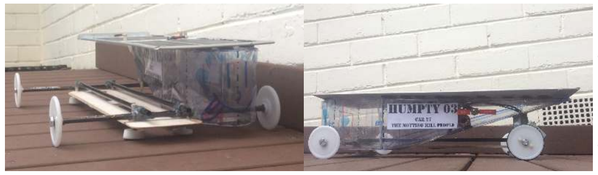
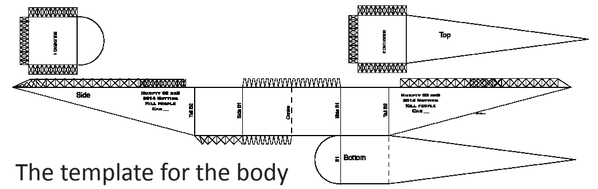


Humpty 03 MK2

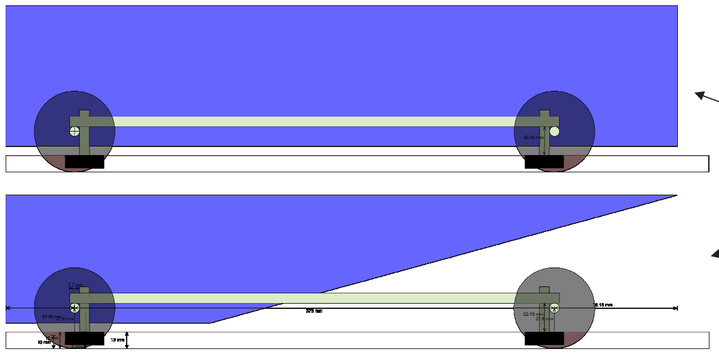
HUMPTY 03 MK 2



The template for the body

DESIGN AND CONSTRUCTION

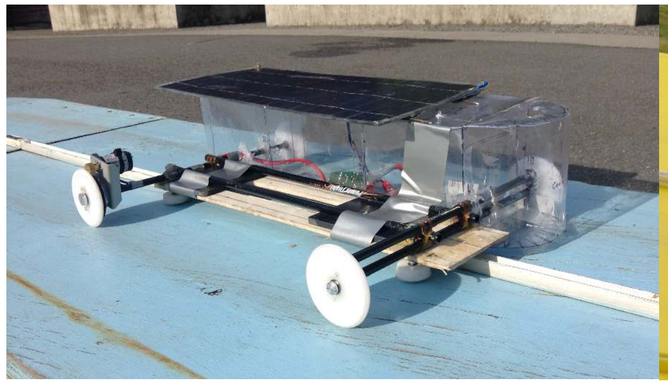
My car this year is based on a vertical, plastic, aerodynamic wing. The wing has been designed so that it creates no lift and to minimise frontal area as much as possible. The body is mounted to one side of a carbon fibre chassis, so that the centre of gravity is as low as possible. This means that the car should be stable. I designed a template for the body using a CAD program. I printed the template out and traced it onto some 0.5mm thick PVC plastic, which I then folded up. I had to make many bodies, because there were weaknesses in the design that required fixing, particularly around where the cube fits in. The original design that I used was a simple wedge, whereas the new design slopes up at the back. This is to improve aerodynamics, to fit the motor in on that side and to save weight. The motor is placed to provide more mass on the driving wheel, thus reducing wheel slip. To build the chassis, I built a jig that holds everything parallel. I bound the chassis together using cotton thread, which I then coated with epoxy resin. To attach the wheels, I made up aluminium plugs that are glued into the end of each rod. These plugs are hollow with internal threads so that the wheels can be screwed on using aluminium bolts. For the State event I used a panel I made by cutting 150mm square cells and soldering the small pieces together. This suffered a crack so I have resorted to a 16v commercial panel for the nationals (higher voltage reduces losses).

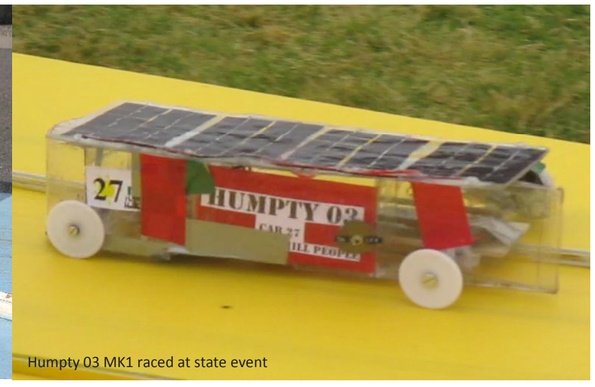


The car from the side

Old Design (Mk1)

New Design (Mk2) - reduced frontal area, less weight, room for motor





Humpty 03 MK1 raced at state event

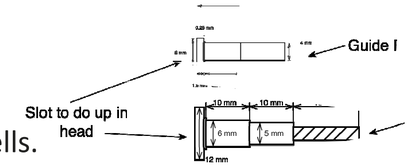
TESTING

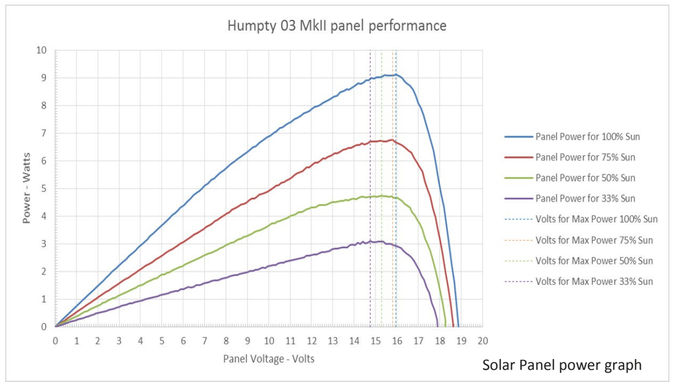
Testing on Humpty 03 included:

- Changing gear ratios to see which gear ratio suited the car and the solar panel the best.
- Changing guide roller posts to specially made bolts instead of standard 4mm bolts to reduce wobbles and therefore rolling resistance. I made the bolts on a lathe.

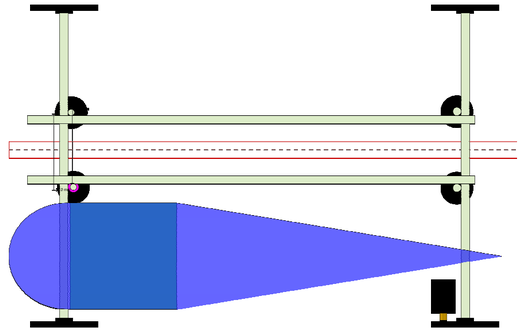
WHAT I HAVE LEARNT

- How a silicon photovoltaic cell works—current is proportional to sun intensity.
- How a Power Point Tracker works—holds panel voltage at peak power point using a reference voltage.
- A solid drive wheel has less friction. But you can have wheel slip problems on a smooth surface or in bright sunlight.
- How to work with metal and carbon fibre.
- Bare silicon cells break very easily.
- You can easily burn the silver off the back of the cells.





Solar Panel power graph



The car design

GREENHOUSE RELEVANCE

- Solar panels are a source of renewable energy.
- They don't generate greenhouse gasses to make electricity although some gasses are produced during manufacture.
- Even though they are a good source of energy, they are only useful when the sun shines – we need some way to store the energy. In the model solar cars, this energy comes in the form of kinetic energy that keeps the car moving under the bridge.

References & Acknowledgements:

- Mr Gardner's Car design guide
- Thank-you to my Dad, who helped me with the guide rollers
- Thank-you to Box Hill High School, who let me test Humpty 03 on the track
- Thank-you to the community of the VMSVC for willingly sharing hints & tips

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2014 AIMSC