



# Highest Egg-Drop

This egg-streme endeavour is a classic try-at-home experiment: how high can you drop an uncooked egg without it cracking? Luckily, the lovely people at GWR will let you use some household items to build a parachute or protective cage. Still, this is a tricky record to *beat*...

**THE RECORD:** Greatest height to drop a protected egg without breaking

**THE CHALLENGE:** Take one raw hen's egg and a selection of items from around the home, then combine in such a way that the egg can be dropped from a great height... and remain intact!

As the saying goes, you can't make an omelette without breaking eggs. The same could be said of record-breaking, at least when it comes to this eggs-tra tricky challenge.

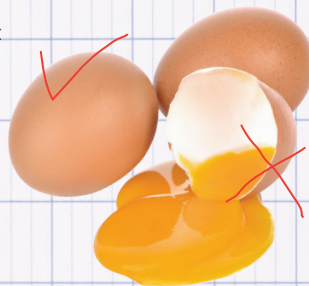
Even without anything to protect it, it's possible to drop an egg an awful long way without it breaking – if you get the technique right. Check out David Donoghue's incredible record-breaking drop in For the Record (right). So just imagine how far an egg can fall safely if you could protect it with something!

To help you with this record, you can use some or

all of the items listed below for prot-egg-tion. [Editor: an *oeuf* with the egg puns!] These include plastic drinking straws, cardboard, string, a sheet of plastic and sticky tape.

Consider encasing the egg in a straw-and-cardboard cage. Or you could perhaps fashion a parachute from the string and plastic. Or what about a series of protective spikes made from straws?

On pp.94-95, you'll find some of the options we explored. You don't have to copy them – see how creative you can be. Whichever route you choose, good cluck!



**FOR THE RECORD**



On 22 Aug 1994, the UK's David Donoghue dropped fresh eggs 700 ft (213 m) from a helicopter on to a golf course at Blackpool in Lancashire, UK, and they *didn't* break; it's the **greatest height to drop an egg (unprotected)**. David, who had served in the British Army, studied the science of the "bouncing bombs" – used in the famous World War II Dambusters raid in Germany in 1943 – to perfect the angle and speed of his drops. "Organically farmed eggs are the strongest," he helpfully suggests.



## YOU CAN USE:

- 1 x PLASTIC SHEET (MAX. SIZE 40 x 40 cm or 15.7 x 15.7 in)
- 4 x PIECES OF CARD (MAX. SIZE 10 x 10 cm or 4 x 4 in)
- 2 x PIECES OF CORRUGATED CARD (MAX. SIZE 10 x 10 cm or 4 x 4 in)
- 1 x PIECE OF FOAM (MAX. SIZE 10 x 10 cm or 4 x 4 in)
- 20 x DRINKING STRAWS
- 1 x PIECE OF ELASTIC STRING (2 m or 6 ft 6 in)
- 1 x PIECE OF CLEAR TAPE (30 m or 100 ft)
- RAW HENS' EGGS (4 g or heavier)

## SHOPPING LIST

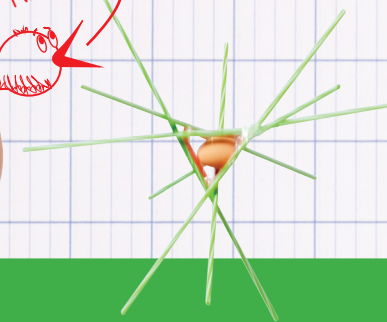


A thin plastic bag works well for a parachute canopy

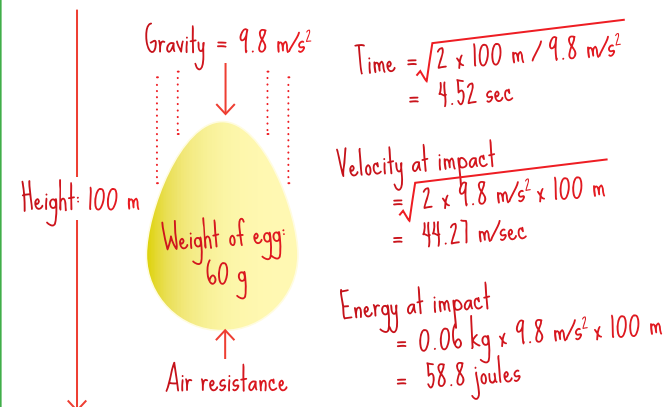
It has nothing to do with this record, but in the Philippines, one of the most popular national dishes is *balut* – a fertilized egg that's boiled and eaten just a few days before the chick hatches! If you indulge, watch out for the feathers and bones! Yuk!



Mama?



## HOW DOES IT WORK?



Gravity is not the friend of eggs. This fundamental force will pull the egg towards certain destruction, unless you can slow its descent or cushion its inevitable impact. In the example above, an egg dropped from 100 m (328 ft) would hit the ground in 4.52 sec, at a final velocity of 44.27 m/sec. So how can you improve the odds and reduce the energy (58.8 joules, as it happens) of the impact?

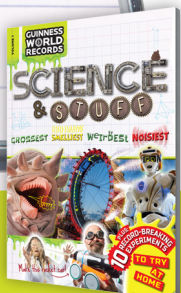
To slow down the egg, you need to increase the surface area – the larger the area, the more that air resistance acts against the egg. One effective way of doing this is to add a parachute, which increases the surface area significantly.

To reduce the force of the impact, think about how you make the egg the last thing that touches the ground. Consider cushioning it to absorb and spread the force – for example, using a star-shaped arrangement of straws to take the impact, rather than the egg.



## GUIDELINES

- The egg must be a commercially available raw hen's egg weighing a minimum of 42 g (1.48 oz).
- All or some of the items listed opposite can be used to encase the egg or assist in the flight of the egg only; it's not permitted to create a landing pad on to which the egg lands.
- You may only drop the egg by hand.
- The measurement must be taken from the bottom of the egg to the ground – using a steel tape – *before* the egg is dropped.
- After the attempt, the egg must be cracked open to prove that it's raw.







# Highest Egg-Drop (continued)

**THE ELEVATOR:** In the first of our suggested designs, we've crafted a closed-end tube from the foam and filled it with shredded pieces of the corrugated cardboard. The tube is then housed in a supportive frame made from the straws. The cardboard "fins" at the top are designed to increase surface area and slow down the descent. The straws also absorb some of the impact – in theory! Consider adding a parachute, as per later designs (right).

**THE ROBOT:** Use your imagination (goodness knows you'll need to!) for this one – it's a quadrupedal "robot" design that's built to absorb the shock of landing. The theory is that the straws take all the impact – the energy is driven up the "legs" and dissipates before reaching the egg. The egg itself is wrapped in the foam and secured with tape to cardboard sides. It's important that this design falls straight down, but just to be sure, we've stuck some "arms" through the "body" for extra protection.

**THE MUMMY:** It's a crazy idea but it might just work. Use scissors to cut the foam, the cardboard, the corrugated cardboard, the straws and the string to shreds. Make a little bag from the plastic sheet and fill this with the fluffy stuffing. Place the egg in the midst of the stuffing before using the sticky tape to bind it all together. Just keep wrapping until you've used up all the tape, like you're making an Egyptian mummy. The hope is that the filling will act as a shock-absorbing cushion, keeping your egg from harm. Yeah, good luck with this...

**THE PARATROOPER:** Here's the first of our designs using a parachute. Firstly, to protect the egg, we've used the cardboard (both types) and the foam to create a squidgy platform. On to this, we've built a pyramid from the straws – this holds the egg in place and gives you something to attach the string to. The string, in turn, is tied (or taped) to the plastic sheet, forming the parachute. The pyramid should be tight enough to stop the egg falling out when you make the drop. You might want to wait for the wind to drop before releasing this one!

## TOP TIP! FROM PROFESSOR ORBAX



- Try eggs-perimenting with different types of eggs. You can only use hens' eggs, but consider spending a little more of your pocket money to buy free range and organic eggs. For one, it's nicer for the hens, but also you might find that organic eggs have tougher shells than the non-organic variety.
- Find the strongest drinking straws that you can, and experiment with different kinds – some have bendy tips, which might (or might not) help!
- Whichever design you settle for, it will probably work best with a parachute, so consider adding this every time.
- To avoid smashing your way through your family's breakfast, practise with a rubber egg (you can find them on sale on the web) or a hard-boiled egg (much less messy).

**THE SPIDER:** This design keeps the egg as far as possible from the point of impact by suspending it at the axis of a handful of straws. The theory is that the straws hit the ground first, taking the brunt of the impact and absorbing energy built up during the descent. With the "spider legs" going off in all directions, it also shouldn't matter how the egg falls, or if it's blown off course by the wind. On saying all this, in the test we did by dropping it on Pepper's head, it failed. Oh well, better luck n-eggs time...

**THE DRAGSTER:** The four-sided pyramid also features in this design. Here, it's used upside down to act as a shock absorber. Fins at the rear should, theoretically, keep the contraption straight as it falls, and the parachute adds the much-needed drag. If nothing else – and given the amount of eggs we broke testing this one, it *will* be nothing else! – it looks cool and aerodynamic.

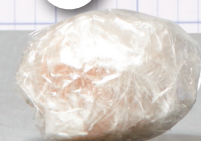
Triangles – like the sides of a pyramid – make other shapes stronger. This is why you see triangular shapes on the trusses of bridges or in scaffolding. Triangles spread a force evenly across all three sides. A cube can wobble but a pyramid can't!



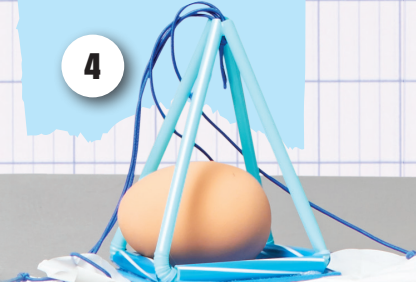
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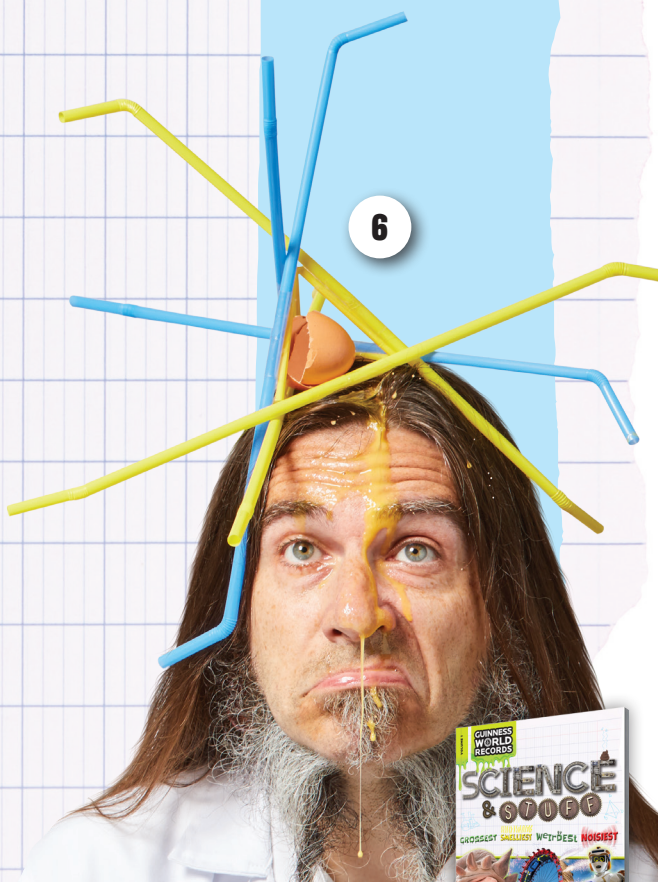
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