Flying Start Challenge

The Rocket Launcher Challenge

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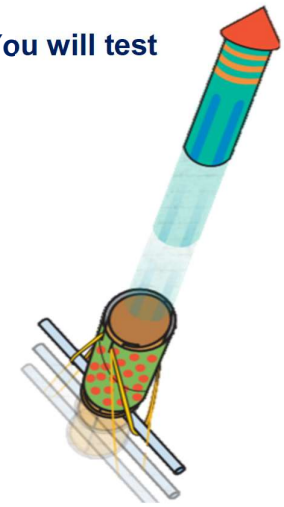
Overview & Objectives



Design and build a rocket and launcher out of household items. You will test your rocket launcher, evaluate your results, and show the class.

- To develop an understanding of aerospace engineering.
- To develop an understanding of space flight.
- Design and construct a rocket launcher.
- Test and refine your designs.
- Communicate their design process and results.
- To use “metres per second” (m/s) as the unit of speed.

Background Knowledge

What is space exploration?
Space exploration is sending people or machines into space to visit other planets. Since the first person walked on the Moon in 1969, hundreds of people have been into space on lots of different types of rockets. Getting rockets into space requires the work of aerospace engineers.

What is an aerospace engineer?
Aerospace engineers evaluate designs to see that the products meet engineering principles. Aerospace engineers design primarily aircraft, spacecraft and satellites to send into space.

How does a rocket get into space?
Have you ever blown up a balloon and let it go? Did you noticed that air goes one way and the balloon moves in the opposite direction? Rockets work in much the same way. Exhaust gases coming out of the engine nozzle at high speed push the rocket up.

What forces are acting on the rocket?
When a rocket is sitting on the launch pad and not moving, there are forces acting on it, but these forces are balanced. This means that the force pulling it downwards (gravity) is equal to the force pushing it upwards (support force of the ground). These forces are balanced.
For a rocket to start moving, there needs to be an unbalanced force. This means that the forces pushing an object in one direction are greater than the forces pushing it in the opposite direction. There are two forces acting on a rocket at the moment of lift-off:

- Thrust pushes the rocket upwards by pushing gases downwards in the opposite direction
- Weight is the force due to gravity pulling the rocket downwards towards the centre of the Earth. As the rocket increases speed, there is a third force of drag that begins to increase, slowing the rocket down.

Building Instructions

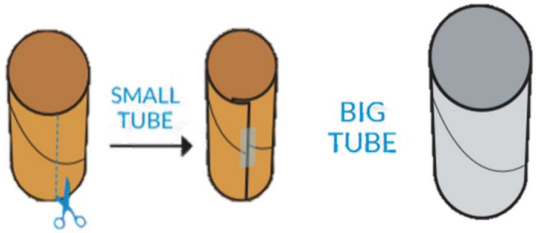
You will need…

- 2x CARDBOARD TUBES
- CARD/CARDBOARD
- STRAW
- ELASTIC BAND
- PAPER
- SCISSORS
- TAPE

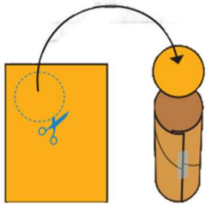
Instructions

Follow the steps below to build your rocket – If you have any questions ask your teacher or a friend from your class.

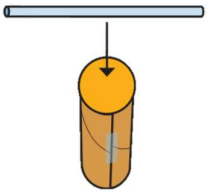
You will need one of your tubes to be smaller than the other to fit inside the first one.
If they are the same size cut one and stick it back with an overlap.



Now block the end of the smaller tube. Draw round the end onto a cardboard sheet and stick it into the end.

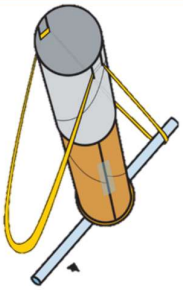


Then stick the straw to the blocked bottom.

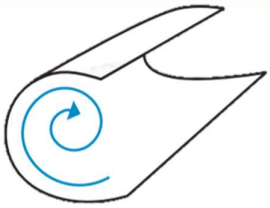


On the bigger tube cut 4 vertical slits, 2 on each side about 1-2 cm apart.

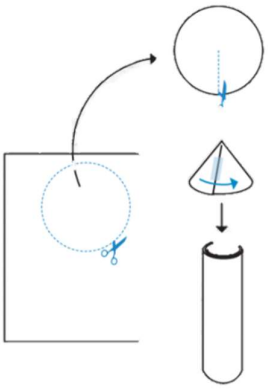
Put the smaller tube inside the bigger one and thread the elastic band through and then loop round the straw.



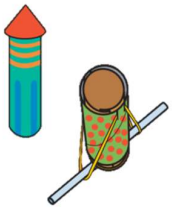
Roll a piece of paper into a tube – this is the body of the rocket.



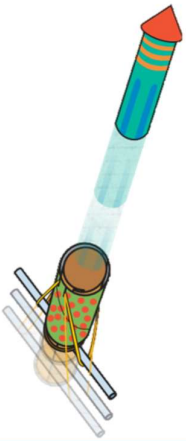
Cut out a circle, cut into the middle and overlap the edges to make a cone. Stick this to the top of your tube.
Think about aerodynamics – how can you make your cone cut through the air efficiently?



Decorate your rocket and launcher.



Place your rocket in the launcher, pull down and release to launch your rocket.



Evaluation & Scoring

Try and answer the questions below, your teacher might want to discuss the answers with you and the class.

1. Did you succeed in creating a rocket launcher?
2. Which materials did you use for your rocket launcher?
3. If you could have had access to materials that were different than those provided, what would you have requested? Why?
4. Do you think engineers have to adapt their original plans during the construction of products? Why might they?
5. If you had to do it all over again, how would your design change? Why?
6. What designs or methods did you try that you thought worked well?
7. Do you think you would have been able to complete this project easier if you were working in a team?

Now we are going to assess how well your rocket worked, your teacher might use these measurement to see whose rocket launcher was the most successful.
We are going to measure the horizontal distance that you can get your rocket to fly across the room.
Try launching the rocket at different angles to see how this effects the horizontal distance you can get it to travel.

Fill In the table below and work out the average Distance Travelled between the tests.

	Distance Travelled (m)
Test 1	
Test 2	
Test 3	
Average	