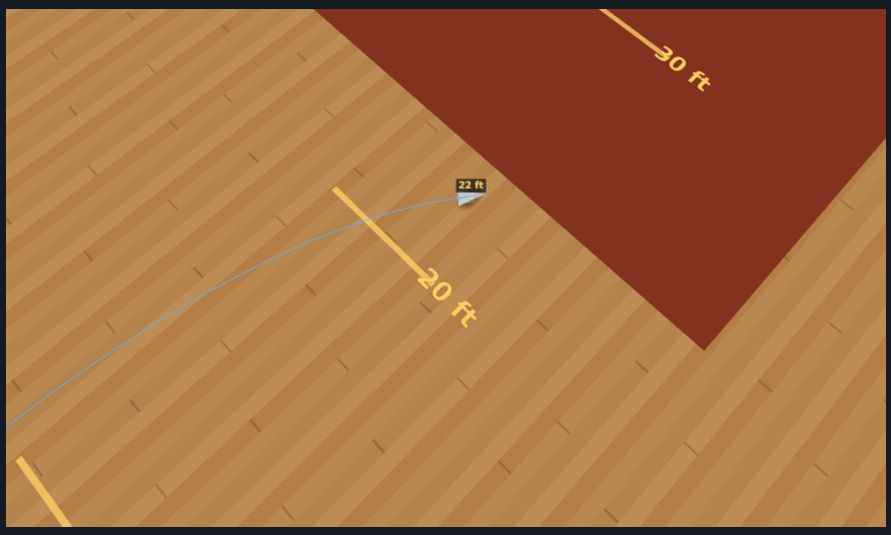
mytekDev

Flight Lab: Steer It Down the Hallway

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 hallway log
- 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

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Students bend one back edge of a paper dart up a little more than the other and watch it bank and turn toward that side: a gentle curve about a foot to the side. Bent very differently, it rolls over and falls. Then the challenge: a hallway 49 feet long, low and narrow. As it comes the dart glides 24 ft; thrown harder it hits the ceiling. Students change one thing at a time until it flies all the way.

At a glance

ESSENTIAL QUESTION

How do you steer a paper plane where you want it to go?

OBJECTIVES

Students will be able to:

- turn a plane left or right on purpose and say the rule
- explain why a banked plane turns, using lift
- test changes one at a time against a goal with limits: the ceiling, the walls and the length
- explain which changes got the plane down the hallway

VOCABULARY

Bank, Roll, Criteria, Constraints, Iterate

STANDARDS

MS-ETS1-2, MS-ETS1-4

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=steer-it-down-the-hallway&ref=tpt-flightlab-3 once on a student computer. Run it yourself, about ten minutes: on Shape set Left back edge 10 and Right back edge 14, then on Fly press From above under Watch and Throw it (a turn, 22 ft, curving right), swap them, try 8 and 16 (a roll), then press Put it back as it came, pick Hallway under Where and Down the hallway under Contest, and get it to the end. 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: how does a paper plane turn? 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. On Shape set Left back edge 10 and Right back edge 14. On Fly press From above and Throw it: it banks and curves gently right, "A turn: 22 ft". Ask the class to predict the swap before you throw it. Show the turn slide and the stat slide. **It's working when:** The rule: it turns toward the back edge bent up more. That side lifts less, so it drops, and the plane banks toward it. Part of the wings' lift then points sideways and pulls it round.	Watch, predict the swap, and fill in the vocabulary on the worksheet.
12 to 20	**Guided practice (We do)** Turn it together	Students open the link or scan the QR code. A short guide walks them through the turn, the swap, and the roll at 8 and 16. Ask for the rule in one sentence. **Watch for:** Students who change Wing angle as well. Press Put it back as it came on Shape and start again: the rule is about the back edges.	Write the rule, and the roll, at the top of the hallway log.
20 to 38	**Independent practice (You do)** Down the hallway	Students press Put it back as it came on Shape, pick Hallway and Down the hallway on Fly, and throw. Then they change one thing at a time, the throw, the bend or the angle, until it reaches the end. Walk the room with the What to look for questions. **If they ask:** "Thrown harder it hit the ceiling. What makes a fast plane climb, and what could stop it climbing?" The ceiling	Log every throw: what changed, what it did, and how far short or which surface it hit.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Two students who reached the end say what they changed, 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=steer-it-down-the-hallway&ref=tpt-flightlab-3. A short guide opens over the app. It is the classic dart as it comes: back edges 12 degrees up on both sides. To set an exact number, click a slider once and press the left and right arrow keys.

1. **A turn.** On `Shape`, set Left back edge 10 and Right back edge 14. On `Fly`, press `From above` under Watch and `Throw it`: it tips its right wing down and curves gently right, about a foot by the time it lands: "A turn: 22

ft". Swapped, it turns left just as far. Under Things to try, A turn on purpose gets a check mark.

2. **Too much.** Left 8, Right 16: "A roll off to one side: 16 ft".
3. **The hallway.** On `Shape`, press `Put it back as it came`. On `Fly`, pick Hallway under Where and Down the hallway under Contest. Throw it: a glide of 24 ft, and the bench says how far short it stopped. At How hard 4 it hits the ceiling. One way through: both back edges at 4, How hard 6, Angle level: "All the way down the hallway!" Another: both back edges at 2, How hard 7, Angle as it came. There are others.

> The moment that lands is the swap: students who predicted it see the rule hold both ways. Keep the turns to a few degrees apart: a 2 degree difference barely curves, and 8 degrees rolls it.

Background for the teacher

The wings lift at right angles to themselves. When a plane tips one wing down, called a bank, part of that lift points sideways and pulls the plane round in a curve. A bicycle does the same thing when you lean into a corner. A back edge bent up more pushes that side down harder and it lifts less, so it drops, and that is the side the plane banks toward: it turns toward the edge bent up more.

Bent very differently, the plane banks so far that the wings no longer hold it up, and it rolls off to one side. Real pilots turn by banking a little and holding it. In the hallway, more speed carries the plane farther, but a fast plane with its nose held up climbs into the ceiling. Less bend lets it fly fast and level instead.

Common mistakes: the plane turns away from the edge bent up more; steering by aiming the throw; changing several things at once in the hallway. 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. The turn rule holds at the wing angles the app allows; the Wing angle slider stops before it would fail.

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- Say the rule in one sentence: which edge, which way?
- Why does a plane that tips its wing to one side go that way?
- What happened at 8 and 16, and why not bank a lot to turn faster?
- Your plane hit the ceiling. What will you change, and why that?
- Which single change got you closest to the end?

> The second question is the real test: a student who says part of the lift points sideways when the wing tips has the idea.

Cross-curricular extensions

- Math: the hallway is 15 m long. Convert it to feet and to your own steps.
- Building: fold a real dart, bend one back edge up a little more, and throw it gently in a hallway. Does it turn the way the app says?
- History: find out how the Wright brothers turned their 1903 Flyer by twisting its wings.
- English: write the hallway log as a short story of the attempts, in order, with what each one taught you.

Vocabulary

Bank	Tipping one wing down. A banked plane turns toward its low wing.
Roll	Tipping over too far, onto its side.
Criteria	What a design has to do to succeed. Here: reach the end of the hallway.
Constraints	The limits on a design. Here: the ceiling and the walls.
Iterate	To test, change one thing, and test again, many times.

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; act out a bank with an arm held out like a wing.
- Accept the hallway log as numbers and words copied from the screen.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students for the independent part, one at the app and one keeping the log.
- Show them how to click a slider, then press the arrow keys to move it one step at a time.
- Accept three logged throws instead of every throw, where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "It turns toward the back edge that is bent up ___."
- A check-in after the guide: every student has a turn both ways before the hallway.
- A hint for the hallway: try less bend on both back edges, then a harder throw, then a level angle.

STUDENTS READY FOR MORE

- Find a second way down the hallway that is different from your first.
- Try Left 11, Right 13, then Left 9, Right 15. How small a difference still turns it?
- Pick Land in the ring under Contest in the gym and land it in the ring three times in a row.

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. Turn it both ways together, then give the hallway as a pair challenge with the hint from More support.

Older students: In high school physics, draw the forces on a banked plane: lift tilted with the wings, its upward part holding the plane up and its sideways part pulling it round the curve, as on a banked race track.

Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/flightlab?lesson=steer-it-down-the-hallway

Essential question: How do you steer a paper plane where you want it to go?

Warm-up: How do you think a paper plane turns? _____

1. **Vocabulary.** Bank, roll, criteria, constraints, iterate: write each in your own words.

2. **The rule.** Left 10, Right 14: it turned _____. Swapped: _____. Left 8, Right 16: _____. The rule: it turns toward _____.

3. **The hallway log.** For each throw: what I changed _____; what it did _____; how far short, or what it hit _____. One throw on each line.

1. What did you change to get all the way down the hallway? Why did each change help?

2. Why does a plane turn when it tips one wing down?

Flight Lab: Steer It Down the Hallway

Exit ticket

Name: _____

1. The right back edge is bent up more than the left. The plane turns (A) left (B) right (C) not at all

2. Both back edges are bent very differently. The plane will most likely (A) turn faster and land farther (B) roll over and fall (C) fly straight

3. In the hallway, a harder throw hit the ceiling. Name one change that could fix it, and explain why.

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Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	It turns toward the edge bent up more: that side lifts less, drops, and the plane banks toward it.
2	B	It banks so far that the wings no longer hold it up, and it rolls off to one side.
3	Less bend, or a level throw	Less bend on both back edges lets a fast plane fly level instead of holding its nose up and climbing; a level angle stops it aiming up. "Throw it gentler" is half: it fixes the ceiling, but the plane lands short.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
Turning on purpose	Turns it both ways, says the rule, and says what too much does.	Turns it both ways and says the rule.	Turns it one way, or gives the rule backward.	No turn.
The hallway log	Every throw logged with one change each, ending at the end of the hallway.	At least four throws logged, one change each.	Some throws logged, or several changes at once.	No log.
Explaining the solution	Names each change that got it there and why it helped, with the ceiling and the length both in the reason.	Names the changes that got it there.	Says it worked, with no changes named.	No answer.

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

Standards

The lesson is built for MS-ETS1-2, testing competing designs against criteria and constraints, with MS-ETS1-4 for the model that generates the data.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-ETS1-2**	6-8	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	Students test one change at a time against the hallway's length, ceiling and walls, and log how well each throw meets them.
NGSS	**MS-ETS1-4**	6-8	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	Students use the app as a model to generate data for each change until the plane reaches the end.

Checked November 2026 against: 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/steer-it-down-the-hallway/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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