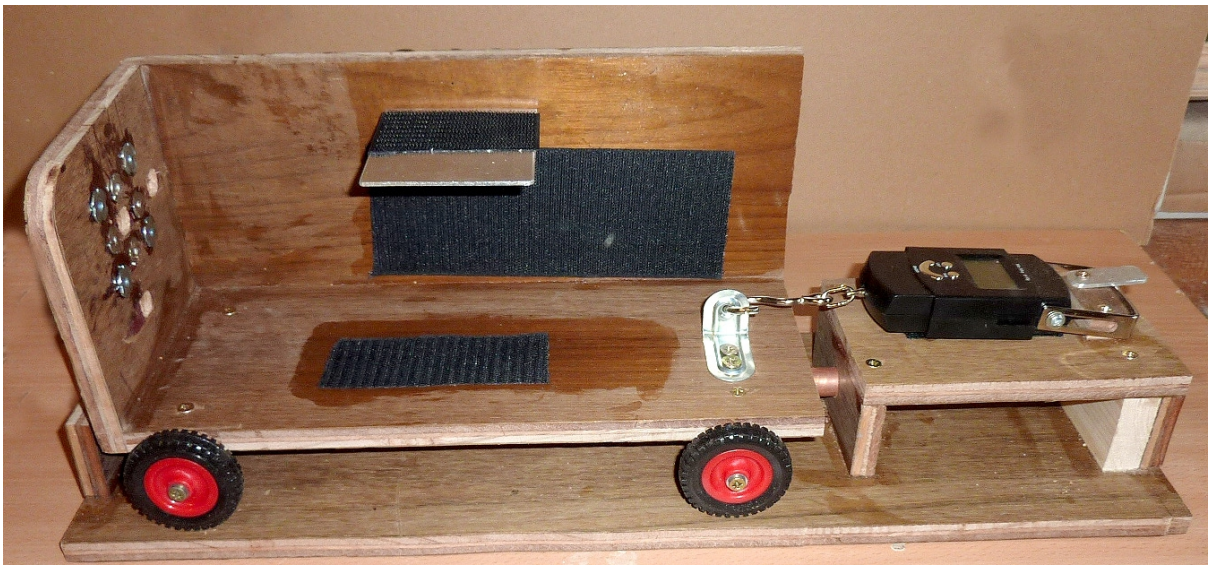
Testing outrunner motor and propellor setups

In the April 2016 edition of RCM&E there was an article about a device designed by Martin Phillips for testing electric motors. It uses a luggage scale to find the thrust and a watt-meter to measure the current and power for different propellors. This enables you to find the best diameter, pitch and make of propellor. One warning that the author gives is that running an outrunner too slowly on a large prop can cause it to take too large a current.

IMPORTANT NOTE: I checked the charge of the battery regularly. When testing it is easy to forget the time and over-discharge the battery and so destroy it.

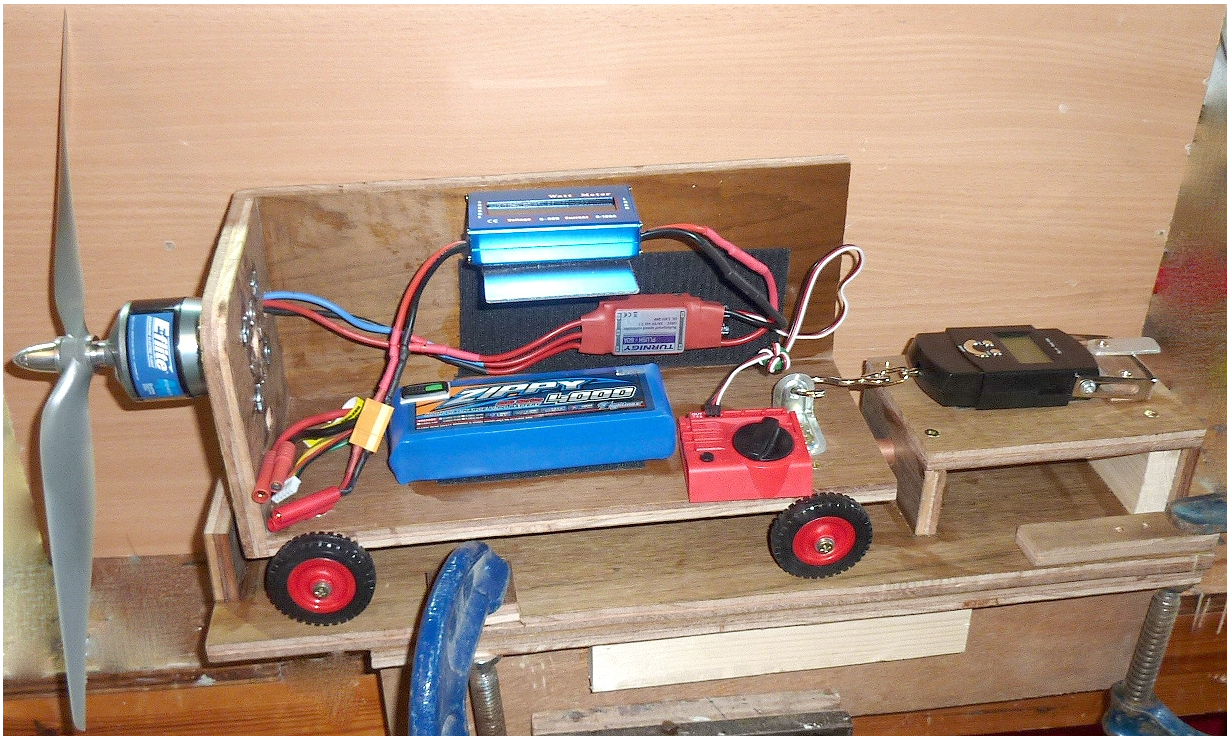
The magazine design of the tester looked very good so I broke the habit of a lifetime and didn't change it. At first I used a Turnigy handheld tachometer and a Turnigy servo tester to provide the throttle settings. I adjusted the servo tester to give each power setting then read the thrust and rpm.

This is the bare rig with only the bag scale on it.



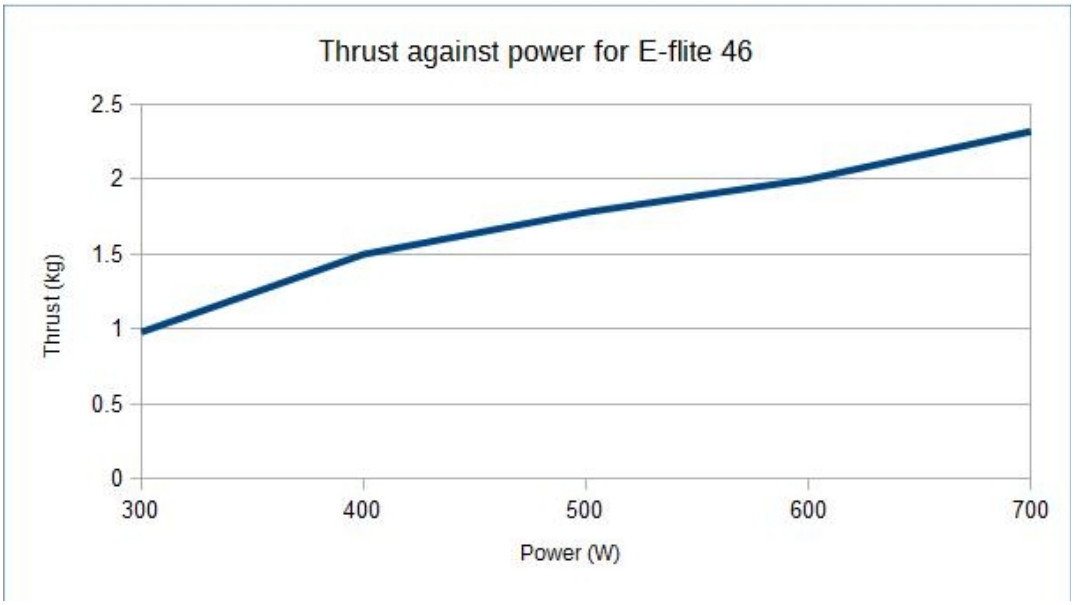
I realised that larger props would need the tester to be raised so I added a base that fits in a bench vice and allows the tester to be g-cramped to it.

This is the complete setup with an E-flite Power 46 and an APC 13 x 8 (330 x 203 mm) prop being tested.



For a range of power settings (300 – 700W), I recorded:
Rpm
Voltage (for maximum only)
Thrust

And what result did I get with the first set of tests? The best prop of the three I tested (12x8, 13x8, 14x10) was the 14 x 10. I got a power of just over 700W and a static thrust of 2.32kg. The model (WOT trainer) into which it is going weighs 2.48kg, so that should be satisfactory. As the prop unwinds in the air I will probably get nearer to the 800W it is capable of. Rpm per volt ('kV') came out at 530 rather than the specified 670, again no doubt due to static loading.



Eventually I will switch to a FrSky rpm and temperature telemetry sensor. This will enable me to check motor and ESC temperatures as well and I won't have to go round the prop to take tacho readings. I will use a FrSky X8R receiver and X9D transmitter for the telemetry. The big advantage of this arrangement is that it tests with the kit that will drive it in the model.

If you want to analyse in more detail, for example by plotting graphs, you'll need to put the results into a spreadsheet table. If you send your email address to me at peter@peterscott.website I will send you the readymade Excel spreadsheet that produced the graph above.

26 April 2016