

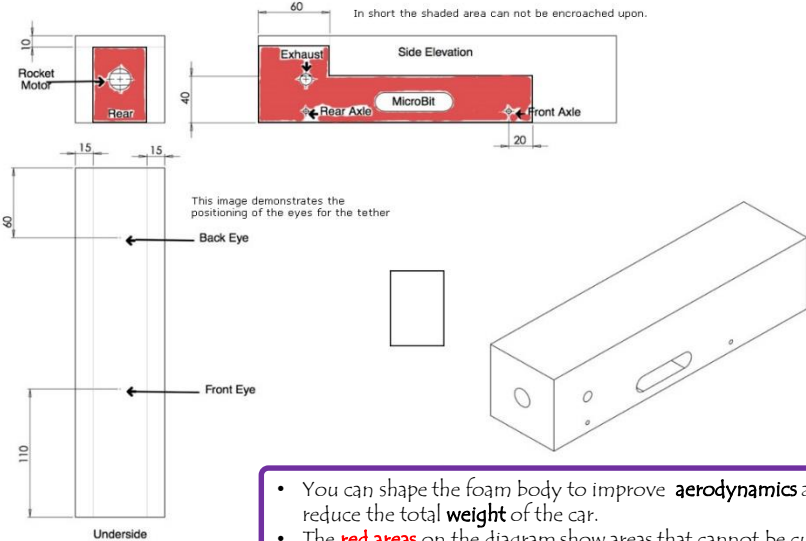
Design & Technology Department Schemes of Work Knowledge Organiser:



Design Brief:

To beat the world land speed record and to make a car travel over 1000mph on the ground involves bloodhound SSC engineers solving problems involving **weight, strength, aerodynamics** and **forces**. Design and make the fastest model rocket car.

As per the drawing below no alterations from a side elevation perspective can be made inside the textured area - the zone is 60 mm from the rear of the block forwards, 40 mm from the base upwards, 10mm from the top downwards and 20 mm forwards of the centre of the front axle. No more than 15mm of the sides of the block can be removed. In short the shaded area can not be encroached upon.



- You can shape the foam body to improve **aerodynamics** and to reduce the total **weight** of the car.
- The **red areas** on the diagram show areas that cannot be cut into. These areas hold the safety guides, a microbit and the rocket motors and the axles must pass through them.

Consider **weigh**, **friction** and **air resistance**:

The **force** of the rocket motor (F) is fixed but the **mass** (m) of the car is a **variable** you can control.

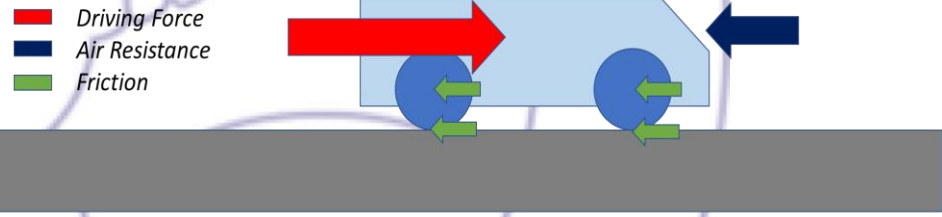
$$a = \frac{F}{m}$$

The maximum **acceleration** (a) your car can achieve is linked to the mass of the car by the following equation:

Friction and **air resistance** are some of the **opposing forces** that will limit the top speed of your rocket car.

You can use **force arrows** to show the size and direction of these forces.

Decreasing opposing forces increases top speed.



Shaping the vehicle:

Styrofoam is an excellent model making material. It is very light and easy to cut and shape, using a hot wire cutter.

It can also be shaped with hand tools and files. It can be painted using water based paints (emulsion paints) giving a really good finish.



Styrofoam



File



Tenon Saw



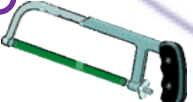
Glass Paper



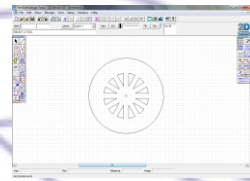
Bench Hook



Coping Saw



Hacksaw



Techsoft 2D Design



Laser cutter

Manufacturing the wheels:

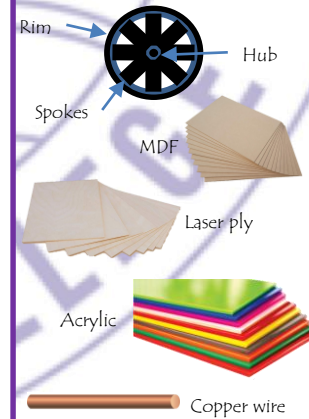
The wheels are to be designed on CAD software called 2D Design. This will then be manufactured on CAM equipment called a laser cutter. You can laser cut either acrylic, laser ply or MDF but will need to investigate their properties.

Acrylic- Thermoplastic, easy to cut, available in different colours, water resistant, brittle.

Laser ply- Manufactured board, good tensile strength, high density, slow to manufacture.

MDF- Manufactured board, easy to cut, doesn't resist water.

Axle to be made from 2mm copper wire.



Key Language / Vocabulary:

- Material properties
- Air resistance
- Friction
- Forces
- Aerodynamics
- Investigate
- Design
- Make
- Evaluate
- Dimensions
- Renewable/Non-renewable energy
- Thermoplastics
- Propulsion