

# ASC2001 DEBRIEFING

Lenexa, KS

A post-event conference was held on September 21<sup>st</sup> and 22<sup>nd</sup> to discuss the technical and logistical aspects of the American Solar Challenge, 2001. On each day there was a general session and then participants divided into two sessions to address technical and logistic issues separately.

The conference was intended to provide a forum for teams to express their opinions of the past event and suggestions for future races. The following sections are a summary of the discussion points and suggestions. Team input from this conference as well as emails and phone calls is always considered during the review of regulations.

**It is important to note that this meeting was a forum for team input and that NO DECISIONS WERE MADE AT THIS MEETING – despite how things may have been stated during the discussion.**

## Tech Session (9/21/01)

### CORNER SPEED

- Is the speed on the yellow sign optional?
- Might not have been uniformly applied during ASC
- Law enforcement doesn't enforce
- Uniformly enforce, but leave at discretion of observer to comment on whether they thought the team was safe
- JH: If you take a corner at 55 mph, but don't handle it well, what then? Is it left to the observer to comment?
- It is in teams' best interest to drive safely.
- You take consequences for team's actions. On rough roads, you sometimes have to go slower than the speed limit because of paving. It is the team's decision.
- Safety is primary concern –margin of safety is there for a reason. Follow signs as limits.

### ROAD CONSTRUCTION

- What about signs for road construction when there isn't any?
- If there is a sign, follow it.
- But safety with speed of traffic?
- Flexibility to observer for RC signs?
- Uniformity in observer decisions?
- Observers are there to observe or there to make decisions?

## **SPEEDING**

- DE – Where did teams get speeding penalties?
- Road construction, school zone. Some didn't know where

## **SOLAR CAR SIGNAGE**

- Limits array area
- WSC different sizing 20cm x 20cm
- Don't have space to do what is required
- Was it larger this time? Would like a standard size.
- Background space is part of problem
- Specify that it has to be seen from a certain distance? Add to body/sizing?
- Make it simple, so it can be seen
- Clear background?
- How do you make it compatible with body colors?
- Have several color schemes available?
- Some teams want to paint over the logo
- DE – What is the goal? Have sticker fit in better with car
- Sticker didn't conform to curved surface well
- JH – Get early for looks & aero?
- Chase vehicles -- fine?

## **BATTERY PROTECTION SYSTEMS / WEIGHT**

- Some teams bought whole modules, others bought assembled cells
- Issues with necessary protection boards (circuits, not physical shielding)
- JH – Are you wanting more standards?
- DE – If circuitry is integrated to cell, than you have to use that. Won't pass if not there.
- Concern that it is safe. Is it ok if cell protection is removed? Does cell protection have to be kept?
- Team had problem with circuits
- DE – Do you feel that we need to monitor that the protection is there?
- In some form?
- This was the first time teams used Lithium Ion. Steve was very helpful. When people took off circuitry, there was still protection.
- DE – What do we want to see?
- We had our own circuitry that Steve approved. Don't want to see restrictions to force us to use other circuitry. Amount needed varies with battery technology. Not good for officials to try to spell out. At minimum, driver needs to know electrical status of batteries.
- Concern with weight of pack and charge circuitry.
- DE – If cells are sold with control integral, than yes (part of weight). Otherwise, no.

- What about a sample set of cells for scrutineering? Steve was satisfied with weighing sample cells.
- DE – is it part of weight in WSC if it is integral with the cell?
- LGChem sells cells w/o circuitry. NRG cells same cell with circuitry. Should weigh cells minus any connections. Need standardizing between Rayces.
- DE – Vast number of participants don't go to WSC. With 36 kg of Li, how many watt-hours?
- 140 watt-hours per kg?
- WSC goes strictly by mass.
- Suggestion that if advanced batteries require extra protection, that should be in the weight.
- DE – Would you like to see strict weight limits or capacity limits?
- General preference for weight.
- Never get straight capacity information.
- DE – CSIRO does sample testing
- WSC says development pack allowed with testing?
- DE – Would you like to see silver-zinc and primaries?
- Generally yes.
- What about a category for development or other types?
- What if weight limits set for ballpark 5 kWh then development set individually to 5 kWh?

### **STOCK v.s. OPEN**

- Capacity might help close gap between two classes.
- DE – This time, no one with LI had over 5 kWh, one lead acid team had much over 5 kWh.
- Suggestion to set a lower LI capacity.
- What about giving stock class more lead acid?
- JH – Is the concern that the top 3 to 5 teams get all the glory and that no one sees stock class?
- Suggestion that the playing field doesn't need to be equal, but that stock class needs more recognition at the end.
- JH – Run as two separate rayces?
- Not have a stock class? The array is the big issue.
- Stock class is important to new teams. Trophy for stock, trophy for open, no overall trophy.
- What about listing them separately on the website?
- More categories would be a mistake and making them more equal would be a mistake.
- DE – Stock lets limited budget teams compete in Rayce. Suggestion of dollar limit for 3 components (array, battery, motor/controller). Would have to show receipts or real market value.
- How do you value custom parts?
- DE - Not stock unless could be purchased by all teams at that price.

- Team thought stock does well as it is. Just needs more recognition or all one class.
- Comment that some professional car races have 3 or 4 classes. Each class got a trophy, all recognized.
- Three rayces now? – Overall, Open, Stock
- What about getting rid of Overall?
- DE - Cars with limited technology have done well.
- Generally teams did not want to get rid of Overall.
- What about incentive to run open? Concern of taking away reason to run it.
- DE – Is it a problem with the perception from the outside or from within?
- It would be good to emphasize bang for the buck.
- Most teams did not want to set a dollar figure for the whole race.

### **REGEN / BRAKING**

- JH – Using regen in dynamic scrutineering. Rules don't say that you can't.
- Suggestion that it not be allowed during dynamic because you can't use it if the battery pack is full.
- Comment that you can have a system designed for when the pack is full.
- But what about complete electrical failure?
- But is it just as reliable as a mechanical brake?
- Four wheel cars have to use regen so if all wheels are required to brake, then they have to.
- NGM doesn't allow brake on the motor wheel. Requirement for dual redundant needs to be there, but not all wheels. 3 wheel is the same.
- DE – For a 3-wheel, is dual redundant both on front ok?
- JH – DR is not question, all wheels is.
- Too much dependency on regen braking.
- Some teams have preference for only on front.
- Varies with system.
- DE – suggestion for DR on 2 wheels not driven.
- Suggestion that regen doesn't count.
- Suggestion for any unpowered axle to have DR system.
- DE – cable system may be inadequate by individual design.

### **WHEELS**

- 3 is minimum now
- WSC anything goes but under 3 is a bike
- Concern is if 3 will still be allowed.
- What about single wheel in front?
- OK if it passes dynamic?
- How to demonstrate it?
- Has to exhibit stability through turns...but this is a gray area.
- DE -- passes if it passes scrutineering. Build figure-8 and test it.

## **FUEL CELLS**

- Fuel cell talk will be tomorrow.
- DE – It is in the discussion because I want teams to be able to get their hands on new technology.
- Better for a different race?
- DE – What about reducing battery storage and supplementing fuel cell or reduce array and give set amount of hydrogen? Think it over. We'll discuss more tomorrow.

## **PORTAGING**

- Allow portaging?
- Some say no.
- What if car gets stuck and you can't carry it?
- JH – Teams find a way to deal with it.
- Issue of safety – how to get out of way. Saw a team pushing car from underneath on RR tracks. Fairing stuck.
- DE – Was this a ground clearance issue?
- Or a route issue?
- DE – There aren't routes w/o tracks.
- JH - Problem with clearance on tracks?
- Tracks were not maintained, beams tilted.
- JH – Leave carrying points up to teams?
- DE – What about tow point?
- DE – Put in an advisory instead of reg? About clearance and moving car.

## **ROLLCAGE**

- Team saw cars where driver w/helmet was 5 cm above roll bar. How to check?
- Is the shrinkwrap rule still in effect?
- DE – Yes. Encompasses entire driver.
- JH – What do we do to help teams understand what needs to be done?
- Specifying material requirements is not good. Elaborate more on specific loads.
- DE – By saying equivalent, that sets strength minimum. Everyone's cage passed the letter but some didn't pass the spirit. Loading is a dynamic thing. One safety item to not compromise is the driver's roll cage.
- Have the evaluation of the roll cage earlier?
- Not enough feedback from structural reports.
- Workshop from a professional roll cage maker?
- DE – What if teams submit a sketch with dimensions and materials this spring.
- Was there a problem in 2001? At least 3 cars.
- DE – How can we write the regulation better?
- More description of shrinkwrap rule?
- JH – Safety award for design?
- Put in the spirit of the rule.

## **AM General Session (9/22/01)**

- Questions left from Friday were prioritized
- DE explained that when ASC adopts a standard, the other rayces end up not adopting it (even if they intended to originally).
- DE mentioned possible route options to be discussed later.

### **PENALTIES**

- DE explained how penalties were supposed to have been given.
- Some teams thought that they should know each day about their penalties and sometimes it took a few days.
- Some teams also did not see their observer logs.
- Options discussed for improving this were: more visits to teams at night by officials, have a place for teams to sign off on observer logs, possibility of copying all or key parts of observer logs, checkpoint inspectors giving warning of possible penalties, phone/internet notifications.

### **FUEL CELL PRESENTATION**

- Trung Van Nguyen gave a talk on fuel cells and answered technical questions.

## **Tech Session (9/22/01)**

### **STOCK/OPEN**

- Request to clarify where discussion ended yesterday on stock/open
- Reminder that no decisions yet, this meeting is for input
- Yesterday discussion about either stock and open classes with no overall or one class
- Discussed if stock is open
- Discussed why to change classes – some teams feel that stock needs more recognition promote stock (both at ceremony and during race)
- Discussion of whether this would confuse the media or not
- General favor for switching to a dollar limit for motor/controller/cells/batteries for stock.

### **SIZING**

- Top priority seemed to be to have a clear sizing direction and to stay with it.
- OK to grandfather through 2003, then stay with new size.
- Generally liked the NIS standard
- Would like to see NIS internationally adopted and other sizes phased out
- Would like size information quickly.
- How uniform internationally? KvR – we can make ASC decisions and work to be consistent, but can't guarantee what happens overseas.

### **INTERNATIONAL STANDARDS**

- Array sizing is the key regulation, then body
- Batteries are next, but are easier to change than array or body.
- Some teams would like to see WSC battery regs in ASC.
- Generally ok that ASC safety regs (roll bar, etc) are higher

### **BATTERY QUANTIFICATION**

- General favor for weighing batteries as limitation
- General favor for weighing bare cells with no charge control equipment.
- Suggestion of battery protection report to be turned in early
- General favor for not changing the weights to try to make LAcid more competitive.
- Some would like to bring sample cells for weighing.

### **2 PASSENGERS**

- Some teams would consider if they thought they could get higher speeds
- Concern about too many classes
- Some teams OK with idea if it matches WSC 2x6
- Most teams thought attraction would be strategy, not media
- Some teams thought it would be useful to be able to give sponsors rides
- Discussion of what passenger would need to do. Generally thought should match WSC.

## **ARRAY STANDS**

- Some would like to see array stand carried by solar car so it is more self-contained.
- Others think that it should remain the way that it is.
- Concern with safety in winds for array stands carry in solar car.
- Generally wanted stands at checkpoints.

## **ARRAY RECONFIGURATION**

- Discussion of whether or not to allow reconfiguration, all or just booster panels.
- Discussion of allowing reconfiguration in just stock class – concern that this would be too complex for new teams. – General feeling that stock should be same as open
- Idea to not have array off of the car at all for charging.
- DE – WSC will not go to deployable array, does ASC want to?
- Generally, group did not favor reconfiguration
- Teams would like to know very early if it happens.
- DE – not in WSC or ASC in 2003

## **SAILS**

- Discussion of sails and whether they are part of array and is considered to be reconfigured.
- Some thought OK if sail within box of body size
- Some thought sail has to be used for some part of qualifiers

## **SAFETY**

- DE – Dick Roberto is writing an addendum to the regs that will discuss some of the threaded rod end issues. Manuf. specs are for normal use and for head of rod. Going to have to quantify the material
- KvR – What about additional lights? (near top of car)
- Lights maybe if supplemental battery.
- Debate of if lights would improve visibility. Suggestion to put more emphasis on caravan driving.
- 4-wheels & braking – concern from team that ASC2001 regulation put them off balance.
- Team thought turn signal inspection was better this time. DE –standards are there, but tried to expedite the process.
- Favor of consistency in testing.
- General favor of changing regs for 1 kill switch.

## **EGRESS**

- Question of unassisted egress.
- Concern of possible damage to car during egress
- Discussion of allowing driver to stand in car and not jump out.
- Some OK with change to 10 sec to driver standing
- Discussion of ability to get driver out w/o driver's help – general favor of adding test at scrutineering for this

## **ERGONOMICS**

- Concern with angle of driver's head
- Some teams think this is up to each team
- Six hours generally OK, most teams said to not extend it.
- Discussion of 5 pt seat belt and situations where different belt styles may be safer.
- General favor of submitting a belting report early for feedback.

## **PM General Session (9/22/01)**

- Some summary from each session given.

## **ROUTE**

- PH summary of morning session
- Question of allowing teams to choose between frontage and interstate
- One team felt they had more public exposure on the interstate.
- Another team liked the frontage roads with turns and hills
- Suggestion to avoid interstate on the first day for unprepared teams.
- Team in favor of long stages
- PH – from morning session, largest downside to new format was less team interaction.
- Suggestion of teams crossing finish in order for public perception –Discussion of different options, WSC, importance
- Most in favor of ASC2001 route, liked variety of geography, weather
- Suggestion of sea-to-sea route, rayce through previous winner's town, NY to LA, Route 2 to Seattle, Route from 84 Crowder team
- Suggestion that going into Canada may not be possible for some international students and rental cars.
- Question of why some organizers don't like Rt66. DE—Interstate, road surface. DE liked 95/97. Possibly Texas to Canada
- Question of 45 mph limit for interstate. DE – this could easily force most all teams to trailer for a large portion of the route, something that he does not like.
- Question of if teams really want the same route or to know the route quickly. Most said same route.
- Comment that many team members have seen only ASC2001 route and possibly SR99, very few rayced Indy to Denver

- Suggestions for first stage stop if route done again. Possibly moving to Neosho, or switching from stage to 24hr stop.
- Some concern if 24hr stop adding day to rayce.
- Question of purpose of 2.5 hr Albuquerque stop. DE-some time off that fit in with 25 mph to Barstow. Goal not to regroup teams. Media more time with teams AP – 1<sup>st</sup> town for some miles with med/hospital facilities.
- Teams generally OK with Albuquerque stop. Some would like more notification of stop times.

### **STOCK/OPEN**

- Question of if Arizona was mentioned in press releases
- Suggestion to display both classes
- Debate about whether or not the media picks up on anything but the overall winner.
- DE – don't assume that stock won't do well.
- Team suggested more recognition for stock class
- Possible \$ limit to give stock class chance to look at other technologies.

### **TRAILERING PENALTIES**

- Suggestion that trailering penalties need to be changed because it is not in the spirit of the rayce to benefit from trailering. Suggestion to make it impossible for a trailering team to place higher than one that doesn't trailer.
- Suggestion that emphasis is not on best car but on best team.
- General feeling that driving team should have a better time than trailering team. Discussion of how to accomplish this (adding time, holding at checkpoint, automatic time penalty for any amount of trailering, not allowing teams to miss a checkpoint).
- How to encourage people to trailer if they are going too slow?

### **FUEL CELLS**

- Suggestion to only use in place of battery
- Question of if fuel cells are used, rayce stops being a solar rayce and that you have to choose one or the other.
- Suggestion that too early for the technology, perhaps have in a separate class. Suggestion that this would become Tour de Sol or become too fragmented.
- Some interest in off-years at FSGP.

## **SUPPORT VEHICLES**

- Concern with distance of scouts from other teams.
- Suggestion to limit the number of vehicles with teams
- Suggestion to limit carbon emissions
- Some teams said don't limit number of support vehicles.
- Question of how to differentiate team vehicles from public. DE – Always ways around it. How to monitor?
- Suggestion to require all support vehicles on the route to have CBs.
- Suggestion to provide teams with team phone lists.
- Question of scout placement.

## **CHECKPOINTS**

- Question of limiting number of vehicles into check point areas.
- Suggestion that check point areas need to be larger
- Question of what if team has to trailer into a check point or stay there overnight.
- Suggestion of more consistency in checkpoint staff directions.
- Suggestion of better direction for where additional support vehicles can go.

## **SCRUTINEERING/QUALIFYING**

- General thought that WMU hosting was great
- Question of a track closer to campus.
- Gingerman generally preferred to a ¾ oval that is closer.
- WMU will investigate Eaton's track that may be a bit closer.

## **WORKSHOP**

- Possibly February 2002
- UM investigating hosting possibilities.
- Weekend preferred.

## **OVERSEAS TEAMS**

- AP – Thank you to WMU for hosting Mad Dog. Anyone else interested in helping an overseas team can contact HQ.

## **WEBSITE**

- Comment that it was difficult to use during Rayce
- Request for faster updates.
- Request for missing penalties for last day.
- Comment that times unclear w/ or w/o penalties.
- Liked WMU link

## **TERION**

- Generally liked tracking units

## **ASC POST-EVENT CONFERENCE: LOGISTICS SESSIONS**

(Friday and Saturday sessions combined as several issues visited on both days).

### **SCHEDULING:**

- It was agreed that during a rayce year, Formula Sun Grand Prix should be held at least 8 weeks before the start of the last-chance qualifier.
- July seemed to be the best month for Formula Sun Grand Prix during the off-year. Other suggested times were April, the last week in May, and the first week in August. Further feedback from teams will be solicited before this date is decided. FSGP dates generally will also depend on availability of testing tracks.
- The trial run was discussed as a scheduling item. No dates have been determined, as timing of the event may be affected by the route (ie, if the route remains the same then the trial run can be done closer to the event time).

### **QUALIFIER**

- Some teams expressed an interest in exploring alternatives to the existing qualifying structure: ie, an alternative to the track component. No suggestions were submitted.

### **ROUTE BOOK**

- The structure of the route book was good overall.
- Teams would like to keep the system of maps with accompanying step descriptions on facing pages.
- The services available in each town should remain listed.
- More detail is required on the turns.
- Where the map is not as clear as the directions, these differences should be noted on the maps, and blown-up sketches of intersections should also be included where possible. Spray-painted markings on the roads would also be helpful.

### **RAYCE FORMAT**

- Overall teams liked the format of having a mostly non-staged rayce. The long stretch between Rolla and Barstow was viewed as especially competitive.
- The length of the raycing day (8 am-6 pm) is appropriate and should be maintained.
- Losing either the am or pm charging time would result in a critical loss of charge
- The “flex time” regulation should be kept, with teams receiving 30 minutes of flex time for either the morning or evening.
- If the same route is used again, a re-structuring of the stages/checkpoints may be needed to include an extra Checkpoint during the long interstate stretches.
- Teams liked having an extended stop in the middle of the rayce.

## **BATTERY IMPOUND**

- The teams generally agreed that 9:00 pm was a good cut-off time for impound.
- There was the suggestion made that an electrical isolation the batteries be imposed at 8:30pm.
- More technical input from other teams and officials is required

## **ROUTE**

**The positive aspects of the existing route were noted as including the following:**

- Teams are now familiar with the existing route
- The variation in terrain, traffic levels, population density, topography and climate was a positive aspect that added to the overall competitiveness of the race.
- Good weather during ASC 2001
- Teams preferred going through small towns because of the reduced traffic and increased interest in the ASC.
- The interstate provided more room on the road for the solar cars
- The minimal traffic along frontage roads increased the overall safety of the solar car travel.

**The negative aspects of the existing route were noted as including the following:**

- The long stretches of Interstate were arduous and possibly unsafe
- There were some very steep hills that were possibly too challenging
- The RR tracks posed a serious safety hazard
- There were too many large towns to go through (increased traffic, reduced interest in ASC)
- Following the same route may not be as exciting or interesting as it was the first time (ie, just a repeat).

### **Options for Future Routes:**

- Use existing route as is
- Use existing route and add another stage
- Use existing route and add another Checkpoint
- Move 2<sup>nd</sup> stage further ahead
- Remove staging between start and finish altogether
- Reverse direction of the route
- Change all or one stage timing to a 24hr stop instead of group staging
- Change Finish Location
- Change Finish Structure to include an official stopping point and then stage a “parade” finish