Helicopter Data Log

Helicopter ID: _____ **Team:** _____

Date (m/d/yr)	Motor before windup Width (in)	Length (cm)	Mass (g)	Turns max/launch ÷15*	Torque max/launch (in-oz)	Maximum height (ft)	Flight duration (min:sec)	Turns Remaining ÷15*	*You don't know what you're doing unless you know what you've done!* comments
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*** Replace "÷15" with correct number if your winder has a different ratio**

Basic Helicopter Data Log Template: Why should I keep a log?

By Dave Drummer for NFFS

Keeping a data log for your flights isn't just something you should do just to add some bonus seconds to your helicopter times, but is an essential aspect of improving your flights and repeating them consistently when you have things working well. The rules for Helicopter specify 3 required parameters and also 3 additional parameters that you are able to choose. The following discussion is not intended to be all inclusive of the possibilities, but relates to the **Basic Helicopter Data Log Template** shown below. This log can be downloaded as .pdf or .xlxs. (Links at end of description paragraph for this document.) The spreadsheet file can be modified to fit your particular needs.

Helicopter Data Log

Helicopter ID: _____ **Team:** _____

	Motor before windup			Turns	Torque	Maximum	Flight	Turns	*You don't know what you're doing unless you know what you've done!*
Date	Width	Length	Mass	max/launch	max/launch	height	duration	Remaining	
(m/d/yr)	(in)	(cm)	(g)	÷15	(in-oz)	(ft)	(min:sec)	÷15	comments
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Basic Helicopter Data Log Template: What use is all of that data?

Required parameters (One from each item 1-3 below is necessary)

1. **Motor size before windup**. There should be enough information about the rubber motor so that you could make another equivalent motor, and use that motor to closely duplicate a particular flight. There are a number of ways to satisfy this parameter requirement. It wouldn't hurt to use all three of the ones below.

   Width (in). If you purchase rubber in a stock width, like 3/32", you can record that, either as 3/32 or the decimal equivalent. If you purchase rubber from one of the kit suppliers, it will be marked, eg. 0.087". We stripped our own, and used to record the width to which our stripper was set. Inches used for this because strippers are typically marked in decimal inches, and rubber is sold marked in fractional inches.

   Length (cm). This would be the length of the loop, measured in some repeatable way of your choosing. I used cm for the units so there is no need to deal in fractions. Decimal inch rulers are hard to find!

   Mass (g). Mass in grams of the loop, including o-rings, if you use them. Many experienced fliers like to record the linear density of the loop, because rubber density can vary somewhat along the strip. Loops of the same mass and length tied from a particular width of rubber should be fairly equivalent.

2. **Turns or Torque at Launch.** If you are using optimal winding technique, you really want both of these. Once again, the goal is to use an equivalent motor to match a previous flight with an equivalent winding method.

   Turns. "Turns" means how many times the rubber has been twisted through one 360° rotation. If you count and record how many times you crank the winder handle, this column should be labelled as "Turns÷15"*. Good to know so you can anticipate how many turns to wind while stretched out, when to start moving in toward the torque meter. (Turns is a unitless quantity, so no units label is needed)

   * If your winder has a ratio different from 15:1, change the label on this column!

   Torque. Torque is typically measured with units of inch-ounces (in-oz), though there are some inexpensive torque meters that have an arbitrary scale, like 1-10. In this case, since the rules include units for numerical values, units should be specified as (arbitrary).

   This is good to know so you don't exceed a torque that is likely to break the rubber. **Important! Helicopter motors are typically wound to very high torques. It is recommended not to wind a wire element torque meter more than on complete rotation of the dial, or you may damage the meter!**

3. **Flight Time (min:sec) or (s).** Often referred to as flight duration, why you record this is obvious, though it is maybe not so obvious that the units should be labelled as shown, or as (s). All parameters should include appropriate units, unless they have none.

<u>Three additional parameters chosen by the team</u>.

Additional motor parameters. To satisfy the required parameter 4.a.i.(1), you need the motor's width <u>or</u> length <u>or</u> mass. Since varying these motor parameters is by far the most important part of optimizing your flight times, it is not a bad idea to record all three of them, and this covers two of the additional parameters.

Torque (in-oz) at Launch. If you used turns as a required parameter, torque is a good additional parameter if you are winding with a torque meter. Measuring torque while you wind can promote better efficiency and longer flights, for reasons discussed elsewhere in the NFFS resources.

Maximum Height (ft). Unlike when you are flying an airplane, the helicopter will typically pin itself up against the ceiling during most of its flight. If you fly in different

locations with different ceiling heights, this parameter will be useful in comparing results when the height is different.

Turns remaining. When you pick up the helicopter after it lands, prevent the rotors from rotating. Transfer the motor back onto the winder and whatever you hook the other end to, and count how many winder turns are left by winding backwards. In general, if you run out of turns before landing or there are very few remaining, this suggests a longer loop might be better. Conversely, many turns remaining suggests a shorter loop is warranted.

Other parameters. As stated previously, the parameters on this log sheet will easily satisfy the requirements in the SO Flight rules, but are not intended to be an all-inclusive list. One thing you might add at some point is the linear density of the rubber in a particular motor, if you use that method, as described in the Next Level Helicopter Flying resource.

Comments. Miscellaneous things that you observe, maybe things you need to change on subsequent flights, or a reminder that something did or didn't work. If you have a comment filled in for every flight, an event supervisor might count this as one of the 3 additional parameters, but it may be better to err on the side of caution, and to have 6 columns of numerical data.

A sample log that includes the parameters discussed above can be downloaded as a pdf or modifiable Excel file via the links on the NFFS resource page, down at the bottom of the paragraph that describes this document.

Summary: Make sure that you have enough recorded data to satisfy the rules. If you record all three of the motor size parameters, turns at launch, maximum height, and duration for 10 or more flights, you will satisfy the minimum requirements.

Helicopter Data Log

Helicopter ID: _____ **Team:** _____

	Motor before windup			Turns	Torque	Maximum	Flight	Turns	*You don't know what you're doing unless you know what you've done!*
Date	Width	Length	Mass	max/launch	max/launch	height	duration	Remaining	
(m/d/yr)	(in)	(cm)	(g)	÷15	(in-oz)	(ft)	(min:sec)	÷15	comments
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For pdf and Excel versions of this same log, see the links at the end of the description for this resource document.