



JUNIOR SOLAR SPRINT

OVERVIEW

Junior Solar Sprint (JSS), an Army Educational Outreach Program (AEOP), provides a hands-on opportunity for students to apply science, technology, engineering, and mathematics (STEM) concepts, 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 is available in the [Educational Resources](#) link found on the JSS website at www.usaeop.com/programs/competitions/jss/.

ELIGIBILITY

- One (1) team of two to four (2-4) students per chapter may participate; one (1) entry per team.
- Participants may be
 - part of a registered Technology Student Association chapter, or
 - part of a group that competes at an approved Army host site

TIME LIMITS

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

LEAP

A team LEAP Response is required for this event and must be submitted at event check-in (see LEAP Program).

ATTIRE

TSA competition attire is required.

PROCEDURE

Preliminary Round

1. At the event, participants check in their LEAP Response and entry for specification approval at the required time and place stated in the conference program.
2. All models meeting safety and performance criteria will be given up to two (2) time trials.
 - a. The fastest time of these time trials will determine the sixteen (16) top semifinalist cars to be raced.
 - b. Cars that are disqualified for any reason will not be permitted to participate in the semifinalist races.
3. Four (4) evaluated areas will be used to determine final standings (see criteria for assessment and racing performance on the official rating form).
4. A list of sixteen (16) semifinalists will be posted.

Semifinal Round

1. The top sixteen (16) cars compete in a single or double elimination racing process. The process will be determined by the event coordinator.
2. The LEAP Response will be judged for semifinalist teams.
3. Ten (10) finalists will be announced during the conference award ceremony.



REGULATIONS

Preliminary Round - Documentation

- A. Documentation materials (comprising a "portfolio") are required and should be placed and secured in a clear front report cover. (Click [here](#) for a sample.)
- B. The report cover must include the following single-sided, 8½" x 11" pages, in this order:
 - 1. Title page with the event title, conference city and state, the year, and the team/chapter ID number; one (1) page
 - 2. Table of contents; pages as needed
 - 3. Project Log (available on JSS website) 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
 - 4. Design drawings must show the model with a minimum of two (2) views; the drawings must be developed using standard engineering practices and procedures (including measurements/dimensions); the drawings may be produced using traditional drafting methods or CAD; rough sketches should be included; pages as needed
 - 5. Design details of the model, including model size, wheel size, gear ratio, specifications of the motor and solar collector used, etc; one (1) page
 - 6. Components list; one (1) page
 - 7. 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
 - 8. Sections of the portfolio may be organized by dividers.

Preliminary Round - Model Car

- A. The model must accurately reflect the design process outlined in the online resources found on the [AEOP website](#).
- B. A decorated shoebox must be used as a display stand during judging of the model car.
 - 1. The portfolio must be placed with the model car.
 - 2. The display may only include the model, shoebox, and portfolio.
 - 3. The display must fit in an area 15" deep x 3' wide.
- C. The materials used to construct the model car must cost less than \$50.
 - 1. Original receipts for all materials purchased must be recorded in the [Supplied Components List](#) form.
 - 2. If using recycled materials, documentation must show how these items were obtained.
 - 3. Recycled materials are not included in the \$50 maximum.
 - 4. Model cars that exceed the \$50 construction cost limit will be disqualified from the competition.
- D. The Ray Catcher Sprint Kit sold by Pitsco www.pitsco.com/Ray-Catcher-Sprint-Kit and the JSS Solar Panel sold by Solar Made www.solarmade.com/store/product/junior-solar-sprint-kit may be used in the competition.
 - 1. Solar panels cannot be shaved, drilled, or delaminated.
 - 2. Only the motor supplied in the kit can be used.
 - 3. Motors cannot be re-wound or disassembled.
 - 4. 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.
- E. 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.



1. Reflectors, supports, and power leads can be added to these components as needed, but they must fit within the required dimensions cited in section F.3, below.
 2. Energy-enhancing devices, such as mirrors, must be firmly attached to the vehicle.
 3. The remainder of the vehicle can be innovative in design and materials.
- F. The vehicle must be structurally sound without the solar panel attached.
1. The solar panel cannot be used as the chassis, or body, of the car.
 2. The axles and wheels cannot be directly attached to the solar panel.
 3. The model car must, with the solar panel attached, not exceed the following dimensions:
 - a. 60 cm (23 $\frac{5}{8}$ inches) length
 - b. 30 cm (11 $\frac{3}{4}$ inches) width
 - c. 30 cm (11 $\frac{3}{4}$ inches) height (as measured from the surface the car is resting upon to the highest point of the car, with all its components attached)
- G. 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 attach an assigned car number for the race.
- H. 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.
- I. If the sun's energy is judged insufficient by the event coordinator, a battery pack and two (2) AA 1.5 V batteries will be furnished for each team.
1. Only the provided batteries are permitted to power the model.
 2. The model's motor power leads must be readily accessible for easy attachment to a battery pack.
- J. A student-designed attachment device must be part of the car to accommodate the easy attachment and removal of a guide wire for steering.
1. A guide wire, such as fishing line, will be no more than 1.5 cm from the surface of the track.
 2. It will go through the attachment device attached to 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 whose race 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.
- K. If a car is deemed unsafe, it will not be allowed to run in the time trials or the semifinalist races.
- L. 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.

Preliminary Round - Time Trials and Semifinalist Racing

- A. The race lane must be 60 cm wide and 20 m 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 just 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. No adjustments or repairs are permitted once a time trial or race begins.
3. 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 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.
4. No more than one (1) team member will be allowed in the start area.
5. Releasing a car before the official start, or pushing a car during its release will result in a Did Not Finish (DNF) for that race.
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 of the time trials will determine the sixteen (16) cars to be raced.
 - 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).
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. All 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. All other 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

D. The LEAP Response:

1. Teams document the leadership skills the team has developed and demonstrated while working on this event, and on a non-competitive event leadership experience.
2. Find the specific LEAP Response regulations in the LEAP Program section of this guide, and on the [TSA website](#).

E. Ten (10) finalists will be announced during the conference award ceremony.

EVALUATION

Preliminary evaluation is based on:

1. The display
2. The documentation portfolio
3. The artisanship and engineering of the model solar car
4. The model's racing performance

Semifinal evaluation is based on

1. Time trials
2. Semifinalist racing of the top sixteen (16) time trial winners
3. The content and quality of the LEAP Response

Refer to the official rating form for more information.

NOTES

1. Junior Solar Sprint (JSS) is an Army Educational Outreach Program (AEOP) competition. Information about AEOP opportunities can be found at www.usaeop.com.
2. 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/programs/competitions/jss.

STEM INTEGRATION

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

CAREERS RELATED TO THIS EVENT

This competition connects to one or more of the careers below:

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



JUNIOR SOLAR SPRINT 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 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. Battery pack with clips soldered on and batteries (AA 1.5 V) (in the event that the sun provides insufficient energy), one (1) 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 with back-ups
- F. Padding for the finish gate
- G. Tables for the display and evaluation of entries (cars and portfolios)
- H. Table and chairs at the starting line for arranging and holding cars prior to the time trials
- I. Table at the finish gate for the placement of cars after time trials
- J. Ranking board for a display of time trials
- K. Tables and chairs for event coordinator, judges, and official assistants
- L. A large display for the final 16 bracket
- M. A gauge to measure line height at the beginning and end of the line

RESPONSIBILITIES

- A. At the conference
 - 1. Attend the mandatory coordinator's meeting at the designated time and location.
 - 2. Report to the CRC room to obtain the coordinator's packet; check the contents.
 - 3. Review the event guidelines and check to see that enough judges have been scheduled.
 - 4. Inspect the area(s) in which the event will be held for appropriate set-up, including location for displays and evaluation of portfolios, racing site, chairs, tables, outlets, etc.
- B. Preliminary Round:
 - 1. Check-in the entries at the designated time.



2. Secure the entries in the designated area.
 3. At least one (1) hour before the event is scheduled to begin, meet with judges/assistants/timers to review time limits, procedures, and regulations.
 4. Position the Junior Solar Sprint portfolios and models for viewing by the judges, and assist them as necessary during judging.
 5. Set up the race track prior to the time trials. Make necessary adjustments.
 6. Permit all vehicles (that can be safely operated) to participate in time trials.
 7. Note: Vehicles that are disqualified will NOT be permitted to participate in the semifinalist races.
 8. Decisions about rules violations must be discussed and verified with the judges, event coordinator, and CRC manager to determine either
 - to deduct twenty percent (20%) of the total possible points in this round or
 - to disqualify the entry
 - The event coordinator, judges and CRC manager must all initial either of these actions on the rating form.
 9. Judges determine the twelve (12) semifinalists.
 10. Submit the semifinalist results and all related forms in the results envelope to the CRC room.
- C. Semifinal Round:
1. Decisions about rules violations must be discussed and verified with the judges, event coordinator, and CRC manager to determine either
 - to deduct twenty percent (20%) of the total possible points in this round or
 - to disqualify the entry
 - The event coordinator, judges and CRC manager must all initial either of these actions on the rating form.
 2. Judges determine the ten (10) finalists, and break any ties for the top three (3) entries, as necessary.
 3. Submit the finalist results and all related forms in the results envelope to the CRC room.
 4. At the designated time, return models and portfolios to student participants.
 5. Manage security for viewing and the removal of materials from the event area.



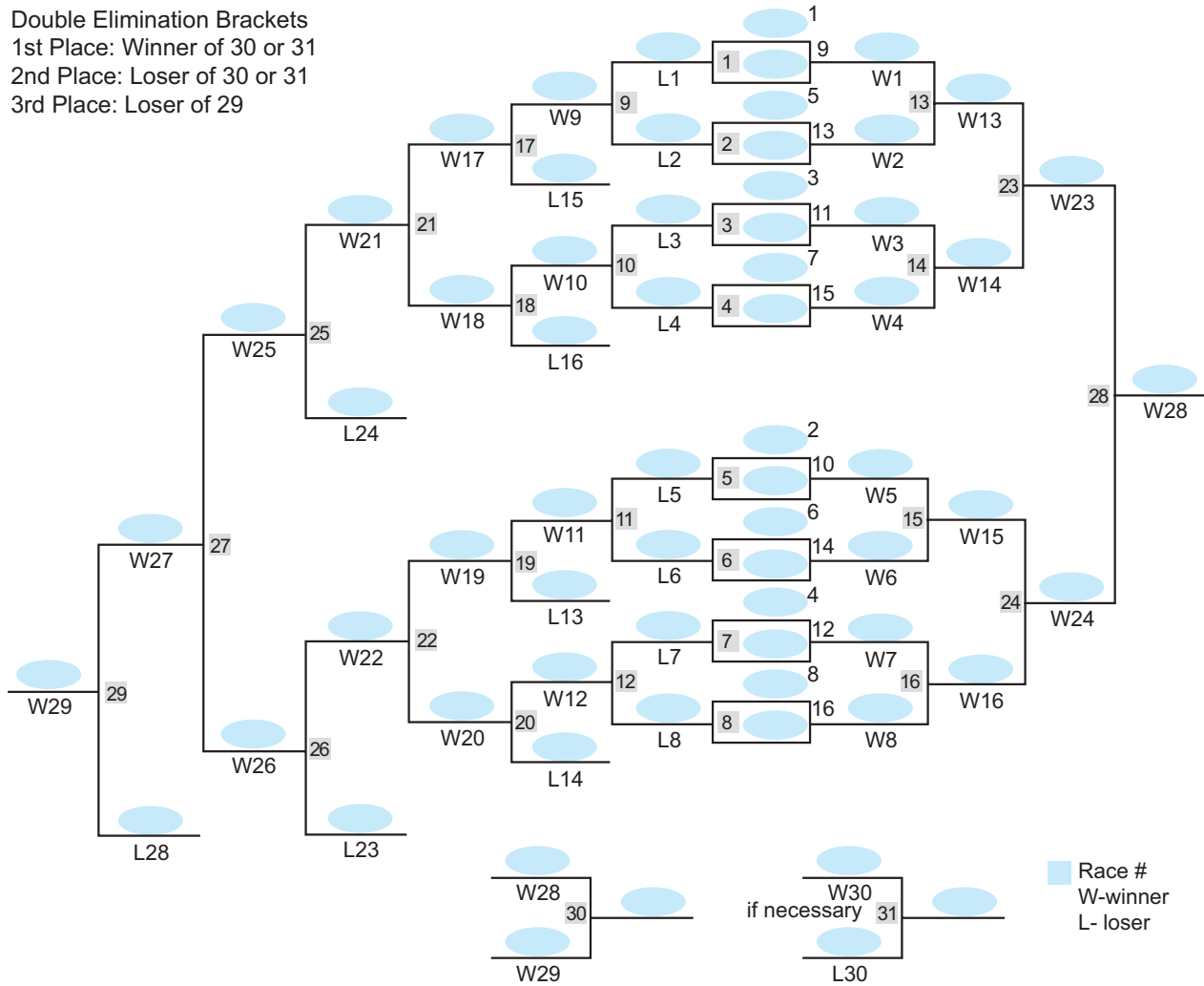
JUNIOR SOLAR SPRINT COMPETITION PROJECT LOG

| Date | Task | Time involved | Team member responsible | Obstacles encountered | Modifications made | Comments |
|--------------------------|------|---------------|-------------------------|-----------------------|--------------------|----------|
| 1 | | | | | | |
| | | | | | | |
| 3 | | | | | | |
| | | | | | | |
| 5 | | | | | | |
| | | | | | | |
| 7 | | | | | | |
| Advisor Signature: _____ | | | | | | |



RACE BRACKET FOR 16-CAR DOUBLE ELIMINATION

Double Elimination Brackets
 1st Place: Winner of 30 or 31
 2nd Place: Loser of 30 or 31
 3rd Place: Loser of 29





Participant/Team ID# _____

JUNIOR SOLAR SPRINT**2018 & 2019 OFFICIAL RATING FORM****MIDDLE SCHOOL****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 blank and place a check mark in the box labeled ENTRY NOT EVALUATED. This will disqualify the entry and it will not be judged.

- Portfolio is present
- Model car with solar panel is present
- The model is safe to participate in the time trials and, if deemed appropriate, the semifinalist races.
- The model meets all required specifications
- Display is present
- Completed LEAP Response is present

Criterion Performance Levels

| CRITERIA | Minimal performance 1-4 points | Adequate performance 5-8 points | Exemplary performance 9-10 points |
|----------|-----------------------------------|------------------------------------|--------------------------------------|
|----------|-----------------------------------|------------------------------------|--------------------------------------|

Evaluators: Using minimal (1-4 points), adequate (5-8 points), or exemplary (9-10 points) performance levels as a guideline, 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.

Display and Model (40 points)

| | | | |
|--|--|---|---|
| Display (X1) | The quality of the display is extremely poor and/or exceeds size requirements. | The display is adequately created and meets the size specifications. | The display is exemplary, includes eye-catching details, and meets the size specifications. |
| Model design (X1) | 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 (X1) | The solar model car design lacks creativity and originality; little effort is apparent; car is 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 and originality. |
| Model construction (X1) | 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 (40 points)**Documentation (50 points)**

| CRITERIA | Minimal performance 1-4 points | Adequate performance 5-8 points | Exemplary performance 9-10 points |
|---|---|---|--|
| Portfolio components See Regulation B (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. |

Record scores in the column spaces below.



Documentation continued (50 points)

| CRITERIA | Minimal performance 1-4 points | Adequate performance 5-8 points | Exemplary performance 9-10 points |
|--------------------------------|--|--|--|
| 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. |

Documentation continued (50 points)

| CRITERIA | Minimal performance 1-4 points | Adequate performance 5-8 points | Exemplary performance 9-10 points |
|--|--|---|--|
| 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 SUBTOTAL (50 points)

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

Indicate the rule violated: _____

PRELIMINARY SUBTOTAL (90 points)

Semifinal Round

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)

LEAP Response (15 points)

| LEAP (10% of the total event points) | The team's efforts are not clearly communicated, lack detail, and are unconvincing; few, if any, attempts are made to identify and incorporate the SLC Practices. | The team's efforts are adequately communicated, include some detail, are clear, and are generally convincing; identification and incorporation of the SLC Practices are satisfactory. | The team's efforts are clearly communicated, fully-detailed, and convincing; identification and incorporation of the SLC Practices are excellent. |
|---|---|---|---|
| | | | |

SEMIFINAL LEAP SUBTOTAL (15 points)

Rules violations (a deduction of 20% of the total possible points for the above section) must be initialed by the evaluator, coordinator and manager of the event. Record the deduction in the space to the right.

Indicate the rule violated: _____

SEMIFINAL SUBTOTAL (75 points)

(To arrive at the TOTAL score, add the PRELIMINARY SUBTOTAL and the SEMIFINAL SUBTOTAL.) **TOTAL (165 points)**

Comments:

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

Evaluator

Printed name: _____ Signature: _____