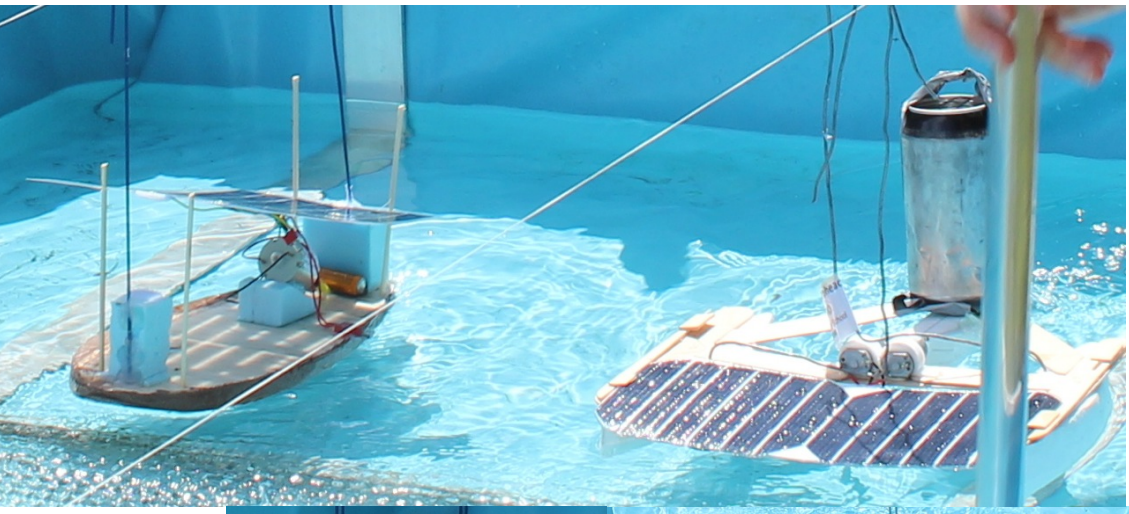
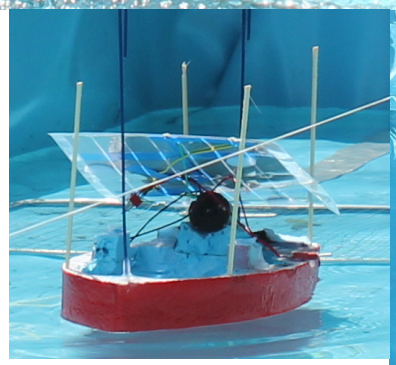
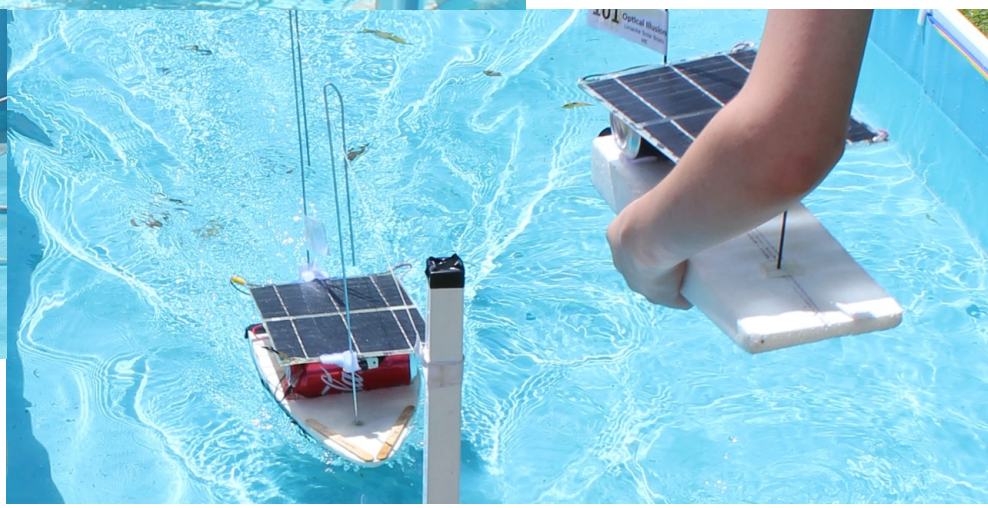
AIMSC Model Solar Boat
2019 Regulations







Mission Statement

To develop and encourage an interest in Science, Technology, Engineering and Mathematics (STEM) and using solar and renewable energies in school aged students throughout the world and to give these students the opportunity to gain some experience and expertise in this by using active learning in addressing real life challenges. By doing this, it is hoped that the citizens, scientists and engineers of the future will be more likely to participate in developing a more environmentally-aware approach to the way energy is used, both by a more efficient use of old technologies and the appropriate introduction of renewable energies and technology.

AIMSC Committee

The Australian-International Model Solar Challenge Committee is a voluntary body consisting of primarily of members from the local state event organisations and may include sponsors representatives, teachers, students and other invited interested persons, is hereafter referred to herein as the AIMSC Committee.

The AIMSC committee and volunteers will act as event Officials for the duration of the AIMSC event.

Contents

1. Introduction

1.1. Overview

The Australian International Model Solar Challenge (AIMSC) is focused on providing first hand education to students based around Science, Technology, Engineering and Mathematics (STEM) with a focus on design, engineering and renewable energy.

The event is comprised of two main categories, the Model Solar Boat event and the Model Solar Boat event. This document outlines the rules and regulations for the Model Solar Boat event. The Model Solar Boat Challenge has two divisions, Advanced and Junior.

Students will design and build Model Solar Boats and race off against each other to determine who has produced the overall best designed, built and executed entry.

The Advanced Model Solar Boat Champion will be determined by the teams combined score from the three competition portions: racing results, video presentation and engineering knowledge. The Model Solar Junior Boat Champion will be determined from racing results and video presentation.

1.2. Spirit of Intent

The event has been designed to improve student learning and provide a practical experience in designing and building a renewable energy vehicle, to gain crucial understanding and development around the engineering process and the importance of renewable energy for a sustainable future; it

also focuses on getting the teams to demonstrate, apply and effectively communicate their learnings.

It is important that the learning outcomes of the challenge are focussed on the students; as such while teacher and parent help is strongly encouraged and absolutely necessary, it is important that the students complete all work themselves and are exposed to the full process of taking an idea from a simple sketch to a well refined engineering masterpiece.

1.3. Competitors

The competition is run in two divisions

1.3.1. Advanced Division

The advanced competition is open to applicants from all schools, other organizations and private entries in Australia and from overseas. Competitors must be students currently studying up to and including Year 12 secondary level, as approved and invited by the AIMSC Committee.

1.3.1. Junior Division

The junior division is open to applicants from all schools, other organizations and private entries in Australia and from overseas. Competitors must be students currently studying up to and including Year 6 primary level, as approved and invited by the AIMSC Committee.

1.4. Contact and Correspondence

All correspondence should be sent directly to the AIMSC committee

secretary@modelsolarchallenge.com.au

2. Interpretation of the Regulations

These regulations have been designed by the AIMSC Committee to operate in good faith. The nature of the event is to promote learning and encourage thinking outside the box, so everything is open for interpretation.

While it is encouraged for students to push the boundary of what is within the rules and what is not, anything outside the Spirit of the Event will not be permitted.

The AIMSC Committee will judge each entry according to these regulations and will investigate anything brought to their attention. They will, within reason, penalise any teams who do not comply, and take any action they believe to be appropriate.

3. Entries

3.1. Invitation to Compete in AIMSC

The aim for the National event is to allow teams to compete at the highest level in each division. Teams may attract an invitation to the event by performing well at their state event, or by invitation directly from the AIMSC Committee. Please contact the AIMSC Committee if you are seeking an invitation to compete.

Potential overseas entrants must notify the AIMSC Committee of their interest in competing by 1 June 2019, to ensure that we are able to provide assistance with visas as needed.

Invitations for the AIMSC event will be sent to the regional coordinators for their local entrants.

International invitations will be sent to the parties that have contacted the AIMSC Committee.

3.2. Registration

Teams that have accepted their invitation to compete must register on the AIMSC website within 10 days of receiving their invitation. All registrations will close on 18 November 2019.

3.3. Original Work

Each team must design and build an original model solar boat each year, and not simply re-enter a boat from a previous event. While some components may be reused, the hull of the boat must be totally original and be the work of the students alone. Where a boat may be similar to previous designs, the team must demonstrate some fundamental difference that sets their design apart from the rest.

Where a school has multiple entries, each boat must be proven to be of different design, and not a slightly varied version of another teams.

Teams must ensure that their answers presented in the knowledge test are in their own words, and that their Video Presentation is created entirely by the team.

4. Video Presentation

As part of each entry to the Solar Challenge, each team must submit a 3-5 minute video presentation to the AIMSC Committee. This video shall outline the design and build of the boat, along with the engineering fundamentals that make the team's boat stand out from the rest.

The video must be submitted along with a media release consent form allowing the AIMSC Committee to use the video for promotional purposes, unless special circumstances prevent this.

The video must show the team and the boat in action, but can incorporate still images, drawings, text or animations created by your team. Points will be also be awarded for outstanding editing and presentation.

Teams must ensure that they do not use content (e.g. music, graphics, animations or text) that are subject to copyright and are encouraged to create their own content entirely.

4.1. Video Content

A key aspect of any innovative engineering endeavour is being able to effectively communicate what you have done and how it stands out from predecessors and your peers. Sharing knowledge is the best way to move forward, and this video will enable teams to collaborate and grow together, while allowing new teams to understand the competition and gain invaluable insight into how to build a model solar boat.

The video should cover the following topics in detail, along with other interesting features that could gain the favour of the people marking.

- The Team – Introduce yourselves and your roles! Team slogan?
- Renewable Energy - How does it work? What is the impact on the automotive industry?
- Design Phase - How the boat was designed, what was the design process?
- Build Phase – How did you bring your boat to life? Special materials or techniques?
- Testing – How did you test your boat? Will it be fast enough? Show us footage of testing and tell us what you have learnt from it!
- Something unique – About the team or the boat!

4.2. Consent – Media Release

Each student who features in the video or attends the AIMSC event must submit a media release consent form signed by a parent or guardian upon registration. The videos may be used by the Committee for promotional or educational purposes, with the best entries displayed on our website.

If parents or guardians are not willing to consent, the team must submit their video without including that member(s) of the team in any footage. This will not impact marking as there are many creative ways you can include your team without needing to use their image.

Parents and teachers should review and approve all video submissions prior to the videos being submitted to the Committee, so it is suggested you seek permission from parents or guardians at the start of the project.

The media release consent form is available on the AIMSC website.

4.3. Video Submission

The video must be submitted as a soft copy, in avi or mp4 format, either:

1) On a USB at the start of scrutineering on the day of AIMSC (videos submitted after 10am will not be marked; corrupt files will achieve a score of zero)
2) By file transfer / email in the week prior to the event

If teams choose not to submit a video will not score points for this portion of the event, which will exclude the team from being in the running for the championship.

4.4. Video Marking Criteria

The video presentation will be marked as per the below guidelines:

Team Collaboration	6 points
Design and Engineering	8 points
Knowledge and Understanding	8 points
Video Presentation	8 points

The video will be given a total mark out of 30, which will contribute to the teams overall score to determine the overall winner of the Challenge.

5. The Pool & Racing

5.1. Pool Size & Shape

The pool is rectangular in shape, approximately 1.6m wide and between six (6) and ten (10) metres long with a side wall of approximately 300mm. The height of the side walls permit for a minimum water depth of 70mm over the entire pool surface area..

5.2. Pool Construction

A layer of polyethylene plastic sheeting is laid over a support frame. The pool is divided into “lanes” equally spaced across the pool using fine wires, strings or fishing lines fixed to supports at both ends of the pool. These supports are stabilised so that the lines can be tensioned ensuring that they are 300mm ±25mm above the water surface level in the pool. There may be either two (2) or three (3) lines suspended above the pool, allowing two (2) or three (3) boats to participate in each race.

Figure 1 shows an example of the pool construction with boats at the starting line.

5.3. Racing

Boats will be assigned a lane on the day for each race in which they compete. Each boat will be placed in their assigned lane and placed on the starting line by a team member. Starting the race is either by the use of a starting gate or the manual release of the boat by the team member.

Boats will compete in round robin races before lunch to determine ranks for the head to head knock out competition held after lunch. All races in a round will be run in the same direction.

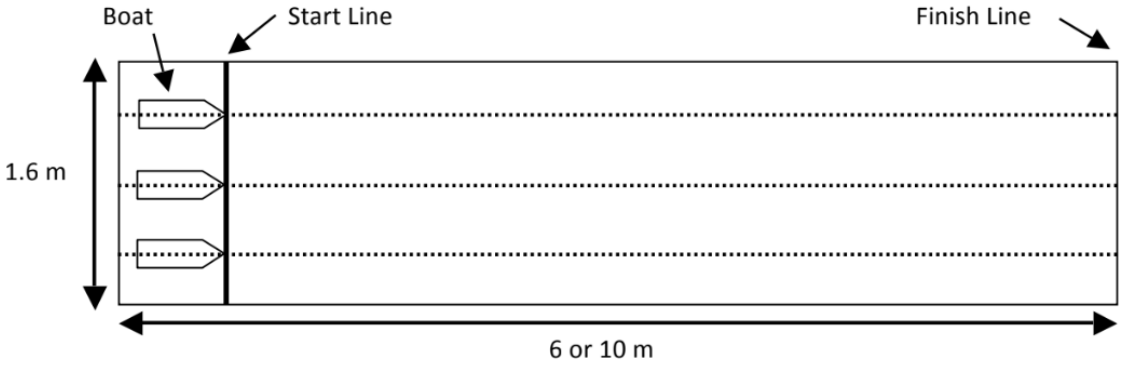


Figure 1 – Layout of a pool configured for three (3) lanes with boats at the starting line

5.4. Winning Vehicle

The winning boat will be the one which reaches the finish line first, as judged by the AIMSC official at the finishing line.

Sometimes a boat does not finish the race, either by submerging, having insufficnet power or coming off the guide wire; if that boat interferes with other boats in the race they will be considered the loser of the race. If all boats in a race do not finish, the boat that travels furtherest without interfering with other boats will be considered the winner.

5.5. Poor sunlight

The race must go on! We don't always get favourable weather; however best efforts will be made to conduct races during good weather. Sometimes this cannot be avoided, so the boats will need to prove themselves under low sunlight conditions, maybe even in the rain.

5.6. Protests

If a team believes they have been mistreated or lost due to an unfair advantage for the opposing team they must report the incident to the AIMSC Committee immediately after their race.

The AIMSC Committee will work together to resolve the issue and return their decision promptly. That decision will be final and no further action will be taken afterwards.

5.7. Practice and Testing

The pool will be open for testing as often as possible, however only while an AIMSC Official is present.

6. Scrutineering

Upon arriving at the event each team must pass the Scrutineering Process prior to be allowed to use the pool or participate in the event.

The team will need to submit their video presentation and boat to pass scrutineering. Each boat will be judged according to these rules while in race ready condition to ensure it fully complies with all

the rules. Where a boat does not meet any rules the team will be allowed to make modifications to the boat to meet these requirements. In the case this is not possible, the boat may not be allowed to race.

Each boat may be checked by an AIMSC Official immediately before and/or after each race, or at any time during the competition.

7. Servicing

7.1. Service Area

To allow students space to work on their boats, a designated area will be setup to work on boats and allow for modifications and repairs. This will be a restricted area only for members of the teams, and as such teachers, parents and mentors will not be permitted in these areas. Team supervisors will be allocated space from which they can readily supervise teams, but will be separated from the servicing area.

7.2. Modifications

Modifications are allowed during the event, but must always comply with these regulations. Any boat may be re-scrutineered at any time to ensure compliance to the regulations.

7.3. Hazardous Substances

Hazardous substances are strictly prohibited due to Health and Safety Regulations throughout all the competition. Any substance that may be classed as hazardous (eg solvents, liquefied gases etc) must be approved by the AIMSC Committee before being used during the competition, and the team must provide the relevant MSDS.

Cooling solar panels with anything other that water ice will not be allowed at any time.

8. Boat Specifications

8.1. No commercially built boats

Boats must not be commercially available or made from a single pre-designed commercially available kit. The intent of the competition is for the team to design their boat from scratch; this may involve the use of commercially available components from kits or purchased separately put together to achieve the teams unique design.

8.2. Size limit

The boat must fit in a box, 550mm long and 300mm wide.

8.3. Guide Height

To enable boats to steer a straight line, they should be fitted with rods with open loops through which the above pool guide line will run. This guide line will be located as near as possible to 300mm ±25mm above the water. Figure 2 shows the guide line height with an example guide rods configuration.

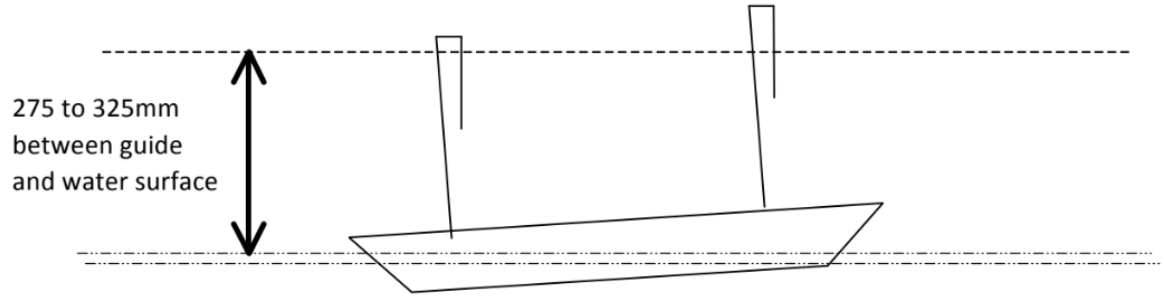


Figure 2 – Guide line height and suggested guide rod position

8.4. Source of power

Boats may be powered only by commercial silicon cells with a maximum active area of 350 square cm. The solar panels must be securely attached to the boat, so that they cannot fall into the water.

8.5. ON/OFF switch

Each boat must be fitted with an 'ON/OFF' switch and labelled clearly! as we can't have any boats running off without supervision.

8.6. Boat wiring

All wiring should be mostly visible for ease of repair and to help the understanding of the AMISC committee. Finding a short circuit inside the chassis can be a bit difficult at times.

8.7. Flags

At Scrutineering teams will be provided with a "flag" with the boat's number and name. This flag is to be affixed to the rear guide rod and must be visible at all times during racing.

8.8. Captain and Crew

A "captain" and one (1) "crew member" must be carried on the boat during racing and must be in position when the boat reaches the end of the pool. The figures must be at least 55mm high and 20mm wide and can be made of any material (e.g. Lego™, other plastics, waterproofed cardboard, timber, pipe cleaners).

The captain and crew must be standing (vertical) and must not have anything above their heads. They must be able to "see" where the boat is going and at least 40mm of their height must be above the deck, i.e. visible from the front and sides.

8.9. Junior Division Specifications

All junior boats must meet specification 9.1 – 9.9 as well as the following specifications:

8.9.1. Motor

Junior boats may have only one (1) hobby type motor commercially available within Australia with a maximum recommended retail price of AUD $ 10.00 is permitted. Motors from scrapped equipment such as VCR's etc. are not permitted as we cannot verify their performance.

8.9.2. Propulsion

There is no restriction on the use of underwater propellers, air propellers, paddle wheels, oars etc. for the selection of the boats propulsion system.

Boats using in water propellers must use direct drive between motor and propeller. Gearboxes or other methods of changing the propeller speed relative to the motors' rotor speed are not permitted in this division

8.9.3. Hull Material

Only hulls made from recycled packaging (such as plastic drink bottles or cans etc.), polystyrene foam, cardboard or balsa wood (appropriately waterproofed) may be used. Moulded hulls, e.g. vacuum formed plastic and fiberglass hulls are not allowed in this division.

8.9.1. Electronics

No electronics/maximizer units may be used in this division.

8.10. Advanced Division Specifications

All advanced boats must meet specification 9.1 – 9.9 as well as the following specifications:

8.10.1. Cargo

Advanced boats must carry a cargo of one standard size tennis ball, as would be used at the Australian Open. Teams will need to provide their own tennis ball of any brand, it must be undeformed and unmodified and in good enough condition to play a tennis match after the racing. The tennis ball must be in place when the boat reaches the end of the pool.

8.10.2. Motor

Any type or number of motors may be used in this division

8.10.3. Propulsion

There is no restriction on the use of underwater propellers, air propellers, paddle wheels, oars etc. for the selection of the boats propulsion system.

Any type or any number of propellers, impellors or other propulsion units may be used. Gearboxes or any type of speed varying system may be used between motor and the chosen propulsion component(s).

8.10.4. Hull Material

Any materials including vacuum formed plastic, fiberglass or carbon fibre hulls can be used.

8.10.5. Electronics

Electronics and capacitors may be used, but the total capacitance on board the boat must not exceed 15000µF.