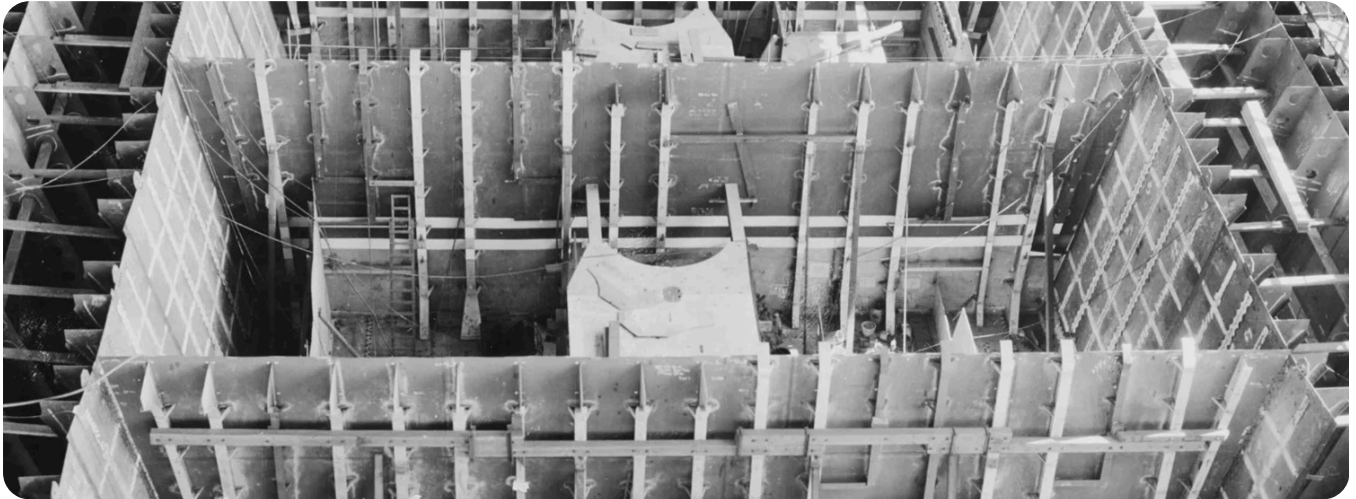




Watertight bulkheads



OBJECTIVE 1

Describe the function of bulkheads.

OBJECTIVE 2

Investigate their effectiveness.

OBJECTIVE 3

Evaluate evidence from an experiment.

Summary of lesson

Students investigate how a watertight bulkhead affects flooding by comparing two model ships. They record observations, compare repeated trials and evaluate the limitations of the model.

EQUIPMENT

- Six similar waterproof drinks cartons
- Waterproof card or plastic
- Waterproof tape
- Scissors
- Ruler
- Pencil or hole punch
- Resealable waterproof bags
- Modelling clay
- A balance if available
- A stopwatch
- A large water-filled plastic box

National Curriculum links

Practical scientific enquiry: use appropriate apparatus, control variables, record observations and draw conclusions. Use scientific terminology to explain forces, floating and the spread of flooding.

STEP

1

Introduce the lesson

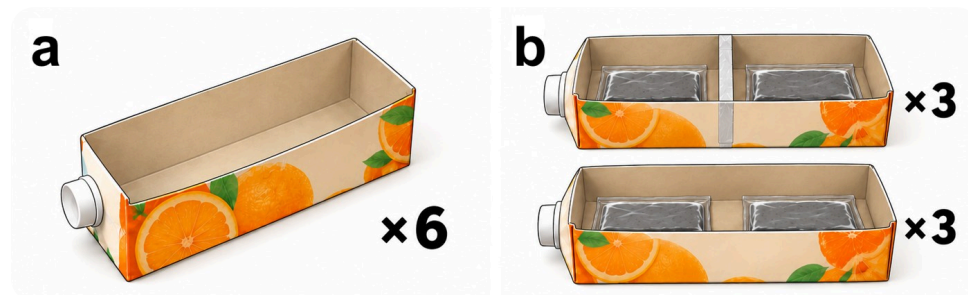
Ask students what they know about Titanic and why it sank. Explain that bulkheads restrict the spread of flooding. A floating ship displaces water whose weight balances its own.

STEP

2

Prepare the two models

Cut away one long side of each carton. Make three boats with a divider and three without. Fit each divider across the middle, sealing it to the bottom and both sides. Test the seal with water, then empty and dry the boat.



a Prepare the carton. **b** Make models with and without a bulkhead.

STEP

3

Prepare and float both models

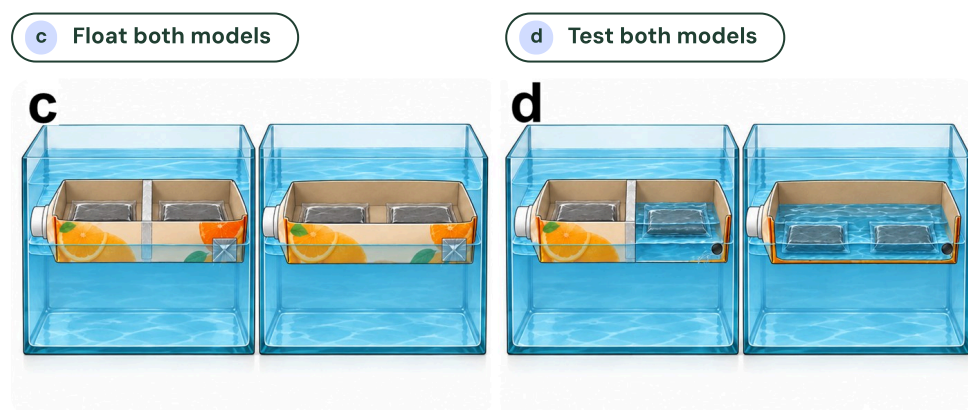
Place flat bags of clay in matching positions. Match each complete boat's mass and balance, including the divider. Make a small hole near the same end of each boat, about 1.5 cm above the bottom, and cover it with waterproof tape. Float each boat and check that the hole is below the waterline and the starting depth is similar.

STEP

4

Test both models

Remove the tape from the floating boat and start the stopwatch. Stop when the outside water first reaches the rim, or after 5 minutes. Record where water spreads, any tilt or capsizes, and whether the boat is still afloat. Test three fresh boats of each type.



In each panel, the boat with a bulkhead is on the left. The cutaways show possible results; actual outcomes may differ.

STEP

5

Compare and discuss

Compare the three trials for each type. Discuss whether the bulkhead changed where water spread or how long the boats stayed afloat, and identify any difficulties in keeping the test fair.

TEACHING NOTES

A sealed bulkhead may confine floodwater and help the boat remain afloat longer, but this is not guaranteed. Check the seal, load, hole size and position, starting waterline and whether water spills over the divider. Record “still afloat after 5 minutes” where appropriate.

Floodwater increases the combined weight of the boat and water, so the boat settles deeper. Titanic sustained damage across several forward compartments, and water could spread above bulkheads as the bow settled. This single-hole model is a simplification.