Masts and Rigging

Curriculum Areas

Key stage 3 Science

Key stage 3 Design and Technology

Learning Objectives:

1. The effect of shape on mechanical strength.
2. How mast riggers can make strong, tall masts.

How do yacht designers stop masts from breaking or bending?

Did you know the ancient Chinese used bamboo for their masts? This was because bamboo is so strong that they didn't need much rigging.

Why do you think we use aluminium or carbon fibre for masts today?

Why are masts tubes and not solid?

What have tubes got to do with scaffolding poles, bamboo stems and your leg bones?

How could we make a mast as tall as possible?

Watch the short video clip to help you answer some of these questions. Why not have a go at these two experiments.

Why are metal and carbon fibre masts tubes?

You will need:- Two sheets of A3 paper; sticky tape; some masses to hang on your mast and some supports – two stools are ideal.

1. Roll one sheet of paper as tightly as possible to make a rod with the help of sticky tape. Roll the second sheet to make a tube of about the same size as a loo roll, again use glue or sticky tape to hold it together. These are your two masts.
2. How can you test their stiffness?

How can you make a mast as tall as possible?

You will need:- 15 straws; 3 metres of thread; 15cm of sticky tape and a small blob of plasticine or blue tack.

Rules Your mast can only be 1 straw wide, all the way up. You get two points for each straw high your mast is. You lose one point for each extra 30cm of thread, extra 5 cm of sticky tape or for each additional straw that you use.

1. Use your blob of plasticine or blue tack as a mast step. (A mast step is where the bottom of the mast sits on the boat, it stops the bottom of the mast sliding about)
2. You can join the straws together by pushing them into each other. Hint a small nick in the end of one straw sometimes helps.
3. If you just use all 15 straws on top of each other to go as high as possible the mast will be very weak, so plan before you start building as to how you can stiffen the mast. It may help to look at some images of yacht masts to get some ideas.

Plan

Before you start, look at some images of yacht masts. How do you think that rigging will help to stiffen the mast? Find out what *spreader*s are, you could use some of your straws to make spreaders.

Use this space or a spare piece of paper to sketch out the design of your mast before you begin.

Evaluation

What made the best masts so strong? What were the strongest shapes in the masts and rigging?

At the Show

Not all masts have rigging. Compare the Finn Class Dinghy that Ben Ainslie won gold in, to the mast on a Star Class keel boat that Ian Percy and Andrew Simpson won silver with at the 2012 Olympics.

What sorts of materials are unstayed masts made of?

Sketch the rigs of an unstayed mast and a stayed mast

Unstayed mast