CREST AWARDS | SILVER AWARD PROJECT IDEAS

30H typically 30 hours of project work

Build a model pirate ship ride

Before you start your investigation, you should carry out a risk assessment and have it checked by your teacher. For help with this, read through our health and safety information and look out for health and safety warnings in the text.

Pieces of eight, pieces of eight! Ahoy there, shipmates – the Pirate Ship awaits! No theme park is complete without a pirate ship ride. This classic ride involves a swinging 'gondola' on a rigid support, often balanced by a large counterweight. How does the ride give you a thrill?

Getting started

Imagine you're a manufacturer of theme park rides. A new theme park is opening near you, and the theme park owner has chosen you to design the pirate ship ride. You should build a model to help you work out things like how big it will and how big the counterweight should be. When you've made a working model you can show the theme park owner.

Take care when using tools. Remember, any use of tools needs to be well supervised, possibly in a workshop (depending on the tools used).

Designing your ride

Carry out some research into the design of theme park rides. You need to think carefully about your design for the ride. The way you decide to support the swinging parts is vital. If your supports are too flimsy then the whole thing could collapse. This is unsafe and will obviously ruin your investigation.

Another vital component is the support that holds the gondola and the counterweight. This needs to be strong and rigid enough to brace the two weights but, if you are going to investigate your design, you need to be able to change its length. The gondola is the component that 'holds' the people. People can be 'modelled' using metal weights – you need to think how to distribute them evenly along the gondola, yet keep them firmly fixed inside.

You should also think about:

- How will you control the amount of swing?
- If you are going to investigate how your ride moves, what factors are you going to measure? Swing time and speed of swing seem good factors to measure, but how will you measure them?
- As the Pirate Ship swing's back and forth it will lose energy, mostly through friction with the bearing and air resistance. How does the amplitude of the swing vary with time?

Investigating your model

Once you have built your model you should investigate how the following things affect the swing of your model:

- Initial swing angle
- Length of support
- Mass of ‘passengers’
- Mass of the counterweight (if you have one).

Going further

Design an electric motor and gearing system to swing your ride. How will you control the motor to supply energy only when you need it?