JUNIOR SOLAR SPRINT

OVERVIEW

Junior Solar Sprint (JSS), an Army Educational Outreach Program (AEOP), provides a hands-on opportunity for students in grades 5-8 to apply science, technology, engineering, and mathematics (STEM) concepts, along with leadership and 21st century skills such as creativity, teamwork, and problem-solving skills, as they design, construct, and race a solar-powered car.

A wealth of resources for teachers to implement the JSS program can be found on the AEOP JSS website.

ELIGIBILITY

One (1) team of two to four (2-4) individuals per chapter may participate; one (1) entry per team.

Participants must be:

A. Part of a registered Technology Student Association chapter, or

B. Part of a group that competes at an approved Army host site

TIME LIMITS

All models meeting safety and performance criteria are given up to two (2) time trials.

ATTIRE

Participants may choose to wear either the TSA approved JSS T-shirt or the official TSA competition attire at the JSS time trials and semifinal event. T-shirts are distributed to each participating team member in the JSS event.

PROCEDURE

PRE-CONFERENCE

A. Participants design and create their solar-powered car while working within the required specifications.

B. Participants record their design processes in a documentation portfolio.

C. Participants prepare a display to showcase only:

1. The solar-powered model car
    a. An 18" x 34" display area will be available for the cars during static judging
2. A decorated shoebox
3. The documentation portfolio

PRELIMINARY ROUND

A. Participants report to the time and place stated in the conference program and check in:

1. A solar-powered model car
2. The decorated shoebox
3. The documentation portfolio

B. Entries are reviewed by judges to determine specification adherence and safety on the track.

C. All models meeting safety and performance criteria will be given up to two (2) time trials.

1. The fastest time of these time trials will determine the sixteen (16) top semifinalist cars to be raced.
2. Cars that are disqualified for any reason will not be permitted to participate in the semifinalist races.

D. Four (4) evaluated areas will be used to determine final standings (see criteria for assessment and racing performance on the official rating form).

E. A list of sixteen (16) semifinalists will be posted.

SEMIFINAL ROUND

A. The semifinalist interview must include a minimum of two (2) team members.

B. The top sixteen (16) fastest cars from the time trials compete in a single or double elimination racing process. The process will be determined by the event coordinator.

C. Ten (10) finalists (selected based on the elimination racing process) will be announced during the conference award ceremony.

REGULATIONS AND REQUIREMENTS

Students will work to develop their leadership and 21st century skills in the process of preparing for and participating in this TSA competitive event. The development and application of those skills must be evident in their submission, demonstration, and/or communication pertaining to the entry.

PRE-CONFERENCE

A. Documentation Portfolio:
   1. Documentation portfolio is required and must be secured in a clear front report cover with the following single-sided, 8½" x 11" pages, in this order:
      a. Title page with the event title, conference city and state, the year, and the team/chapter ID number; one (1) page
      b. Table of contents; pages as needed
      c. Project Log (see the Competition Project Log attached to this event) that indicates preparation for the competition, as noted by date, task, time involved, obstacles/issues encountered, modifications made, team member responsible, and any comments; pages as needed
      d. Design drawings; pages as needed
         i. Must show the model with a minimum of two (2) views
         ii. The drawings must be developed using standard engineering practices and procedures (including measurements/ dimensions)
         iii. The drawings may be produced using traditional drafting methods or CAD
         iv. Rough sketches should be included
      e. Design details of the model, including model size, wheel size, gear ratio, specifications of the motor and solar panel used, etc; one (1) page
      f. Components list; one (1) page (see the Supplied Components worksheet attached to this event)
      g. Design process description, including pre-testing notes of various configurations of the model and revision notes about the model design throughout the process; pages as needed
      h. Sections of the portfolio may be organized by dividers

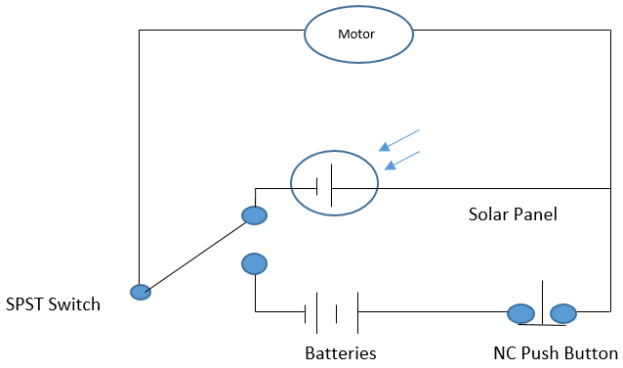
B. Display:
   1. must include the model, decorated shoebox and portfolio only.
   2. A decorated shoebox will be used as the display stand for the model car:
      a. The shoebox must be decorated and reflect creativity.
      b. The shoebox must have a label with a team ID.
   3. The portfolio must be placed with the model car.

C. Solar-Powered Model Car:
   1. The model must accurately reflect the design process outlined in the online resources found on the AEOP JSS website.
   2. The materials used to construct the model car must cost less than $50. The $50 does not include the cost of the panel. For example, Pitsco's Ray Catcher Sprint Deluxe Solar Vehicle costs $52.95. The Ray Catcher panel costs $38.25. Therefore, the cost of just the materials in the kit would be the difference between the two costs, $14.70.
   3. Original receipts for all materials purchased must be recorded in the Supplied Components List.
   4. If using recycled materials, documentation must show how these items were obtained.
   5. Recycled materials are not included in the $50 maximum.
   6. Model cars that exceed the $50 construction cost limit will be disqualified from the competition.
   7. The vehicle must be structurally sound without the solar panel attached.

D. Solar Paneling:
   1. One (1) solar panel (limited to a maximum output of 3.2 W), and one (1) motor (limited to a maximum 3.0 VDC) are allowed per car

2. The Ray Catcher Sprint Kit sold by Pitsco (www.pitsco.com/Ray-Catcher-Sprint-Kit) or the JSS Solar Panel sold by Solar Made (www.solarmade.com/store/product/jss-kit) are the only panels that can be used in the competition.
3. Solar panels cannot be shaved, drilled, or delaminated.
4. Only the motor supplied in the kit can be used.
5. Motors cannot be re-wound or disassembled.
6. If an evaluation group convened by the event coordinator determines that the solar panel and/or motor have been modified, the car and team will be disqualified from the competition.
7. The solar panel cannot be used as the chassis, or body, of the car.
8. The axles and wheels cannot be directly attached to the solar panel.
9. Reflectors, supports, and power leads can be added to these components as needed, but they must fit within the required dimensions.
10. The model car must, with the solar panel attached, not exceed the following dimensions:
    a. 60 cm (23 ⅝ inches) length
    b. 30 cm (11 13⁄16 inches) width
    c. 30 cm (11 ¾ inches) height (as measured from the surface the car is resting upon to the highest point of the car, with all its components attached)

JSS Wiring Diagram



11. Each vehicle must include a mounted battery holder that is capable of holding two AA batteries. The battery holder needs a switch or another easy device to operate a method of 'switching on' the battery power at the starting line. For example, a Single Pole Double Throw (SPDT) switch with a Normally Closed (NC) push button in series would be appropriate. In addition, a center-off type switch could be used.
12. The team is encouraged to decorate the body of the car, but a clearly visible 3 cm square space must be available on the car to display the team ID#.
13. If it is determined that the vehicles will be raced using solar power, the sun's light is the only energy source that can be used to power the vehicle. Batteries, capacitors, flywheels, or any other energy storage devices are prohibited.
14. If the sun's energy is judged insufficient by the event coordinator, two (2) AA 1.5 V batteries will be furnished for each team
    a. Only the provided batteries are permitted to power the model.

E. A student-designed attachment device must be part of the car to accommodate the easy attachment and removal from a guide wire for steering. A purchased screw eye or eye bolt is not considered a student designed attachment device.
    1. A guide wire, such as fishing line, will be no more than 1.5 cm (⅝") from the surface of the track.
    2. The wire will go through the attachment device on the car and serve as a steering mechanism to keep the car in its lane. **This must be done without disconnecting the guide wire.**
    3. Both ends of the guide wire will be fixed to the track. This is the only allowable method of steering the car.
    4. No radio control is permitted in the car.
    5. Lane changing or lane crossing will result in a Did Not Finish (DNF) standing.
    6. A car's race that is impacted by an out-of-control vehicle will be allowed an opportunity to run the race again.

7. A car that lacks steering control and interferes with other cars in other lanes will not be allowed to race again.

F. If a car is deemed unsafe, it will not be allowed to run in the time trials or the semifinalist races.

G. If the model is safe, but does not meet the required specifications, it will be allowed to run in the time trials but not the semifinalist races.

H. The remainder of the vehicle can be innovative in design and materials.

PRELIMINARY ROUND

Time Trials

A. The race lane must be 60cm wide and 20m long.

B. The track will be a hard flat surface, such as a tennis court or a smooth-surfaced running track.

C. The time trial/race specifications are as follows:

1. Tables will be set up for teams to make adjustments and minor repairs to cars prior to each time trial and the semifinalist heats.
   a. Teams that are "next up" to be timed or raced are given priority to use the tables.
   b. Teams must supply their own tools.
2. Time trials and semifinalist races will not be delayed to permit adjustments or repairs to cars. If a repair is needed during time trials, a three (3)-minute time limit for repairs will be permitted.
3. Prior to semifinals, teams will have an opportunity to perform up to two (2) trial races during a practice run session.
4. At race time, each car will be placed with the most forward part of the vehicle set even with the starting line and all of its wheels in contact with the ground.
   a. Each solar car's panel car will be covered completely by an opaque sheet covering that does not touch the solar panel.
   b. The opaque sheet will be removed at the start of the race, allowing the vehicle to collect solar power and start driving.
5. No more than two (2) team representatives will be allowed in the race area; one at the starting line, one to catch.
6. All cars will be started when the official signal is given.
   a. Each car will have up to two (2) time trials, unless otherwise determined by the event coordinator.
   b. The fastest time recorded will determine the sixteen (16) cars to race in the semifinal portion of the event.
   c. If, for any reason, a car is not able to participate in the time trials, or race at its scheduled time, it may be disqualified.
7. The judges will note the official time for each time trial.
   a. At the time designated, if a car does not start the time trial, OR if during the time trial it does not finish, it will be noted as a Did Not Finish (DNF).
   b. If a car has a false start, the entry will be given one (1) more opportunity to race.
8. One (1) team member must wait at the finish line to catch the vehicle for each timed trial. Team members are responsible for finding someone to catch their vehicle if another team member is unavailable.
9. After each timed trial or race, the vehicle and team member must remain at the finish line until the time is recorded for the vehicle.
10. No one, including team members and spectators, may accompany or touch the vehicle on the track during a timed trial or semifinalist race.
    a. Vehicles stalled on the track can be retrieved after the end of the trial or the race has been declared by the lead judge.
    b. A violation of this rule will result in disqualification of the offending team.
11. Challenges must be made before the next timed trial or race begins.
    a. Any challenges must come from team members who are actively competing, not the coach/advisor, parent, or coordinator.
    b. Any challenges need to be directed to the lead judge.
    c. The decisions of the judges regarding challenges are final.

12. Only competing students and race officials may be in the race area.
    a. Spectators, including coaches/advisors, parents, coordinators, and non-competing students, must remain in the designated spectator area throughout the duration of races.
    b. Teams will be disqualified if a spectator, including a coach/advisor or parent, interferes with a race. This includes a coach/advisor or parent helping team members get their car on/off the guide wire.
13. Judges may inspect cars at any time before, during, and after timed trials or semifinalist races.
14. Any additional rules, regulations, or guidelines established by the event coordinator must be followed.

SEMIFINAL ROUND

Semifinalist Racing

A. Regulations and procedures outlined in the preliminary round time trials are repeated for semifinalist racing.

EVALUATION

PRELIMINARY ROUND

A. The documentation portfolio
B. The artisanship and engineering of the model solar car
C. Creativity in the decoration of the shoebox
D. The model's racing performance
E. Time trials

SEMIFINAL ROUND

A. The semifinalist interview, which includes a minimum of two (2) team members
B. The time trials regulations in the preliminary round also apply to the semifinal races. Semifinalist racing of the top sixteen (16) time trial winners, which will be conducted using a double elimination bracket. Teams will be ranked based on their fastest recorded time from time trials. Semifinal races will not be timed, however, the winner will be determined by the car that crosses the finish line first, barring any penalties.

Refer to the official rating form for more information.

NOTES

A. Junior Solar Sprint (JSS) is an Army Educational Outreach Program (AEOP) competition. Information about AEOP opportunities can be found at www.usaeop.com.
B. An array of support materials, such as correlations to STEM standards, a glossary of terms, course outlines, and lesson plans can be found at www.usaeop.com/program/jss once registered.

STEM INTEGRATION

This event has connections to the STEM areas of Science, Technology, Engineering, and Mathematics.

LEADERSHIP AND 21ST CENTURY SKILLS DEVELOPMENT

This event provides opportunity for students to build and develop leadership and 21st century skills including but not limited to:

- Communication
- Collaboration/Social Skills
- Initiative
- Problem Solving/Risk Taking
- Critical Thinking
- Perseverance/Grit
- Creativity
- Relationship Building/Teamwork
- Dependability/Integrity
- Flexibility/Adaptability

CAREERS RELATED TO THIS EVENT

This competition has connections to one (1) or more of the careers below:

- Energy efficiency technician
- Mechanical engineer
- Solar engineer
- Solar panel installer
- Solar sales consultant

COMPETITION PROJECT LOG

JUNIOR SOLAR SPRINT COMPETITION

Date	Task	Time involved	Team member responsible	Obstacles encountered	Modifications made	Comments
1.						
2.						
3.						
4.						
5.						
6.						
7.						

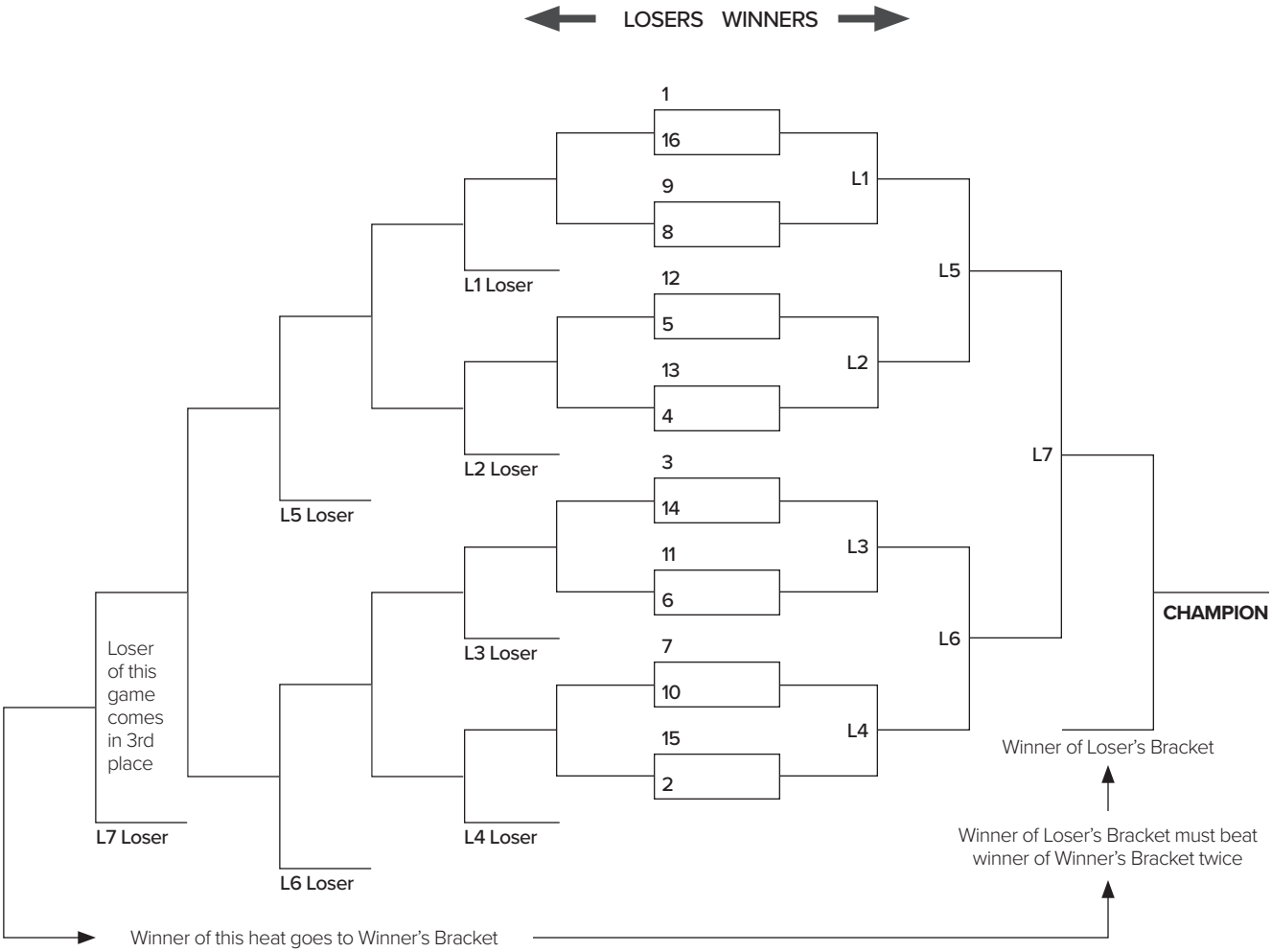
Advisor Signature: _____

SUPPLIED COMPONENTS LIST

Part	Description	Purchased Recycled	Cost
		TOTAL	

RACE BRACKET FOR 16-CAR DOUBLE ELIMINATION

Double Elimination Tournament Chart Seeded 16 player Field



Participant/Team ID# _____

JUNIOR SOLAR SPRINT

2022 & 2023 OFFICIAL RATING FORM

MIDDLE SCHOOL

Judges: Using minimal (1-4 points), adequate (5-8 points), or exemplary (9-10 points) performance levels as a guideline in the rating form, record the scores earned for the event criteria in the column spaces to the right. The X1 or X2 notation in the criteria column is a multiplier factor for determining the points earned. (Example: an "adequate" score of 7 for an X1 criterion = 7 points; an "adequate" score of 7 for an X2 criterion = 14 points.) A score of zero (0) is acceptable if the minimal performance for any criterion is not met.

Go/No Go Specifications

- Before judging the entry, ensure that the items below are present; indicate presence with a check mark in the box.
- If an item is missing, leave the box next to the item blank and place a check mark in the box labeled ENTRY NOT EVALUATED.
- If a check mark is placed in the ENTRY NOT EVALUATED box, the entry is not to be judged.

☐ Documentation portfolio is present
☐ Model car with solar panel is present
☐ A decorated shoebox
☐ The model is safe to participate in the time trials and, if deemed appropriate, the semifinalist races
☐ The model meets all required specifications
☐ ENTRY NOT EVALUATED

DISPLAY AND MODEL (80 points)				
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	Record scores in the column spaces below.
	1-4 points	5-8 points	9-10 points	
Display/Decorated Shoebox (X2)	The quality of the display is extremely poor and/or exceeds size requirements; the shoebox is not decorated and there is no creativity.	The display is adequately created and meets the size specifications; the shoebox is decorated and creative.	The display is exemplary, includes eye-catching details, and meets the size specifications; the shoebox is creatively decorated and shows exceptional originality.	
Model Design (X2)	The design of the solar model is poor and shows little effort.	The design of the solar model is adequate but not of exceptional quality.	The design of the solar model exhibits exceptional quality.	
Model Creativity/ Originality (X2)	The solar model car design lacks creativity and originality; little effort is apparent; car is an exact, or nearly an exact replica of purchased kit.	The solar model car design demonstrates an adequate level of creativity and originality; at least one (1) modification has been made to the car.	The solar model car design shows exceptional creativity, originality, artisanship, and engineering.	
Model Construction (X2)	The solar model car lacks quality of construction.	The solar model car demonstrates adequate quality of construction.	The solar model car demonstrates exceptional quality of construction.	
			DISPLAY AND MODEL SUBTOTAL (80 points)	

DOCUMENTATION PORTFOLIO (50 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	
	1-4 points	5-8 points	9-10 points	
Portfolio Components (X1)	A number of portfolio components are missing.	Most of the portfolio components are included, but the portfolio lacks overall quality.	The portfolio includes all required components; it is neat and properly organized; effort and quality are evident.	
Project Log (X1)	The Project Log is lacking significant portions; it is messy and demonstrates lack of effort.	The Project Log is acceptable, with most information included.	The Project Log is complete and accurate; the presentation is neat and orderly; a great deal of effort is evident.	
Design Drawings (X1)	Some drawings are missing and/or drawings are of poor quality.	Drawings are acceptable; all required views are shown.	Drawings are accurate and complete; all required views are present; rough sketches are included.	
Design Details/ Components List (X1)	Several details of the model, such as model size, wheel size, and gear ratio are missing and/or are poor; the components list is very limited.	Most details of the model, such as model size, wheel size, and gear ratio are included; most components are included.	All details of the model, such as model size, wheel size, and gear ratio are present; all components are included.	
Design Process Description (X1)	The design process description lacks detail and is poorly documented.	Most of the design process description is present.	All parts of the design process description are present.	
			DOCUMENTATION PORTFOLIO SUBTOTAL (50 points)	

Rules violations (a deduction of 20% of the total possible points for the above sections) must be initialed by the judge, coordinator, and manager of the event. Record the deduction in the space to the right. Indicate the rule violated: _____

PRELIMINARY TOTAL (130 points)

RACE (60 points)							
1st	2nd	3rd	4th	5th & 6th	7th & 8th	9th – 12th	13th – 16th
60 Points	55 Points	50 Points	45 Points	40 Points	35 Points	30 Points	25 Points
							RACE SUBTOTAL (60 points)

Rules violations (a deduction of 20% of the total possible points for the above sections) must be initialed by the judge, coordinator, and manager of the event. Record the deduction in the space to the right. Indicate the rule violated: _____

CAR BUILDER INTERVIEW (40 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	
	1-4 points	5-8 points	9-10 points	
Car Builder Interview (X2)	The team shows very limited knowledge of (and has difficulty articulating) how the car was produced or decisions made during the production; the student exhibits a basic understanding of design elements and functionality, and the rationale is inconsistent or absent.	The team demonstrates some knowledge of the vehicle production and has adequate knowledge of some processes or reasoning behind the vehicle design.	The team shows competence and knowledge related to the design and production of the vehicle; the student is able to articulate "reasoning" behind the decisions made.	
Articulation (X2)	Communication of the design process is unclear, unorganized, and or illogical; leadership and/or 21st century skills are not evident.	Communication of the design process is somewhat logical and clear; leadership and/or 21st century skills are somewhat evident.	Communication of the design process is clear, concise, and logical; leadership and/or 21st century skills are clearly evident.	
			CAR BUILDER INTERVIEW SUBTOTAL (40 points)	

Rules violations (a deduction of 20% of the total possible points for the above sections) must be initialed by the judge, coordinator, and manager of the event. Record the deduction in the space to the right. Indicate the rule violated: _____	
SEMIFINAL TOTAL (100 points)	
To arrive at the FINAL TOTAL score, subtract rules violation points, as necessary. **TOTAL** (100 points)	

Comments:

I certify these results to be true and accurate to the best of my knowledge.

JUDGE

Printed name: _____ Signature: _____

JUNIOR SOLAR SPRINT
EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

A. Event coordinator
B. Judges, six (6) or more
C. Assistants, six (6) or more

MATERIALS

A. Coordinator's packet containing:
    1. Event guidelines, one (1) copy for the coordinator and for each judge
    2. TSA Event Coordinator Report
    3. Stick-on labels for identifying entries
    4. Race bracket form
    5. Results envelope with coordinator forms
B. Batteries (AA 1.5 V) (in the event that the sun provides insufficient energy), two (2) per entry plus spares on-site
C. Braided fishing line for the track:
    1. Four (4) pre-tied
    2. Two (2) on track
D. Race track set, including a starting gate and finish gate with digital timer
E. Spare stopwatches for back-ups
F. Padding for the finish gate
G. Tables for the display and evaluation of entries (cars and portfolios)
H. Lane Assignment Board to be used for a display of semifinals racing
I. Tables and chairs for event coordinator, judges, and official assistants
J. A large display for the final 16 bracket
K. A gauge to measure line height at the beginning and end of the line

RESPONSIBILITIES

AT THE CONFERENCE

A. Attend the mandatory event coordinator's meeting at the designated time and location.
B. Report to the CRC room and check the contents of the coordinator's packet.
C. Review the event guidelines and check to see that enough personnel have been scheduled.
D. Inspect the area(s) in which the event will be held for appropriate set-up, including location for displays and the evaluation of portfolios, racing site, chairs, tables, outlets, etc.
E. At least one (1) hour before the event is to begin, meet with judges and assistants to review time limits, procedures, regulations, evaluation, and all other details related to the event. If questions arise that cannot be answered, speak to the event manager before the event begins.

PRELIMINARY ROUND

A. Participants report to the time and place stated in the conference program and check in:
    1. The solar-powered model car and decorated shoebox
    2. The documentation portfolio
B. Secure the entries in the designated area.
C. Late participants and/or entries are considered on a case-by-case basis and only when lateness is caused by events beyond the participant's control.
D. In order to compete, participants must be on the entry list or must have approval of the CRC.
E. Position the Junior Solar Sprint portfolios and models for viewing by the judges, and assist them as necessary during judging.
F. Set up the race track prior to the time trials. Make necessary adjustments.
G. Permit all vehicles (that can be safely operated) to participate in time trials.

H. Vehicles that are disqualified will NOT be permitted to participate in the semifinalist races.

I. Decisions about rules violations must be discussed and verified with the judges, event coordinator, and the CRC manager to determine either:

   1. To deduct twenty percent (20%) of the total possible points in this round
   2. To disqualify the entry

   The event coordinator, judges, and CRC manager must initial either of these actions on the rating form.

J. Judges determine the sixteen (16) semifinalists.

K. Submit the semifinalist results to the CRC room.

SEMIFINAL ROUND

A. Post the top sixteen (16) cars with interviews times.

B. Car builders will report to the track at the posted time for a five (5)-minute car builder interview.

C. Conduct interviews with the qualifying top sixteen (16) car builders.

D. Begin the semifinals at the scheduled time.

E. Run the semifinalist race. A sample double-elimination bracket follows.

F. Only the sixteen (16) qualifying cars are raced.

G. Public viewing is allowed.

H. Discuss rule violations (e.g., 20% deduction, disqualification) and have all relevant parties initial the rating form.

I. Judges use qualifying times to break any ties among the sixteen (16) qualifying cars.

J. Submit the finalist results and all related forms in the results envelope to the CRC room.

K. If necessary, manage the security and removal of materials from the event area.