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Flight Lab: Stop the Dive

Grades 6-8 · 45 minutes

Physical science · Engineering



Slides, rubric and answer key | Print and go | No student accounts | Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a bend table
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 4 and 5 and in high school physics
- Standards: NGSS

Flight Lab: Stop the Dive

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A paper dart with flat back edges dives into the floor. Students bend both back edges up a little at a time and record each throw: too little and it dives, about 8 to 12 degrees and it glides 24 ft, more and it slows and lands short. Then a paper clip near the front moves the balance point forward and lets a big bend fly farther. They explain it as a seesaw: the wings' lift behind the balance point against the back edges' push.

At a glance

ESSENTIAL QUESTION

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

OBJECTIVES

Students will be able to:

- make a plane dive on purpose and say why
- test one change at a time and find the bend that glides farthest
- explain how bending the back edges up lifts the nose
- explain how a paper clip moves the balance point

VOCABULARY

Balance point, Back edges, Trim, Variable, Dive

STANDARDS

MS-PS2-2, MS-ETS1-3

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student, with a mouse or trackpad
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/flightlab?lesson=stop-the-dive&ref=tpt-flightlab-2 once on a student computer: it opens on the classic dart with its back edges flat. Run it yourself, about ten minutes: press Fly and Throw it (a dive, 14 ft), then on Shape set both back edges to 4, 8, 12, 16, 20 and 24, throwing each time, then try the paper clip. The starter is set to feet and letter paper. The two buttons under Units on the Fly bench switch to meters (about a third as big).

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install and no sound. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: your plane keeps diving, what do you change? Write every answer on the board.	Answer the warm-up on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app with the starter open. Press Fold, then Show the layers: the nose is brightest, the most paper. Press Fly and Throw it: "A dive: 14 ft." Read the advice under it aloud. Show the layers slide and the stat slide. > **It's working when:** The bench says which side of the lift the balance point is, never a distance. Ask students to say it as a seesaw: the wings' lift, a little behind the balance point, tips the nose down.	Watch, and fill in the vocabulary on the worksheet.
12 to 22	**Guided practice (We do)** Stop the dive together	Students open the link or scan the QR code. A short guide walks them through the dive and a bend of 8 on both back edges. Ask what changed. > **Watch for:** Students who change only one back edge. The plane curves off to one side; that is the next lesson. Today, both edges the same.	Fill in the first two rows of the bend table: flat, and 8.
22 to 38	**Independent practice (You do)** The best bend	Students set both back edges to 4, 8, 12, 16, 20 and 24, throwing each at How hard 3, then put both at 20 and try the paper clip Near the front and In the middle. Walk the room with the What to look for questions. > **If they ask:** "At 24 it still glides, but slower and shorter. Why would a plane with its nose held up go slower?" Too much bend	Fill in the bend table and the clip rows, then answer the questions.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Two students explain the seesaw, then go back to the warm-up answers. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/flightlab?lesson=stop-the-dive&ref=tpt-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 students want to know why.

Background for the teacher

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.

What to look for

Ask these while students work. A student who has understood the lesson 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 student who describes a seesaw with the balance point in the middle has the idea.

Cross-curricular extensions

- 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 student using only a seesaw.

Vocabulary

Balance point	The point where the plane would balance on a fingertip. Its weight acts there.
Back edges	The back corners of the wings, bent up a little before a throw.
Trim	Small changes that make a plane fly steadily: the wings' lift and the back edges' push matched.
Variable	Something you change in a test. Change only one at a time.
Dive	Nose down, flying fast and steeply into the floor.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the screen as you say each word: the flight line, the plane and the slider numbers carry the meaning.
- Pair each learner with a partner; draw the seesaw on the board with the balance point, the lift and the back edges' push as arrows.
- Accept the bend table as numbers and flight names copied from the screen.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students for the independent part, one at the app and one filling in the table.
- Show them how to click a slider, then press the arrow keys to move it one step at a time.
- Allow three bends instead of six, where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "With flat back edges the plane ___. Bent up to ___, it ___."
- A check-in after the guide: every student has a dive and a glide before anyone moves on.
- Give three bends only: 0, 8 and 24.

STUDENTS READY FOR MORE

- 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?

Adapting for other grades

Younger students: In grades 4 and 5, do the guide together on the projector, then let pairs share a computer with one student on the mouse and one recording. Give them the numbers to try instead of asking them to choose. Skip

the third rubric row; total 8, and 6 meets the objectives. Use three bends: 0, 8 and 24, and talk about the seesaw with a ruler balanced on a pencil.

Older students: In high school physics, write it as torques about the balance point: the wings' lift at a small distance behind it, and the back edges' downward push at a longer distance. Students explain why trim depends on speed, using lift that grows with the square of the speed.

Student worksheet

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?

Flight Lab: Stop the Dive

Exit ticket

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.

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Exit ticket

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

Answer key: exit ticket

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.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
The bend table	Every bend from 0 to 24 and both clip places, each with what it did and how far, and How hard kept at 3.	At least five bends with what it did and how far.	Some bends recorded, or two things changed at once.	No bends recorded.
The best bend	Names the best bend from the table and says why both less and more bend went shorter.	Names the best bend from the table.	Names a bend that glided, with no reason.	No answer.
Explaining balance	Explains the seesaw: lift behind the balance point tips the nose down, the bent edges tip it back up, and the clip moves the balance point forward.	Says the bent edges lift the nose and the clip moves the balance point.	Says the bend or the clip helps, with no reason.	No answer.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for MS-PS2-2, forces and the plane's motion, with MS-ETS1-3 for comparing several bends and clip places and combining the best.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-PS2-2**	6-8	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	Students change the bend and the clip's place, one at a time, and record how the plane's motion changes.
NGSS	**MS-ETS1-3**	6-8	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	Students compare the flights of seven bends and two clip places, and combine a big bend with a clip near the front.

Checked November 2026 against: NGSS MS-PS2-2, Motion and Stability, NGSS MS-ETS1, Engineering Design.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/flight-lab/lessons/stop-the-dive/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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