

ASME - NORTH AMERICAN PACIFIC DISTRICT RADIO-CONTROLLED BAJA CAR CONTEST RULES 3 April 2007



THEME:

Teams of engineering students demonstrate their skills by designing, building, presenting, and racing relatively inexpensive radio-controlled Baja vehicles on a variety of challenging race-courses at the District's Student Professional-Development Conference ("SPDC"), formerly called "Regional Student Conference" ("RSC").

For the purposes of this competition, a car will be defined as a self-propelled radio-controlled electric land vehicle running on three or four or more wheels not in a straight line, or on tank-treads. See: "**Car Restrictions**" and "**Repeat Entries**" on page 2.

The car must be conceived, designed, and fabricated by students without any direct involvement from professional engineers, automotive engineers, or related professionals. The student competition team may use any literature or knowledge related to the design of the car. The students may use information from professionals or from professors as long as the information is received in a discussion of alternatives with their pro's and con's; however, professionals may not make decisions of design, or drawings, or fabricate parts for the team.

It is intended that the car compete in all events without any changes that would provide an advantage for a particular event. Therefore, car-modifications and tire-style changes affecting the performance of the car will not be allowed after first competition in any event. Necessary repairs will be allowed if the judges are notified of the simple necessity and general nature of the repairs.

ELIGIBILITY:

Team-member eligibility shall be the same as for the Old Guard Oral Presentation Competition. Entering the RC Baja Contest does not exclude the team-members from entering any of the Old Guard Competitions. No limit on the number of teams entering from each school.

JUDGES:

Three required; recommended to be at least two ASME members or supporters and at least one RC hobbyist or enthusiast. Host School recruits and selects the Judges. Judges may be subject to approval by District Leadership.

PRIZES:

Awards: Certificates for Overall First Place, Second Place, Third Place.

Certificate for Best Design-and-Creativity per Judging Form II.

Prizes: At discretion of District Leadership, in accordance with Budget and Policy constraints.

DIRECT QUESTIONS TO:

Direct your questions to the "SPDC Coordinator" at the Host School, or to the person designated by the SPDC Host School to manage this RC Baja event.

Post-event suggestions for contest-improvements may be directed to District Leadership or the District person designated to administer the Contest.

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CAR RESTRICTIONS

The purpose of these restrictions is to ensure a competition of student-produced cars, all of which use common, easily available drive trains; rather than allowing expensive, off-the-shelf "professional-sports" entries. This policy was first adopted for the 1989 Regional Student Conference at the University of British Columbia.

1. "MANDATORY SELECTION" = Radio-controlled car parts which you must use, as specified here, without alterations. You must use the motor and the battery pack as specified below; these are the only sources of power that can be used for propulsion:

- **Propulsion Motor:** One per vehicle. Propulsion motor may perform additional functions, and additional motors may be carried on the vehicle for other purposes, but only one motor may propel the vehicle. Any motor which conforms to current-vintage "ROAR" (<http://www.roarracing.com/approvals/smotor.php>) specifications and manufacture is legal. "ROAR" motors from previous-years' vintages are also legal. If ROAR identification doesn't show on the motor, bring the box or literature.
- **Propulsion Battery Pack:** One per vehicle. Propulsion battery-pack may perform additional functions, and additional batteries of other types may be carried on the vehicle for other purposes, but only one battery-pack may propel the vehicle. Propulsion battery-pack: any 7.2 volt battery-pack intended for RC use, any milliamp-hour rating. Vehicle's batteries may be of any chemistry except lithium-polymer or other possibly-flammable type. Batteries may be un-wrapped and wired separately but not altered internally; bring the original case or wrapper to show type and classification. Teams may bring and swap-out more than one battery-pack to minimize "re-charging" downtime.
- **Transmitter:** For non-interference during the Competition, transmitter frequencies must be unique and at least two Channel numbers apart. Request approval of your desired Channel with the Host School via e-mail or equivalent, and demand that confirmation be returned. Channels will be allotted on a first-requested first-accepted basis by time of correspondence, so do this early.

2. "MAKE OR BUY, IT'S YOUR CHOICE" = Commercially-manufactured car parts which you may select and purchase, subject to these limitations; you may also make any of these items:

- Transmitter, receiver, servo's: Your choice, make or buy, with proper Channel per above.
- Speed control: Any available RC style – e.g. mechanical, resistor, or electronic – is okay. Home-made controls can be of any common RC style. Separate dedicated batteries just for your controls are acceptable, but they may not help propel the vehicle.
- Wheels, shocks, tank-treads, springs, hubs and spindles.
- Multiple servo's are okay.
- Store-bought universal joints are okay.
- Nuts, bolts, shafting, ordinary hardware and machine components; transistor and chip components.
- Differentials made by the team from pre-existing separate components, or "toy-kit" (e.g: Erector Set; Lego™) differentials, ARE acceptable. Differentials sold or intended for radio-controlled vehicles are NOT acceptable. You must describe the origin of your differential unit.
- Non-functional ornaments.

3. "YOU MAKE IT" = the rest of the car.

RULES REGARDING "REPEAT ENTRIES"

If a car, or a substantial portion of it, has been entered in a previous year's Contest, the following rules shall apply:

- (1) During the main Presentation, the presenters shall identify the "pre-existing" and the "new" elements of the entry, fully and accurately. Full Presentation points can be earned for this type of presentation. "Presentation" points depend upon the speakers, *not* the car, so, full-score points can be earned in this event.
- (2) For scoring for "Design-and-Creativity" and for "Manufacturing Skills," points will be earned thus: Up-to-full points can be earned for new elements of the entry; proportionally fewer points are earned for improvements to pre-existing elements; no points are earned for fully pre-existing elements. In short, "full points" can only be earned once, and not again in future contests.
- (3) Repeat-entries may compete in the "Performance" Events without penalty. A pre-existing "hot" design has the right to compete against anything new, which was created to try to beat it.

SUMMARY OF COMPETITION EVENTS

The competition is divided into two categories:

(1) **TWO ORAL PRESENTATIONS:**

- one main Presentation about the vehicle, which is scored for **Presentation Skills** (Form I) and for vehicle's **Design** and **Creativity** (Form II)
- one rather-less-formal Presentation with Q&A about the manufacture of the vehicle, which is scored for **Manufacturing Skills** (Form III).

(2) **THREE PERFORMANCE EVENTS** which test the abilities of the car in acceleration, cornering, and maneuverability on a variety of tracks:

- **Acceleration**
- **Slalom**
- **Baja**

Each of these events are described here in terms of the concept and what is intended to be tested, how the event is conducted, the criteria used in judging, and the formulae used in scoring.

The Judges will inspect the car to confirm that all design requirements have been met and that an allowable motor and battery are being used. Before set-up and competition, the Host School will examine the transmitter frequencies to verify that they are as pre-registered or at least unique and properly spaced from others; if not, transmitters will have to be changed or isolated so as not to interfere with other competitors.

Scheduling, managed by Hosts: While waiting to make Presentations, teams ready to compete may go to the tracks and compete, but have to promptly appear for vehicle-examination and oral Presentations when called-forth to present. Teams who are finished with their Oral Presentations may go to the tracks and compete without waiting all through the other teams' presentations. After each run, in order to save time, team members shall assist in clearing their car (and remnants) off the track so that another team can be running. Track and Presentations appearances may be alternated amongst events and teams for continuous enjoyment and effective use of time. To reduce the possibility of disabling damage to each vehicle, the Acceleration Event shall be entered first, then the Slalom Event, and then the Baja Event; team requests to depart from this sequence are allowable but are done at the team's own risk. A team may forfeit (decline to compete) in any or all of the Performance events; forfeiting an event earns Zero points for that event.

It is expected that teams from the "Host School" shall be honorable, by NOT taking any advantage from advance practice on a track, facility, or racing arrangement prepared by their own school for this event (there have NEVER been any complaints in this regard).

It is traditional (but at the option of the Host School) that at least four bona-fide entries are required in order for the Host School to commit resources to building a track and staging this event; therefore, early pre-registrations may be required.

In extra-ordinary circumstances, such as a far-distant Conference with very limited attendance of team-members, District Leadership can declare that as few as one person can drive in all events and presentations may be made via VCR or PPT or equivalent.

“Points’ are totaled from each of the following events to determine the winners:

ORAL PRESENTATIONS: For each vehicle, each Judge will need a Form I, a Form II, and a Form III. “Presentation Skills” and “Design-and Creativity” are both scored from the main oral Presentation; “Manufacturing Skills” are scored after a separate presentation about them.

Presentation Skills	Design & Creativity	Manufacturing Skills
Judged on organization, content, delivery, etc. Visual aid’s are allowed but entirely optional.	Judged on design and creativity of vehicle, as shown in main Presentation.	Separate presentation, follows main Presentation about vehicle.
Presentation counts, <u>NOT</u> the quality of the car.	<u>Design</u> 150 pts max	Less formal; includes Q&A with Judges
4 minutes talk 2 minutes for questions	<u>Creativity</u> 100 pts max	2 minutes plus questions time from Judges
Uses Judging Form I	Uses Judging Form II	Uses Judging Form III
<u>MAX POSSIBLE</u> 100 POINTS	<u>MAX POSSIBLE</u> 250 POINTS	<u>MAX POSSIBLE</u> 100 POINTS

PERFORMANCE EVENTS Host School furnishes a Master-of-Ceremonies and Starters / Timers, a “road-repair crew,” and people to make and record math-calculations of Points-Earned from Elapsed-Times.

In each event, “Point” scores are calculated from “Time” scores per specific Formulae. The Formulae determine and distribute Points between the slowest and fastest cars. In each event, it is necessary for all cars to compete before calculating any “Points” because the Formulae use the fastest and slowest times as calculation-constants.

Acceleration	Slalom	Baja
Sprint	Zig-zag	Baja Course
50 points plus up to 150 points per formula	50 points plus up to 150 points per formula	50 points plus up to 150 points per formula
<u>MAX POSSIBLE</u> 200 POINTS	<u>MAX POSSIBLE</u> 200 POINTS	<u>MAX POSSIBLE</u> 200 POINTS

The following course features have been used in prior races, so don’t be surprised by: varnished-wood gymnasium floors; Astro-turf™; plywood surfaces, ramps, and bumps; outdoor asphalt; indoor rugs; varnished concrete; PVC pipes and wood or duck-tape boundary markers; trays of gravel and sand; plastic tarps; chicken-wire “mountains;” loop-de-loop; generally any surfaces found around a college campus and any common construction materials. Track features that can “snag” the vehicles, or tunnels and tubes that cause the driver to lose more-than-momentary sight of the vehicle, are prohibited.

TO DETERMINE A TEAM’S TOTAL SCORE:

Presentation-Skills Score = _____ (0 – 100, from Judging Form I, page 6)
 Design Score = _____ (0 – 150, from Judging Form II, page 8)
 Creativity Score = _____ (0 – 100, from Judging Form II, page 8)
 Manufacturing Skills Score = _____ (0 – 100, from Judging Form III, page 10)
 Acceleration Point-Score = _____ (50 – 200, from formula based on elapsed-time, page 11)
 Slalom Point-Score = _____ (50 – 200, from formula based on elapsed-time, page 12)
 Baja Point-Score = _____ (50 – 200, from formula based on elapsed-time, page 13)

TOTAL SCORE _____

BEST DESIGN-AND-CREATIVITY SCORE: _____ (0 – 250, total from Judging Form II, page 8)

CONDUCT OF THE PRESENTATION-SKILLS EVENT

“Presentation Skills” and “Design-and Creativity” are both scored from the main Oral Presentation.
“Manufacturing Skills” are scored after a separate presentation about them.

The judging team will assemble with the competition team and their car. One (or more) team member(s) will give the presentation to the judging team and audience. The presentation cannot last more than 4 minutes and should not be interrupted by questions. After the presentation, there will be approximately 2 minutes of questions. During the question period, team members other than the presenter are encouraged to answer questions. For the oral Presentations, the car must be present to be viewed and examined by the judges in the condition specified by the team.

JUDGING OF THE PRESENTATION-SKILLS EVENT

The judges will consider the content, organization, and delivery of the Presentation and Answers, and will only evaluate the team's ability to give a technical presentation. The team making the best Presentation (regardless of the quality of the car) wins the event. Each Judge will use a Presentation-Skills Form I.

SCORING OF THE PRESENTATION-SKILLS EVENT

The scoring of the Presentation-Skills event will be based on points from the Presentation-Skills Judging Form I. The Presentation Points will be the average of the totals from each of the Judges' forms.
SEE ALSO: "Rules Regarding Repeat Entries," Page 2.

PRESENTATION SCORE = average of points from Judging Forms (100 points max).

It is fully intended that the Presentation scores will range from almost zero to almost 100 to provide good separation, since there will be no 'mathematical scaling' as is done in the Performance events.

PRESENTATION-SKILLS JUDGING FORM I

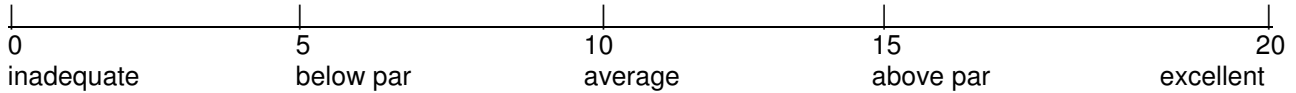
School _____
Car I.D. _____

PRESENTATION-SKILLS: 100 POINTS MAXIMUM

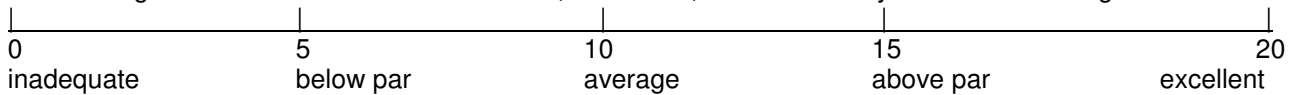
Score the following categories on the basis of 0 - 20 points each, according to the following scale (any number or fraction along this scale can be used): In accordance with rules for "Repeat Entries" (page 2), full Presentation-Skills points can be given for describing features retained from a previous year's entry.

- 0 = inadequate or no attempt
- 5 = attempt, but below expectation
- 10 = average or expected
- 15 = above average, but still lacking somehow
- 20 = excellent, perfectly meets intent

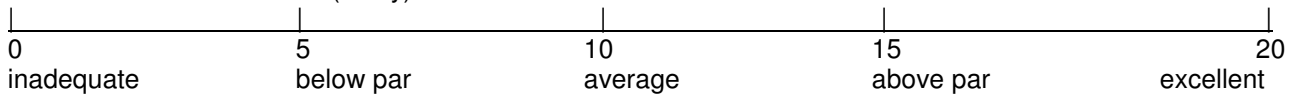
CONTENT: Were the concepts presented in a manner appropriate and adequate to explain how the car meets the intent of the customer contest? Were enough technical details presented without being boring?



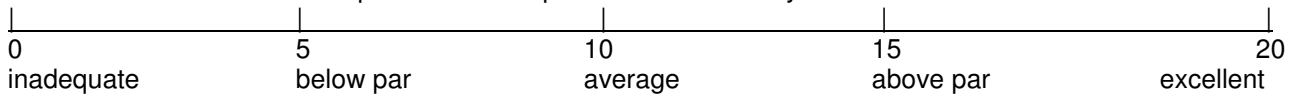
ORGANIZATION: Were the concepts presented in a logical order, progressing from basic concept and showing how the engineering accomplished the concept? Was it clear to the listener, what was to be presented, and what was coming next? Were a distinct introduction, overviews, and a summary with conclusions given?



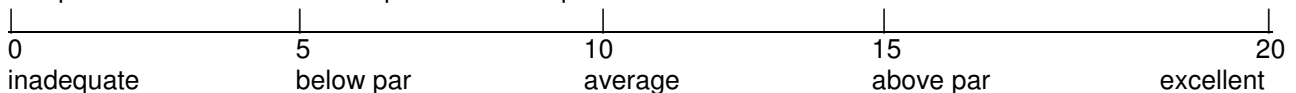
VISIBILITY: Were (optional) visual aids (if any) used effectively, or, were clear visual references made to the car? Were the illustrations (if any) visible to all of the audience?



DELIVERY: Did the presenter speak in a clear voice? Did the presenter show enthusiasm and promote confidence in the technical aspects? Did the presenter maintain eye-contact?



QUESTIONS: Did each answer indicate that the team fully understood that question and the intent of that question? Could it be seen that the whole team understood the answer as given? Did the team promote complete confidence in their responses to the questions?



TOTAL PRESENTATION-SKILLS SCORE =

CONDUCT OF THE DESIGN AND CREATIVITY EVENTS

“Presentation Skills” and “Design-and-Creativity” are both scored from the main oral Presentation; “Manufacturing Skills” are scored after a separate presentation about them.

The concept of the Design-and-Creativity Event is to evaluate the engineering effort and comprehension that went into the design of the car and how the engineering meets the intent of this contest. The team that illustrates the best use and understanding of engineering to meet the design goals wins the Design Event. The team that illustrates the best creativity in the application of unique ideas wins the Creativity Event.

After the team's Presentation, the Judges are encouraged to ask penetrating questions relative to the team's understanding and level of analysis of the car.

JUDGING OF THE DESIGN AND CREATIVITY EVENTS

The Judges will use the presentation and answers as a basis for evaluating the engineering effort. The Judges will also inspect the car to form their own opinions of the design concepts being adequate and appropriate for the application. Each Judge will use a **Design-and-Creativity Form II**.

SCORING OF THE DESIGN-AND-CREATIVITY EVENTS

The scoring of the Design-and-Creativity Events will be based on points from the Design-and-Creativity Judging Form II. The Design Points will be the average of the Design totals from each of the Judges' Forms. The Creativity Points will be the average of the Creativity Totals from each of the Judges' Forms.

SEE ALSO: "Rules regarding Repeat Entries," Page 2.

DESIGN SCORE = average of the Design points from Judging Forms (150 points max).

It is fully intended that the Design scores will range from almost zero to almost 150 to provide good separation, since there will be no 'mathematical scaling' as is done in the Performance events.

CREATIVITY SCORE = average of the Creativity points from Judging Forms (100 pts max).

It is fully intended that the Creativity scores will range from almost zero to almost 100 to provide good separation, since there will be no 'mathematical scaling' as is done in the Performance events.

CONDUCT OF THE MANUFACTURING-SKILLS EVENT

“Presentation Skills” and “Design-and-Creativity” are both scored from the main oral Presentation; “Manufacturing Skills” are scored after a separate presentation about them.

The concept of the “Manufacturing Skills” Event is to evaluate the team's manufacturing and fabrication decisions and methods, keeping in mind that the car was made specifically as an entry in a low-cost design-and-performance contest for student engineers, facing only loosely-defined racing conditions, limited preparation time and resources, and restrictions tending away from the use of expensive or pre-manufactured radio-control parts.

At the conclusion of the Presentation-Skills and Design-and-Creativity Events, the team will have 2 minutes to describe the manufacturing techniques used on the car parts. This will be a less formal presentation and can have interactive questions from the Judges; Judges’ “question time” does not deduct from team’s “allotted” time.

Economical cost, strength, and reliability will be considered. The team that presents the best approach to the parts of the car wins the event.

JUDGING OF THE MANUFACTURING-SKILLS EVENT

The Judges will use their best evaluation of the information presented. Of interest will be the percentage of parts discussed, the demonstration of knowledge of the alternatives for manufacturing and the wisdom in the selection of the techniques used for this vehicle. Each Judge will use a **Manufacturing-Skills Form III**.

SCORING OF THE MANUFACTURING-SKILLS EVENT

The scoring of the Manufacturing-Skills event will be based on points from the Manufacturing-Skills Judging Form III. The Manufacturing-Skills Points will be the average of the totals from each of the Judges' forms.

SEE ALSO: "Rules Regarding Repeat Entries," Page 2.

MANUFACTURING-SKILLS SCORE = average of points from Judging Forms (100 points max).

It is fully intended that the Manufacturing-Skills scores will range from almost zero to almost 100 to provide good separation, since there will be no 'mathematical scaling' as is done in the Performance events.

ACCELERATION EVENT

The concept of the Acceleration Event is to evaluate the car's acceleration ability. This event rewards cars that are lightweight and can deliver power efficiently to the ground. The team having the highest point score (via lowest elapsed time) wins this event.

CONDUCT OF THE ACCELERATION EVENT

To reduce the possibility of disabling damage to each vehicle, the Acceleration Event shall be entered first, then the Slalom Event, and then the Baja Event. Departures from this sequence are by team's own approval and risk.

The cars will accelerate from a standing start behind the starting-line onto a straight track of length of 60 feet or more (the Host School is encouraged to maximize the track length beyond 60 feet) on a flat surface with a track width of 9 feet. Special agents that increase traction may not be added to the tires or track surface. Tires that would leave marks on the Host School's floors will not be allowed. Elapsed time begins with the 'Start!' signal, and ends when the vehicle crosses the finish-line.

No time penalty will be assessed for hitting or displacing a barrier, or for going outside a non-barrier-type (e.g. masking tape, chalk) track boundary, but the clock will continue to run.

HEATS AND RUNS:

This event calls for two Drivers from each team. Each Driver will be given one individual run. The total elapsed time to complete each run, from 'Start!' signal to finish line, will be recorded.

The Driver may stand anywhere or move about, during the run. The Driver (only) may rescue, by hand, a stranded or marooned vehicle, but the clock will continue to run during the rescue. The rescue may not improve the track location or velocity of the vehicle.

TIME SCORING OF THE ACCELERATION EVENT

The best (lowest) time, obtained by either of the team's Drivers, will be the TIME score for that team. T_{your} = Your team's best (lowest) time, regardless of which Driver.

POINT SCORING OF THE ACCELERATION EVENT. FASTER CARS GET MORE POINTS.

This formula awards 50 points for entering the event in good faith, plus up-to-150 more points based on elapsed time. Minimum score, for the slowest car, is 50. Maximum score, for the fastest car, is 200. Other cars receive scores between 50 and 200. Cars that try in good faith but cannot finish the course are simply awarded 50 points for entering.

It is necessary to know the fastest time overall and the slowest time overall, before making any Points calculations. T_{min} = fastest time by any of the teams; T_{max} = slowest time by any of the teams. **Please be alert** that there are squared-exponents in this formula.

$$\text{ACCELERATION SCORE} = \frac{(T_{\text{max}} / T_{\text{your}})^2 - 1}{(T_{\text{max}} / T_{\text{min}})^2 - 1} \times 150 + 50$$

SLALOM EVENT

The concept of the Slalom Event is to measure the cornering ability of the vehicle while making rapid, successive turns. The team having the highest point score (via lowest elapsed time) wins this event.

CONDUCT OF THE SLALOM EVENT

To reduce the possibility of disabling damage to each vehicle, the Acceleration Event shall be entered first, then the Slalom Event, and then the Baja Event. Departures from this sequence are by team's own approval and risk.

The course will have the general shape of a bowling alley lane. There will be ten pylons in a straight or offset central line, laid out between two side barriers. The pylons will be four feet from each other and four feet from any side barrier. A combined start-and-finish line will be at one end of the course, and the first pylon will be four feet from the start/finish line. The vehicle shall begin by crossing the start/finish line, pass to one side of the nearest pylon, wend its way between each of the successive pylons in order (passing each on alternating sides), pass around the far side of the farthest pylon, then return, again wending between successive pylons, and end the run by crossing the start/finish line. This complete circuit (across the line, all the way out, all the way back, and across the line again) is called a "run." "Elapsed time" begins with the 'Start!' signal, and ends when the vehicle crosses the finish-line. No time penalty will be assessed for hitting or displacing a pylon or barrier, but the clock will continue to run, and displaced items will remain in that displaced position and still count as pylons or barriers for maneuvering purposes for the duration of that run. No time penalty will be assessed for going outside a non-barrier-type (e.g. masking tape, chalk) track boundary, but the clock will continue to run.

HEATS AND RUNS:

This event calls for two Drivers from each team. Each Driver will be given one individual run. The total elapsed time to complete each run, from starting line to finish line, will be recorded.

The Driver may stand anywhere or move about, during the run. The Driver (only) may rescue, by hand, a stranded or marooned vehicle, but the clock will continue to run during the rescue. The rescue may not improve the track location or velocity of the vehicle.

The first Driver may pass the first pylon on either the right side or the left side (thus setting the route along the rest of the course for that run). The second Driver must pass the first pylon on the opposite side from the selection used by the first Driver. Thus, while the layout of the course remains the same, the second run will be of the "opposite hand" from the first.

TIME SCORING OF THE SLALOM EVENT

The best (lowest) time, obtained by either of the team's Drivers, will be the TIME score for that team. T_{your} = Your team's best (lowest) time, regardless of which Driver.

POINT SCORING OF THE SLALOM EVENT. FASTER CARS GET MORE POINTS.

This formula awards 50 points for entering the event in good faith, plus up-to-150 more points based on elapsed time. Minimum score, for the slowest car, is 50. Maximum score, for the fastest car, is 200. Other cars receive scores between 50 and 200. Cars that try in good faith but cannot finish the course are simply awarded 50 points for entering.

It is necessary to know the fastest time overall and the slowest time overall, before making any Points calculations. T_{min} = fastest time by any of the teams; T_{max} = slowest time by any of the teams. **Please be alert** that there are NO exponents in this formula.)

$$\text{SLALOM SCORE} = \frac{(T_{\text{max}} / T_{\text{your}}) - 1}{(T_{\text{max}} / T_{\text{min}}) - 1} \times 150 + 50$$

BAJA EVENT

The concept of the Baja Event is to evaluate the car's maneuverability and handling qualities on a tight and difficult course. This course will combine the performance features of acceleration, braking, and cornering, in one event. Team having the highest point score (via lowest elapsed time) wins the event.

CONDUCT OF THE BAJA EVENT:

To reduce the possibility of disabling damage to each vehicle, the Acceleration Event shall be entered first, then the Slalom Event, and then the Baja Event. Departures from this sequence are by team's own approval and risk. To best challenge the car's design, the track will simulate an actual off-road Baja track, with bumps and jumps, in a manner such as can be constructed inside a building or in a college courtyard.

RACE-COURSE:

Race-course lay-out and features are determined by the ingenuity of the Host School; creativity and challenging features are encouraged. Parts of the racing-surface may be "slick" or may be "rough," to simulate different kinds of "Baja" terrain and traction. Approximate length of the course will be 400 feet, possibly attained by multiple laps. Course will have bumps and jumps made of plastic or wood etc. and may include varying types of surfaces, including carpeting. Bumps may be single or multiple, up to three to six inches high. Course may have some off-tilted and changing-radius or sharp-radius turns. There may be a sand, gravel, or rock-filled pit. There will be at least one long straight portion with at least one three- to six-inch jump in it. The highest "jump" drop-off shall be no higher than twelve inches. Any racing-surface going "up" shall be no steeper than 45° and shall be blended or 'radiused' at its start with carpet, cardboard, duct tape, or the like. Course may be laid out with side-barriers made of wood or plastic-pipe etc, or use masking-tape, duck-tape, or chalk. The edges of barriers and rugs may be blended with duck-tape or the like, or they may be left as-is. Track elements such as screws, nails, and wire structures shall not snag or ensnare the vehicles. Course will have a start and finish line, possibly coincident. The Host School will measure the total center-line length of the course for use in calculating the Time-Limit.

CLEARANCES:

The track shall be laid out with clearances such that a three foot diameter circular template would be able to transit the entire course at the level used by the vehicles. (This template could look like a garbage-can lid of that diameter and would check all minimum passages and clearances.) Tunnels and overpasses that obscure visibility or do not meet the clearance criteria are prohibited; minimum overhead clearance is 24 inches.

HEATS AND RUNS:

This event calls for two Drivers from each team. Each Driver will be given one individual run. The total elapsed time to complete each run, from 'Start!' signal to finish line, will be recorded. The Driver may stand anywhere or move about, during the run.

The Driver (only) may rescue, by hand, a stranded or marooned vehicle. Rescues may not improve track location or velocity of vehicle; except if the vehicle cannot get over a course obstacle after three good-faith attempts, the Driver can carry or drive around to the other side. The clock will continue to run during rescues. Vehicle may go completely outside a non-barrier-type (e.g. masking tape, chalk) track boundary on an outside turn or a straight portion of the track; but if ALL of the vehicle's wheels go outside a boundary on an inside turn ("taking a short-cut"), that turn must be repeated from at or behind point of departure.

TIME SCORING OF THE SLALOM EVENT

The best (lowest) time, obtained by either of the team's Drivers, will be the TIME score for that team. $T_{\text{your}} =$ Your team's best (lowest) time, regardless of which Driver.

There is a Baja **TIME-LIMIT**, equivalent to running the full course at 1.0 MPH. Host School measures the center-line main-route length of its own track and divides by 1.0 MPH to determine the maximum allowable Time Limit; for example, 272.7 seconds for an exactly 400-foot course. Cars that try in good faith but break down or exceed the Time-Limit are simply awarded a Time score equal to the Time-Limit. Time scores can't exceed Time-Limit.

POINT SCORING OF THE BAJA EVENT. FASTER CARS GET MORE POINTS.

This formula awards 50 points for entering the event in good faith, plus up-to-150 more points based on elapsed time. Minimum score, for the slowest car, is 50. Maximum score, for the fastest car, is 200. Other cars receive scores between 50 and 200. It is necessary to know the fastest time overall and the slowest time overall, before making any Points calculations. T_{min} = fastest time by any of the teams; T_{max} = slowest time or Time Limit by any of the teams. **Please be alert** that there are NO exponents in this formula.

$$\text{BAJA SCORE} = \frac{(T_{\text{max}} / T_{\text{your}}) - 1}{(T_{\text{max}} / T_{\text{min}}) - 1} \times 150 + 50$$