USB camera
- Raspberry pi 2 with micro USB and SD card
- Delay and range functions
- Automatic Startup when Power is applied

Source: Spencer

Quadrino and Radio Transmitters

- Flight Controller
- In flight communication
- GPS
- Telemetry data



Source: Spencer

Quadrino cont..

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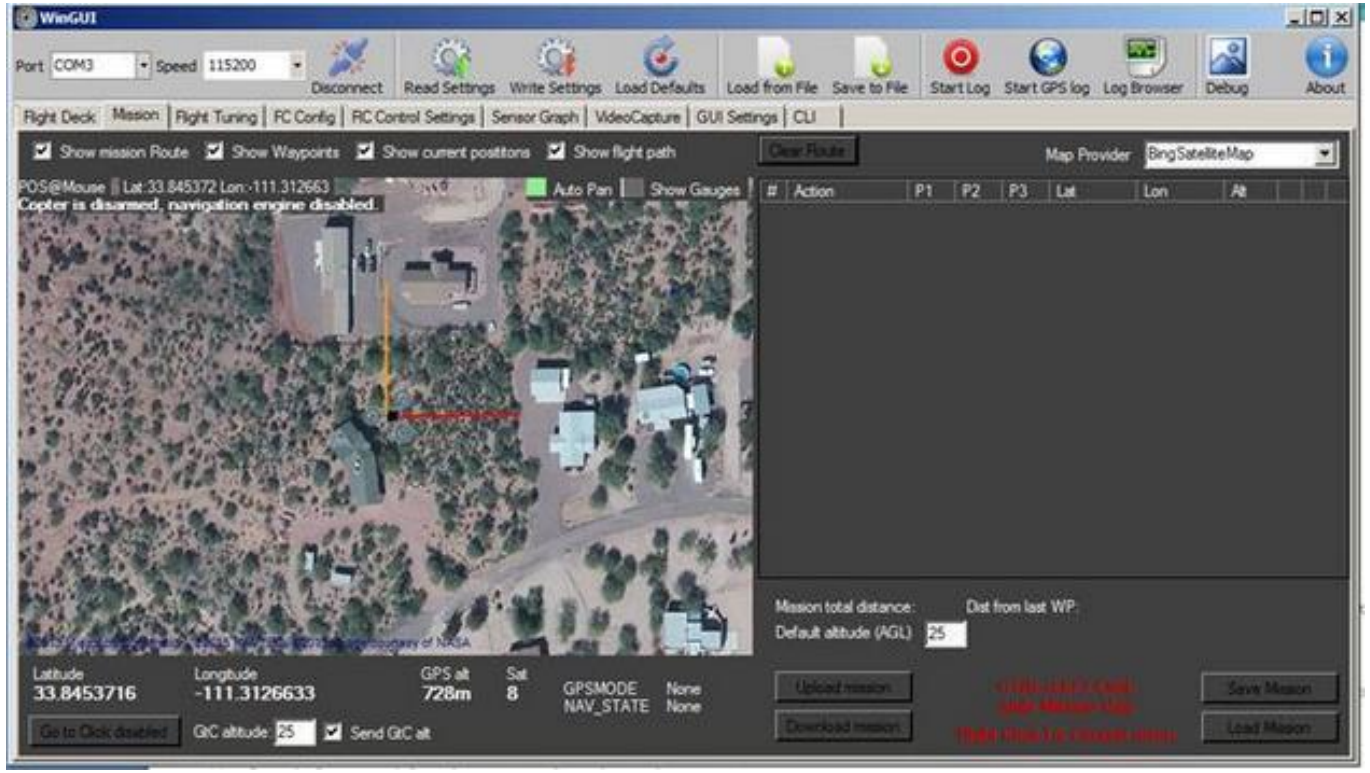


Source: Spencer

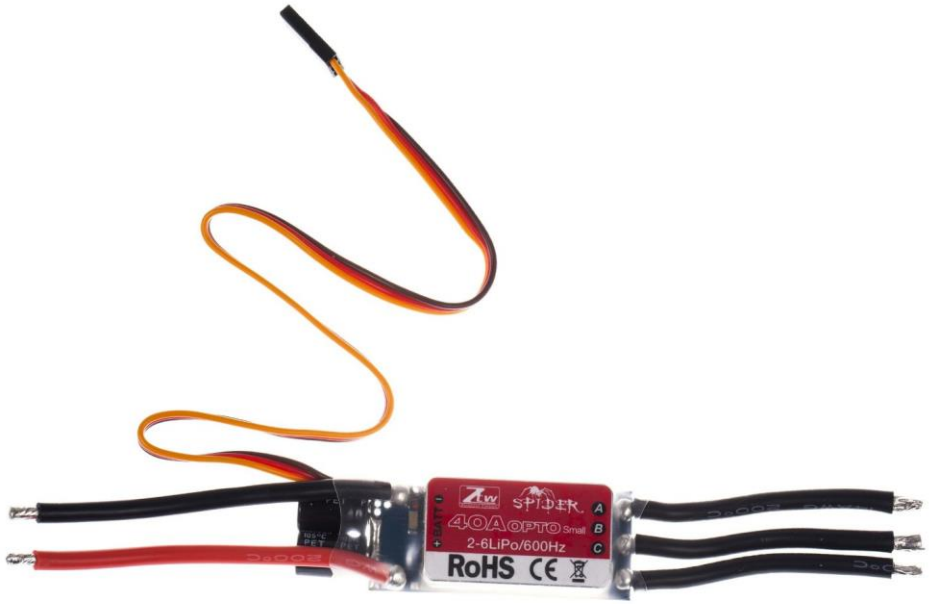
Receiver

- Flysky 6 channel Receiver
- Communicates with CT6B Transmitter
- Powered by the Quadrino
- Transmitter needs to be recalibrated

hobbypartz.com

Electronic Speed Controller (ESC)

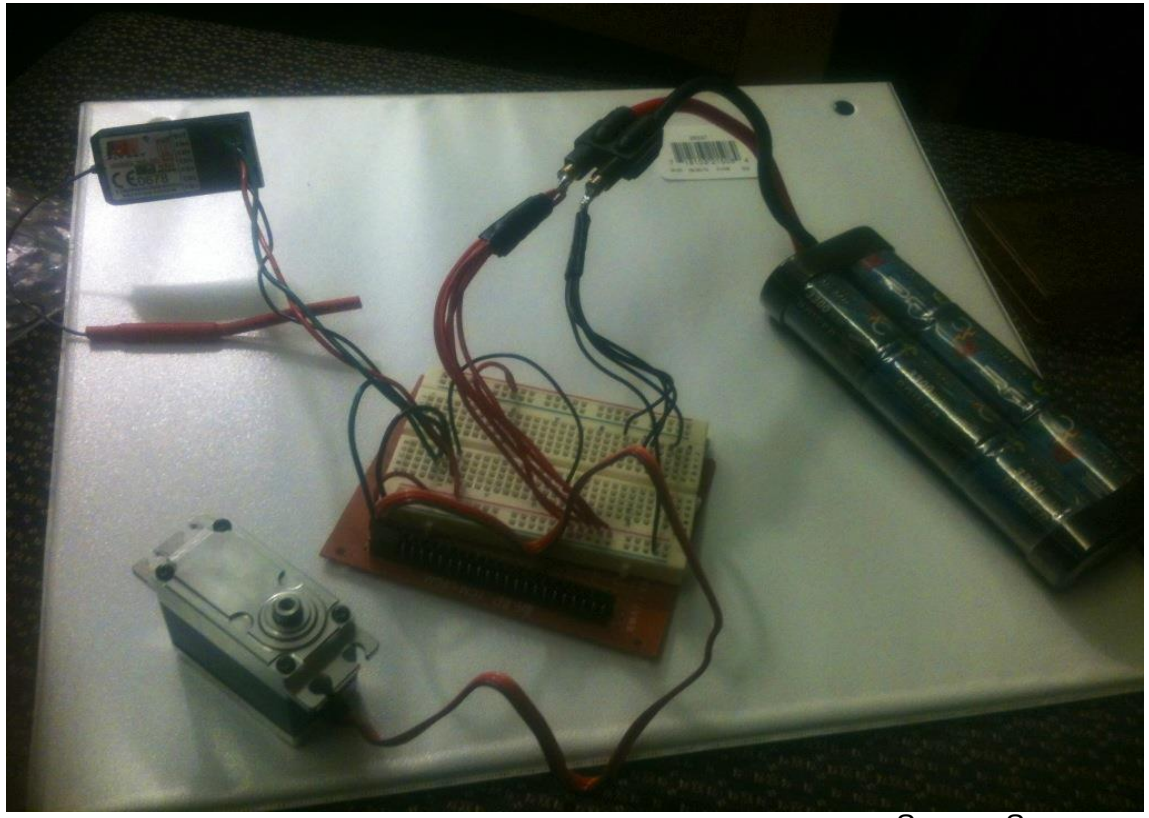
- Connection point between battery and signal output for motors
- ESC will directly connect with Quadrino
- 40 amps



amazon.com

Possible Electronic Setup

- Using a PCB board
- Soldering wires directly to PCB board allows for one power supply
- Use headers to connect to motors
- Split off signal wires to go to Quadrino or receiver directly



Source: Spencer

Bill of Materials

Table 2: Bill of Materials for enclosure parts

Name	Cost ($)	Total ($)Cost	Dimensions(mm)
Dynam Carbon Fiber Propellers	72.10	72.10	762x139.7
lynxmotion quadrino nano	149.99	149.99	53x53x17
Fly-Sky 2.4G 6-Channel Receiver (R6B) for CT6B 6-CH TX	11.24	11.24	30x25x8
Lynxmotion Quadrino Nano Advanced Wiring Kit	9.99	9.99	
3DR 915MHz Radio Set for UAV	100	100	26.7x55.5x13.3
Raspberry Pi 2	42	42	127x101.6x76.2
Usb camera	45	45	38 x 38
micro SD card	8.05	8.05	
Portable Battery	14.99	14.99	88.9x50.8x6.35
mini Usb Flash Drive 64 gb	15.99	15.99	
2 X Brushless Motor	$56.90	$113.80	47x37.8
2 X Turnigy Servo 180 degree	64.48	128.96	40.5x21x42
Repair	100	100	
Turnigy Battery	99.99	99.99	195x50x55
	Total	912.10	

What to do next

- Set up a efficient and effective power system
- Connect the Quadrino and the receiver to the full system
- Test the system without final enclosure
- Make the final enclosure
- Test the blimp tethered and untethered

Conclusion

- The Helium MAV device to fly over fires and contaminated areas
- Constraints include that the budget is $2000, remote control guidance system, reach a minimum height of 31 m
- The propellers have a high thrust is needed to counter the buoyancy force.
- Lightweight servo with high torque using Turnigy™ TGY-20C
- The Quadrino Flight Controller has In flight communication GPS Telemetry data
- At the end the blimp will be tested for multiple runs as well as the enclosure testing.

References

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