Picking a motor and Propeller Combination for a Tug

After doing much research and testing I have come up with recommended RPM for various propellers. I did testing with 4 different boats with propellers ranging from 1 1/2 inch to 3 1/2 inches. I also used both 2S and 3S LIPO batteries to provide different Propeller RPMs.

The recommended RPMs are given in table 1 below. The table has 3 columns. The first is a speed that will give something close to scale speed. The second column is what you might want to use if you want your boat to run like most of the overpowered boats in the club. The third is what you might want to try and get if you are building a Springer to play polo.

Prop Size inches	Scale Performance	Faster Performance	Too much
1	6000	9000	12000
1.25	4800	7200	9600
1.5	4000	6000	8000
1.75	3429	5143	6857
2	3000	4500	6000
2.25	2667	4000	5333
2.5	2400	3600	4800
2.75	2182	3273	4364
3	2000	3000	4000
3.25	1846	2769	3692
3.5	1714	2571	3429
3.75	1600	2400	3200
4	1500	2250	3000

Table 1

These propeller speeds are the same for either Brushed or Brushless motors. With Brushed motors it is not easy to tell what speed the motor would have at your operating voltage. For 500 sized motors (one of the most popular size motors we use) you can get some indication if you can find the number of turns. For a Speed 600 that is about a 15 turn motor and runs 18,000 RPM at 6 volts. Many of the generic 500 sized motors are about this speed. For most of our applications you would want to choose a 30 to 80 turn motor if you can find one. Be aware that some car motors have as few as 5 to 7 turns and run just way too fast for our applications. If you choose one of these faster motors and run it with a 1 1/2 inch prop it will slow down draw too much current and overheat. For larger motors you should try and find specifications. The motor in my Tug Boat was rated 3,200 RPM at 12 volts. In general when looking at motor specifications more turns or more poles will run slower. When looking for Brushless motors it is easier in that most are rated in KV or RPMs per volt so a 1000 KV motor will have an unloaded speed of 6000 RPM at 6 volts.
Both brushed and brushless motors can be geared down to match the speed of the motor to the desired speed of the propeller.

By Allan Wing