Author: Ryan Dunn
Position: DBF Propulsions Subteam Lead 2019-2021
Email: rcdunn@ucsd.edu

Important Values:

Kv value: Very rough estimate of revolutions per minute (RPM) a motor will produce per volt supplied [RPM/V]

Internal Resistance: The effective resistance of the motor in a simplified circuit [ohms]

No-load current: The minimum current supplied to the motor in order to produce a torque [amps]

Stator Diameter: The diameter of the motor's housing in millimeters. Shown by the first two numbers in a motor's name (Example: a 5055-3000kV Brushless Outrunner Motor would have a stator diameter of 50)

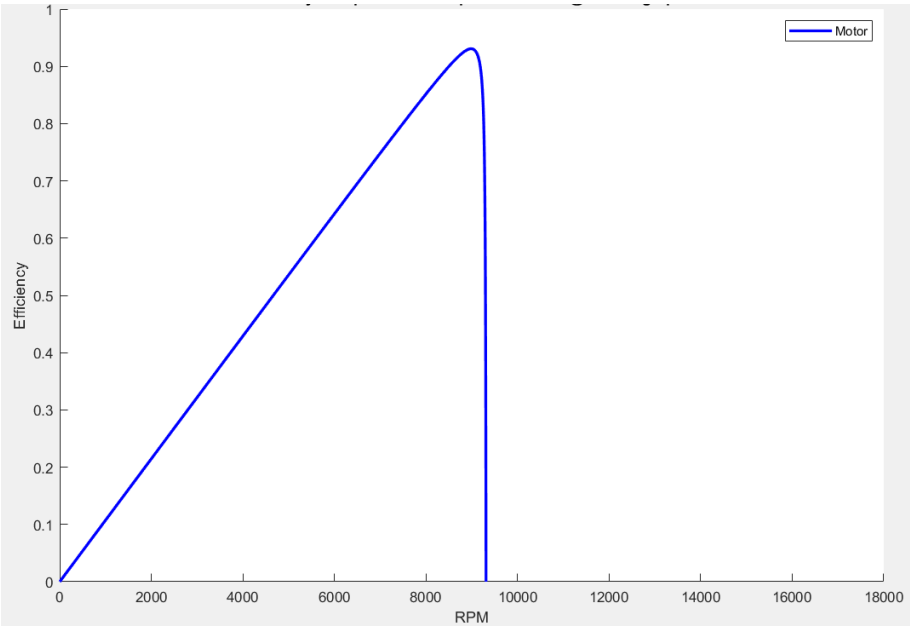
Stator Length: The length of the motor housing in millimeters. Shown by the second two numbers in a motor's name (Example: a 5055-3000kV Brushless Outrunner Motor would have a stator diameter of 55)

Important Considerations:

Speed: Given a certain propellor, can this motor spin fast enough to reach a desired cruising speed?

Weight: Motors are the 2nd most heavy component of the plane (1st is batteries). Mostly made of conductive metals, electric motors are a huge research area for improvement in industry, but in this club we try to balance the weight and efficiency of our motor selection

Motor Efficiency Plot



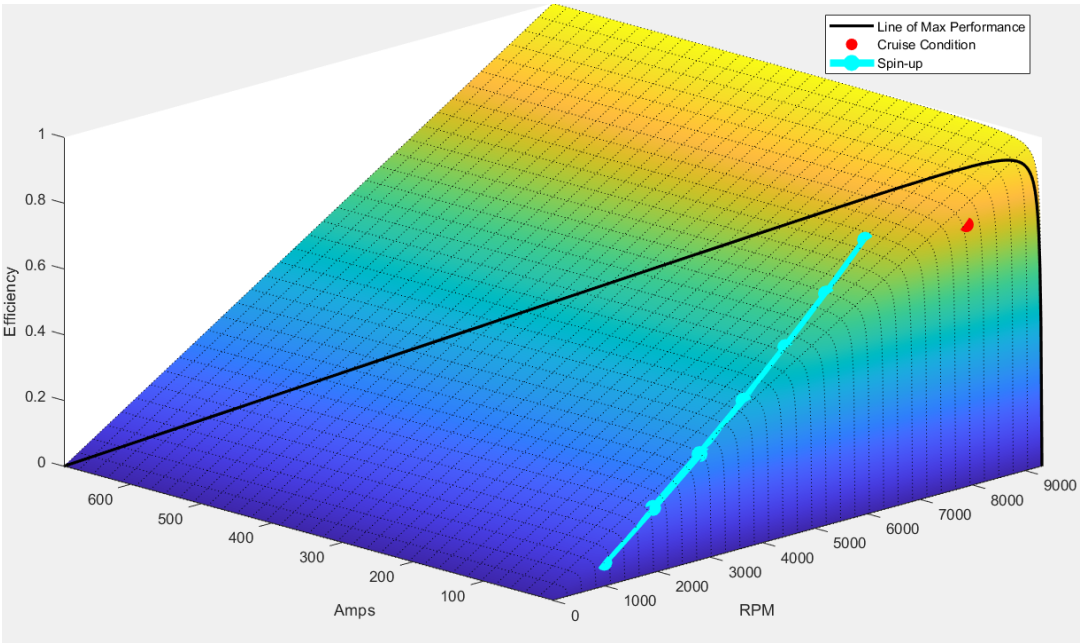
Useful Equations:

Max RPM: RPM = Kv * (V - Rm*I0)

Max Current Draw: Imax = V / Rm

Kt = 1355 / Kv

Efficiency = Kt*(I-I0)*0.007061552*RPM*2*pi/60 / (V*I)



If I0 is small and V is constant, then efficiency is *only* a function of RPM

Academic Reference:
http://adl.stanford.edu/sandbox/groups/aa241x/wiki/e054d/attachments/14c7c/electricpropulsionnotes.pdf?sessionID=de525594bd25c51fa0424a7eda069f802596d80a