The Astronaut Egg Experiment

Your mission is to launch an 'Astronaut Egg' into Space, landing it safely in one piece.

We'll be creating an extension to your rocket bottle by adding a further payload containing your Astronaut Egg. We will do this by adding the bottom of another plastic bottle, (that is the same size as the rocket bottle) and securing it on top with sticky tape.

Ask your group how they think they might protect their Astronaut Egg and prevent it from cracking on impact.

How NASA prepares for a mission

Before a mission commences at NASA, the team will agree on their mission objective. They will define their parameters by outlining what key steps are needed before they commence their mission, and what is required to reach their objective successfully.

At the end of the mission, they assess what parts of the mission were successful, and what could be improved for next time — they have a big checklist that they tick off.

Remember that often the biggest lessons learned in life are from the mistakes we make, as this is how we truly learn from our experiences. It's about enjoying the journey, not just getting to the destination. Failure cannot deal with persistence. So, fail forward and try again.

Adopt this method when experimenting:

Test/Measure/Improve/Optimise

Mission Objective – To launch and return your Astronaut Egg to Earth in one piece

Step 1 – Decorate your Astronaut Egg.

Step 2 – Create your additional payload by cutting another plastic bottle (the same size as your booster bottle) in half.

Step 3 – Protect your egg with different types of soft materials and packaging. Bubble wrap / cotton wool – anything you can bring from home that will soften the impact on re-entry.

Step 4 – Place your astronaut into the bottle with its protective covering.

Step 5 – Attach your payload on top of your booster bottle with sticky tape, ensuring that your astronaut is secured inside.

Step 6 – Execute your mission by launching your rocket.

Step 7 – Record your findings and observations.

- Was your mission successful and why? What could you further improve for next time?
- Was your mission unsuccessful and why? What you could improve for next time?

The science behind the experiment

Why does an Astronaut Egg that is protected with packaging and materials (such as cotton wool), stand a much better chance of landing in one piece than an egg that is left unprotected?

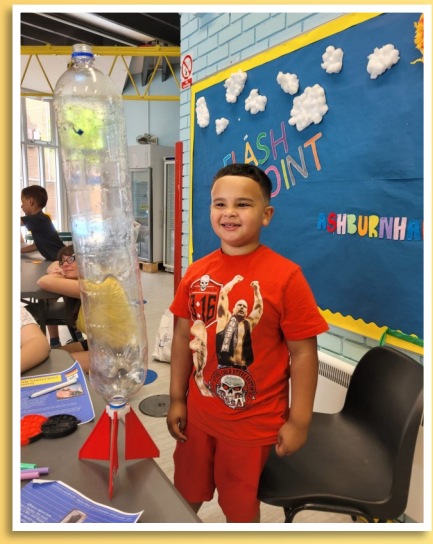
Impact Force

Impact force is a force that delivers a high impact in a relatively short period of time. It occurs when two objects collide. It's the result of one object falling or colliding onto, or slamming into, another object. (You may have experienced this if you've ever fallen off a bike or scooter. Usually, the faster you're going, the more it hurts.)

When your egg is falling, it contains energy. The higher the fall, the faster it goes, so the more energy it has. So, if we can pack the egg with soft materials, this will help absorb and soak up this energy on impact.

Ask your team how else they could reduce the energy of impact.

How about slowing your Water Rokit down by either fitting a parachute, by using a bigger bottle, or by adding less water to start with? Record the difference these factors make.



Why understanding ‘Impact Forces’ is a great example of illustrating the effects of Newton’s Third Law of Motion

When the Water Rokit with its Astronaut Egg hits the ground, there will be an ‘impact force’ to the ground, and the ground will have ‘an equal and opposite reaction’. (Just like when we spoke about the octopus, and the thrust of a rocket.) The dropped egg will absorb the forces from the collision upon landing and react. So, packing the egg in soft protective materials means that the energy will be absorbed by the material, minimising the energy absorbed by the egg.

(If done correctly, this will leave the egg intact, in one piece, and ready to be eaten for breakfast with buttered soldiers – yummy!)

If you would like to develop this experiment further, download Professor Simon Foster’s (the Rocket Man from Imperial College in London) **instructions for adding a nose cone and parachute**, plus some **great handouts** for your students so they can attribute their Astronaut Egg to a real-life astronaut.

At Water Rokit, we recommend creating teams, each with their own Water Rokit and egg which is named after a real-life astronaut from a different country. (See the links above for Simon Foster’s guides.)

Try testing this with different sized bottles – 1 litre or 2 litre.

Enjoy, and happy rocketeering!