Family edition

Flight Lab: Stop the Dive

Ages 11-14 · about 45 minutes, in one sitting

Your child makes a paper plane dive in Flight Lab, then bends the back edges of its wings to make it glide, and uses a paper clip to move its balance point.

What you need

- A computer or Chromebook with a current browser, and a mouse or trackpad.
- The lesson link: mytekdev.com/try/flightlab?lesson=stop-the-dive&ref=fam-flightlab-2. No account, no email and nothing to install.

Before you start: try it once yourself

Open mytekdev.com/try/flightlab?lesson=stop-the-dive&ref=fam-flightlab-2. A short guide opens over the app. It is the classic dart, with its back edges flat instead of the 12 degrees up it usually comes with. To set an exact number, click a slider once and press the left and right arrow keys: each press moves it one step.

1. **The dive.** Press `Fly` and `Throw it` (How hard 3): "A dive: 14 ft." The bench says to bend the back edges up a little to lift the nose.
2. **The bends.** On `Shape`, set both back edges to the same number, then throw on `Fly`: at 4 it glides 19 ft; at 8 and at 12, 24 ft; at 16, 20 and 24 it still glides but slower and shorter: 21, 18 and 16 ft.
3. **The clip.** With both edges at 20 (18 ft), pick Near the front under Paper clip: 21 ft. In the middle: 20 ft.

> The moment that lands is the first glide. One small bend at the back changes the whole flight, and children want to know why.

The ideas, in plain words

A folded plane's weight acts at its balance point, which sits near the nose because most of the paper is folded there. The wings' lift acts a little behind the balance point, so it tips the nose down. Air pushes down on a back edge bent up, which tips the nose back up, like a seesaw with the balance point in the middle. When the two match, the plane glides. Getting them to match is called trim.

Too little bend and the nose drops: a fast dive. Too much and the nose is held up, the plane flies slower, and it lands short. A paper clip is weight: near the front it moves the balance point forward, away from the lift, so the plane can carry more bend before it slows down too much. Flight Lab says which side of the lift the balance point is, never a distance.

Common mistakes: the heavy nose itself tips the plane (weight acts at the balance point and cannot turn the plane about it); throwing harder will fix a dive; changing the bend and the throw together. Flight Lab works out each flight

from the folded shape and the throw. A few of its numbers are our own, set where no published measurement exists, so a real paper dart lands near the distances on screen, not exactly at them. Real throws also vary more than the app's, real paper softens with use, and the app never shows a stall: its short paper wings tip over before they would stall.

Do it together

1. Open mytekdev.com/try/flightlab?lesson=stop-the-dive&ref=fam-flightlab-2 together. A short guide opens over the app. Press `Fly`, then `Throw it`.

   > **You'll know it worked when:** With flat back edges the plane dives into the floor at 14 ft.

2. Press `Shape`. Set Left back edge and Right back edge both to 8. Press `Fly` and `Throw it`.

   > **If you get stuck:** Click a slider, then press the arrow keys to move it one step at a time.
   >
   > **You'll know it worked when:** A steady glide of 24 ft.

3. Try 16 and 24, the same on both sides, throwing each time.

   > **You'll know it worked when:** 21 ft and 16 ft: still glides, but slower and shorter.

4. With both at 20, pick Near the front under Paper clip and throw. Ask: why did the clip help?

   > **If you get stuck:** Read the line under the clip choices.
   >
   > **You'll know it worked when:** About 21 ft, against 18 ft with no clip.

Talk about it

Ask these while you work together. A child who has understood it can answer them without help:

- What did the plane do with flat back edges, and what did the bench say to do?
- Which bend went farthest? How do you know it was the bend and not something else?
- Why did a big bend make the plane slower?
- How does a bend at the back lift the front?
- Why did the clip near the front help most?

> The fourth question is the real test: a child who describes a seesaw with the balance point in the middle has the idea.

For younger and older kids

Younger: For a younger child, try 0, 8 and 24 only, and balance a ruler on a pencil to show the seesaw.

Older: For a teenager, try another plane from the Plane bench and find its best bend.

Keep going

- Try 10, between 8 and 12. Is there a bend that beats 24 ft?
- Pick another plane on the Plane bench, such as the snub-nose dart or The NASA glider. Flatten its back edges and find its best bend.
- Put the clip Near the front with the back edges at 12. Does it help as much as it did at 20? Why might it not?

Bring it into other subjects

- Math: graph distance against bend, 0 to 24. Where is the top? Is the graph flat near the top?
- Building: balance a folded paper dart on a fingertip and mark its balance point. Add a paper clip at the nose and find it again.
- History: find out what the elevators on a real airplane's tail do, and how pilots trim a plane for steady flight.
- English: explain trim to a younger child using only a seesaw.

For your records

Ready to copy into an hour log, a portfolio or a transcript.

LESSON	Flight Lab: Stop the Dive
SUBJECTS	Physical science, Engineering
TIME	45 minutes
WHAT WE DID	Made a paper plane dive and glide on purpose, found its best trim by changing one thing at a time, and explained its balance.
SKILLS PRACTICED	Forces and balance; Changing one variable; Engineering design

Activity sheet (optional)

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/flightlab?lesson=stop-the-dive

Essential question: Why does a paper plane dive, and how do you make it glide?

Warm-up: Your paper plane keeps diving into the floor. What would you change to fix it?

_____

1. **Vocabulary.** Balance point, back edges, trim, variable, dive: write each in your own words.

2. **The bend table.** For back edges 0, 4, 8, 12, 16, 20, 24 (both the same, How hard 3): what it did _____; how far _____ ft. Then 20 with the clip Near the front _____ ft, and In the middle _____ ft.

1. Which bend went farthest? Why did less bend and more bend both go shorter?

2. Why did the paper clip near the front help the plane with a big bend?

Quick check

Name: _____

1. A paper plane dives into the floor. You should (A) bend both back edges up a little (B) bend both back edges down (C) throw it harder

2. Moving a paper clip toward the nose moves the balance point (A) forward (B) backward (C) nowhere

3. Explain how bending the back edges up lifts the nose. Use the word balance point.

Answers

QUESTION	ANSWER	WHY
1	A	Air pushes down on edges bent up, which tips the nose up and stops the dive.
2	A	The clip is weight, so the balance point moves toward it.
3	A seesaw about the balance point	The wings' lift acts a little behind the balance point and tips the nose down. The air pushes down on the bent-up back edges, far behind it, and tips the nose back up. "The bend pushes the back down" without the balance point is half.

If your state or umbrella school asks, this lesson covers NGSS MS-PS2-2, NGSS MS-ETS1-3.

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The app this lesson uses is free and runs in the browser, with nothing to install and no account needed. It is at mytekdev.com.

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