Evaluating Science Olympiad Helicopter Flight Logs

NFFS SO Education Committee, Fall 2025

This presentation is designed to assist those serving as Event Supervisors for the Science Olympiad Helicopter event (either B or C division) in evaluating helicopter flight logs, per item 5 in the rules. Intended mainly for an ES with little or no previous experience in this event, it builds on many years of observations by experienced supervisors who have extensive knowledge of indoor flying events.

Item 5 in the Helicopter rules:

5. **FLIGHT LOGS:**
   a. Teams may present a Flight Log of recorded data for a BONUS. This data must include 6 or more parameters (3 required and at least 3 additional) with data for 10 or more test flights prior to the competition.
      i. The required parameters are:
         (1) Motor Size before wind-up
         (2) Number of Turns on Launch or Torque at Launch
         (3) Flight Time
      ii. The team must choose 3 additional data parameters beyond those required (e.g. turns remaining at landing, estimated/recorded peak flight altitude, the motor torque at landing, propeller pitch, etc.)
   b. All numeric data must include units which may be listed with the column headers of the log. Torque units may be "arbitrary" if an uncalibrated torque meter with arbitrary numbers is utilized.
   c. All logs will be returned to teams after inspection.

Above are the requirements for flight logs as published in the 2025/26 rules. Since some of what the rules specify may not be obvious if you have limited experience with indoor flying events, it is highly recommended that you take a look at the sample log template on the NFFS website. The pdf version includes a detailed discussion of numerous log parameters, including how they are measured, appropriate units for each, and other pertinent information.

On the next slide, we will start with a simulated flight log based on many observations by some experienced event supervisors. This log has been purposely seeded with numerous common shortcomings and omissions.

As this presentation proceeds, we will discuss these issues, explaining why they do not comply with the rules, and how to correct them. In each case, the log will be revised in red text on the next slide.

Some of these issues will render a log “partial”, per rule 6, though there are some exceptions, which will be noted in blue text. In these latter cases, we will recommend that you advise the students to make certain changes to reduce the chance that a future ES will assess a penalty based on a slightly different interpretation of the rules.

At the end, there will be a corrected, annotated version that you can use as a reference while evaluating logs at a tournament.

Flight #	Date	Motor size Before windup	Turns at launch	Flight time	Peak flight altitude	Comments
1	03/15/2025	0.125	30	15	10	
2		0.125	30	17	10	Needs more turns
3		0.125	40	28	10	
4		0.125	40	26	10	
5		0.125	50	31	10	
6	03/19/2025	0.125	50	12	17	Hit wall, slid to floor
7		0.125	50	33	17	
8			50	32	17	
9			60	8	8	Motor broke during flight
10			60	41	17	

This log has 10 numbered flights. The columns with their labels highlighted in yellow appear to match these requirements in rule 5.a:

i. The required parameters are:
(1) Motor size before windup
(2) Number of turns on the motor or torque at launch
(3) Flight time

However, since these are **required** parameters, each of them must be recorded for a given flight in order for that flight to count as one of the required 10. Since the motor size was recorded for only the first 7 flights, flights 8-10 would not satisfy the requirements, and this log would be scored as “partial”.

Flight #	Date	Motor size Before windup	Turns at launch	Flight time	Peak flight altitude	Comments
1	03/15/2025	0.125	30	15	10	
2		0.125	30	17	10	Needs more turns
3		0.125	40	28	10	
4		0.125	40	26	10	
5		0.125	50	31	10	
6	03/19/2025	0.125	50	12	17	Hit wall, slid to floor
7		0.125	50	33	17	
8		0.125	50	32	17	
9		0.125	60	8	8	Motor broke during flight
10		0.125	60	41	17	

OK, now there are 10 flights, all of which have data entered for each of the 3 required parameters. But let's look at the middle column: "Turns at launch". Except in unusual circumstances (eg students winding with their finger), a typical helicopter will be launched with at least several hundred turns, often more than a thousand. These numbers are almost certainly "winder turns", and each turn of the geared winder puts multiple turns on the rubber. A typical gear ratio is 15:1. In that case, the turns column should be labeled as "Turns at Launch ÷15". NFFS recommends that failing to observe this distinction does not warrant a penalty, but that the student should be advised to revise it, as a future ES may expect that their log is labeled accordingly.

Flight #	Date	Motor size Before windup	Turns at launch ÷15	Flight time	Peak flight altitude	Comments
1	03/15/2025	0.125	30	15	10	
2		0.125	30	17	10	Needs more turns
3		0.125	40	28	10	
4		0.125	40	26	10	
5		0.125	50	31	10	
6	03/19/2025	0.125	50	12	17	Hit wall, slid to floor
7		0.125	50	33	17	
8		0.125	50	32	17	
9		0.125	60	8	8	Motor broke during flight
10		0.125	60	41	17	

The next issue is that the motor size and flight time are parameters that have units, but no units are indicated. The motor parameter shown here is likely the rubber width, 0.125”, as 1/8 inch is a common stock size for rubber, and is the size that most current helicopter kits are shipped with. The recorded flight times are certainly seconds, so that column should either indicate (s), or (min:sec), as shown on the next slide.

Note: Item 5b of the Helicopter rules says “**All** numeric data must include units”. One exception to this is unitless parameters, such as turns data, which are just a number.

Flight #	Date	Motor size Before windup	Torque at launch (Arbitrary)	Flight time	Peak flight altitude	Comments
1	03/15/2025	0.125	4	15	10	
2		0.125	4	17	10	Needs more turns
3		0.125	6	28	10	
4		0.125	6	26	10	
5		0.125	7	31	10	
6	03/19/2025	0.125	7	12	17	Hit wall, slid to floor
7		0.125	8	33	17	
8		0.125	8	32	17	
9		0.125	8	8	8	Motor broke during flight
10		0.125	9	41	17	

Students who wind using a torque meter may include torque in their log (may be substituted for or in addition to turns.) Most torque meters are calibrated in units of "inch-ounces" (in-oz). There is one commercially available meter that is uncalibrated, and has its dial marked from 0-12. A torque meter constructed by the students may also be uncalibrated. The rules state:

"Torque units may be "arbitrary" if an uncalibrated torque meter with arbitrary numbers is utilized."

The torque column in the log shown here would be in compliance with the rule book. If using a meter calibrated in in-oz, typical values would be in the 0-2 in-oz range.

Flight #	Date	Motor width Before windup (in.)	Turns at launch ÷15	Flight time (min:sec)	Peak flight altitude	Comments
1	03/15/2025	0.125	30	0:15	10	
2		0.125	30	0:17	10	Needs more turns
3		0.125	40	0:28	10	
4		0.125	40	0:26	10	
5		0.125	50	0:31	10	
6	03/19/2025	0.125	50	0:12	17	Hit wall, slid to floor
7		0.125	50	0:31	17	
8		0.125	50	0:32	17	
9		0.125	60	0:08	8	Motor broke during flight
10		0.125	60	0:41	17	

Ok, now we have 10 flights with data that includes all three of the required parameters. Now we need to see 3 additional parameters.

The team must choose 3 additional data parameters beyond those required (e.g., turns remaining at landing, estimated/recorded peak flight altitude, the motor torque at landing, propeller pitch, etc.).

Peak flight altitude would count as one of those, if it included units, probably (ft.) in this case. Per the rule above, this log needs two more parameters in order to be considered complete.

Flight #	Date	Motor width Before windup (in.)	Motor Length (cm)	Turns at launch ÷15	Turns remaining at landing ÷15	Flight time (min:sec)	Peak flight altitude (ft)	Comments
1	03/15/2025	0.125	"X"	30	"X"	0:15	10	
2		0.125	"X"	30	"X"	0:17	10	Needs more turns
3		0.125	"X"	40	"X"	0:28	10	
4		0.125	"X"	40	"X"	0:26	10	
5		0.125	"X"	50	"X"	0:31	10	
6	03/19/2025	0.125	"X"	50	"X"	0:12	17	Hit wall, slid to floor
7		0.125	"X"	50	"X"	0:31	17	
8		0.125	"X"	50	"X"	0:32	17	
9		0.125	"X"	60	"X"	0:08	8	Motor broke during flight
10		0.125	"X"	60	"X"	0:41	17	

One possibility has peak altitude and 2 additional parameter labels shaded in violet. Motor width would count as a required parameter, but motor length, as shown, or motor mass (g) would be appropriate additional parameters considering that one of the main parameters used to optimize flight times is the amount of rubber used for the flight. Turns remaining is one of the examples from the rulebook. Students with a torque meter could measure torque at launch, and/or after landing. There are other possibilities, but remember that, as denoted by "X", each or 10 or more flights must have values recorded for at least the 6 parameters specified in the rules.

Valid parameters are typically something you adjust, or an observation about the flight, so things like flight number and date, while they can be useful in a log, do not count as one of the 6 necessary parameters. Likewise comments are not a safe choice for an additional parameter.

The final slide (next) is a corrected, annotated copy of the original log that started this presentation. In addition to that and your copy of the helicopter rules, you may also find it helpful to print a copy of the parameters discussion from the NFFS sample log template, found here.

Flight #	Date	Motor width Before windup (in.)	Motor Length (cm)	Turns at launch ÷15	Turns remaining at landing ÷15	Flight time (min:sec)	Peak flight altitude (ft)	
1	03/15/2025	0.125	"X"	30	"X"	0:15	10	
2		0.125	"X"	30	"X"	0:17	10	Needs more turns
3		0.125	"X"	40	"X"	0:28	10	
4		0.125	"X"		"X"	0:26	10	
5		0.125	"X"		"X"		10	
6	2025	0.125	"X"		"X"		17	
7		0.125	"X"		"X"		17	
8		0.125	"X"	50	"X"		17	
9		0.125	"X"	60	"X"	0:08	8	Motor broke during flight
10		0.125	"X"	60	"X"	0:41	17	

Three required parameters (yellow) plus 3 additional parameters (violet) with data for 10 or more flights.

Minimum of 10 flights

Advise students as to difference between turns and winder turns, but no penalty.

Each of six necessary parameters should have correct units. (s) would also be correct units for flight time.

Comments not counted as one of the 6 necessary parameters.

Flight number and date not counted as one of the 6 necessary parameters.

Each of six necessary parameters must have data for at least 10 flights.

Torque at launch (Arbitrary)

4

If torque is included in log, units should be either "in-oz" or (arbitrary) if the meter is not calibrated.