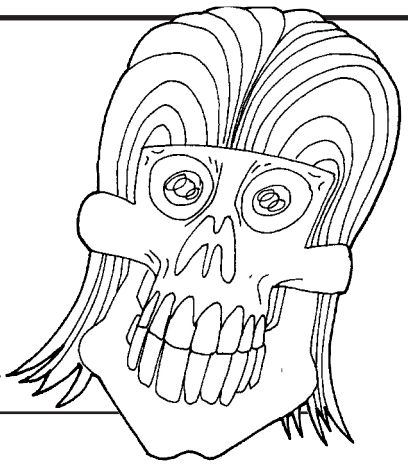
Masks



The big picture

Task

To design and make a face mask incorporating simple electric or electronic effects.

The story so far

Magic Masks is a company that specialises in developing special-effects masks for a wide variety of customers. These include actors, panygoers and advertisers. The company generally uses simple switching to control a range of light and sound effects in its masks, though it has recently been using programmable chips to add more sophistication to mask displays.

The students' task is to identify a specific situation for a mask and then to develop a mask that meets the needs of that situation.

Learning

Designing

Achieving fit and comfort in a product that has to be worn.

Achieving striking visual effects in low-light conditions.

Making

Forming sheet materials to a high standard of finish.

Building simple electrical and electronic circuits into a product.

Technical matters

Simple electrical circuits to control low-voltage sound and lighting effects.

Programmable control of sound and lighting circuits (optional).

Other matters

The use of masks in a variety of cultures.

Design decisions

The sort of product

This has been decided by the teacher – a special effects mask for Hallowe'en (or other suitable occasion).

The customer

The student can decide whom the mask is for.

The performance of the product

The student can decide what the mask will do in terms of sound and light effects. The student can decide how to ensure that the mask fits and is comfy.

The appearance of the product

The student can decide the overall size, shape and proportions of the mask. The student can decide the overall effect of the mask: comical, serious, frightening, friendly, sad, happy, bizarre, realistic, fantastic.

The way the product works

Within electrical control, the student can choose the sound and lighting components and the types of switch. Within computer control, the student can also choose the types of sensor. In choosing the battery, more able students can consider how to maximise battery life and minimise component cost.

The way the product fits together

The student can decide:

- how the parts that hold the mask in place are fixed together;
- how the mask is attached to the parts which hold it in place;
- how to mount the circuitry and electrical components in the mask;
- how to fit remote components to the mask.

The materialsi adhesives[a] fixings and components

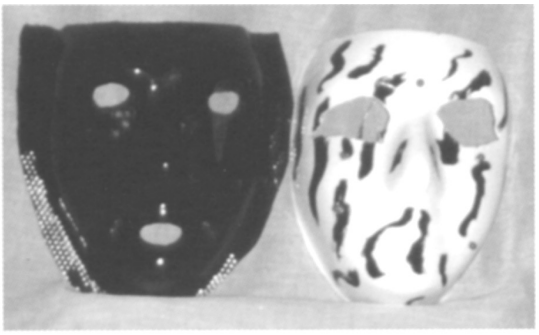
The student can choose from:

- a range of technical components: light bulbs, LEDs, flashing LEDs, buzzers, on/off, push-to-make, push-to-break, tilt switches, light-dependent resistors, 1.5 – 9 V batteries.

- a range of construction and moulding materials;
- thin card, polystyrene sheet, tissue paper, thin wire, cane, clay, Plasticine, papier-mache;
- range of adhesives and fixings: liquid adhesives, spray adhesives, tape adhesives, staples, paper fasteners, click rivets, pop rivers, Velcro®;
- range of decorations: string, beads, fabric, paints.

Products

The teacher gave the students the choice of using vacuum forming over a dummy face to produce the mask or constructing from chicken wire and papier-mache. The production of the dummy face took a long time but gave rapid results once it was produced. The chicken wire and papier-mache gave more scope.



Some students produced novelty masks to be worn at a party. They used the vacuum forming method and decorated the masks carefully with enamel paints. They included flashing LED's which provided a visual effect in darkened conditions.

Mere the student produced a bull mask for a play using the wire and papier-mache method. The lights, when in place, will glow eerily during darkened scenes in the play.

Values

Technical

Students should consider the need for technical reliability.

Economic

Students should consider the need to match production costs to target sale price.

Environmental

Students should consider the environmental impact of materials used in battery-driven electrical goods.

Social

Students should consider the the place of parties in people's social lives.

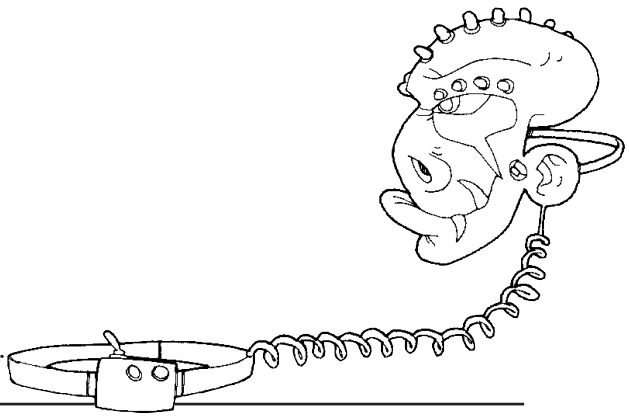
Moral

Students should consider avaoiding offending deeply held beliefs through the mask's character.

Aesthetic

Students should consider the appearance of the mask and the emotional response it generates: happiness, laughter, fear, loathing.

Masks



The detail

Sample brief

Design and make an interactive mask for a Hallowe'en party.
It is part of the range of'for hire' masks supplied by Magic Masks.

Sample specification

What the product has to do:

- have an interesting electrical or electronic display:
- fit comfortably as a mask;
- be light enough to wear:
- be easy to put on and remove.

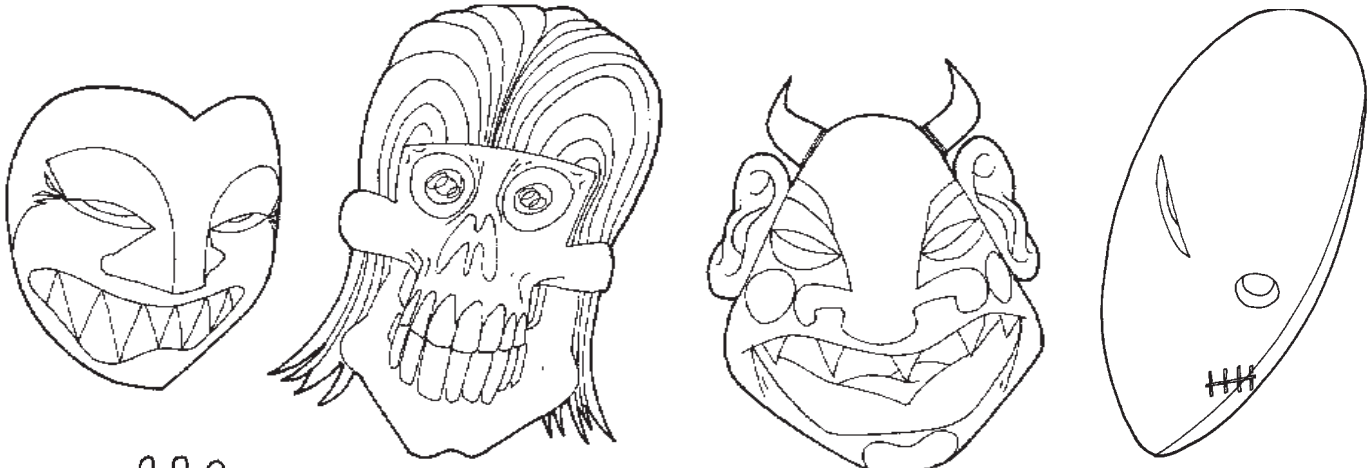
What the product should look like:

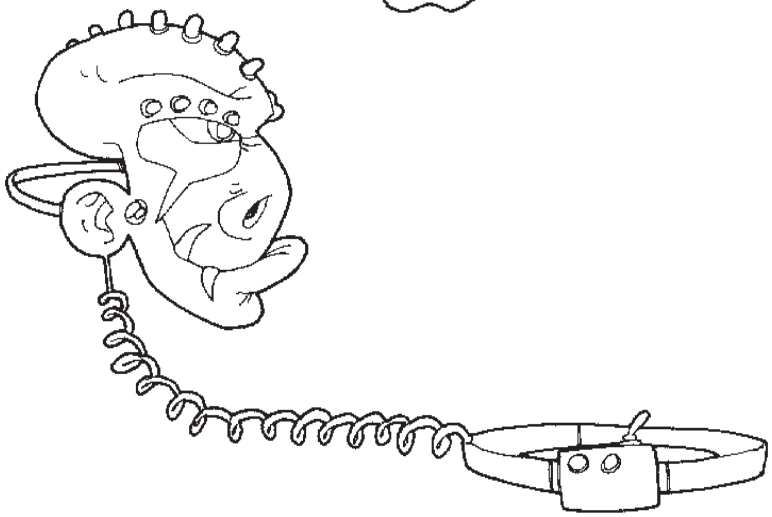
- be appropriate to the Hallowe'en setting;
- be effective as a mask in the dark;
- effectively disguise the wearer

Other features:

- be controllable by the user;
- be battery powered;
- have a target price of less than £2.50.
- limited environmental impact. e.g. uses recyclable or recycled materials in both the product and its packaging.

Starter sketches





Nuffield teacher talk

'How do you make sure it doesn't fall off the head?'

'Are you sure an elastic band will do? You could make a simple card 'crown and attach the mask to that; You only need two strips of card and a stapler, look'

'I get it – five LEDs – two ordinary ones for each of the eyes and one flashing one in the mouth; How are you going to wire them up to the battery?'

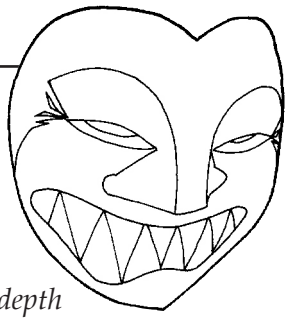
'Yes you can – draw the circuit diagram; Start with the battery, now put in the first LED- That's it, where does the next one go ~ in series or in parallel? That's got one eye done, now do the next eye.'

'Do you want to be able to make it blink? OK, where does the switch need to go?'

'Are you sure you can run all those light bulbs off one 9 V battery? How long do you think the battery will last? How can we find out?'

'Are you sure that people will be able to see all that decoration in the dark? What sort of stuff is used to show up in the dark? Why don't you think about using some of that then?'

'I like the big frill behind the mask but are you sure it won't be too heavy? How can you keep it really light? What about a frame made from thin wire? Covered with tissue paper?'



Resource Tasks

General design

For the first Capability Task in Year 7:

SRT 1 *Writing design briefs*
SRT 2 *Specifying products*
SRT 8 *Using image boards*
SRT 21 *Using simple shapes and guidelines*
SRT 37 *Evaluating outcomes — user trips*

For the second Capability Task in Year 7:

SRT 11 *Brainstonning*
SRT 12 *Metamorphosis*
SRT 22 *Using grids - enlarging and reducing*
SRT 29 *Putting products onto backgrounds*0
SRT 17 *Appreciating products - style*

For the third Capability Task in Year 7:

SRT 13 *Pattern design*
SRT 9 *Choosing and manipulating images*
SRT 10 *Capturing and manipulating images*
SRT 18 *Appreciating products — colour*
SRT 41 *Cool or what? Developing your design vocabulary*

Focus area design

SRT 26 *Using nets*

Communication

CRT 3 *Surface shading - showing depth*

Making

TRT 11 *Simple one-piece sun hat*

RMRT 9 *Designing containers to be made by vacuum forming* – use this to explore how to get the mask to fit onto the head

HSRT 4 *Being safe with technical components*

Technical

ECRT 1 *Choosing batteries*
ECRT 2 *Making a membrane panel switch*
ECRT 4 *Using switches to control lights*
ECRT 7 *Can you make it safe and secure?*
ECRT 8 *Working out a circuit diagram (suitable for homework)*
CCRT 3 *Child's toy (if you wish to use PIC technology in controlling the mask)*

Case Studies

Real-time information for passengers, *Student's Booky* page 245 Taking cover, downloadable from the website http://www.nuffieldiOrg/secondaryDandT

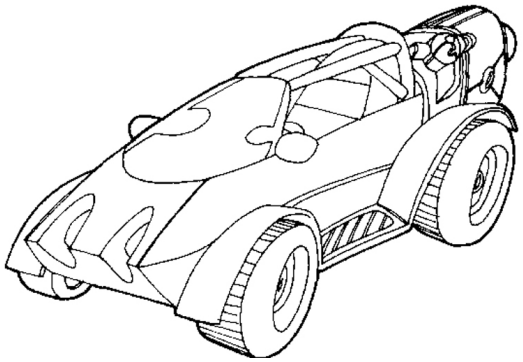
ICT opportunities

Use www to find out about masks from different cultures which could be used as a stimulus for design; Try putting 'masks' in the search engine. Look directly at http://wwwmaddogcurioSiCom/guameXihtm

If the mask is based on geometric forms and can be constructed from a single net or an assembly of nets, then use CAD/CAM to produce and cut out the nets.

Use CAD/CAM to produce decorative 'stick-ons' for the mask.

Special effects



The big picture

Task

To design and make a small-scale controllable vehicle.

The story so far

A large studio is producing a science fiction film in which the heroine is searching for her lost family by exploring the planet where they went missing. The planet has varied terrain and weather conditions — sand dunes with frequent dust storms, large swamps and shallow lakes with regular monsoons, grassy plains with some steep hills and high winds. Acting as members of the special effects team at Illusion Unlimited, students have been asked to design and produce realistic model vehicles suited to the terrain they must cross and able to move under their own power across miniature sets.

Learning

Designing

Using the natural world (weather and terrain) as inspiration for style and appearance.

Relating technical performance to technical systems.

Team work and communication skills.

Making

A range of construction and modelling skills requiring accuracy, attention to detail and visual sensitivity.

Technical matters

An understanding of basic mechanical and electrical control.

Other matters

The role of marketing associated with the film and other industries.

Design decisions

The sort of product

This has been decided by the teacher – a model vehicle for a science fiction film.

The customer

The student can decide the nature of the heroine who will use the vehicle.

The performance of the product

The student can decide what the vehicle will be able to do. All of the following are possible: move forwards and backwards, turn left and right, go fast or slow, climb inclines, grip slippery surfaces, illuminate its path, sound warnings.

The appearance of the product

The student can decide the overall appearance and style of the vehicle and how this relates to the nature of the heroine, the terrain it must cross and the weather it must endure.

The way the product works

For the drive systems, the student can choose one or two motors. (Two motors provide the possibility of steering through left-side/right-side motor control.)

For the transmission system, the student can choose from belt drive, gear train, worm and wheel.

For the electrical control, the student can choose the arrangement and types of switching.

The way the product fits together.

The student can decide on the parts that make up the chassis, although the teacher may prefer to provide a standard chassis design.

The student can decide how to mount the technical components (wheels, axles, motors, lights, buzzers,

switches) on the chassis:

- how to mount the body shell on the chassis;
- the arrangement and connection of any remote-control components.

The materialsi adhesives, fixings and components

For the vehicle a student can choose from:

- a range of electrical components — light bulbs, LEDs with resistors, flashing LEDs, buzzers, on/off, push-to-make, push-to-break, changeover switches, 1.5 – 9 V batteries;
- a range of mechanical components – wheels of various diameters and thicknesses, gears, pulley wheels, worms, belts, tracks;
- a range of construction materials – 6x6 mm softwood strip, card for corners, glue, thin sheet for supporting components (ply, hardboard, mdf), 3 mm steel rod for axles, found materials;
- a range of adhesives and fixings — liquid adhesives, spray adhesives, tape adhesives, staples, paper fasteners, click rivets, pop rivets, Velcro®, clips, cable ties.

The finishes

A student can choose from:

- water paint, spray paint, rub-down lettering, stick on shapes and decorations. **The mini set**

Here it is useful if the students work in teams. The nature of the terrain and weather for the set are given but students will need to decide how best these can be represented. For materials, students can choose from:

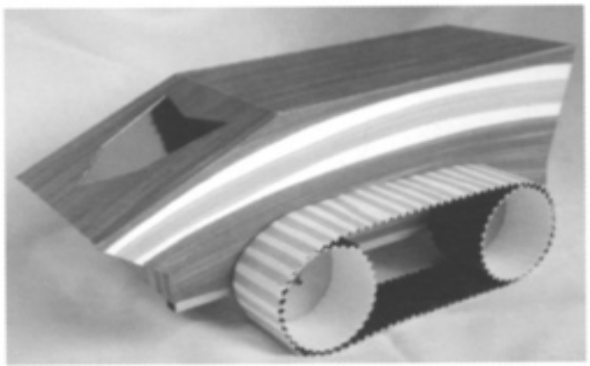
- card, a large (500 x 1000 mm) baseboard, chicken wire (for landscaping), newspaper and paste for papier-mache, found materials, sand.

Products

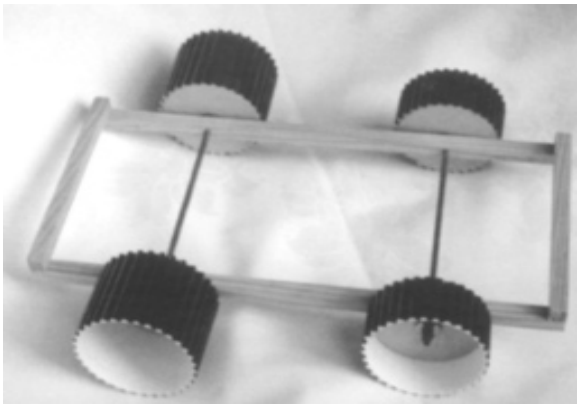
The teacher produced a small background of the planet as a line drawing which was scanned into the computer. Students took photos of their vehicles with a digital camera and were able to place these images on the landscape.

The teacher produced some images of the heroine to add interest to the task.

The teacher showed the class how to construct simple networks from card and how to add visual detail bu using cut outs, stick-ons and simple marker work. He provided full scale templates for a varietu of networks.

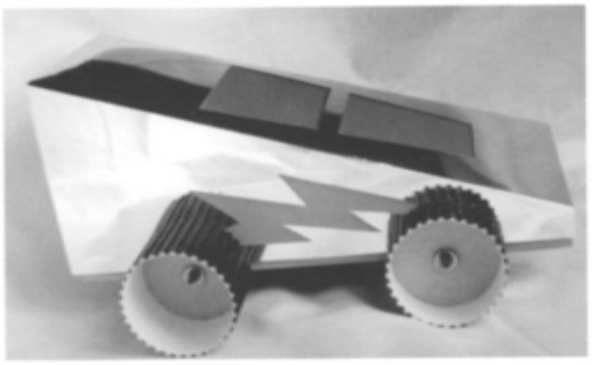


The teacher showed the class how to produce a simple basic frame which rolled straight. The students then had the challenge of adding electrical components to cause movement and lighting.

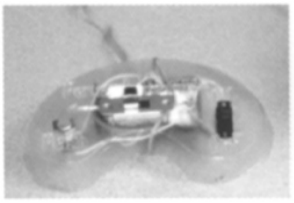


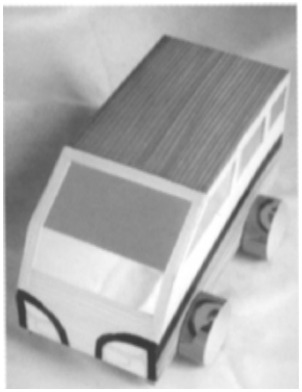
Here the student has produced a racing stule vehicle for sand dunes.

Here the student has produced a track vehicle for shallow lakes and swamps.



The teacher also showed the class how to produce a simple controller which could be attached to the buggies for remote-control.





Values

Technical

Students should be made aware of the need for care and accuracy in making the vehicle if it is to work as intended.

Economic

Students should consider the merchandising that is associated with big-budget films.

Environmental

Students should consider the role of science fiction films in raising awareness of environmental issues.

Social

Students should consider the role of film-going as part of our lives: why do we go, who do we go with, how does a film compare with broadcast television and hired videotapes?

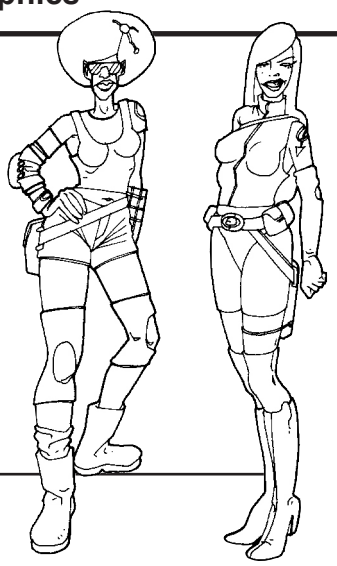
Moral

Students should consider whether the production of special effect movies is justifiable.

Aesthetic

Students should have the opportunity to appreciate the machine aesthetic as well as the dramatic nature of landscapes.

Special effects



The detail

Sample brief

Design and make a realistic model vehicle for a film set. with a display showing how it will look in its intended settings

Sample specification

What the product has to do:

- move across the terrain effectively and in a realistic manner;
- be controllable (start, stop. forward and reverse);
- be able to illuminate its path.

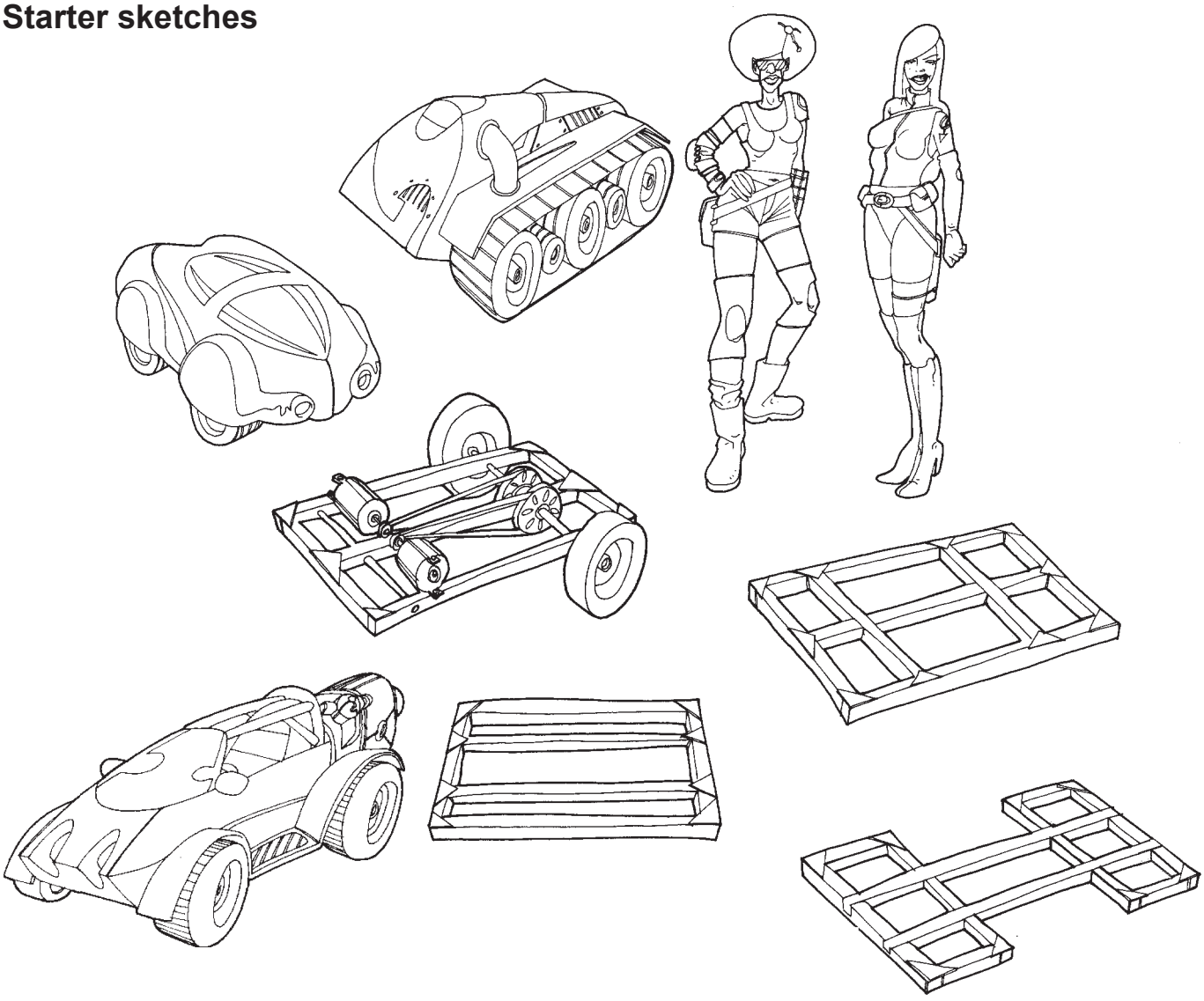
What the product should look like:

- be realistic;
- have a recognisable and pleasing style.

Other features:

- be based on a given chassis design;
- use card nets for the body shell.

Starter sketches



Nuffield teacher talk

'What sort of shape would be good in high winds? That's right – low and smooth so the wind doesn't catch it. Let's draw some low smooth shapes then.'

'What sort of wheel wouldn't sink into swamps? That's right – wide ones, so draw some really big wide wheels on your buggy. Either side or in the middle – it's up to you.'

'What could you use for big wide wheels?'

'How are you going to make the wheels go round? With the motor. OK, but I can't see how the motor is connected to the wheels.' 'By an elastic band.'

'But isn't the plate holding the motor in the way?'

'You want a flashing light on the top so that it can be seen in a dust storm?'

'Yes, you could use a flashing LED. Show me where it goes in the circuit diagram. You haven't got one? Quick, let's draw one. You start with the battery.'

'You want to put a buzzer, two LEDs and a motor all running off the same battery, and you've got in a bit of a mess with the circuit diagram. OK, try using the top and bottom rail approach and string the components in between. When that's clear, we can draw a layout diagram. You start by drawing the rails.'

'You've got three control switches. One for forwards, backwards and stop, one for sounding the buzzer and one for turning on the lights – right? Can you fit all the switches and the battery onto a piece of card and run the wires to the buggy? Or do you want all the switches on the buggy?'

'I like the idea of 2 suns in the sky on the back-drop. How are you going to make them look really bright?'

'Are you sure that hill won't be too steep for your buggy? Have you tried it? Oh, it's struggling. What can you do to improve the grip?'

Resource Tasks

General design

For the first Capability Task in Year 7:

SRT 1 *Writing design briefs*
SRT 2 *Specifying products*
SRT 8 *Using image boards*
SRT 21 *Using simple shapes and guidelines*
SRT 37 *Evaluating outcomes – user trips*

For the second Capability Task in Year 7:

SRT 11 *Brainstorming*
SRT 12 *Metamorphosis*
SRT 22 *Using grids – enlarging and reducing*
SRT 29 *Putting products onto backgrounds*
SRT 17 *Appreciating products – style*

For the third Capability Task in Year 7:

SRT 13 *Pattern design*
SRT 9 *Choosing and manipulating images*
SRT 10 *Capturing and manipulating images*
SRT 18 *Appreciating products — colour*
SRT 41 *Cool or what? Developing your design vocabulary*

Focus area design

SRT 23 *Drawing quick 3D views*
SRT 24 *Crating*
SRT 25 *Making things look solid* SRT 26 *Using nets*

Communication

CRT 2 *Surface shading – showing texture*
CRT 3 *Surface shading – showing depth*

Making

Demonstration of chassis construction techniques: measuring to length, marking all round, cutting square, cleaning up, cutting two identical lengths together, drilling holes (in identical pieces together), using card corners, clamping while gluing. Followed by test piece: a postcard-sized picture frame with 90° corners, emphasis on quality making. Homework: create a postcard-sized alien landscape scene and fit it to the frame.

HSRT 4 *Being safe with technical components*

Technical

MCRT 1 *Changing types of movement*
MCRT2 *Changing axis and direction of rotation*
ECRT 1 *Choosing batteries*
ECRT 3 *Making a reversing switch*
ECRT 4 *Using switches to control lights*
ECRT 5 *Using switches to control motors*
ECRT 8 *Working out a circuit diagram* (suitable for homework)
CCRT 3 *Child's toy* (if you wish to use PIC technology in controlling the vehicle)

Case Studies

Real-time information for bus passengers, *Student's Book* page 245.

ICT opportunities

Use www to find out about recent science fiction films. Try putting '+film +genres' in the search engine. Look directly at www,filmsite.org/sci-fifilms.html.

Use CAD/CAM to produce basic nets from sheet material. Use CAD/CAM to produce decorative 'stick-ons' for the body shell. Use CAD/CAM to produce decorated nets from sheet material.