



## ***Project Guide***

Formula Sun is a competition to design, build, test and race ***model boats powered by solar energy***. The aim is to introduce the world of renewable technologies, teamwork, as well as designing and making in a marine project.

### ***For this project you will:***

- ✓ ***work in a small team***
- ✓ ***have a clear role within your team***
- ✓ ***collect information, advice and possibly sponsorship***
- ✓ ***contact experts in the Marine Industry***
- ✓ ***learn about solar energy***
- ✓ ***design and make a Solar Powered craft***
- ✓ ***test and modify your designs and model them***
- ✓ ***if possible, use CAD/CAM to produce designs for your craft***
- ✓ ***model your hull template in foam***
- ✓ ***vacuum form your hull***
- ✓ ***assemble a suitable powertrain***
- ✓ ***solder components together***
- ✓ ***produce a website to promote your team***

The fastest boats will be entered on the official Race Days, held at different locations around the country. The top teams from all over the country will be invited to take part in the national finals at the London International Boat Show in January. Teams are notified of this by November.

Prizes are awarded for the best designed, built and fastest craft. Points going towards the overall prize are also awarded for teamwork, organisation, promotion and links with local marine industries.

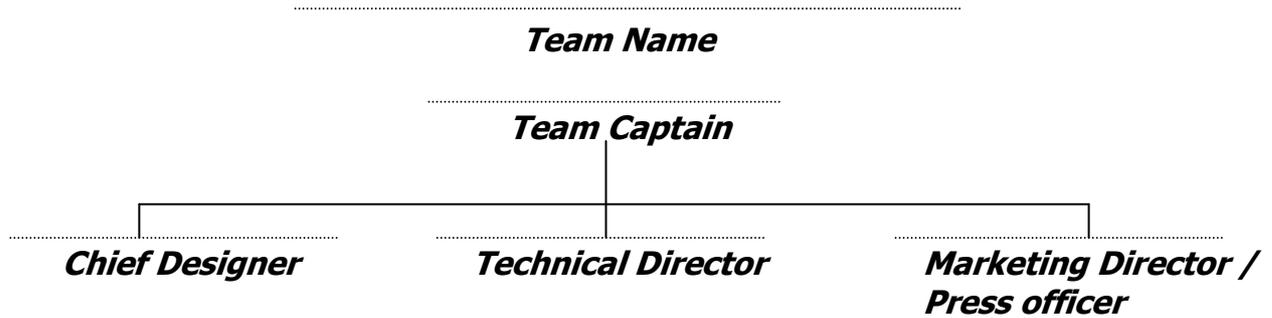
For more information visit [www.schoolsmarine.com](http://www.schoolsmarine.com)

### ***What your team needs to do...***

The ability to work as part of a team is an important skill you will need to develop throughout life and particularly for when you enter the world of work.

So, before you start designing your fantastic solar-powered race-winning boat, you must decide upon a team name and the roles within your team. It is important you distribute roles evenly amongst the group so you can work most effectively in lessons. You will be judged on your team-working skills... no squabbling please!

Below is one way of organising yourselves; however you can combine roles for smaller teams.



Position within team	Role description
<b>Team leader / Captain</b>	You must make all the main decisions with the approval of other team members. You must organise other team members and distribute jobs between each member. You will be the spokesperson for the team and must therefore have a clear idea of the aims of your team.
<b>Chief Designer</b>	You are responsible for what the boat will look like – consider hull shape, team colours, livery and the distribution of components within the structure.
<b>Technical Director</b>	The boat may look good but does it work? You need to plan what components are going to be used, where and how. You will need to regularly test the boat in the floating tank and discuss with the Chief Designer what changes and modifications need to be made.
<b>Marketing Director / Press officer</b>	You are in charge of promotion, publicity and how the outside world views your team. You will plan the content of a webpage to promote the team and regularly take photos to document evidence of progress. You could also contact prospective companies for help, advice or possible sponsorship.

**Assessment Criteria & Competition Rules**

Key Targets

- ✓ Work well as a team
- ✓ Produce a range of initial solar craft designs
- ✓ Research existing boat and hull designs
- ✓ Design, manufacture and develop a working solar powered craft
- ✓ Contact local companies for advice, support or possible sponsorship
- ✓ Promote your team through a webpage

**Schools Marine Challenge – Official Solar Craft Racing Rules**

The boat must be free running over a distance of 10m. Each school can enter three rounds with either the same or different craft competing but craft may not be swapped *within* a round. The winner will be the boat completing the course in the least amount of time.

Points will be awarded as follows:

Position	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>
Points	10	8	6	5	4	3	2	1

- The vessel can only be powered by solar cells which it must carry onboard
- The maximum length of the vessel is 450mm
- Maximum width 150mm for test tank class
- Any type of solar cell and motor can be used although basic components are provided
- There are no restrictions on hull format or construction,
- The boat must run attached to a wire over a distance of 10m in still water

## Components

### Hull

Your boat needs to float and travel smoothly through the water: a well designed hull should meet both these criteria. Materials to consider depend upon your manufacturing capability, but producing a mould for vacuum forming from foam can be done using hand or CAD CAM skills.

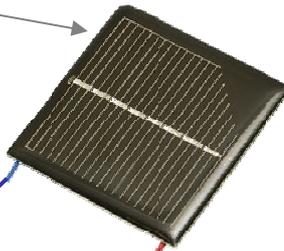


### Solar panels

Your boat must carry a cell solar module. However, if you obtain sponsorship, several solar panels are available:

Small panels are powerful but have a very high resistance. They only work at high light levels and so may not work on an overcast day.

Larger panels have a lower resistance and provide a steady supply of power at low light levels. However they are heavier which could slow your boat down.



### Wire

You will join each component together with flexible wire and solder. Incorporate switching and plug connectors for ease of use.

The quality of your soldering is very important - your vessel must be 100% reliable!

### Propeller

This transfers energy from the motor and rotates to push against water thus thrusting the boat forward.

### Motor

The SMC provide basic motors although any type of motor can be used. The lower the resistance of the motor the easier it will start – this is vital for a quick getaway!

### Propeller shaft

This links the motor to the propeller.

It is very important to align your motor and propeller accurately for maximum efficiency.



## A guide to design work

It is really important that you have a clear idea exactly what you are going to make and how it will be made. This detail should be expressed through your design work. It should include:

- ✓ A range of initial ideas for hull designs drawn in small sketches
- ✓ A team logo or visual identity
- ✓ Use of 3D wherever possible to show shape clearly
- ✓ Use of colour to show a common team identity or to highlight key areas
- ✓ Front, end and plan views showing the shape of the hull(s) and location of components
- ✓ Clear and detailed annotation explaining your ideas clearly

Here are some examples of what your design pages should look like. The pages are generally well arranged and include team names. A wide range of initial designs have been suggested and each has been explained through clear annotation. Key words have been underlined and colour coded. Background shading has been used to highlight important parts of the design on the page.

