



# EGG-CELLENT ENGINEERING

Tips from a new study and world record could help you succeed at a classic engineering challenge: the egg drop. BY JENNIFER BARONE

An engineering student drops her device.

A contestant packs an egg in foam pellets.

Students construct an egg protector from paper and tape.

A student examines his successful protective device.

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AS YOU READ, THINK ABOUT how best to prevent an egg from cracking when dropped.

## In August 2024, Derrick Wood climbed onto a platform attached to a lift outside the

American Helicopter Museum in Pennsylvania. The Conestoga High School chemistry teacher, who's not a fan of heights, waited anxiously as the vehicle carried him eight stories into the air. Wood carried an egg nestled inside a contraption his students had made using simple materials—including paper, string, and straws. Could the device keep the egg intact after plummeting more than 24 meters (80 feet)?

Wood was attempting a record-breaking egg drop. Egg drops are a popular activity for middle and high school students across the country. The goal is to build a simple device capable of protecting an egg when dropped. A few years earlier, Wood and a few of his students had set a Guinness World Record for the highest successful egg drop, at 13.3 m (43.7 ft). Then, in 2023, a college student in India broke that record with a drop from 16.8 meters (54.1 feet).

A year later, Wood and his students—who call themselves the T/E Egg Drop Team—hoped to reclaim their title. They didn't realize it at the time, but the device they'd developed for the challenge took advantage of a strategy supported by recent research. It turns out that an egg's orientation when striking a surface affects its chances of cracking. Would their design be enough to take back the egg drop record?

### BREAKING SOME EGGS

Annual egg drops are also a tradition at many colleges, including the Massachusetts Institute of Technology (MIT). Professors often shared a piece of advice with engineering students: Eggs would be more likely to survive if they were oriented vertically rather than horizontally. "We followed that conventional wisdom," says MIT engineering professor Tal Cohen.

At MIT and elsewhere, experts reasoned that the more pronounced curves at the top and bottom of an egg

## GUINNESS RECORD SETTERS

THE DEVICE This protective structure made of simple materials allowed an egg to survive an 83-foot drop!



THE TEAM Breckin Shefflerwood, teacher Derrick Wood, Charlie Gawthrop, Jeffrey Wang, and Matthew Ma (left to right)



would better protect against the force of hitting the ground than its gently sloped sides. This thinking was based in part on the use of arches in architecture. Arches help support the **loads** acting on a structure—like its weight and other forces.

But Cohen and her colleagues wondered what people who hadn't heard this traditional advice would think. So they spoke with non-scientists around MIT's campus, such as custodial staff and landscapers. Many of these community members suspected eggs dropped on their side would be safer. That's when Cohen decided, "Let's check!"

Cohen's team squeezed eggs in clamps and measured how much force they could withstand before cracking. Whether positioned horizontally or vertically, the maximum force was about the same. The shell's strength is roughly equal either way. But the researchers detected one interesting difference: Eggs squeezed on

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their sides flexed a little more before breaking than those compressed from top to bottom (see *Crush Test*, below).

Next the researchers dropped eggs. Those that landed on their sides were less likely to break than those that landed on their ends. Eggs that land sideways “can absorb more energy and fall from higher before breaking,” explains Joseph Bonavia, a mechanical engineer who worked on the study.

Before an egg is dropped, it has **potential energy**. As it falls, that stored energy from its height changes into **kinetic energy**—or energy of motion. Flexing on impact absorbs some of that kinetic energy, which helps prevent cracking. Think of how a ball made of glass—a rigid material—shatters when dropped. But a rubber ball can squish and bounce back. The MIT findings suggest that the conventional wisdom is wrong. Eggs dropped vertically didn’t survive better—they broke more often.



**SMASHED:** A student examines the aftermath of his team’s entry in an egg drop in Los Angeles, California.

## REACHING NEW HEIGHTS

The T/E Egg Drop Team didn’t know about MIT’s results when attempting to regain their record title. (The study hadn’t been released yet.) But the group had a hunch that an egg oriented horizontally would fare better.

The team’s students included Matthew Ma, Charlie Gawthrop, and Jeffrey Wang, who’d worked

together to set the initial record in ninth grade in 2022. For the 2024 attempt, they were joined by then-sixth-grader Breckin Shefflerwood. The group didn’t want to just beat the current record—they wanted to blow way past it. “We said, ‘We’re going big this time,’” says Wood.

For their device, the team could use only materials permitted in a Guinness World Record egg drop—including pieces of plastic bag, elastic cord, note cards, cardboard, foam, straws, and tape. They tested their contraption by using a drone to drop an egg from 30.5 m (100 ft).

That successful test gave them confidence in their design but didn’t count for the record, which requires releasing the egg by hand.

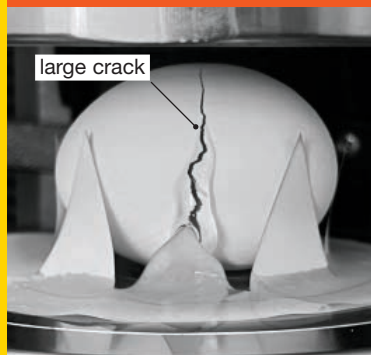
On the big day, supporters gathered to watch. Breckin, the youngest team member, prepared to film the drop in a slow-motion video, which Guinness required. “I was thinking, ‘I don’t want to be the person to mess this up!’” he recalls. “We all worked so hard.”

Wood dropped the egg, laid on its side in the team’s contraption, from a height of 25.3 m (83 ft). Breckin captured its graceful descent, slowed by a plastic-bag parachute. After its landing, Matthew checked that it was intact. Once its survival was documented on video, Matthew grinned and threw the egg to the ground. It splattered—providing the required proof that the egg wasn’t hard-boiled. A few weeks later, confirmation came: The record was theirs again! ✨

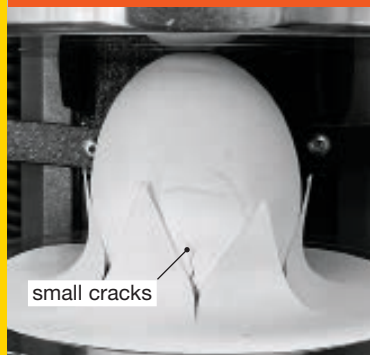
## CRUSH TEST

Engineers at MIT used this device to test the force eggs could withstand before breaking. They compressed eggs both horizontally and vertically. The force turned out to be similar in both orientations—with one difference. Horizontal eggs flexed more before cracking.

### HORIZONTAL COMPRESSION



### VERTICAL COMPRESSION



**DESIGNING SOLUTIONS:** Design your own protective device for an egg. Use evidence from the text to explain why you think your design would work.