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Guides and Resources: Hardware - QDrone

Propulsion System

This document provides information on the QDrone's propulsion system.

Motors and Propellers

The QDrone uses the Cobra 2100Kv (size 2206) motors (Figure 1a) with dual-blade polycarbonate 6045 propellers (Figure 1b). The specifications are listed in Table 1.

a. Cobra 2100Kv motors

b. 6045 polycarbonate propellers

Figure 1: Motor and Propellers

Table 1: Motor and Propeller Specifications	
Item	**Description**
Motors	
Kv	2100 RPM/V
Stator diameter/thickness	22.00 mm / 6.00 mm
Stator slots/magnet poles	12 / 14
Max continuous current	25 Amps
Time constant	40 ms
Propellers	
Diameter	6.00 Inches
Pitch	4.50 Inches
Material	Polycarbonate

Response Curves

The motor propellor combination was characterized using a dynamometer to yield the following response curves. The command sent to the ESC is represented by ***u***, the Throttle Command (%). This is compared to ***ω***, the angular velocity of the spinning propeller (RPM) and ***T***, the thrust generated (N).

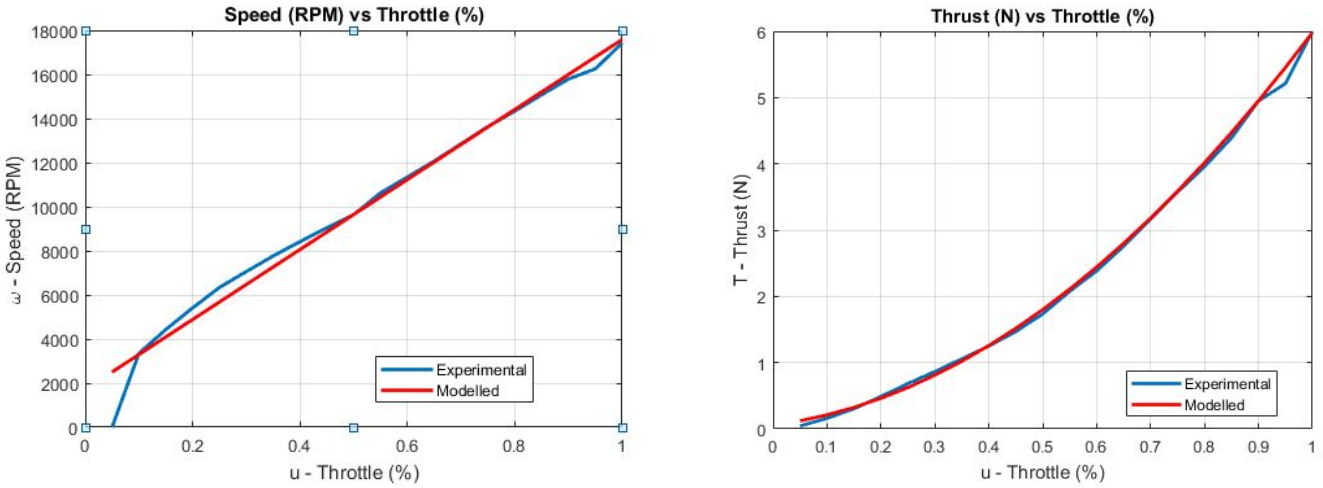
$$\omega = C_m\, u + \omega_b \tag{1}$$

$$T = c_t\left(\frac{C_m\, u + \omega_b}{1000}\right)^2 \tag{2}$$

The parameters C_m, ω_b and c_t were experimentally determined (using the dynamometer data) and are outlined in Table 2. For more information on this modelling, see Guides and Resources > Concepts.

Table 2: Parameters Determined Experimentally via the Dynamometer		
Parameter	**Value**	**Units**
C_m	15873	RPM/%
ω_b	1711	RPM
c_t	0.01935	N/(RPM)^2

The experimental and modelled responses are provided in Figure 2.



a. Throttle (%) vs. Propeller Speed (RPM)

b. Throttle (%) vs. Thrust (N)

Figure 2: Experimental vs. Modelled Responses of Throttle (%), Propeller Speed (RPM) and Thrust (N)