Hull Design: solar boats

Target Areas

KS 3 or 4
Resistant Materials
Material properties and processing

GCSE Engineering
Unit 1
Specifications and Engineering drawings
Unit 2
Production planning, Choosing materials, Using processes
Health and Safety
Unit 3
Investigating Products
Key Skills
Communication, Number, IT

Task:
To design a hull for your Schools Marine Solar Challenge entry.

Introduction
The hull of your craft is the most fundamental element of any boat.
It is the structure that holds in place all other components. It gives the craft its shape size, form and buoyancy. Other fundamental aspects are the influence it has on performance and handling.

Research Section
What different forms of boats have evolved over time?
Produce a time line showing the evolution of basic hull design from simple wood and skin craft to advanced composites used in Formula One power boating
For each list the typical materials, forming systems, jointing processes and the main advantages and disadvantages of each.

What are the key design elements a hull must posses for the solar challenge?
Lightness
Stability
Ability to carry solar panels
Ease of manufacture
For each of the above say why they are important, add more if you can.

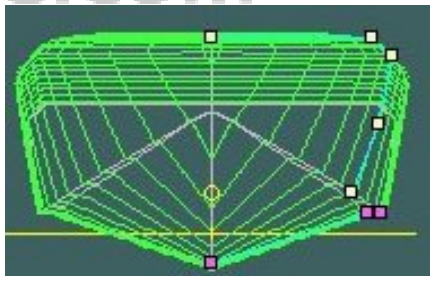
Design section
Collect all the information you will need to enable you to start designing your hull and draft a specification.
Scale and size required, maximum length 450mm
Major component locations and fixing methods, e.g. motor and propeller mount
Wire guide systems, see web site
Material availability
Processing availability, particularly the size of a likely vacuum former

Initial design
Produce a few freehand sketches of ideas then progress to dimensioned drawings, appropriate to your design. Remember to include all necessary information for someone else to manufacture your hull to the correct dimensions and tolerances and using the appropriate materials and manufacturing systems.
For example you may want to use a modelling foam for a form tool, which will be time consuming to make. Your boat will be guided by an overhead wire so make sure you have a mounting point for this. Visit the schools marine web site to find ideas from previous entries.
Produce full working drawings showing at least two cross-section views along the length of the hull and across the beam.

Manufacturing Section
Produce test pieces for any processing skills such as pattern making, from wood or styra-foam. A tip for removing the form tool from the moulding is to carefully cover the Styrofoam with masking tape. This prevents the heat from the vacuum forming plastic from sticking your former to the surface of the plastic.
Produce a sequence of operations for manufacturing from cutting materials to finishing and applying a surface finish which will allow the mould to release from the pattern

Health and safety
Carry out a risk assessment for vacuum forming.
Consider: Materials, protective equipment and action in case of problems.

a



b

c

a Basic hull layouts

b Lines drawings

c Guidance system