

Drone Total weight - 31b (pound) $\rightarrow 1.36\text{Kg}$

Battery - 5000 mah 11.1V 50C battery

Motors - A2212 1000KV Brushless

ESC - 30A RC Brushless

Assumption: - Battery discharge - 80%.

$$\text{time} = \text{Capacity} \times \text{discharge} / \text{AAD}$$

How to calculate Amp draw

AAD - Average amp draw

$$\text{AAD} = \text{AUW} \times P / V$$

AUW - All up weight

$$\frac{P}{V} = I$$

P - Power

So,

V - Bt Voltage

$$\text{AAD} = \text{AUW} \times I$$

I - Current

$$\text{AAD} = 1.36 \times 170 / 36$$

$$\text{Time} = 5\text{ah} \times 80\% / 6.4$$

$$\text{AAD} = 1.36 \times 4.72$$

$$= 0.625\text{hrs}$$

$$\text{AAD} = 6.4\text{A}$$

$$\text{Time} = 37.5\text{minutes} / 0.625\text{hours}$$

A single 1000KV BLDC motor with 30A ESC can able to lift 600 grams to 900 grams

$$P_{\max} = T_{\max} * \omega_{\max}$$

$$P_{\max} = 4.7 \times 11.1$$

$$P_{\max} = 54.99 \text{ Watt}$$

$$F = m \times g \quad F - \text{Force}, m - \text{mass}, g - \text{gravity}$$

$$F = 1.36 \times 9.81$$

$$F = 13.3416 \text{ Kg m/s}^2$$

Measured Forces

$$M = F \times r = m \times g \times r \quad r - \text{torque}$$

$$\text{output Power} = \frac{2\pi N T}{60} \quad N - \text{rpm} \quad T - \text{torque}$$

$$T = \frac{\eta P_i 60}{2\pi N} = \frac{54.99 \times 60}{2\pi \times 1110} = \frac{164.97}{3485.4}$$

$$T = 0.04 \times 97\%$$

$$T = 0.045$$

$$M = F \times r = 13.3416 \times 0.045917748$$

$$M = 0.6125 \text{ kg} \Rightarrow \text{Max load that a motor can carry is } 612 \text{ gms}$$

$$612.5 \text{ grams} \times 4 \text{ motors}$$

$$2450 \text{ grams}$$

$$\text{Total payload} = 2.4 \text{ kg} / 2450 \text{ grams}$$

$$\text{Total Flight time} = 37.5 \text{ minutes} / 0.625 \text{ hours}$$

$$\begin{aligned} \text{Only payload} &= 2450 - 1360 \\ &= 1090 \text{ grams} \end{aligned}$$

$$\text{Only Payload} = 1.09 \text{ kg} / 1090 \text{ grams}$$

$$\text{In pounds} = 2.4 \text{ lb}$$