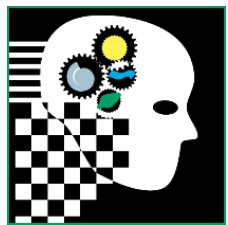


SOLAR CAR CONFERENCE | MARCH 20-22, 2015 | UNIVERSITY OF MICHIGAN



ASC 2016 REGULATIONS

Greg Thompson
March 20, 2015



ASC 2016 REGULATIONS

Objectives

- High level summary of ASC 2016 Regulations
- Changes from ASC 2014
- Potential amendments
- Discussion on inclusion of Cruiser class vehicles



ASC 2016 REGULATIONS

Principals for ASC 2016 Regulations

- Maintain basic car form from ASC 2014
- Updates to improve safety
- Incremental updates to improve clarity and fairness



ASC 2016 REGULATIONS CHAPTERS

Ch. 1 – Purpose/Vision

Ch. 2 – Administration

Ch. 3 – Entry Information

Ch. 4 – Event Components

Ch. 5 – Electrical

Ch. 6 – Body

Ch. 7 – Mechanical

Ch. 8 – Driver Requirements

Ch. 9 – Raycing

Ch. 10 – Penalties

Ch. 11 – FSGP/Qualifier Operations



ASC 2016 REGULATIONS – CH.1 & 2

Vision / Purpose

- Promote, celebrate educational excellence & engineering creativity.
- Spirit of friendly competition & team work

Administration

Staff

- Inspectors
- Chief Inspector / Regulations Manager
- Observers
- Staff
- Track Stewart
- Jury

Regulations & Interpretation of Regulations

- Official/Unofficial interpretations



ASC 2016 REGULATIONS – CH.3 (ENTRY)

Entries & Registration

- Higher education teams
- Registration packages (Initial, Track, Road)
- Dates (Initial - September 15, 2015 / Track – December 15, 2015 / Road – March 15, 2016, Refund Cut-off – May 15, 2016)
- Late penalties – *Higher this year than previous*

Preliminary Vehicle Design Report (PVDR) – Due Sept 15, 2015

- Initial look at vehicle design

Vehicle Design Report (VDR) – Due Dec 15, 2015

- Mechanical Section
- Electrical Section
- Battery Section
- Battery Protection
- Solar Cell Report



ASC 2016 REGULATIONS – CH.3 (ENTRY)

Report Grading

- Green / Yellow / Red

Team Data – Due May 1, 2016

- Team Photo (with CAR!), Data sheets
- For use in website, Event Brochures

Advisors

- Key to team success
- Teams need an advisor who is an employee

Communication – new this year

- Generic team email address which forwards to PM, Dept Managers
- Email to ASC with Generic team email and Advisor email

Insurance

- Vehicular liability and General Public Liability (big stumbling block – don't leave this to last minute)



ASC 2016 REGULATIONS — CH.4 (EVENT)

Scrutineering

- Green on pre-event submissions & paid fees etc
- Inspection of cars at multiple stations across 2-3 days

Qualifier / FSGP

- Track rally and qualifier at the same time
- Does sometimes result in competing goals
- Need Green or Blue in Scrutineering to participate

The Rayce

- Road event for those who satisfy Scrutineering, Qualifying

Safety

- Paramount objective
- Talk later this evening
- Safety officer – one person, recommended multiple



ASC 2016 REGULATIONS – CH.5 (ELECTRICAL)

Solar Array – updated for ASC 2016

- No need for approval under 22.8% (Cell type 1) = 6 m²
- Approved List – will be soon published (Cell type 2) = 6 m²
- Cell Type 3 – Silicon - not on the approved list = bounding equations
- Cell Type 4 – Ga/As = 3 m²

Energy Storage / Batteries

- Pb Acid – 125 kg / NiMH – 60 kg / LiFePo₄ – 40 kg / Li-Ion & Li-Poly – 20 kg
- Looking at Capacitors
- Supplemental Batteries – used for instrumentation, driver fans, horn, etc.

Battery Protection Circuitry (BPS)

- Pb Acid – Passive protect for OV
- NiMH – Passive protect for OT and OV
- Lithium based – Active protect for OV, OT, OC, UV
- Passive – driver monitoring and react
- Active – automatic control without human intervention (reviewing no reset-on-the-fly)



ASC 2016 REGULATIONS — CH.5 (ELECTRICAL)

Battery Enclosures

- Contains batteries, BPS, main fuses. Max 2 boxes. Removable, non-conductive
- *Ventilation requirements updated for ASC 2016*

Main Fuse & Power Switch

- If Power Switch is a relay or contactor must be in Battery Enclosure (*new for ASC 2016*)
- Power switch used to isolate battery in the event of a BPS trip
- Also need External Power Cut Off Switch (for emergency use)

Accelerator

- Must return to zero (0) position.
- Cruise control allowed but also must shut-off (when driver intervenes, or when driver is out of the car)

Control

- Driver control only, no control/uploading to the car (*new for ASC 2016*)



ASC 2016 REGULATIONS — CH.6 (BODY)

Size

- No change (5 m x 1.8 m x 1.8 m).
- *Ventilation requirements updated*

Lighting (*clarified from ASC 2014*)

- Front Turn Signals, Side Marker Lights, Rear Brake Lights, Rear Turn Indicators, High-Mounted Brake Light
- Viewable from 30 m with various angles. Will be inspected from somewhere within the defined viewing angles
- Must be as bright or brighter than Reference Standard

Visibility (*updated from ASC 2014*)

- 8 m on ground in front, 6.4 m above @ 12.2 m ahead, 100 deg to either side

Egress

- 10 s one side, 15 s other side, unassisted, unchocked



ASC 2016 REGULATIONS — CH.6 (BODY)

Ballast

- No changes from ASC 2014
- Allow for common ballast
- 2 boxes (1 for individual, 1 for common)

Marking (*clarified from ASC 2014*)

- #'s , Institution, sponsors
- Winning Team = #1
- Retention of numbers
- Event Logo
- National Flag



ASC 2016 REGULATIONS – CH.7 (MECH)

Covers and Shields

- Moving parts shall be covered
- No interference - no rubbing (fairings on wheels)
- Array Attachments 2 lanyards (*revised from ASC 2014*)

Tires & Wheels

- No changes from ASC 2014
- 3 or 4 wheels
- *ASC 2016 Recommendation for wheel base / track width given (>1.5)*
- Tires/Wheels shall be as per mfg recommendations and for intended use

Driver Cockpit

- Seating position – 27 deg – (*revised templates for ASC 2016*)
- Seat Belts – *heavily revised for ASC 2016 with guidelines for position*



ASC 2016 REGULATIONS – CH.7 (MECH)

Chassis / Crush Zone / Roll Cage

- Crush zone regulations maintained from ASC 2014
- Roll cage – encompassing full head motion (*clarified from ASC 2014*)
- Roll cage – forward roll cage angled backwards to deflect array (*change from ASC 2014*)

Fasteners

- No changes from ASC 2014
- Flex-loc or other flexure style locking nuts (no nyloc, no interference style)
- Castle nuts + cotter pins (axles)
- Safety wired

Brakes

- Dual, balanced braking system. Front/rear or front/front. Left/right redundant is not acceptable (*reworded for ASC 2016*)
- Right foot braking
- *Special requirements for cars that have Front/Rear mechanical braking (new for ASC 2016)*
- *Rear brake must hold 15% of the car weight (front wheels free moving / lifted)*
- *Proportioning valves must be lockable and away from driver*



ASC 2016 REGULATIONS — CH.7 (MECH)

Parking Brake

- 10% of the cars weight both forward and rearward
- Non-tire or non-wheel contact style
- Locking

Steering

- Added Steering backlash requirement (*new for ASC 2016*)

Dynamic

- Figure-8 = 12 m ID, 22 m OD, 9-sec per side
- 3.5 m lane for 250 m at speed
- Slalom 126 m lg with cones every 18 m, 11.5 sec
- Brake test 50 km/h + to 0 with deceleration $> 4.72 \text{ m/s}^2$



ASC 2016 REGULATIONS — CH.8 (DRIVERS)

Drivers

- No changes from ASC 2014
- 1 driver in the car
- Team can defined 2 to 4 drivers (18 years old, licensed)
- Ballasted to 80 kg
- Helmets, shoes, water/fluids
- Driving time = 6 hrs max per day
- Communication – verbal, hands-free (applies to support vehicle drivers as well)



ASC 2016 REGULATIONS – CH.9 (RAYCE)

Road Event – Multi-stage

- Shortest Elapsed Time = Winner

Support Vehicles *(requirements updated in ASC 2016)*

- Lead + Chase + Trailer (mandatory)
- Scout + others (optional)

Support Vehicles *(requirements updated in ASC 2016)*

- Lead + Chase + Trailer

Overall Format - Unchanged from ASC 2014

- Will be looking at timing for non-stage starts (pending change)
- Trailering – can restart at Checkpoint (new in ASC 2014)

Impound

- Updated box requirements *(Changed from ASC 2014)*



ASC 2016 REGULATIONS — CH.10 (PENALTIES)

Posting

- *Will be revised in future regulation releases*

Speeding

- *Will be revised in future regulation releases*
- *Evaluating use of GPS tracking for speed penalties*

Oversize Body and Oversize Array *(revised from ASC 2014)*

- 15 min / day / 1000 cm² (array)
- 7 min / day / 1000 cm² (body)

Overweight Battery Penalty *(new for ASC 2016)*

- Defined penalty



ASC 2016 REGULATIONS — CH.11 (FSGP)

FSGP Event

- Most Laps = FSGP Winner

ASC Qualifier

- 330 km (1 day)
- 495 km (2 consecutive days)
- 85 km / driver
- Provisional Qualification (*Changed from ASC 2014*)



CRUISER CLASS VEHICLES

Major differences between Cruiser class vehicles and ASC 2014-2016 car form

- More batteries
- Less array
- 2-seater
- Driver / Passenger cockpit form
- Bi-lateral Egress
- Crush Zone

Inclusion for ASC 2016

- Understood that there is interest from some teams for FSGP 2015 and also ASC 2016
- How best to include..... Still working on this.



ASC 2016 REGULATIONS

- *This presentation is a summary of the regulations only and is non-binding. The regulations govern!*
- It is recommended that you read the regulations thoroughly.
- Have alumni or other student teams scrutineer your car before you bring it to scrutineering
- Finish your car and test your car before the event!