EXPERIMENTING WITH FORCES

MATERIALS

- Balloon
- Straws
- Corrugated card cut to the size of the chassis (14cm x 5.5cm)
- Wagon net
- 4 wheels
- barbecue skewers / dowel (pre-cut by adult to 7cm long)
- Different sorts of material for tyres and track eg carpet, sand paper, perspex

Here is a real steam wagon at the museum.

TOOLS

- Scissors
- Felt tips
- Sticky tape
- Blu-tak
- Stop Watch

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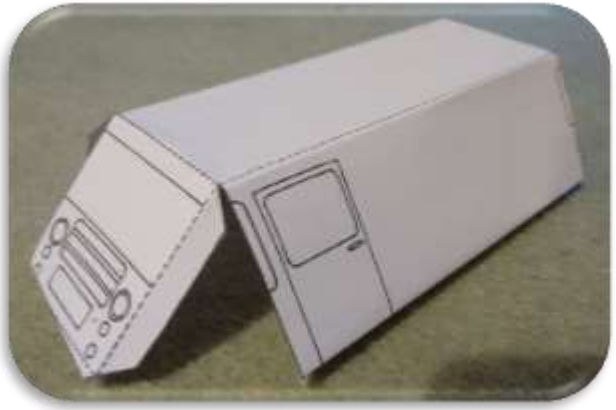
LET'S BUILD

POWER

1. Make a jet nozzle by cutting a drinking straw into sections about 6cm long.
2. Insert the jet nozzle into the neck of the balloon and make an air tight seal with more tape. Make sure you leave enough straw poking out so you can blow up the balloon once it is attached to the wagon.



Decorate your wagon then cut along the solid outline and fold along all the dotted lines to make a wagon shaped box. Hold the box together with sticky tape.

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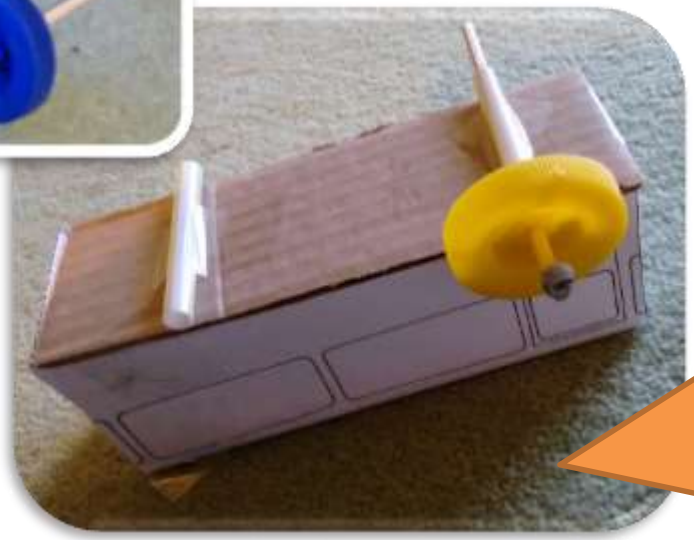
Running Gear!



ASSEMBLY

Make two axles out of the pre-cut barbecue skewers.

The full sized wagon has three axles but we will just be using two.

You can either poke the axle through the channels of the corrugated board, or tape pieces of straw to the underside and run the axles through those.

Which way will give least friction?

Decide where to put the axles and stick them on.

Push a wheel onto each end of the axles and keep it in place with a bit of blu-tak on the very end. Make sure it turns freely.

Put the wagon box on top of the chassis and hold them together with sticky tape. Tape the neck of the balloon to the roof of the wagon. Arrange it so the straw sticks out the back of the wagon. As the gas escapes backwards from the balloon it produces a force on the wagon which makes it move forwards.

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FACTOIDS

FRICTION FACTS

Friction is the force between two surfaces sliding against each other.

Friction works in the opposite direction to the motion of a moving object and slows it down. For example, if you push a block of wood across a carpet, friction slows down the forward movement.

Rough surfaces produce more friction. Smooth surfaces produce less friction. For example, ice is very smooth and it is easy to slide on it because there is little friction.

Heat is produced by friction, for example you can rub two sticks together to make a fire.

Air resistance is a type of friction when air surrounding a moving object slows it down.

Engineers use friction when designing vehicles, tyres and roads. For example, friction makes brakes work, and stops tyres skidding.

Engineers sometimes need to reduce friction. For example cars and aeroplanes are designed to be ‘streamlined’ so the air flows around them as easily as possible and does not slow them down.

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EXPERIMENT

Take your wagon to the test tracks. Try it on a rough track and then a smooth track.

On which track does it run fastest? Why do you think that is?

Now fit different sorts of material to the wheel for tyres with a dab of glue and see how different sorts of material affect how fast the wagon goes. What sort of material helps it to go faster? Why?

Think how air moves around your wagon when it is moving. What happens if you decorate your wagon with things that stick up eg a Domino Pizza sign on top? How could you change the shape of your wagon to help air move around it more easily so it goes faster?

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