Australian - International Model Solar Challenge

AIMSC

# Regulations for 2017

# Student Designed Car

# Technical Specifications

The Event will be held in Adelaide on 25th and 26th of November 2017, Venue to be announced.

Additional information will be published on the web site www.modelsolaraustralia.org

This document supersedes all previous versions. Issue Date 5th March 2017

# Section 9. Car Specification

## MODEL SOLAR VEHICLE 2017

## SYNOPSIS OF CAR SPECIFICATIONS

The following is intended to be used as a quick reference guide only. It contains the important basics but does not cover all the detail. YOU MUST REFER TO THE COMPLETE REGULATIONS FOR FULL DETAILS. Remember that car design and construction is to be the work of students and only students are to undertake the operation and any repairs on cars, penalties for adult input will apply. (See Administration Section)

- **Maximum body dimensions:** 550 mm long, 320wide, 180 mm high and less than 190 mm from centre line of guide rail at all times.
- **Wheels:** minimum width 1mm or 0.6 mm radius at contact point with track.
- **Bumper Bar:** While not mandatory, as the 2017 event will be conducted as a pursuit race teams should consider the areas both front and back that will impact the opposing car.
- **Guiding:** must be on the outside of the guide rail
- **Side panels:** one each side, minimum 100 mm long by 50 mm wide.
- **Cargo:** The car must carry an empty undeformed 1 litre milk carton of minimum dimensions 70 mm by 70 mm by 235 mm at all times when engaged in time trials or racing.
- **Solar array:** Practice will be conducted with an array provided by the competitors. All races and time trials will be conducted with the array provided by the organisers. See 8.12 for details. The array provided by the organisers will have a power output of 5.5 watts + or – 0.1 watts.
- **Wiring:** all wiring and electronics must be visible, otherwise circuit diagram required.
- **ON-OFF switch:** commercial switch required easily visible to the starter, off clearly marked. (This switch may also be used to configure the solar array in series or parallel.)
- **Energy storage:** not allowed, except capacitors up to 0.2 farad provided they are discharged immediately prior to race starting. Inductors to 1 mH allowed.
- **Electronics:** teams may elect to either use or not use electronics systems. When an electronics system is used 150 grams of ballast must be carried whenever the electronics unit is on board the car.

# 9. CAR SPECIFICATION

### 9.1 Test criteria.

Unless otherwise specified all references to car behaviour and measurements will assume that the car is on a flat, straight section of the track, and in full racing configuration.

### 9.2 No commercially built cars

Cars must not use any part of the chassis or body of any commercially available model car. This only refers to the structural frame and body, not to the drive train components such as gears, shafts, wheels, tyres, or to suspension and steering components.

### 9.3 Size limit

Maximum car size allowed is 550mm long, 180mm high and 320mm wide, at no time may any part of the car extend sideways more than 190mm from the centre of the guide rail.

### 9.4 Source of power

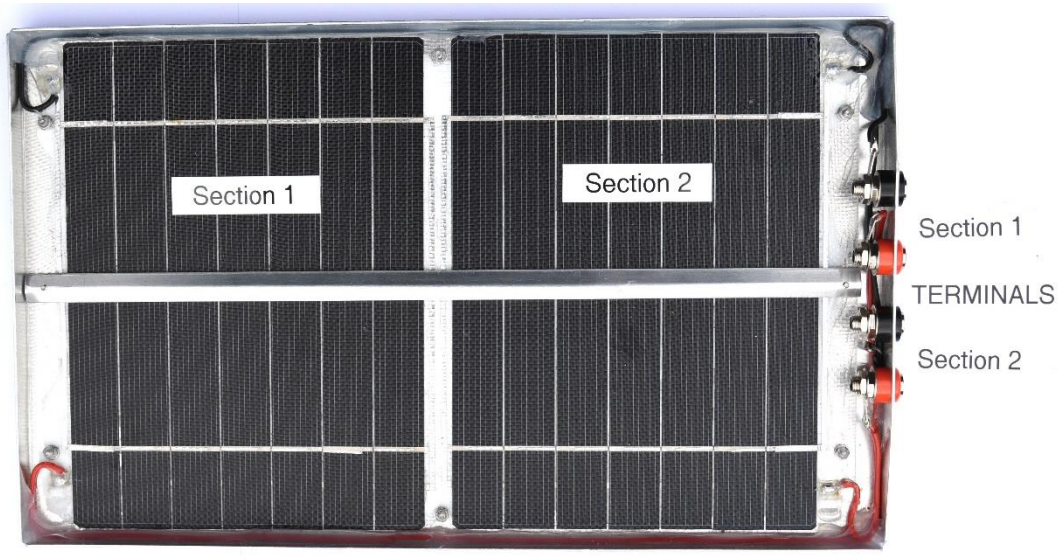
In all races and time trials the car must only use the solar array provided by the organisers and must operate only on the energy provided by this solar array during the course of the race.

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 is a Scorpio Number 26 solar panel mounted on an aluminium backing for protection see below for details.



**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.
Weight 240 plus or minus 15 grams.

**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.


The banana sockets are spaced at a nominal 20 mm (+ or – 2mm) apart.

**Mounting:**

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

**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 | 8.64 |
| Volts at maximum power | 6.88 |
| Current at maximum power amps | 0.808 |
| Current short circuit | 0.9 |
| Maximum power watts | 5.56 |

**9.5 Use of electronic devices.**
Teams may elect to use electronic circuitry for such purposes as solar panel regulation or motor control.
If using electronics of any sort the car will be required to carry ballast of 150 grams, this is in addition to the weight of the electronics used.
This ballast must not perform any function other than being additional weight carried at all times when the electronics in on board the car.

**9.6 No energy storage systems**
No energy storage system, whether electrical, mechanical or chemical, which assists in the performance of the car, will be permitted. Capacitors of less than 0.2F and inductors less than 1mH are allowed as part of the electrical system. Capacitors above 0.047F must be discharged immediately before the race.

**9.7 ON/OFF switch**
Each car must be fitted with a commercial 'ON/OFF' switch, the ON and OFF positions must be clearly marked and the switch must be in a location easily visible by the official starter when the car is on the start line. Note: the starter is on the left hand side, so typically the switch would be mounted on the left hand side or on the top. This switch may also be used to configure the solar array in series or parallel but must have an off position clearly marked.

**9.8 Car wiring**
All electrical wiring and electronic modules in the car must be reasonably visible. Teams will be required to explain any wiring going into sealed body areas. A simple block wiring diagram will be required if this condition is not met.

**9.9 Motors**
There is no restriction to the type, size, or number of motors that may be fitted to the car. However, the motor manufacturer and/or part number must be made available to the scrutineers for data base information.

**9.10 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.

**9.11 Steering**
Each car must incorporate a means of steering around the track. The guide rails are approximately 16mm wide and 13mm high. The steering mechanism must be designed to operate on the outside of the guide rail.

**9.12 Cargo**
The car must at all times when racing or engaging in time trials carry a single undeformed and empty 1 litre milk carton of minimum nominal dimensions 70 mm by 70 mm by 235 mm.

**9.13 Side Panels**
The car must have two side panels capable of retaining their shape at all times for attaching numbers and sponsors logos. These must be easily seen by spectators while the car is racing. They will be located one on each side of the car. Each side panel must be capable of supporting a sticker 100mm long and 50mm high. Allowed curvature of the side panels is 20 mm vertically and 15 mm horizontally.

**9.14 Bumper Bar**
While not mandatory, as the 2017 event will be conducted as a pursuit race teams should consider the areas both front and back that will impact the opposing car.
The use of some form of bumper bar should be considered to protect fragile areas of the car.

**9.15 Autonomous operation**
After the race has started the car must operate totally autonomously for the duration of that race. This means that team members or any other person must not provide any input of any type to the car during the course of the race. This of course means the use of any form of remote control, or even the operation of a mechanical switch by anything external to the car during a race is prohibited.

**9.16 Non Conformance**
If a car fails to conform to the requirements detailed in any section of the regulations it must be modified in order to conform or penalties may be imposed. Penalties will normally be in the form of the requirement to carry additional ballast weight. Minor non-conformances will typically attract a 50g penalty with this increasing to 200 g for more significant breaches of the regulations. The magnitude of penalty will be determined by the chief scrutineer in conjunction with the scrutineering team. In the event that the scrutineers believe the non-conformance gives the car a significant advantage unlikely to be negated by the carrying of additional ballast the car will be excluded from the event. Penalty decisions will be final and not open to appeal.

**9.17 Structural Integrity**
The car must be constructed such that impact with the stopping block and normal handling will not cause damage. No responsibility will be accepted for any damage no matter how it occurs.