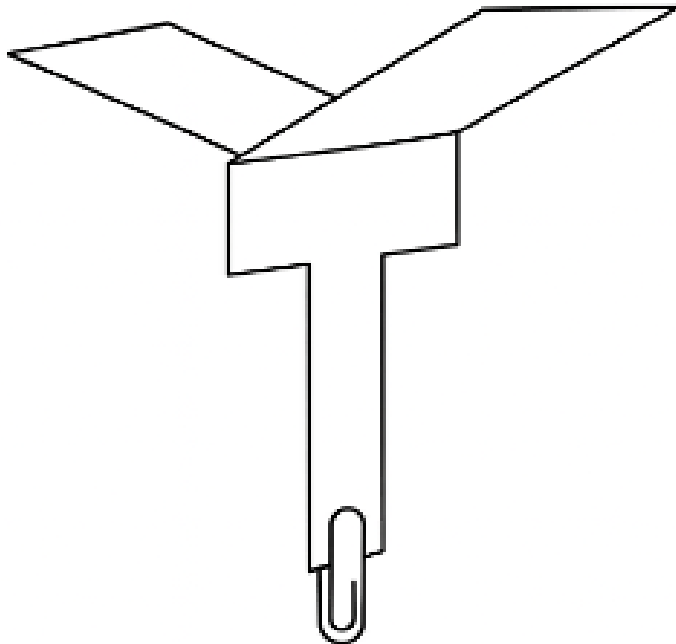


Paper Helicopter Blade Length STEM Lab

Blade Length vs Descent Time

Scientific Method • Variables • Data & Graphing

- ✓ Classroom-Ready
- ✓ Data tables + Templates Included



Teach With
Fergy



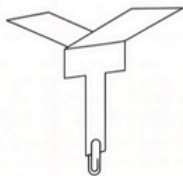
Helicopter Blade Length STEM Lab – Blade Length vs Descent Time - Teacher

Purpose

Investigate how the length of paper helicopter blades affects descent time.

Materials (per team)

- Paper helicopter templates printed on regular copy paper (or index cards for sturdier models)
- Scissors, ruler, pencil; paper clips for mass at the tail (1 small clip)
- Stopwatch or timer app; measuring tape for drop height
- Data sheets and pencils



Controls to Keep the Test Fair

- Use the same paper type and tail weight (one small paper clip).
- Keep fold pattern and blade width the same across all models.
- Release from the same height each trial.
- Release method: hold by the tail, arms extended, release without push or spin; blades horizontal at release.
- Time from release to first touch on the floor. Use the same timer for all trials if possible.

Background Science

As a paper helicopter falls, the offset blades create torque and spin. Spinning increases air resistance (drag). Longer blades increase area and leverage, generally increasing drag and descent time up to a point; very long blades may bend or flutter and reduce stability.

Answer Key and

Blade Length (cm)
6
8
10
12
14

Interpretation

- In the sample
- Longer blades
- stability and

Model Responses

- Best (slowest)
- Pattern: round
- Critical content
- consistent results
- Next test: could increase drag

Rubric

Category	4 — Exceeds	3 — Meets	2 — Approaches	1 — Beginning	0 — Not Evident
Experimental Design & Build Fidelity	All controls followed; precise lengths; same width and folds; consistent release and timing.	Minor slips but fair test preserved.	Several inconsistencies affecting fairness.	Major inconsistencies; not repeatable.	Not attempted/unsafe.
Variables & Controls	IV, DV, and key controls correctly stated and maintained.	IV/DV correct; most controls applied.	IV/DV partly correct; several controls missing.	Variables unclear; controls absent.	Not addressed.
Data Quality & Recording	3 trials for each length; neat entries; averages computed; anomalies noted.	All lengths tested; minor omissions/messiness.	One length missing or inconsistent units.	Two or more lengths missing; data unreliable.	No usable data.
Graphing & Communication	Correct bar graph with title/labels; accurate bars; best length identified.	Graph present with minor issues.	Graph present but missing key elements.	Incorrect graph or major errors.	No graph.
Claim—Evidence—Reasoning	Clear claim naming best blade length; cites data; explains drag mechanism.	Claim with data and partial reasoning.	Claim or data present; reasoning generic/weak.	Vague claim with no evidence.	No CER.
Collaboration & Safety	Roles shared; safe drops; area clear; cleanup complete.	Mostly safe/organized; occasional reminders.	Uneven participation; repeated reminders.	Off-task or unsafe behaviors.	Unsafe/remove d.

Helicopter Blade Length STEM Lab – Blade Length vs Descent Time

Driving Question

How does paper helicopter blade length affect descent time from a fixed height?

Hypothesis

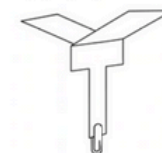
Write a testable hypothesis predicting which blade length will produce the longest average descent time and why.

Variables

Type	Describe for This Experiment
Independent Variable (IV)	Blade length (cm): 6, 8, 10, 12, 14
Dependent Variable (DV)	Descent time (seconds) from the same drop height
Controlled Variables	Blade width, paper type, tail mass (1 small paper clip), fold pattern, drop height, release method, timing method

Procedure

- Build five helicopters with the same fold pattern and blade width but different blade lengths: 6, 8, 10, 12, and 14 cm.
- Attach one small paper clip to the tail of each helicopter for stability.
- Mark the drop height (for example, 2.5 m) and a landing area free of drafts.
- Hold the helicopter by the tail with blades horizontal. Release without adding extra push or spin.
- Time from release to first floor contact. Record to the nearest 0.1 s.
- Repeat for 3 trials at each blade length, then compute averages.



Raw Data Tables (3 trials each)

	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)
Blade Length: 6 cm			
Blade Length: 8 cm			
Blade Length: 10 cm			
Blade Length: 12 cm			
Blade Length: 14 cm			

Summary Table

Blade Length (cm)	Average Time (s) = (Trial 1 + 2 + 3)/3
6	
8	
10	
12	
14	

Graphing

Create a bar graph titled Average Descent Time vs Blade Length. X-axis = Blade Length. Y-axis = Average Descent Time.

Analysis Questions

- Which blade length produced the longest average descent time? Include the value.
- Describe the pattern as blade length increased. Was the relationship linear, curved, or did it plateau?
- Which controlled variables were most important for a fair test?
- What would you test next (blade width, tail mass, drop height, material)? Write a new hypothesis.

What You Get

- **Teacher Guide:** setup, pacing, and background science (drag, autorotation, surface area, stability).
- **Student Packet:** clear, step-by-step build and release procedures plus raw data tables for 5 blade lengths (6, 8, 10, 12, 14 cm) with 3 trials per length.
- **Summary & Graphing Pages:** average-by-length table and graph template (Average Descent Time vs Blade Length) with included graph paper and blade template.
- **Analysis & Model Answers:** four prompts with sample class data and exemplar CER responses explaining drag/area and rotation effects.
- **Rubric:** rubric for easy grading.