

New South Wales
Model Solar Car Challenge
2022

Regulations

100m Figure 8 Event



UNSW
SYDNEY



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1. Introduction

1.1. Overview

The SunSprint 100m Challenge aims to deliver a first hand educational experience to students in the areas of Science, Technology, Engineering and Mathematics (STEM), with an emphasis on design, engineering and renewable energy.

The event has been designed to expand student learning and provide a practical experience in designing and building a functioning solar powered vehicle, to gain an understanding of the engineering processes involved and recognise the importance of renewable energy for a sustainable future. It also focuses on getting students to work together as a team and demonstrate, apply and effectively communicate their learnings.

Learning outcomes of the Challenge are to be focused on the students. Teacher, mentor and parent guidance is strongly encouraged but it's important that students complete all work themselves and are exposed to the full process of taking a problem from a simple sketch to a well-refined engineering masterpiece.

1.2. Competitors

The competition is open to entries from schools, other organisations and private entries in NSW and the ACT. Competitors must be students currently studying up to and including secondary level Year 12.

1.3. Contact and Correspondence

All correspondence should be sent directly to the coordinator at SunSprint michael.richards@unsw.edu.au or 0411 357 894

1.4. Interpretation of Regulations

These regulations have been designed by the national AIMSC Committee and adapted for the New South Wales competition. The nature of the event is to promote learning and encourage thinking outside the box, so everything is open for interpretation, but please check with the Coordinator if uncertain whether an interpretation may give an unfair advantage and be ruled against later on.

2. Entries

2.1. Entry

Teams will be required to submit their details on the website www.sunsprint.com.au

2.2. Original Work

Each team must design and build an original model solar vehicle, and not simply re-enter a car from a previous year's event. While some components may be reused, the chassis and body of the car must be original and be the work of the students alone. Where a car may be similar to a previous design, the team must demonstrate some fundamental difference that sets their entry apart.

3. Competition Elements

At the State level we will concentrate on the car and racing however we point out that if you are keen to go on to the National event it is important to know that there is a requirement for a knowledge test plus a video. The video needs to capture your construction of the car so you may need to review the National rules.

3.1 Track Type and Racing Format

Racing will take place across two days on the UNSW 100m figure 8 track. A start gate is located on the downhill slope of the figure-8 track and racing typically held over a single lap of approximately 100m in length.

The racing format will be decided by the Committee and communicated to teams prior to the event. Round robin rounds are typically held on Day 1 and cars then ranked on their performance for the final knockout competition on Day 2. Figure 8 races may be extended from a single lap to two laps in the finals.

3.2 Winning Vehicle

The winner shall be determined as the first to cross the finish line or the car which travels the longest distance in bad weather. All this must be achieved without interfering with the opposing car or any official equipment.

If a car comes off the track at any point during a race then the opposing car shall be deemed the winner.

If a team believes they have been mistreated, or lost due to an unfair incident or advantage for the opposing team, then they must report this to the Committee immediately after their race. The Committee will work together to resolve the issue and return their decision promptly. That decision will be final.

4. Scrutineering

Upon arriving at the event each team must pass through Scrutineering with their vehicle. Cars will not be allowed on the track until they've been checked for compliance and fitted with a race number.

Each car will be judged according to these rules. Where a car does not meet these rules the team will be allowed to make the necessary modifications until it complies. A car may not be allowed to race if this isn't possible.

5. Servicing

Modifications are allowed during the event but must always comply with these regulations in full. Cars may be checked and re-scrutineered at any time to ensure ongoing compliance.

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

6. Car Specifications

6.1. Size Limit

The car must fit in a box, 500mm long, 150mm high and 320mm wide with the solar panel fitted in place. It must also stay within 190mm of the centre of the guide rail at all times to ensure there's no interference with the car beside it or any timing equipment when racing.

6.2. Source of Power

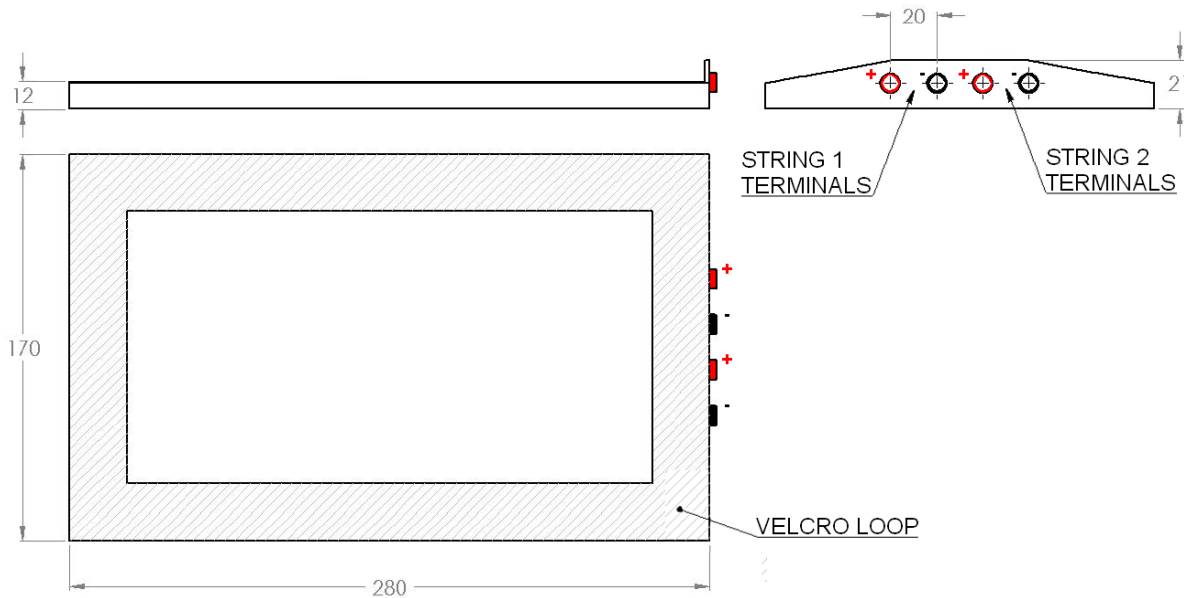
Cars must race with a solar array as set out in section 6.3. Final races will use the solar array provide by the event and they will be as per section 6.3 Car design must allow for easy installation and removal in less than 1 minute. Any practice must be conducted with a solar array provided by the team.

6.3. Solar Array Specifications

Competition arrays consist of a Scorpio Technology Number 26 solar panel mounted on an aluminium backing for protection. These have been standardised to weigh $240g \pm 15g$ and produce 5.5 ± 0.1 Watts of power at standard test conditions (1000 W/m^2 irradiance, 1.5 air mass, 25°C).

Arrays are approximately 276-280mm in length and 165-170mm in width. The height of the terminal end will be no more than 21mm and all other sides a maximum of 12mm. 25mm wide Velcro loop tape is available around the outer edge on the underside of the panel as a possible method of attachment to the car.

Arrays consist of two identical solar cell strings, each wired to a positive red (Jaycar PS-0406) and negative black (Jaycar PS-0408) 4mm banana socket terminal, and teams are free to connect these in either series or parallel as desired. A typical electrical output of the two strings configured in series is given below:



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

6.4. Use of Electronic Devices

Electronics of any kind are allowed however any energy storage devices such as capacitors must be fully discharged before the start of each race.

6.5. ON/OFF switch

Each car must be fitted with a commercially available ON/OFF switch. The position of ON/OFF should be clearly marked.

6.6. Motors

Cars may use any type of motor/s but specifications of the make and model must be made available at scrutineering.

6.7. Wheels

Wheels must be at least 2mm wide and have a radius of at least 1mm on the running surface. No knife-edge wheels.

6.8. Cargo Area

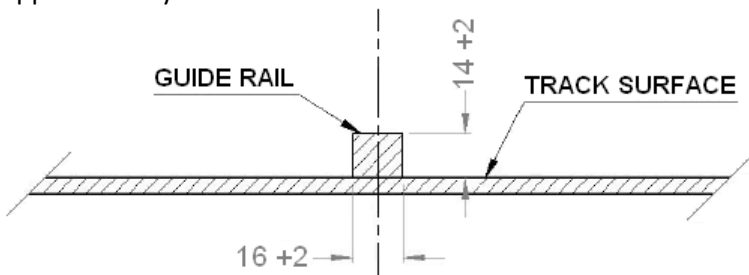
Cars will require a fully enclosed space large enough to fit 15 table tennis balls of nominal 40mm diameter. The solar array may form the top of this enclosure. The balls do not need to be carried on board while racing but designs must allow for them to be easily added and removed in less than 1 minute during scrutineering. This space cannot be reshaped, collapsed or capable of having air pass through it for racing.

6.9. Side Panels

Cars must have two rigid side panel areas of at least 100mm long and 50mm high, one on each side, for attaching number stickers that can be easily seen by spectators when racing. The curvature over this area can be no more than 20mm horizontally and 10mm vertically.

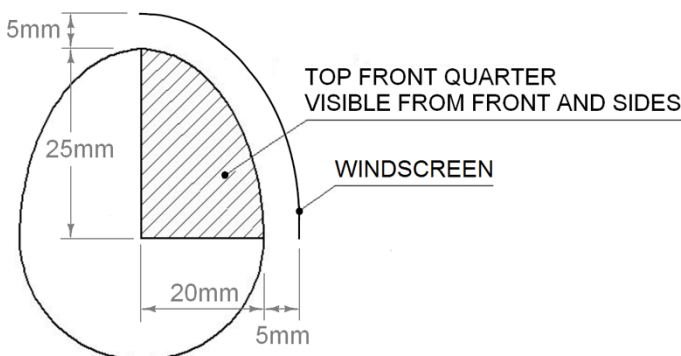
6.10. Steering

Cars must incorporate a means of steering around the track using the rectangular guide rail at the centre of each lane. This rail will be 16-18mm wide and 14-16mm high. It's advised that designs have an adjustable guide system to suit different tracks and overcome minor lane misalignments. Track curves will be approximately 5m in radius.



6.11. Driver & Passenger Compartment

Each car must have space for both a driver and passenger to navigate the track. The occupants will be regular ~50g eggs provided by the event. The compartment must be sealed to prevent a broken egg from spilling on the track and the top half of the eggs have a transparent windscreen with 180° vision in the horizontal plane. Only the other egg may interrupt this field of view and both must have a clearance of at least a 5mm from the windscreen.



6.12. Stopping Block

Cars will need to be capable of withstanding a collision with a weighted styrene foam stopping block. The blocks, one for each car, will be placed on the track after the finish line and be approximately 400mm long, 250mm wide, 100mm high, and ballasted to weigh 500 +/-10 grams. Blocks will have a groove of approximately 25 mm wide, and of similar depth, cut into the bottom to clear the guide rail and be free to slide along the track after impact. Cars may be subject to a number of such collisions during the course of an event. Eggs may be checked for damage after each race and the win awarded to the other car if the faster car's driver or passenger suffers an injury (cracked or broken egg).

Good luck and we look forward to a great event this year.