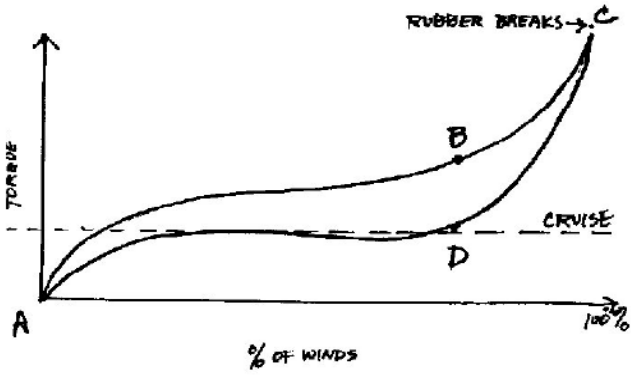
ON MOTOR WINDING

An article written by Tom Arnold in 1996 and republished in the July-August 2011 issue of Scale Staffel, George Mansfield, Editor

I learn about this crazy hobby of ours, but it's a slow process. I believe in making the same mistake over and over to prove conclusively that it is indeed a dumb move and not just a statistical aberration. For years I had seen graphs of torque vs. turns of a rubber motor such as below



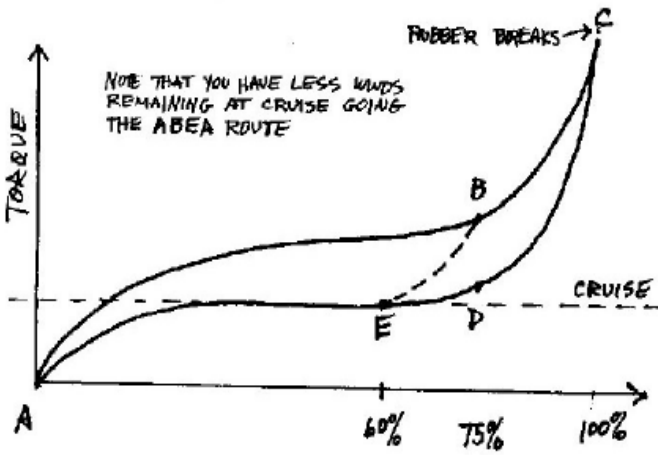
I understood that the top line represents the winding torque up to motor breakage and the bottom line the unwinding torque back to a slack motor. I also understood the reason the difference exists is due to internal stress of the rubber, heat generated, degree of lubrication and all those things that make for imperfect energy transfer in physics. I also understood about that enormous "spike" of torque at the end and about the practice of winding to near max capacity of a motor and backing off turns to drop the torque down to a more manageable level. It was that last move that I though was incredibly bizarre. It eliminated that monstrous torque, true, but why go past the turns you want, take a chance on blowing your motor to oblivion, and then run back to the turns and torque you wanted all along?

It seemed like walking down the street past the hardware store you want to go into, continuing down the block to the corner then turning around and strolling back to the hardware store. Just didn't make sense and the graph seemed to prove it. Why take the trip A-B-C-D when you get the same results with A-B-D?

Yet on the field the logic seemed fuzzy at best. How many times have you seen the classic mass launch of a bunch of torqued-out WWII fighters and at the moment of release one goes zipping around and around on a wing tip and into the grass in about 5 seconds flat. The pilot goes over in disgust, picks it up with 80% winds still in it and just to get rid of them gives it a toss. The errant aircraft than smoothly climbs away and puts in a minute plus flight with an open-mouthed modeler wonder what perverse demon inhabits his P-40.

The peanut gallery always would make some remark about flight #1 getting rid of the excess torque. Believing rubber and props are voodoo anyway, our hero gets sucked into taking sideline advice and next time winds to 80% winds. He is absolutely amazed that he gets a torque burst again and a shorter flight as a result. Those guys sounded so expert too. (You are probably asking who this rube is!)

The answer is lies in that we have incomplete information on the graph. Here is what it should look like"



The graph A-B-E-A is what things look like when you don't wind to near max. So when you wind to B and launch there is still a big torque burst before the torque drops to a cruise level around E. Notice that by taking the A-B-C-D route you arrive at a more comfortable level with a lot more winds. So, actually, it is better to walk down the block and turn around and come back.

(Weasel clause: It's admitted that the graphs shapes are not exact and varies according to rubber type and size and where the wind and release points are. The whole concept is a matter of degree rather than an exact process.)

There are two ways to get rid of the torque spike. One is to let the prop spin for a number of seconds before launch. Inexact at best, this technique is incredibly hard to pull off in a mass launch situation. Throwing away winds as your competitors keep theirs until the moment of release is too nerve wracking for man or beast. Every time you get eliminated you can only think "I let the prop go too soon" and before long you hoard those hard twisted knots like gold itself and back comes the torque burst like a bad joke.

The second way is a bit more stress free and a lot more exact. The motor is wound to whatever ulcer level you can stand and then is backed off X number of turns by your winder. The beauty of this is by keeping a few notes you can vary the back off turns and give the exact level of launch torque desired.

As a further addendum to the weasel clause, this practice of backing off winds came from indoor modelers as a way to restrict the climb in a world with a ceiling. By cutting the torque spike down, they get a climb to the ceiling (and no higher) and then cruise. Outdoor flyers want to go as high as possible and that torque spike is where the climb comes from. Some outdoor flyers would never cut the torque burst and can successfully control it. Others would rather take a lessened climb for more predictable and repeatable results. With that, choose your weapons, gentlemen!!