Year 7 | Elastic Racecar | Project Focus (Woodwork) 12 hours

Design Constraints

- Should be inspired by car design of your choice
- Manufactured using hand tools and machines
- Safe for children to use
- 550mm length of pine
- Use elastic energy to rotate the wheels

ITERATIVE DESIGN PROCESS

STAGE 1- RESEARCH
Find out what products are already on the market.

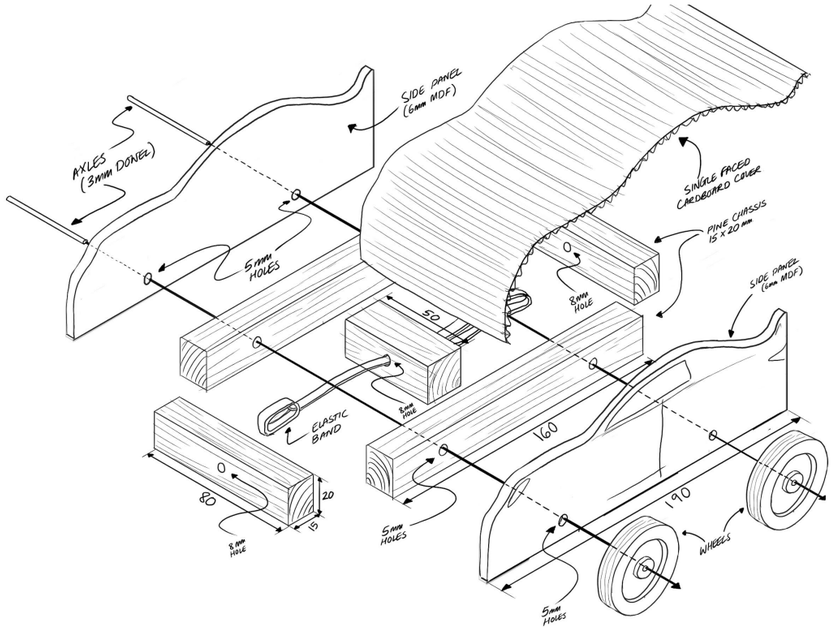
STAGE 2 - DESIGN
Create your own designs that meet the brief and are within the constraints.

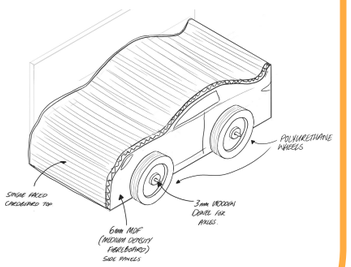
STAGE 3 - FEEDBACK
Get feedback to see where you can improve.

STAGE 4 DESIGN DEVELOPMENT
Make changes to your design based on feedback.

STAGE 5 - MANUFACTURING
Manufacture the product to the specification

STAGE 6 - EVALUATION
Test the product to see how it performs and where it meets the requirements of the design brief and specification. See where possible improvements could be made.





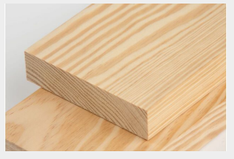
MATERIALS

Pine - A type of softwood that is used for the chassis of the racecar. It will be cut using a tenon saw and a bench hook to make sure you get straight cuts. The pine you use will be 15x20 and a length of 550mm to make all of your pieces from.

Polyethylene - A type of thermoplastic which means that it can be reheated and shaped multiple times. The wheels of the pull along toy are made from polyethylene. It is very resistant to wear and impact.

Single faced cardboard - Cardboard that is corrugated for strength but has a smooth piece of cardboard on one side which allows designs to be added and the cardboard can be easily bent in one direction.

MDF - Medium Density Fibreboard is a manufactured board made from small timber fibres and mixed with resin. It is compressed into a board which has a very smooth surface. It has no grain which makes it easy to shape. It is used for the car side profiles.



KEY CONCEPTS

DESIGN
- The iterative design process. Including research,

HEALTH & SAFETY
- Risk Assessment - being able to identify a hazards, risks and control measures in the workshop. To stay safe when working with tools and equipments.

TECHNICAL KNOWLEDGE
- Explain elastic energy and how the mechanism works to make the racecar move down the track

MAKE
- Use use tools and equipment safety and proficiently in the workshop.

QUALITY CONTROL
- Using a template to assure quality and test for applying tolerance to design.

Year 7 | Pull Along Toy | Project Focus (Woodwork) 12 hours

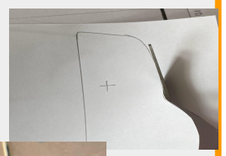
PROCESSES

DESIGN IDEAS AND ANNOTATION

We go through an iterative design process by making designs based on the target audience and making changes in order to improve and refine them.
All designs must be annotated which means all the key information must be labelled such as: materials, colour, key components. We always analyse, test and evaluate our work in order to improve our designs and solutions to successfully meet the design brief.

QUALITY CONTROL AND MARKING OUT

To make sure that we make a successful elastic racecar that is fully functional, we must find ways of ensuring that the quality is controlled throughout the manufacturing process. We make templates from paper of the side profile to trace around onto MDF. This means that we know we have enough material before we start cutting, all parts are a suitable size and that any holes are drilled in the correct place. You could also use a drilling jig for this which you place over the material. Always mark out the waste material to avoid cutting out the incorrect area.



CUTTING

Before cutting, you must check that the components are the correct size and shape. When cutting pine, you will use a coping saw because the thin blade and small teeth are designed for curved cuts. You must keep the saw moving at all times to reduce the amount of tension and avoid snapping the blade. Always cut on the waste side of the wood, just outside of the pencil line.

SHAPING AND SANDING

To refine and shape the side profiles of the racecar you will use the belt sander. The belt sander has a continuous belt of abrasive paper that rotates on a roller at a high speed. It has a flat bed that the material is rested on and it must stay flat on here at all times. It is much faster than hand sanding.
To refine the shape of more detailed shapes you will need to sand them by hand using sandpaper. This ranges from coarse to fine and can be identified by a number on the back of the paper. The smaller the number the coarser (rougher) the paper, for example P40 would be very rough.

ASSEMBLY

To assemble the racecar, use the instructions and demonstration for the chassis of the racecar. Before fitting the axles, align the side profiles with the holes in the side of the chassis then secure them with hot melt glue. Insert the axles followed by the elastic band which is secured by a cable tie. Add the wheels to each end of the axle and test the car by pulling it backwards with the wheels on the bench - this should make the car move forwards when you let go. Finally, add a length of cardboard to seal in the chassis and add a design to the car.

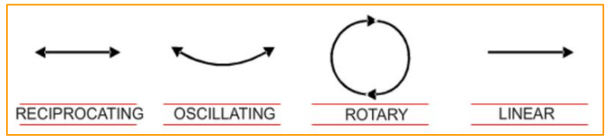
TECHNICAL KNOWLEDGE

ELASTIC POTENTIAL ENERGY

Elastic objects can store elastic potential energy if they are stretched or squashed. This happens when the elastic band is stretched and wound around the rear axle of the racecar. Once the elastic band is released, the elastic potential energy is converted into kinetic energy which causes the axle to rotate rapidly in the opposite direction and the car to move forwards.

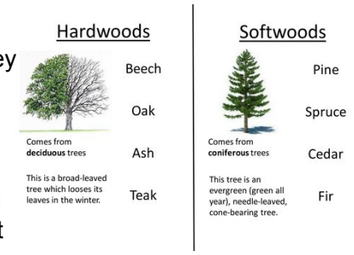
TYPES OF MOTION

There are four types of motion: linear, oscillating, rotary and reciprocating. The wheels move in rotary motion. When the toy is released it moves in a straight line, this is linear motion and when it is pushed and pulled back and forth in a line, this is reciprocating motion.



TYPES OF WOOD

There are two main types of wood - softwoods and hardwoods. Hardwoods come from deciduous trees which always lose their leaves in the Autumn. They are much more expensive to buy than softwoods and considered to be less sustainable as they take hundreds of years to grow, unlike softwoods which take on average about 40 years to grow.
Softwoods come from coniferous trees which means that they have needles which they do not lose in the Autumn. They stay evergreen all year round and are much easier to source than hardwoods. Softwoods are much easier to cut than hardwoods which makes them suitable for the pull along toy.



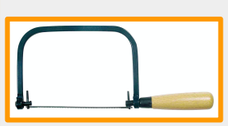
HEALTH AND SAFETY

In the workshop there are many hazards and we must work together to make sure that it is a safe environment. Therefore, the floor must be clear of any obstructions so bags must be on shelves and chairs must be stacked. Everybody must be wearing an apron at all times and when using the machines, you must wear eye protection and long hair must be tied back. The yellow markings on the floor around the machines indicate that nobody else should be in that area when the machine is being used. When using the pillar drill, work must be secured using clamps to prevent injury. When using hand tools, you must collect them safely and sensibly and hold them down by your side to keep yourself and others safe.

TOOLS AND EQUIPMENT

sandpaper

Pillar drill to drill through holes for the axles.



Coping saw used to cut out the side profiles of the car.

Tenon saw for straight cuts

Sharp pencil for precise marking out.

Steel rule for measuring lengths accurately.

Bradawl to mark where holes go.

Belt sander to shape wood

Hot glue gun

Woodworking vice to hold materials securely.