Engineer Inside

Expert Creation

Launch an Object Challenge

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Idea 3 – An Air Cannon

If we squeeze these containers then that pushes the air out from inside the bottle and maybe I could use that to launch our object using the air pressure around the top of the bottle to make our object launch.

Now, I've already started to think about this a little bit.

Antony balances a paper ball on top of an empty plastic milk bottle.

Well, that's going to be quite hard to put on the top of the bottle and get any kind of seal around there. So, I was thinking that I need some kind of tube or something on the neck of the bottle. And, obviously, these bottles are different sizes so that's quite large, quite a large opening on the top.

Antony is comparing the size and shape of a plastic milk bottle and a 2 litre fizzy drink bottle.

This one - still quite a large volume in there, a small neck at the top so the air will be coming out of there a little bit faster because it's got a smaller hole to get the same amount of air coming through.

We now join Antony, and his son Wilfred, in their garden where they are showing the launcher that they have created.

[Antony]: And what I've done is taped the loo roll onto the top of the bottles, we've put some sticky tape around there. And we've done it to two milk cartons, and one pop bottle.

The creation is a plastic bottle with a cardboard tube attached around the top of the bottle to create a large enough opening for a paper ball to be placed inside.

[Antony]: So we pop the paper in the top there.
[Wilfred]: Into there.
[Antony]: Okay, and you can see straight away it's actually quite hard to get that to go in, there's a little bit of friction around there. Okay, so give that a good squeeze and see what happens!

Wilfred squeezes the bottle which launches the paper ball across the garden.

[Antony]: Okay so it did come out but didn't go very far. The problem there is that we've got friction around the top there which means that that's getting stuck. But if you remember before I said that some of these card tubes are different sizes. So we're actually going to change objects here. We've taken one of the slightly larger tubes and we needed to seal the end of that so we've put kind of a rocket top on the end of that, and I've stuck that on with sticky tape.

The creation is a small cardboard tube with a cone of paper attached to the top. The opening at the bottom of the tube is left open and is large enough to slide over the cardboard tube from earlier that had been taped onto the plastic bottle.

[Antony]: Now that will fit on one of the bottles.
[Wilfred]: That one.
[Antony]: So if we pop that on the top. Nice and gentle, okay.
[Wilfred]: And... there we go!
[Antony]: Let's have a go with that - so squeeze that.

Wilfred squeezes the bottle and launches the cardboard rocket slightly further than the paper ball went before.

[Antony]: And that's a little bit better isn't it? Still isn't going with a lot of force. Let's just try the pop bottle because I think the pop bottle might be a little bit easier.
[Wilfred]: Yeah.
[Antony]: Again we've got the smaller tube on there and this was made from the larger tube.
[Wilfred]: So..
[Antony]: This one. What you could do, Wilfred, do you want to try and put it under your arm and squeeze it with your arm? Try that. Okay, go!

Wilfred has placed the bottle with the cardboard rocket on top between his arm and his side so that when he squeezes his elbow in towards his side it squeezes the bottle. This launches the cardboard tube – again – further than before.

[Antony]: Similar thing, didn't really go very far.
[Wilfred]: But as you can see it's a lot easier to reinflate.

Wilfred demonstrates that after squeezing the bottles some of them go back to their original shape easier than others.

[Antony]: Yeah a lot easier to get that back to its shape. Can I have a go with this one?

Antony is now holding the cardboard rocket launcher ready to shoot it.

[Antony]: So from there we're going to go...

This time the rocket launches really quickly off screen, faster than it had in previous launches.

[Antony]: It went a little bit further but still not very far!

Summary

All three creations, the catapult, the elastic cannon and the air cannon are now out on the table being compared.

[Antony]: Okay so to summarise then, we had the catapult - seemed to work quite well didn't it? We played with the different positions and we actually found that the longer side having the object on there actually made it launch further but that did mean you then had to hit that quite hard. Our second one, the cannon that was probably the hardest one to make. It's quite complicated to make those different shapes but it did work fairly well. Then the third one, we struggled a bit with this. We struggled with the objects we chose. Once we changed the object it did actually work, but still wasn't brilliant. I think we were losing air pressure around there. So it wasn't brilliant. Which of these was your favourite, Wilfred?

[Wilfred]: I think it was probably the crisp tube because it’s fairly easy and there's a lot of different forces working together.

[Antony]: Yeah, so different forces - the force from you pulling it back, and then the elastic bands releasing the object, storing that energy in the elastic bands.

[Wilfred]: And the friction.

[Antony]: Let's have one last go, let's fire Foxy. Let's see if we can hit the camera.

Wilfred takes the elastic cannon made from the crisps tube with Foxy inside it and points it towards the camera. Foxy is fired but it falls short of the camera.

[Antony]: Nope!