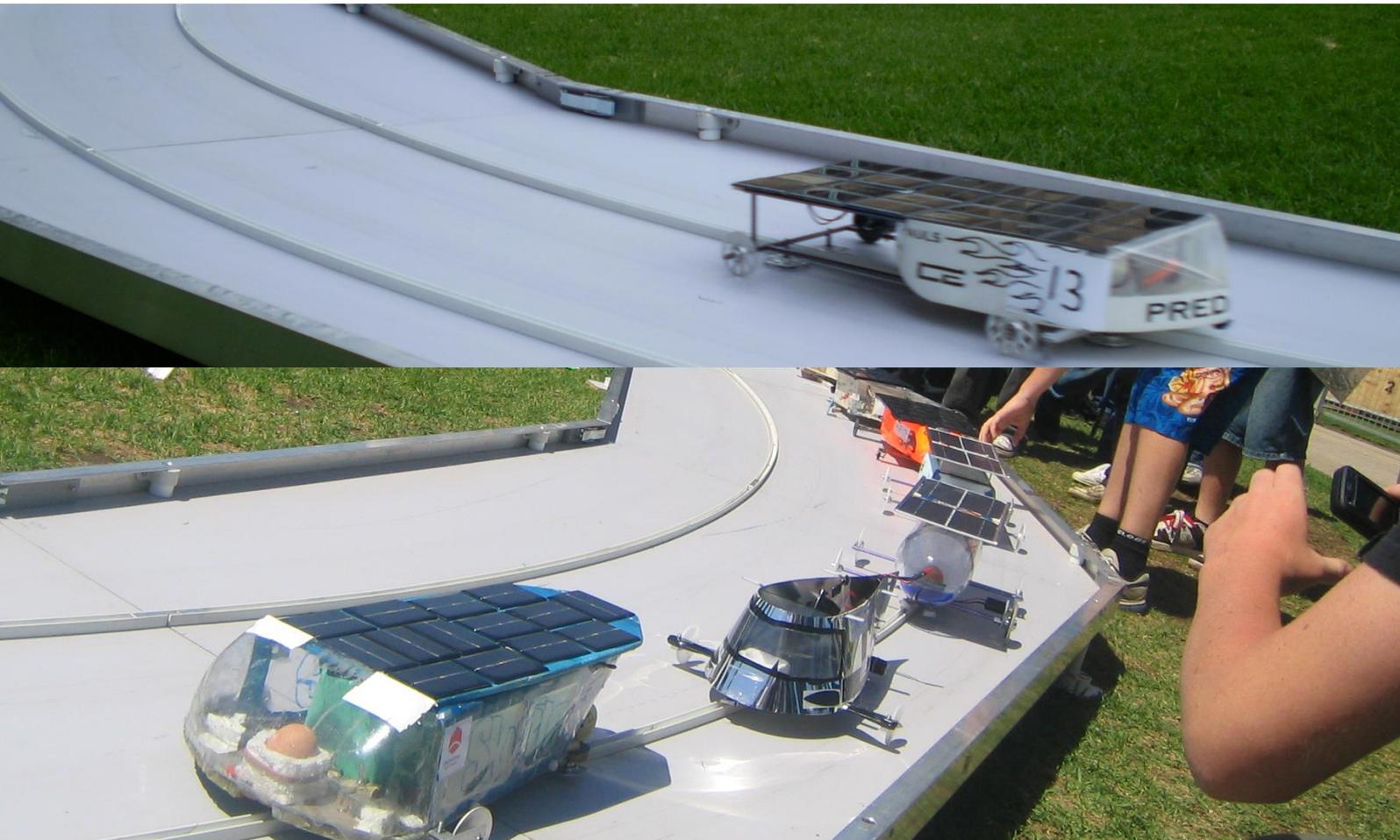


AIMSC Model Solar Car Regulations



Mission Statement

To develop and encourage an interest in 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.

Organising Committee

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

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

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1. Introduction

1.1. Overview

The Australian International Model Solar Challenge (AIMSC) is focused on providing first hand education to students based around design, engineering and renewable energy.

The event is comprised of two main categories, the Model Car event and the Model Boat event. This document outlines the rules and regulations for the Model Car event.

Students will design and build Model Solar Cars and race off against each other to determine who has produced the overall best designed, built and executed entry. The winner will be determined by the combined score of racing results, presentation and knowledge demonstrated by the students.

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 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. Allocation of Points

Points allocated for each portion of the event are based off the importance of each section. Detailed explanations of the points for each area can be found in the relevant sections.

Racing Result:	40%
Video Presentation:	30%
Engineering Knowledge:	30%

1.4. Competitors

The competition is open to applicants from schools and other organizations 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 Organising Committee. All teams entering this event must comply with the regulations.

1.5. Correspondence

All correspondence should be sent directly to AIMSC:

secretary@modelsolarchallenge.com.au

2. Interpretation of the Regulations

These regulations have been designed by the Organising 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 Organising 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. Number of Teams

The aim for the National event is to allow 32 cars to compete at the highest level. Cars may attract an invitation to the event by performing well at their state event, or by invitation directly from the Organising Committee.

International entries should contact the Organising Committee as early as possible to reserve places and organise travel plans.

3.2. Original Work

Each team must design and build an original car each year, and not simply re-enter a car from a previous event. While some components may be reused, the chassis and body of the car must be totally original and be the work of the students alone. Where a car 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 car must be proven to be of different design, and not a slightly varied version of another teams.

3.3. Multimedia Presentation

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

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

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

3.3.1. 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 car.

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 car was designed, what was the design process?
- Build Phase – How did you bring your car to life? Special materials or techniques?
- Testing – How did you test your car? Will it be fast enough?

- Something unique – About the team or the car!

3.3.2. Consent

Each student who features in the video must get the consent form in Appendix XXX signed by a parent or guardian. The videos may be used by the Committee for promotional or educational purposes.

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.

Parents and teachers must 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.

3.3.3. Submission

The video may be submitted via soft copy, in avi or mp4 format, on a USB. The video must be submitted a minimum of 7 days prior to the competition to allow time for marking and evaluation. Alternative submission methods may be arranged if required.

The video must be submitted along with a PDF file containing all the signed consent forms from the team, videos will not be opened or marked without provision of the consent forms. If teams choose not to submit a video or cannot obtain consent forms they will not score points for this section. The consent form is available in Appendix A.

3.3.4. Marking

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 30% of the teams overall score to determine the overall winner of the Challenge.

3.4. Knowledge Test

Each team will be required to complete a questionnaire on the first day of the event, answering some technical questions about their car. This will make up the 30% Engineering Knowledge marks. The Committee may also be asking questions during the event, and the teams understanding of the car when explaining technical details to the Committee may impact the teams Engineering Knowledge score.

Teams may be selected at random to conduct interviews on stage in front of the entire event, with the aim of demonstrating what they have learnt and how they have overcome some challenges during the design process.

4. Registration

Australian entrants must confirm their participation with their regional Event Coordinator within one week of receiving their invitation to participate in this event. Potential overseas entrants must notify

the AIMSC Organisers of their interest in competing by June 1st 2018, so that assistance with visas can be arranged. Invitations for the AIMSCC 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 organisers.

5. Track and Racing

5.1. Size and Shape

The track will be either a single lane oval track, or a two lane figure-8 track. The track will be approximately 100m long, depending on where the event is held and what track is available. The track presented for the competition will be the same for every entrant, and as such cannot be modified in any way shape or form to suit any entrant.

5.2. Track Construction

The track surface will be mostly smooth with a rectangular guide rail in the centre of each lane. The guide rail will be 16-18mm wide, and 14-16mm high. It is advised that cars should design an adjustable guide system to suit multiple tracks, and ensure enough clearance to not scrape on any part of the track.

As the track will be made in sections for ease of storage between events, it is normal to expect gaps or bumps of up to 3mm. Every effort will be made to minimise these imperfections, however they are to be expected as must be taken into account when designing a car to win.

Further details of the track can be provided on request, full specifications of the guide rail and surface available in Figure 1. The exact design of the track will be advised when the once the location of the event is confirmed, however it will conform to the drawing below.

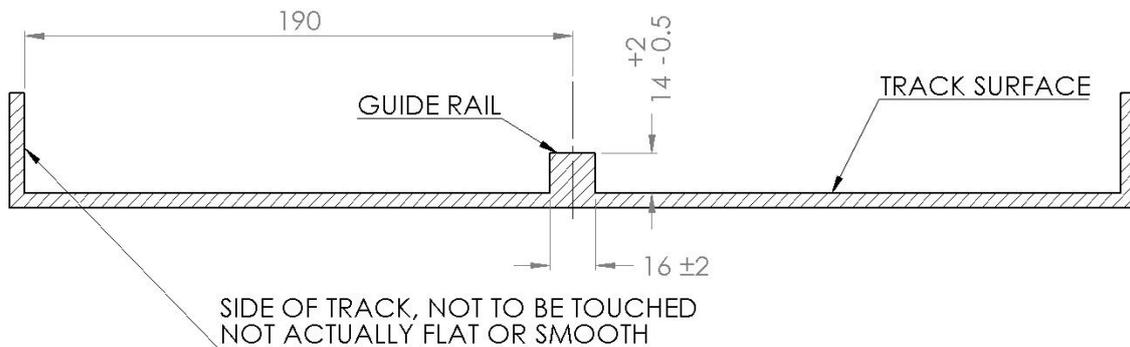


Figure 1 - Track Cross Section

5.3. Race Format

Racing may be conducted in a number of ways, as outlined below:

- Round Robin Knockout
- Swiss Perfect Tournament
- Time Trials
- Head to Head Knockout
- Pursuit Racing

Other methods may also be used to determine the fastest car, and will be communicated effectively on the day of racing.

The preferred method of racing is over a two day event using the figure-8 track, to use the first day as testing and 4 rounds of Swiss Perfect Tournament. The second day will begin with 2 additional rounds of Swiss Perfect Tournament, followed by a 32 car knockout.

Time permitting, each knock out race shall be best of 3. After the top 4 teams have been determined the race format may be adjusted from single lap races to 2 lap races.

The actual format for racing will be decided by the Committee on the day and communicated to the teams prior to the start of racing.

5.4. Winning Vehicle

Depending on the style of race, the winner shall be determined by either the fastest time, the first to cross the finish line, the first car to catch the opponent and make contact, or to complete a set number of laps in the case of a pursuit race.

In the event neither car finishes the race in full, the car that has travelled the furthest distance shall be determined the winner.

All this must be achieved without interfering with the opposing car in any way shape or form, and any actions that effect the other team will result in the team at fault receiving a penalty at the discretion of the Organising Committee.

If a car comes off the track at any point during the race that car will not be awarded the win; part of the race is to successfully complete the distance and come to a stop in the stopping zone as outlined by the Organising Committee. In the case where both cars come off the track, the car which has travelled the furthest shall be awarded the win.

After the completion of racing each team will be awarded points as per below according to their finishing position. These points will be added to the teams total to help determine the overall champion team.

1 st Place	50 points
2 nd Place	48 points
3 rd Place	46 points
4 th Place	44 points
5 th – 8 th	35 points
9 th – 16 th	25 points
17 th – 32 nd	15 points

5.5. Starting/Stopping Procedure

Both cars competing in a race will be started and stopped in the designated zones, and will not interfere with any official equipment or the other team.

The method of starting will be determined by the Organising Committee depending on the style of racing being conducted at the event.

Such methods could include a start gate being operated by an official, or a team member may be directed to release the car at the starting signal.

5.6. 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 cars will need to prove themselves under low sunlight conditions, maybe even in the pouring rain.

5.7. 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 Organising Committee immediately after their race.

The Organising 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.

5.8. Practice and Testing

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

5.9. Results

Results will be published in an easily accessible manner on the day of racing, and updated continuously throughout the day. Following the event results will be posted online along with photos of the event and details of each car.

6. Scrutineering

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

The team will need to submit their video presentation and car to pass scrutineering. Each car will be judged according to these rules while in race ready condition to ensure it fully complies with all the rules. Where a car does not meet any rules the team will be allowed to make modifications to the car to meet these requirements. In the case this is not possible, the car will not be allowed to race.

Each car may be checked immediately before each race, prior to being issued panels, and may be checked after each race, or at any time during the competition.

7. Servicing

7.1. Service Area

To allow students space to work on their cars, a designated area will be setup to work on cars 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 be permitted in these areas for the express purpose of supervision and ensuring student safety, all the work on vehicles is carried out by students alone.

7.2. Modifications

Modifications are allowed during the event, but must always comply with these regulations. Any car 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 Organising Committee before being used during the competition.

8. Car Specifications

8.1. Test criteria

Each car built for racing in this challenge will need to comply with these specifications, which are assumed to be on a straight, flat section of track unless otherwise stated.

No car will be allowed to race until it complies with all these specifications.

8.2. No commercially built cars

Cars 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 car from scratch; this may involve the use of commercially available components from kits or purchased separately put together to achieve the teams unique design.

8.3. Size limit

The car must fit in a box, 500mm long, 180mm high and 320mm wide.

While cornering at speed the car must stay within 190mm of the centre of the guide rail, so that it doesn't crash into the car beside it or damage any timing equipment when racing. This will be determined by placing the car on a section of guiderail and testing where the outermost points the car can reach, this is often your wheels and/or axles.

8.4. Source of power

In all races the car must only use the solar array provided by the organisers and must operate only on the energy provided by this solar array during the course of the race.

The array provided will be configured to produce a power output of 5.5 + or – 0.1 watts at AM 1.5 conditions.

Details of this unit are included below. As this array will be provided immediately before a race and collected immediately after, car design must allow for installation and removal in less than 30 seconds.

Practice will be conducted with a solar array provided by the competitor. It is strongly suggested that this array have a maximum nominal power of 6 watts and similar characteristics to the panel which will be provided for racing.

The array provided by organisers will be a Scorpio Number 26 solar panel or similar mounted on an aluminium backing for protection see below for details.

8.4.1. Standard Array Dimensions:

Overall dimensions, length 276 to 280 mm not including the terminals, width 165 to 170 mm maximum height of sides 20 mm at terminal end other sides 12 mm as per Figure 2.

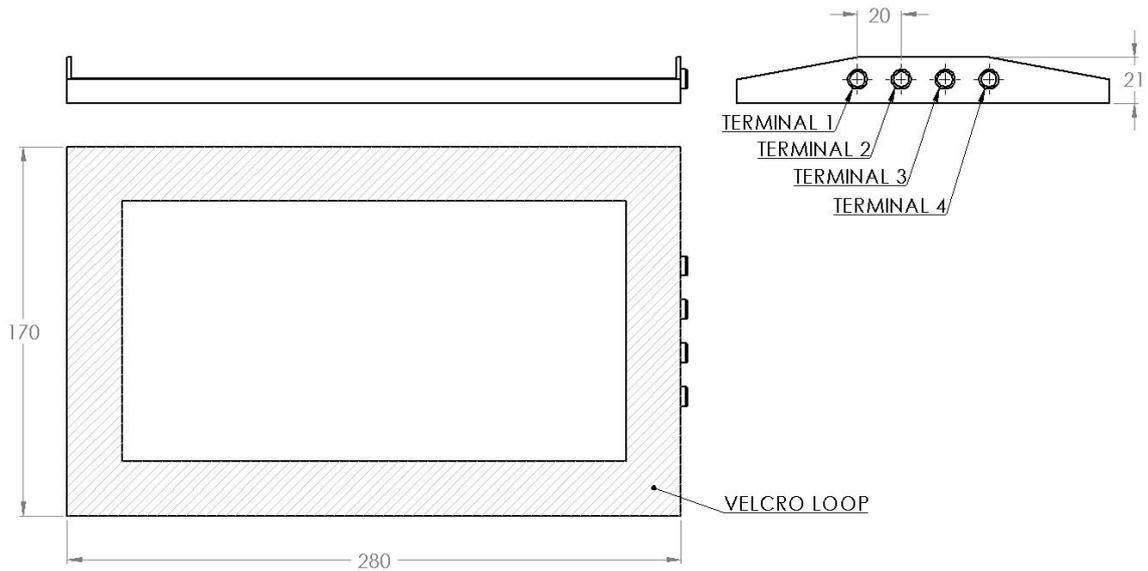


Figure 2 - Solar Panel Dimensions

Weight 240 plus or minus 15 grams.

8.4.2. Standard Array Terminals:

Jaycar banana chassis sockets catalogue PS-0406 (red) PS-0408 (black) are mounted on one end. The two sections of the panel have their positive and negative terminals brought out to these banana sockets allowing for connection in either series or parallel as desired by the competitors as per Figure 3. The banana sockets are spaced at a nominal 20 mm (+ or – 2mm) apart.

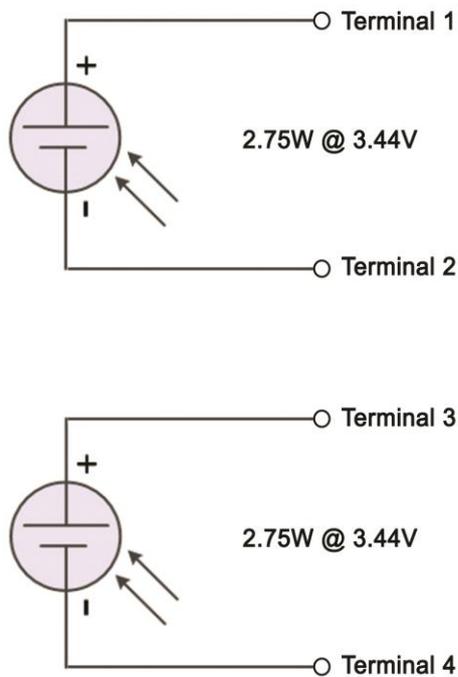


Figure 3 - Solar Panel Schematic

8.4.3. Standard Array Mounting:

Velcro loop tape 25 mm wide is available all around the outer edge of the underside of the panel.

8.4.4. Standard Array Power:

Each array will be configured to produce 5.5 watts + or – 0.1 watts at AM 1.5 conditions when connected in series. Typical electrical output of the provided array at AM 1.5 25 Deg. C when connected in series.

Volts open circuit	8.64V
Volts at maximum power	6.88V
Current at maximum power	0.808A
Current short circuit	0.9A
Maximum power watts	5.56W

8.5. ON/OFF switch

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

8.6. Car wiring

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

8.7. Motors

Cars may use any type of motor and as many as desired, but the specifications of the motor must be provided to the committee.

8.8. Wheels

To reduce damage to the track, knife-edge wheels are not allowed. Each wheel must be at least 1mm wide or have a radius of 0.6mm on the running surface.

8.9. Steering

Each car must incorporate a means of steering around the track, based on the guide rail specification in section 5.2. These should be adjustable to some extent, as every track is different.

8.10. Driver and Passenger

Each car will have space for a driver and a passenger to navigate the track. These occupants will be regular ~60g eggs provided by the Committee. To see where they are going, the driver and passenger must have 180° vision in the horizontal plane and 90° upwards the forward vertical plane. This must apply for the top half of the eggs as per Figure 4. The exception is the other egg may block this view like a regular passenger car has two occupants side by side. If the passenger is behind the driver, it will not need to have 90 vision in an upward direction.

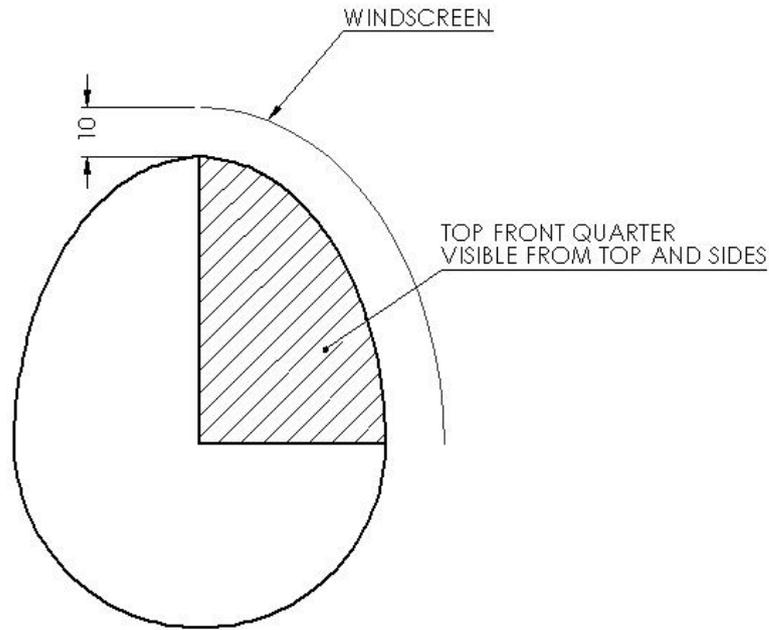


Figure 4 - Driver and Passenger

In the case of adverse weather, the driver and passenger would prefer to remain dry, so the cabin must be totally sealed from the elements to prevent water getting inside – or broken egg on the track! The cabin must not be closer than 10mm to any part of the passengers, so they have room to move and climb in and out of the seats.

During the race, if the driver or passenger suffers an injury (any damage at all) that team will lose the race. Eggs will be checked after each race. It will be the team's responsibility to provide medical attention to the eggs (clean up the mess!).

8.11. Cargo

A car without boot space isn't very practical, so every solar car needs to carry a 200mL juice box. Teams will need to provide their own juice box of any brand, it must be undeformed and unmodified and clearly state that its capacity is a minimum of 200ml, the straw may be removed. If the car isn't using electronics then the juice box is allowed to be empty, in this case the factory seal may be broken to drain the liquid.

8.12. Use of electronic devices

Electronics of any kind are allowed, however if anything is used to maximise the power output of the solar panel or store electrical energy, then the 200mL juice box will need to be fully sealed and undamaged, hence adding 200mL of liquid to the car.

8.13. Side Panels

The car must have two rigid side panels, one of each side of the car, for attaching numbers and sponsors logos. These must be easily seen by spectators while the car is racing and they will be flat. Each side panel must fit a sticker 150mm long and 80mm high.

8.14. Bumper Bar

While we try to avoid crashes, these things do happen from time to time, and solar racing on a pursuit track means the cars will hit each other, sometimes very heavily! Teams should consider this while building the car and think about what could get damaged if it was involved in a crash.

8.15. Autonomous Operation

After the race has started the car must be fully autonomous and not receive any kind of signal or input from any source.

8.16. Structural Integrity

The car must be reasonably tough, so it does not get damaged while being handled during scrutineering or any other time. While race cars do tend to be extremely light weight and designed for the conditions, these solar cars are versatile and need to withstand the tough conditions of the Australian sun.



Appendix A

AIMSC Media Release Deed

NOTE: You must complete this deed and submit it when you register at a Australian International Model Solar Challenge (AIMSC) event otherwise AIMSC will not permit your child/ ward to enter the AIMSC event and venue.

1. By competing in an AIMSC competition, I understand that it is likely that I and my child/ward may be photographed or filmed by the media or other individuals at the competition.
2. I grant permission to AIMSC and its agents, to use my name and image and the name and image of my child/ward in any AIMSC materials, including, but not limited to, official AIMSC newsletters, websites, marketing material, televised broadcasts and major sponsors web sites (AIMSC Materials).
3. I waive any right to:
 - a. inspect or approve any AIMSC Materials which contain my name and image or the name and image of my child/ward, whether in draft or the final product;
 - b. royalties or other compensation in respect of the use of my name and image and my child/ward's name and image in the AIMSC Materials, now or in the future and whether I know of the AIMSC Materials or not.
4. I agree to release and discharge AIMSC and its agents, including, but not limited to, any organisation publishing and/or distributing the AIMSC Materials in whole or in part, whether on paper or via electronic media, from any and all claims for damages, loss, liability or other relief that I or my child/ward may have against any of them in respect of the use of my name and image or the name and image of my child/ward in any AIMSC Materials.

School

Student's Name

Parent's/Guardian's Signature

Date