GGA Knowledge Organiser - Year 5 STEM Summer Investigation –Water Rockets

Making - Learning using Tools and Equipment

Design and making your rocket design flight-ready

1. A specialist kit will be provided for you to launch your rocket when it is completed.
2. You are responsible for making your rocker design flight-ready by following all instruction carefully.
3. The bottle will be upside down in comparison to the way it is usually stored and used. The opening needs to be at the base to allow the propellants (air and water) to be released. The 'old' base will become the top where you will attach the nose cone. This conical (and more aerodynamic) shape will allow for some streamlining.
4. From WWII planes to modern day passenger planes and space rockets these modes of travel have been given names/numbers. You will have used your figurative language skills to create a livery/name label to identify your design.
5. The nose cone is mounted on the top (flat base of the bottle to allow for. A small lump of Blue-tack is inserted into the nose cone to enhance the rocket's stability in flight.

Trialling with string tests

1. When the rockets have been completed, qualify your rockets for launch/flight by conducting string tests (see image below-right). Using approx. 100-150cm of string, tie the rocket around the middle so that it balances. This part of the test needs to be carried out with your teacher's permission and guidance.
2. As a result of the nose cone weight, the balance point (where you tie the string) will be more towards the nose.
3. When the rocket hangs level, a small piece of tape should be temporarily fixed to the string and bottle to keep the string from slipping and sliding backwards and forwards.
4. The rocket is then twirled in a circle. If the rocket tumbles while circling, it is not stable and needs more nose cone weight, bigger fins, or a combination of both.
5. If the rocket circles with the nose always pointed forward and staying reasonably level, it is stable and ready for flight!
6. Fins should be vertical and securely attached. The rocket should be stable.
7. Your teacher will guide you on the launch day – **follow all health and safety rules!**

Research, Designing & Planning

Kolb's Learning Cycle (below)	**Use this cycle to help you to continuously improve your design ideas and refine them until you have a successful outcome within the time constraints of the project.**

Using your DT booklet, plan and prepare using the step by step pages of guidance number below.

1. Design Specification	**Go through the specification carefully with your teacher to ensure you understand the task. Understand who or what you are designing for depending on your project.**
2. Planning	**The careful selection of tools, equipment and resources in order to make your 3D design accurately and with a good quality finish. Consideration is given to why they have been selected.**
3. Design Development	**To develop and refine the design on paper to ensure that any potential problems are identified before making (and possibly wasting materials)**
4. Making and adapting	**Making the design as per the instructions given, always adapting and adjusting the 3D model to get the most accurate and precise finish possible.**
6. Evaluating	**To understand your experience and learn from it e.g. new skills acquired, new knowledge gained**

Why are we learning this?

To know how: to gain a basic understanding of the different types of structures and the forces and loads that affect them

Why is it important?

So that we understand how to: apply our learning to design engineer our own truss bridges based on the designs of Isambard Kingdom Brunel

Cross Curricular Opportunities

Art	Creativity to make the structure aesthetically pleasing
English	Using alliteration, assonance. Onomatopoeia and rhyme to create a memorable and relevant name for the name of the design
Maths	Use of basic geometry to trial and test trajectory of the rocket – positioning the rocket to launch at the most efficient angle.
Science	Investigating balance/weight and motion, forces and trajectory

Key Technical Vocabulary-Glossary

Trajectory	• The flight path followed by a flying object
Isaac Newton's 3rd Law	• Like all rocket engines, it operates on the principle of Newton's third law of motion. (see rocket and balloon diagram below) • 'Every action has an opposite and equal reaction' • In this case, the introduction of air combined with the water propels the rocket into the air
Propulsion /Propellants	• The seal on the nozzle of the rocket is released and rapid release of water occurs at high speeds • The water is forced out by a pressurized gas, i.e. the compressed air. • The expulsion of the water causes the rocket to leap to high distances into the air i.e. this is the propellant. • The propellant has been used up i.e. water pressure inside the rocket drops causing the rocket to lose power and drop back down to the ground.
Aerodynamic and Streamlined	Aerodynamic – the way in which air moves around things Streamlined – something that has very little resistance to air flow
Launch	To set something in motion-to get it moving