



PRE -EVENT CHALLENGE

What do you need to do?

1. Gather the materials.

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You should be able to find these items in the kitchen and garden!

- Baking Powder or Bicarbonate of Soda
- Sauce – Brown Sauce, Barbecue or Ketchup
- Vinegar – White or Brown
- An old cooking oil Container – with A 'flip lid'.
- An old milk container, and a small plastic bottle.
- Cardboard
- Blue Tack
- Scissors
- Vaseline (optional)
- Old flower pot or ice cream tub filled with earth or sand





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What do you need to do?

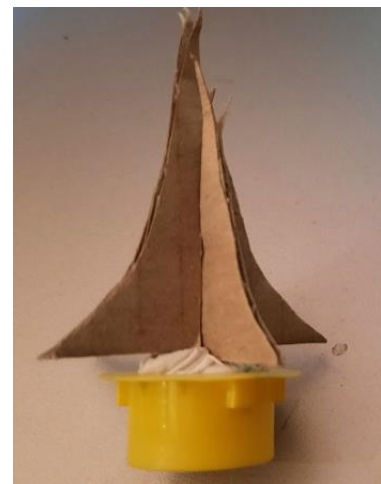
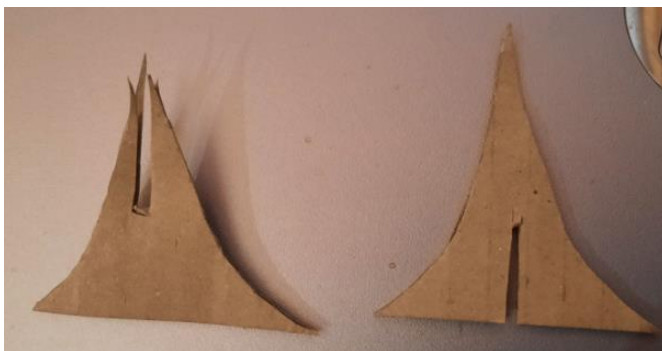


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2. Prepare for Launch!

- Carefully cut off the flip lid from the oil bottle so you can easily remove it and push it in like a stopper.
- Cut a small rocket template out of the cardboard
- Use the tack to attach it to the lid
- If it's a very tight fit in bottle put some Vaseline around the bottom of the stopper





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3. Prepare the Dry Fuel!

- Cut a 5cm square hole in the side of a plastic bottle
- Put 4 generous spoons of baking powder / bicarbonate of soda into the bottle
- Place this to one side





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3. Prepare the Wet Fuel!

- Squirt some sauce into the old milk container
- Add some vinegar
- Add Water
- Put on the top
- Shake Well





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4. Prepare Launch vehicle.

- Place the empty oil bottle in an old pot with earth or sand to stop it moving about
- Add the bicarbonate of soda
- Fill with the liquid to about half way
- Put in the stopper
- Step back and wait for Launch!





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What happened?

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- The acid from the vinegar and sauce in the liquid reacted with the powder
- This generated a small amount of Carbon Dioxide
- Once the top was put on the pressure built up inside the bottle until the stopper was forced out launching the rocket!
- This principle of combining highly reactive 'hypergolic' materials without igniting them is used in rocket propulsion!



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Real Applications!

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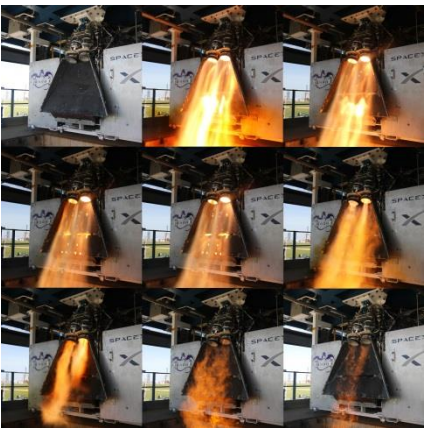
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- 80 years ago this technology was employed in the Me. 163 Komet propelling it to over 700mph, 100 miles an hour faster than a modern airliner!

- Today it used by SpaceX on the Crew Dragon spacecraft in the manoeuvring and emergency escape system rocket engines!



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ROYAL AIR FORCE Youth & STEM ROYAL AIR FORCE museum cosford Delivered by LEARN bydesign



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Thank You!

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Do not forget to upload a picture of your completed challenge to the event webpage and tag us on social media using STEM@meggitt.com, @rafmuseum and use the hashtag #ForcesinSTEM.

Good luck and I look forward to seeing what you create!

Thank you for taking part in the Forces in STEM challenge, I hope you enjoyed it and will go on to keep investigating, testing and having a go in the future.

We hope to see you at the Forces in STEM event!

