**Mars rover –**

**Images:**

**Fusion files, real life files, videos of it moving around, drill mechanism**

CAD designer and builder for mars rover, explain design process.

Creating a prototype rover for a course wide competition. Rover must traverse through an obstacle course, pick up objects with a claw and drill through different sediments all while competing for the fastest time.

Original design was based on a turtle shell, however after prototyping with vacuum forming I decided to switch to a more angular approach using laser cutting.

This design required much more thought during the design process, but also gave specific compartments for the batter and motor carrier. We were also required to make a suspension system to minimise the impact of a drop test. This system was made using widely available parts in the lab.

I designed a needle shape for the drill similar to precusive drills, with a rack and pinion attached to a servo motor to allow for repetitive strikes.

For maximum efficiency, we created a very simplistic claw as to not make the rover too front heavy.

**Problems in design**

**Demo day**

**Outcomes**

Bicycle indicators –

Images:

Circuit photos, physical product, video of it blinking

Creating a bicycle light indicator system to improve safety for cyclists at night and in hard to see envornments. Uses indicator lights at the back of the bike which can be activated using controls at the front of the bike.

For this project, a circuit was needed to blink lights on the left and right side at the press of a button to indicate the turning direction. My initial prototype used an Arduino UNO with code written in C to blink the lights, however due to size limitations of the indicators, I decided to make a specific circuit for this project. This circuit was made using a NE5555 IC to create a LED blinking circuit as seen below, with the final circuit being soldered on perfboard.

Nature glider

The initial idea for the wings was to have them made of a fabric, however when we consider the weight of the pod itself it would be a much wiser idea to have solid wings for improved stability, and a method of storing these wings.

To improve wing strength, I looked at the wings of locusts which use their veins as a method of improving wing strength, while not increasing weight. To mimic this, a Voronoi generator was used to create a similar effect.

We also need a method to reduce the impact force. As the speed of the pod increases, we want to make sure the volume of our object isn’t affected in a negative way. Using the TRIZ matrix, we’re led to looking at the theory of a nested doll. Placing multiple objects inside of each other. Interestingly, this is the same principle seen in toucan beaks. Toucan beaks have a very strong thin outer shell, which has a thick lining of foam on the inside to absorb shock. The rest of the beak is empty to make the structure lightweight. To emulate the hard outer shell, the pod has been constructed out of an aluminium shell, which is both durable and lightweight.

The actual launcher for the pod went through several different iterations, in the final version the ejector holds the wings up at a 35 angle. 4 cylinders are used to hold them up, while also stopping the pod from accidentally leaving the rover. A claw at the back holds the pod in place before lift-off. The spring-loaded mechanism will launch the pod forward. Once it reaches a specific point on the runway, The catapult is powered by a motor and will then launch the pod up vertically. As the pod is in mid air, the wings will then hold outwards to allow it to glide. Magnets are used in the wings to hold them outwards, so they don’t retract back inwards. Launching it into the air and allowing it to glide. 2 springs are used on hinges of the wings.

To test the structural stability of the pod, several instances of Finite Element Analysis were used, including both static and dynamic as seen below. More information about this project can be found with the video listed above.

Boat design – (?)

Prpokect manager

Face tracking camera progress –

-Boards used

-concept of project

-CAD files

-Motor driver PCB

-microphone

-guitar pedal