Ferries: Acting Forces

Speeding across the Solent!

Student Introduction

- This activity is all about understanding forces in relation to ferries, and how they change throughout the phases of your ferry journey.
- You will also observe how friction affects vessels of different types.

This force diagram shows the forces acting on the Red Funnel vehicle ferry.

The ferry is floating because:

- ✓ The two forces acting upon it are the same size
- ✓ They are acting in opposite directions
- ✓ They are balanced.

Balanced forces cause an object to remain still **or** continue to move at the same speed in the same direction. This is **Newton's First Law of Motion**.

Add force arrows to this picture to show the ferry moving at the same speed in the same direction.

Label your force arrows:

1. Thrust from the propellers
2. Air resistance
3. Friction (from the water)

In the box opposite, **draw a force diagram showing a ferry accelerating**.

Your force arrows should be labelled:

1. Thrust from the propellers
2. Air resistance
3. Friction (from the water)

In the box opposite, **draw a force diagram showing a ferry decelerating (slowing down)**.

Your force arrows should be labelled:

1. Thrust from the propellers
2. Air resistance
3. Friction (from the water)

In the five boxes below, draw a storyboard of force diagrams to represent the journey of your Red Funnel ferry.

On each diagram include three force arrows: Thrust, Air Resistance and Friction.

A. Ferry stationary at the ferry terminal dock.

Forces are **BALANCED**.

B. Ferry accelerating away from the terminal dock.

Forces are **UNBALANCED**.

C. Ferry travelling at a constant speed.

Forces are _____.

D. Ferry decelerating into the ferry terminal dock.

Forces are _____.

E. Ferry stationary at the ferry terminal dock.

Forces are _____.

The force diagram shown gives data for the forces acting on the Red Funnel vehicle ferry.

A = THRUST of 1,000N
B = AIR RESISTANCE of 500N
C = FRICTION of 500N (from the water)

These forces are acting in opposite directions and cancel each other out giving no resultant force.

The forces are **balanced**. The ferry's movement is unaffected by the forces shown.

This force diagram shows the forces acting on the ferry when in normal motion

A = THRUST of 1,500N
B = AIR RESISTANCE of 500N
C = FRICTION of 500N (from the water)

Write down:

The resultant force of the ferry

The direction of travel

to

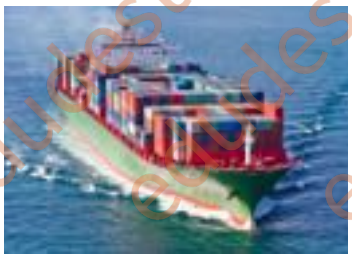
Draw a force diagram to show the forces acting on the Red Funnel ferry as it slows down on entering the ferry terminal dock at its destination.

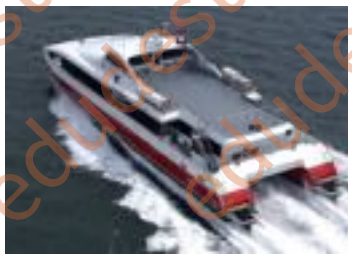
Add labels and quantities to your force arrows.

TASK 2

BACK AT SCHOOL - HULL DESIGN CHALLENGE

The hull of a boat or ship needs to move through the water with as little friction as possible. At school you will investigate how the movement of a boat is affected by the shape of its hull.



- Research different shapes of hull
- Plan how you will model different hull designs
- What will be your independent variable?
- What will be your dependent variable?
- How will you make your results more reliable?
- Draw a table for your results!

Not sure what to do? You could...

- ✓ Try making models of the different shapes using modelling clay
- ✓ Fill a large measuring cylinder with wallpaper paste
- ✓ Tie a length of thread (longer than the measuring cylinder) around your model to help you retrieve it
- ✓ Time how long it takes each shape to travel down the measuring cylinder.