

Simple step by step winding without a torque meter.

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Coach Brian's video, "Winding with a Torque Meter", explains how to use a meter to achieve optimum results when you wind. A torque meter will help you get more consistent results for a number of different reasons, so it is highly recommended. If you are winding without a meter, you can modify the winding technique shown in the video so that you can still gain some of the benefits, while avoiding possible problems that are difficult to deal with if you do not have a torque meter.

As you watch the video, noted below are some things that you should do differently if you will wind without a torque meter. These points are referenced to the relevant times in the video. At the end is a step-by-step procedure that you can print out and take with you to the gym when you start winding per these recommendations.

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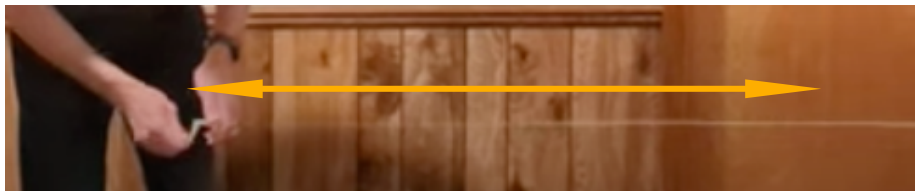
2:15. Don't worry about using the calculator to find maximum turns right now. You won't be winding nearly that hard if you don't have a torque meter.

4:15. You definitely want to wind the rubber off the plane to avoid the possibility of damage if the motor should break. Instead of hooking the motor to a torque meter, you can put a small screw hook into a block of wood, and clamp that to the table in place of the meter.

5:10. Instead of setting a target of 1600 turns (about 90 winder turns), your target should be the number of turns you want on the rubber when you launch the plane. If you're not sure how many that is, start conservatively so that the plane doesn't go whacking around in the ceiling beams on the first flight. For sake of discussion let's suppose that you choose 600 turns to start, which is 40 winder turns with a 15:1 winder.

6:00. As shown, wind 50-60 percent of the number you chose above at full stretch. If you want to launch with 40 winder turns, start with about 20-25 winder turns while stretched, then wind the rest as you approach the table, like he does as he approaches the torque meter.

Important! Notice that Coach Brian orients the winder so that the shaft is along the same straight line as the rubber. If you angle the winder relative to the motor, it puts stress on the winder gears, and will eventually destroy your winder!



7:20. Your target is the total winder turns you set above, 40. Since you did 20 while stretched, wind the remaining 20 turns as you move in, plus one addition turn, to a total of 41. (Reason for the extra turn, then backing off is explained at 15:10). You won't be watching a torque reading while you do this, so just move forward at a uniform pace. The main goals are to always be winding as you move, and to finish with the motor at same length as it will have on the plane, or maybe a little shorter.

10:30. If you had a torque meter, you would want to wind way up and then back down to your intended launch torque like he describes. Instead, wind to one more than you want, then back off one winder turn.

10:50. In your log, record max turns as 41, and backoff turns as 1. (If instead of backoff turns your log specifies turns at launch, that would be 40).

11:10. Very good procedure for having one person transfer rubber to the plane to minimize the chance of breakage. Definitely do it this way!

15:10. Good discussion of hysteresis, reason for backing off turns. This is why it is recommended that you wind one more winder turn than you want, and then back off by one. If you had a torque meter, you could safely wind way more turns, and back off more turns as shown in the video. For now, you can gain some benefits of better winding technique without winding too hard, which causes the rubber to stretch. If you had a torque meter, you could compensate for the stretch, but without a meter, it is better to play it safe, and minimize the stretching.

Another thing you can do to promote consistency is to try to make your motors as alike as possible. Let's say that you are flying well with the rubber marked "0.087" that was supplied with your kit. Try to tie all of your loops so that they finish right up at the maximum, say 1.48-1.49 g. Then, measure the loops. The ones that are nearly the same length will be approximately the same linear density, as coach Brian mentions in the video. Sticking to those most similar motors will help you to achieve more consistent results. But even better would be to have a torque meter.

On the next page, you'll find a step by step procedure that you can use as a guide when you go to the gym to start putting these winding tips in action.

Note: A starting point of 40 winder turns (600 actual), as mentioned above, is probably pretty reasonable for a 1.5 g loop of 3/32" rubber. Depending on the specifics of your plane, results will vary, but this is unlikely to climb the plane too high, up into the ceiling obstructions, on the first flight.

Step-by-step winding procedure (without a torque meter)

1. Lube the rubber, and hook the o-ring on the end with the knot to your wooden block with a hook that is clamped to the table.
2. Stretch the rubber out to 5-6 times its relaxed length. Wind 50-60% of your target turns (20-25 winder turns) while the rubber is stretched.
3. Wind the remaining turns, plus one extra, while you approach the table, ending up at a length that matches the prop to rear hook distance on the plane.
4. Back off one winder turn, and record maximum turns and turns at launch in your flight log.
5. Transfer the rubber to the plane using the technique shown in the video.
6. Launch the plane from down close to the floor. Observe the maximum height and duration. Record these in your flight log. If the plane doesn't reach a height just below the lowest obstructions, add 2 or 3 additional winds for your next flight. Be a little conservative here - you can't want to damage your plane by stuffing it into the ceiling!
7. Repeat this process until you achieve a flight that starts close to the floor and climbs up to just below the lowest ceiling obstructions. Record all flight data in your log.
8. Consider building or buying a torque meter so that you can reap the full benefits of winding harder. This will put more turns on the motor without sacrificing consistency, and your plane will fly longer! The meter will also help to compensate for variations in rubber density, and the stretch that occurs with you wind hard, so you come out ahead in both respects!