How to Make a Flight Log

By
Ray Harlan

Even when first trimming your model to fly, it is useful to create a flight log. It will help you sort out which variables are influencing the model's performance and by how much. Keeping good notes will help you fly the model consistently after it is trimmed. Rubber can be very fickle and seem not to behave the same way on consecutive flights. However, usually it is some difference in the way it is wound or torque levels that is the culprit. A torque meter is one of the most useful tools to get consistent flights. You can make one (see the article Build a Simple Torque Meter) or purchase it from one of the mail-order companies (www.indoorduration.com and links on that site).

Let's take a look at the eleven parameters in the table below. Although you only need six to have a qualified flight log, there are more parameters that should be recorded if you want to learn how to get the most from your model. Motor length always is measured when the motor is new and has never been wound. After a motor is wound the first time, it has some permanent stretch that will increase slightly as it is wound more times. The rules require you to record the motor length when it is new, its width and the weight. The important parameter is length. If all motors weigh 2 grams, width will be inversely proportional to length. If you get your best times on a 14" motor, you will know that a 13" motor will run out of turns too soon or get the model too high and that a 15" motor will not get your model high enough to fly a long time and will come down with a lot of turns left. Being able to adjust the width of a motor, so the length can be changed and the weight held constant, requires the use of a rubber stripper to cut custom widths. There may be a model airplane enthusiast in your area who has one.

When you wind a motor, you should get it close to breaking in order to make it do the most work for you. That is not to say that you launch the model with it fully wound. Rubber exhibits a hysteresis effect; you don't get out what you put in! By winding it all the way up, the unwinding torque curve will be flatter and will have a higher average torque than if the motor is only wound to the launch torque. By recording the max torque and turns, you will know what levels did not break the motor, so you may be able to repeat them for the next windup. After you have gotten the model to fly well, it is worthwhile to wind some motors to breaking so that you know the limits. Rubber is capricious; it may break at surprisingly low torque levels. Always check the motor for little tears in it. If you see any fraying, discard it.

The next two parameters, launch turns and torque, go hand-in-hand to define the energy in the motor at the start of a flight. For a particular motor, they are the variables that control how high the model will climb. Since we fly mostly in low ceilings that have nasty girders, they are critical to learn in order to keep the model safe. The maximum torque that a motor can be wound to is 5 or 6 times higher than the average torque. This means that the rubber is very nonlinear in its torque characteristics. This isn't a terrible thing for us, however. It is easy to see how raising or lowering these two parameters affects peak height. You can think of it this way: at some torque, the model will just fly steady and level. If the torque is increased, it will climb until the motor has unwound to the point of level flight torque. Further unwinding will lower the torque and the model will begin to descend.

Finding the right launch torque should be done in steps. If the model climbs halfway up with 1200 turns, add only 100 turns to the next flight. Notice that the torque goes up much more than the 8% you increased the turns. This time, the model might go three quarters of the way up. Succeeding flights should have turns increased by smaller increments until the model just touches the girders once or twice (or maybe not at all if they catch models easily).

It is important to know how to wind a motor to get the most out of it. To get the most turns, it needs to be lubricated and stretched. Use a lube like ArmorAll or Formula 2001, found in auto parts stores. After some of the liquid has evaporated, they get nice and greasy to keep the rubber from chafing on itself. Stretch the motor about 6 feet and put half of the turns in at that distance. Then continue winding and moving closer to the other end of the motor until it is about 12” long when fully wound. Of course you don’t know what max turns are, so it is clear you need to wind the motor several times and ultimately break it so you can find out how much it takes.

Once you have gotten the model to reach the ceiling, it is time to fine tune the motor used. Every time it lands, put the winder back on the rear of the motor and count how many turns are left. This is a good clue in choosing the right motor. If the rubber has only a few turns, or it ran out of turns in the air, the motor is too short and you need more turns. If it comes down from the ceiling with 700 or more turns, the motor is too long. Ideally, the average torque should be near that needed for level flight. Finding average torque is complex and not really needed. Instead, just experiment with different length motors until you find the one that gets the best time. In a low ceiling (20 – 30 ft.), 250 to 500 turns at landing may be about right.

As a motor is used for more flights, it will take some more turns to get to the max torque. Most of this energy is seen at the end of rundown and is not useful. The important thing is to wind to the same peak torque each time. After each flight, inspect the rubber for nicks or fraying. Discard any that are damaged.

You can measure the height of your flying site with a balloon on a string. Let the balloon touch the girders and use a tape measure to find the length of the string and balloon after it is pulled down parallel to the floor. Proportioning this height (1/2, 3/4, 7/8 etc.) gets you the peak height entry in the log.

Measure off 20 feet on the floor and mark both ends with tape. Start with a heel at the first mark and walk naturally to the second mark, counting steps as you go. Divide 20 by the number of steps to get your step length. When your model is flying, stand under it as it flies by and start walking to the other side of the circle in which it is flying. Count the steps and multiply by the length of your step to get the circle diameter. Models should fly in small circles (10 -15 ft) in small sites and larger circles (20 - 30 ft) in larger sites. If the circle is small and the model is banking a lot, it needs to be retrimmed, perhaps adding left wing washin (twist trailing edge down), removing some left rudder and left thrust. In a site with a peaked roof, a small circle lets the model climb higher and if it does hit a girder and the circle moves, it has less chance of getting into trouble.

It should be clear by now that the parameters listed in the flight log are very useful for improving flights as you build up experience with your model. There are lots more things that could be recorded, but these are the most important ones. Lots of practice will make you a better flier, able to find the best settings in a new flying site at a regional or state meet much faster than someone who just finished a model the night before.

Name ____

	Flight 1	Flight 2	Flight 3	Flight 4	Flight 5
Motor length (new)*					
Motor weight*					
Max turns					
Max torque					
Launch turns*					
Launch torque					
Turns at landing					
Flight time					
Peak height					
Circle diameter					

* required

	Flight 1	Flight 2	Flight 3	Flight 4	Flight 5
Motor length (new)*					
Motor weight					
Max turns					
Max torque					
Launch turns*					
Launch torque					
Turns at landing					
Flight time*					
Peak height					
Circle diameter					

* required

	Flight 1	Flight 2	Flight 3	Flight 4	Flight 5
Motor length (new)*					
Motor weight					
Max turns					
Max torque					
Launch turns*					
Launch torque					
Turns at landing					
Flight time*					
Peak height					
Circle diameter					

* required

Balloon-launched Glider Flight Log

Name ____________________________________

	Flight 1	Flight 2	Flight 3	Flight 4	Flight 5
Model weight					
Height at launch					
Flight time					
Circle diameter					

	Flight 6	Flight 7	Flight 8	Flight 9	Flight10
Model weight					
Height at launch					
Flight time					
Circle diameter					

Name ____________________________________

	Flight 1	Flight 2	Flight 3	Flight 4	Flight 5
Model weight					
Height at launch					
Flight time					
Circle diameter					

	Flight 6	Flight 7	Flight 8	Flight 9	Flight10
Model weight					
Height at launch					
Flight time					
Circle diameter					

Name ____________________________________

	Flight 1	Flight 2	Flight 3	Flight 4	Flight 5
Model weight					
Height at launch					
Flight time					
Circle diameter					

	Flight 6	Flight 7	Flight 8	Flight 9	Flight10
Model weight					
Height at launch					
Flight time					
Circle diameter					