Rural Solar Boat Challenge

2010 Regulations for:
Model Solar Boats

For further assistance, information and resources please contact:
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Rural Solar Boat Challenge to be held at
Bannockburn Primary School
on Saturday, October 9th, 2010
visit: www.bannockburnps.vic.edu.au
**Registration**
Anyone planning to enter should download a registration form from the website detailed below and mail it back together with payment of the $10 registration fee (per team – max $25 per school) to the Business Manager at the address given in Correspondence (below) by July 29th. Details of method of payment will be on the form.
www.bannockburnps.vic.edu.au

**Correspondence**
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The Rural Solar Boat Challenge will be held at Bannockburn P.S on the 9th October. We will commence with a round robin event in which each boat will have a number of races with the most successful continuing to a knockout competition.
Regulations
A. General Regulations
The following regulations 1 to 10 apply to all boats.
1. The maximum boat length i.e including any front and rear projections, must be less
than 550mm to ensure that the boat fits behind the starting line. See fig 1

![Figure 1](image)

Layout of pool showing 2 boats lined up at the starting line.

2. The maximum boat width (including the cells) must be less than 300mm.

3. To enable boats to steer a straight line down the pool, a guide line will be provided
as near as possible to 300mm above the water surface. Boats must be able to follow
this line. Normally rods with open loops through which the guide line will run are
used. Guide designs other than the one shown below may be used. The guide line
must not be used for propulsion.

![Guide Line](image)

4. All boats must only be powered by commercially available **silicon** cells with a
maximum total active area of 350cm² (note 1: active area means the area covered by
the photovoltaic cells only, not including encapsulation around the edges and
between cells. Note 2: commercially available silicon cells means the cells must be
silicon based and in general commercial supply, specialized or recycled cells from
research or space use therefore cannot be used.) Panels must be securely attached, so
they cannot fall into the water.

5. A functioning on/off switch must be installed between the solar panel and the
motor.

6. No commercially available boat hulls or kits can be used. Entrants are to design and
construct their own boats in the year of the race. Hulls unaltered from previous year’s
competitions must not be submitted.

7. No batteries or energy storage devices are allowed.
8. Boats will be run in either a generally North – South or a South – North direction at the discretion of the race coordinator. All races in any round will be run in the same direction. In finals where the winner is determined on a best of 3 race principle, the boats will race in alternate lanes.

**Motors**
Only one motor of a maximum value of $20 may be used.

**Hulls**
Only hulls made from drink bottles or cans, polystyrene foam, cardboard or balsa wood may be used. (Obviously cardboard and balsa must be water proofed). Moulded hulls e.g: vacuum formed plastic and fiberglass hulls are not allowed.

**Electronics**
No electronic systems or capacitors are allowed.

**Propulsion**
Paddle wheels, rowing, air propellers, water propellers etc are all permitted. However only one air or water propeller is permitted (a water propeller of 35mm or less is recommended).

**Cost**
The maximum allowed cost of the complete boat is $50 – solar cells not included.
Advice on the Electrical Power System

Solar Cells
Make sure that the cells that you use are silicon based and of a durable, waterproof nature. Generally it is recommended that the cells are connected as shown in Figure 2—in series if the weather is sunny, but in parallel if cloudy. The best connection configuration depends on the motor and propeller combination together with solar cell characteristics consequently testing is critical to determine the best configuration for your particular combination. NB Solar cells are fragile and can easily be detached if handled roughly. Resoldering wires onto the cells is possible, but not easy. We recommend the wires should be taped to the back of the panel to minimise damage.

Cells wired in series $V_{total} = V_1 + V_2 + V_3$

![Figure 2](image)

Cells wired in parallel $I_{total} = I_1 + I_2 + I_3$

Motor
A medium torque low voltage (3 volt) hobby motor available from hobby or electronics shops is recommended.
Helpful Overview for First Time Entrants

Materials Guide
Recycled materials which might be useful include:
- plastic juice, milk and PET soft drink bottles
- Aluminum cans
- Pieces of polystyrene
- Foam, plastic, and aluminum food containers

Model building materials such as balsa wood, metal rods and tubing, propellers and shafts, motors, polystyrene, fiberglass, adhesives and silicon sealants are available from model shops and hardware shops. Hot melt glue guns are quick and easy to use. Model shop owners are usually enthusiasts who, if asked, may advise and assist with information on the best materials and how to use them.

Guides to Ensure that the Boat Follows the Suspension Line
As described in regulations there will be a horizontal guide line suspended approximately 300mm above the pool. In past events, the biggest problem for new entrants was the guides rubbing on the line creating excess drag. The guides must be made of stiff material which does not bend when in contact with the line. It is particularly important that if the guide has a loop over the wire, the boat will not hang from the loop as this will impede forward motion. It is a good idea to set up a test rig in a small pool and test your boat prior to the event.
Resources

“Model Solar Boat Guide” $14 GST inc – Student education by Wayne Young. This guide book is aimed to assist each team of students to design and build their boat and organise their poster.

“Model Solar Car Racing” $18 GST inc – by Peter Harley of Einstein Design. While this guidebook mainly offers practical ideas for teaching on design and construction of cars, it also contains information on team organisation, budgeting, sourcing of materials and design criteria which are appropriate to boats as well.

“A Solar Future” $11 GST inc – Video 11 mins by Don Scutt, Double D productions.

“Solar Car Competition and Boat” – Video by the students of Footscray Secondary College.