

# The value of our maritime motorways

## Teacher's Notes






### Preface:

**The value of our maritime motorways** is an introductory activity to the physics behind shipping. Through this opening activity to Module A) the value of our maritime motorways is covered, as well as some basic theory behind the physics of shipping and how it applies to ship design in the real world. The plenary activity is designed as a card sort game to consolidate pupils' appreciation for the diversity of ships and the jobs that they do. This activity is also designed as a complement to Module B) Shipping in Our Everyday Lives, also a module on the Inspiring Seas website.

**Audience:** Key Stage 3 pupils - all years

**Length:** 1 – 3 hours (dependent on whether the extension activity is undertaken)

### Learning Objectives:

-  To give pupils an appreciation for the importance of shipping in our everyday lives.
-  To provide pupils with a background to physical concepts such as stability, buoyancy and resistance and their practical application.
-  To give pupils an example of where theoretical physics is applied to the real-world.

### Running the activity:

**Starter – 5 minutes:** Using whole class discussion, ask pupils to provide definitions for the following key terms: *buoyancy*, *stability* and *resistance*. Write these up on the white board.

**Main – 30 minutes:** Present the *value of our maritime motorways slideshow* using the notes provided on each slide.

**Plenary – 20 minutes:** Using the plenary activity resource provided, print out copies of the *job cards* and *ship cards*. The *ship cards* will need to be double printed for this exercise from pages 2-10, and single printed for pages 1 and 12. If laminating and using as a card sort exercise, cut out the ship pictures, job cards and the ship names on the bottom of the *ship cards* document and laminate each. If using as a cut and stick, provide a copy of both the *ship cards* and *job cards* document for each pupil. The aim is to read the clues on the back of the ship picture cards and match that ship to its respective job card. Once this has been completed, the names of each ship need to be determined using the name cards provided.

An interactive software game, entitled *that ship does what again?* is available for download from the *Inspiring Seas* website now! Why not download the game and allow your pupils to consolidate knowledge whilst they play. Enter the **interactive activities** area of the *Inspiring Seas* website and open the *that ship does what again?* game. You will need to download Java to install this game. The readme file provides instructions on how to do this. Java is a completely free and an entirely safe internet-based software programme. The game should take approximately five minutes to install.

*Where it fits in:*

### **Module-based curriculum**

#### *1. Unit 7K- Forces and their effects*

- Identify the origins of friction, water resistance, up thrust and weight and describe situations where these forces act.
- Factors affecting frictional forces
- Water resistance opposes motion
- Why objects float in relation to the displacement of water

#### *2 – Unit 9L – Pressure and moments*

- Learn about the principle of moments
- That a force can make an object topple over about a pivot
- That a turning effect is referred to as a moment

### **Enquiry-based curriculum**

#### *3.1 – Energy, electricity and forces*

3.1b – Forces are interactions between objects and can affect their shape and motion

#### *3.4 – The environment, Earth and universe*

3.4c – Human activity and natural processes can lead to changes in the environment

#### *4 - Curriculum opportunities*

4c - Use real life examples as a basis for finding out about science

*Suggested activity extension:*

The extension activity provides a practical exercise concerning loading lines on ships and their importance for the safety of seafarers. In order to undertake this activity, pupils must first create model ships at a range of depths (the distance from the base of the ship to the deck). This can be carried out in a complementary Design and Technology lesson prior to this resource being used.

The simplest way to do this is to purchase some home insulation polystyrene foam. This material is high density but still easy to mould and shape using hack saws and other school approved design and technology equipment and is therefore perfect for modelling ships quickly and easily. The material is relatively cheap and can be purchased under the following link:

[http://www.diy.com/diy/jsp/bq/nav/nav.jsp?action=detail&fh\\_secondid=9374253&fh\\_view\\_size=6&fh\\_start\\_index=6&fh\\_location=%2f%2fcatalog01%2fen\\_GB&fh\\_search=kaunf&fh\\_edu=%c3%9f&fh\\_refview=search&ts=1220944345860&isSearch=true](http://www.diy.com/diy/jsp/bq/nav/nav.jsp?action=detail&fh_secondid=9374253&fh_view_size=6&fh_start_index=6&fh_location=%2f%2fcatalog01%2fen_GB&fh_search=kaunf&fh_edu=%c3%9f&fh_refview=search&ts=1220944345860&isSearch=true)

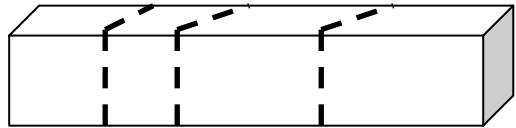
To make the model ships follow the instructions below. Once the strips and blocks have been cut its over to the pupils to cut out and shape their ships. These model ships will be useful for the rest of module A so can be retained for future use.

To make the model ships pupils will need:

- Junior hacksaws
- Stanley knives
- Flathead screwdrivers
- Sand paper (various grades)
- Waterproof markers
- Safety rulers
- Nuts (various sizes) to function as cargo
- A deep tray/tank filled with fresh water

Steps: (before class)

1 – Cut the foam board into strips of varying widths (this will ensure ships with a range of depths are produced).

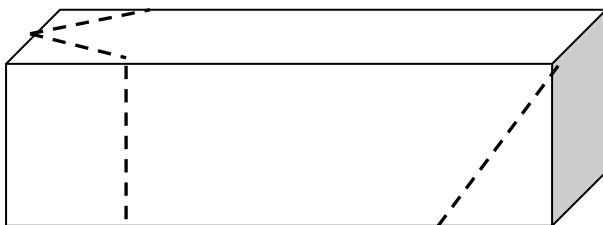


2 – Slice each of the strips into varying lengths

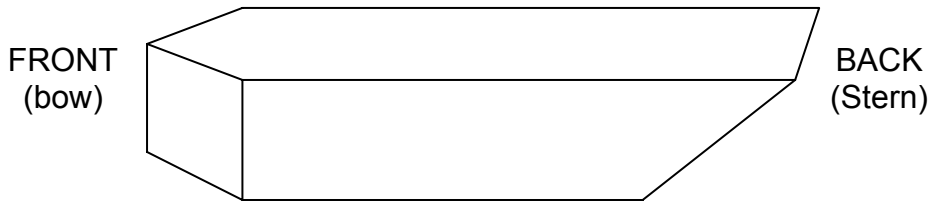
Steps: (in class)

1 – Provide pupils in groups (or individually) with one cut foam block, one junior hacksaw, one Stanley knife, some sandpaper, a flathead screwdriver, a safety ruler and a waterproof marker.

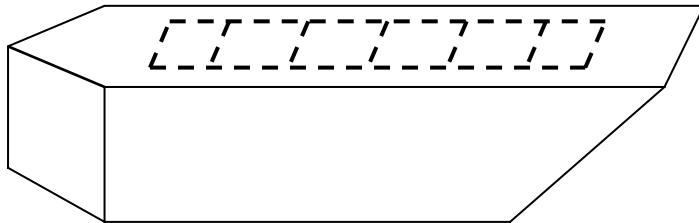
2 – Ask pupils to draw onto their foam strips the shape indicated below:



3 – Ask pupils to cut boats from their foam blocks using the safety ruler and the junior hack saw so they have something that looks like this (this is not strict by any means and pupils can be more imaginative with their shapes).



4 – Pupils now need to make their cargo hold. Ask pupils, with their marker pens, to draw a box on the top of their ships similar to the one below. Under supervision, ask pupils to use their Stanley knives to cut along their shapes and also to score across the box too. This will help to remove the material during the next stage.



5 – Using the flathead screwdriver ask pupils to press the end of the screwdriver into the scores made on their model ships. By levering the screwdriver at the same time, sizable chunks of the cargo hold should come up in one go. Repeat the process until there is a hollowed out cargo hold approximately half the depth of the ship.

6 – Using the sandpaper, round-off the ship on the outside to make it smooth. Pupils should also sand flat the inside of the cargo hold. Once this is complete, pupils could decorate and name their ships. The suggested extension activity in this resource can now be undertaken using the ships created.