



## OVERVIEW

Participants design and produce a race-worthy CO<sub>2</sub>-powered dragster according to stated specifications, using only specified materials. Special design requirements will be posted for this event on the TSA website under Competitions/Themes and Problems.

## ELIGIBILITY

Two (2) individuals per chapter may participate; one (1) entry per individual.

## TIME LIMITS

1. The dragster and drawing are submitted at the time and place stated in the conference program.
2. The sixteen (16) qualifying car builders will receive a five (5)-minute interview.
3. Drawings and cars must be picked up at the specified time at the conclusion of the event.

## LEAP

An individual 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. Participants check in their entry and LEAP Response at the time and place stated in the conference program.
2. Entries are reviewed by judges to determine specification adherence and safety on the track.
3. Safe dragsters race for qualifying time on the same lane of a raceway.
4. The top sixteen (16) qualifying cars, based on time trials, are evaluated against the required specifications for this event.
5. Dragsters that do not meet event regulations are disqualified and lower qualifying cars are moved up until sixteen (16) dragsters meeting specifications are determined.

### Semifinal Round

1. The top sixteen (16) car builders will report to the track at the posted time for a five (5)-minute interview.
2. The top sixteen (16) cars race in a double-elimination format to earn points for the race portion of the event.
3. Drawing, design, and body finish points are combined with race points to determine the final standings.
4. Following the race, participants pick up their entries from the display area at the time and place stated in the conference program.
5. The LEAP Response will be judged for semifinalists.



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

**REGULATIONS**

- A. Each entry must be submitted at check-in with a full-size metric drawing of the completed vehicle.
  - 1. The two (2)-view (top and side) working drawing with metric dimensions must be made on 11"x 17" drawing paper.
  - 2. The drawing must be developed using standard engineering practices and procedures, and may be produced using traditional drafting methods or CAD.
  - 3. The title block includes only the student's identification number, which is assigned at conference registration and is placed on the entry and drawing during check-in.
- B. The official distance between the start line and the finish line on the race track is twenty (20) meters.
- C. **Dragsters that do not meet the following specifications and tolerances are disqualified from the race.**

**Dragster body**

- 1. One (1)-piece, all-wood construction
  - a. Any type of lamination will result in disqualification.
  - b. Two (2) or more like or unlike pieces of wood glued together are not considered one (1)-piece, all-wood construction.
  - c. No add-ons, such as body strengtheners, fenders, plastic canopy, exhausts, or air foils may be attached to or enclosed within the vehicle.
  - d. Fiberglass and shrink wrap are considered body strengtheners and cannot be used on the car body for any reason.
  - e. Decals may be used for decoration only; they may not be used to gain an aerodynamic advantage, i.e., decals cannot cover the exterior axle holes or be used to cover open areas of the body.

	<b>MINIMUM</b>	<b>MAXIMUM</b>
2. Body length	230mm	240mm
3. Body height with wheels		75mm
4. Body weight (completed car without CO2)	*(2018) - 60g *(2019) - 35g *specific school year requirement	80g 65g
5. Body width at axles, front and back	35mm	42mm
6. Vehicle total width (including wheels)		90mm

**Axles/axle holes/wheelbase**

- 1. Dragsters must have two (2) axles per car, no more.
- 2. Bottom of axle hole or bearing above bottom of car .... 5mm .....10mm  
(measured at sides)
- 3. Axle hole from front or rear of car ..... 9mm .....100mm
- 4. Wheelbase (axle distance apart at farthest points) 105mm .....222mm
- 5. Bearings, bushings and lubricants may be used.



**Spacer washers/clips**

- 1. Spacer washers .....10
- 2. Axle clips .....4
- 3. Silicone or any other type of glue/adhesive may not be used in place of wheel clips to hold wheels or axles in place.

**Power plant (CO<sub>2</sub> cartridge hole)**

- 1. The power plant hole must be at the farthest point at the rear of the car and must be drilled parallel to the racing surface to assure proper puncture of the CO<sub>2</sub> cartridge.
  - a. A minimum of 3mm thickness around the entire power plant hole must be maintained on the dragster for safety.
  - b. There should be no paint inside the CO<sub>2</sub> cartridge hole.
- 2. Hole depth..... 45mm .....55mm
- 3. Safety zone thickness ..... 3mm
- 4. Chamber diameter ..... 19mm .....20mm
- 5. Lowest point of chamber diameter to race surface (with wheels)..... 26mm .....40mm

**Eye screws**

- 1. Dragsters must have no more than two (2) eye screws per car that meet tolerances.
  - a. Eye screws must not make contact with the racing surface.
  - b. The track string must pass through both eye screws, which are located on the center line of the bottom of the car.
  - c. Glue may be used to reinforce the eye screws.
  - d. It is the responsibility of the car designer/engineer to see that the eye screw holes are tightly closed to prevent the track string from slipping out.
  - e. As with all adjustments, this must be done prior to event check-in.
- 2. Inside diameter..... 3mm .....5mm
- 3. Distance apart (at farthest points)..... 150mm .....270mm

**Wheels**

- 1. A dragster must have exactly four (4) wheels, each of which separately must meet regulations in items in 2 and 3 below.
  - a. All four (4) wheels must touch the racing surface at the same time.
  - b. All wheels must roll.
  - c. Wheels must be made entirely from plastic.
  - d. Dimensions must be consistent for the full circumference of the wheel.
- 2. Wheel diameter ..... 30mm .....40mm
- 3. Wheel width\* ..... 2mm .....18mm

\*Width is determined by the continuous point of contact between the wheel and track or flat surface.



- D. No repair or maintenance is allowed after the entries have been registered.
- Any vehicle damaged during the race is evaluated by the event coordinator to determine whether or not the vehicle is allowed to race again.
  - In the event that the vehicle is damaged by conference personnel, the event coordinator rules as to whether the vehicle may be repaired by the participant entering the vehicle; this is the only reason a participant is allowed to touch his/her vehicle after registration.
  - Undamaged wheels that come off during the event may be replaced as determined by the event coordinator.
  - Damaged wheels may not be replaced.
- E. All CO<sub>2</sub> cartridges for the race are provided by national TSA.

### **Semifinal Round**

- A. The semifinalist interview must include both team members.
- B. The LEAP Response:
- Teams document the leadership skills they have developed and demonstrated while working on this event, and on a non-competitive event leadership experience.
  - Find specific LEAP Response regulations in the LEAP Program section of this guide, and on the [TSA website](#).

### **EVALUATION**

Evaluation is based on:

- Points earned through car design and appearance
- Accuracy and quality of the drawing
- The interview
- Placement in the double elimination on-site race
- The content and quality of the LEAP Response

Refer to the official rating form for more information.

### **STEM INTEGRATION**

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

### **CAREERS RELATED TO THIS EVENT**

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

- Aeronautical engineer
- Automotive designer
- Automotive modeler
- Industrial designer
- Industrial engineer
- Mechanical engineer
- Race car engineer



# DRAGSTER

## EVENT COORDINATOR INSTRUCTIONS

### PERSONNEL

- A. Event coordinator
- B. Judges:
  - 1. Preliminary round, two (2) or more
  - 2. Semifinal round, two (2) or more
- C. Recorder for double elimination chart, one (1)
- D. Assistants, two (2)

### MATERIALS

- A. Coordinator's packet, containing:
  - 1. Event guidelines, one (1) copy for the coordinator and each judge
  - 2. TSA Event Coordinator Report
  - 3. List of judges/assistants
  - 4. Stick-on labels for identifying entries
  - 5. Time trial record sheet
  - 6. Qualifier Interview Time Slot sheet
  - 7. Double elimination bracket chart
  - 8. Results envelope with coordinator forms
- B. CO<sub>2</sub> cartridges
- C. Go/No-Go gauges for all judges
- D. Metric scientific scales (triple beam balance or digital)
- E. Mono-filament fishing line (50lb) for track (4 pre-tied, 2 on track, and 2 reserve)
- F. Race track set, including a starting gate and a finish gate with digital timer and winning lane indicator
- G. Padding for the finish gate
- H. One (1) or more test cars
- I. Tables for the display of cars and for evaluation
- J. Table at the starting line for arranging and holding cars prior to the races
- K. Table at the finish gate for the placement of cars after the races and to hold eliminated cars
- L. Table for the official time keeper
- M. When using a computer controlled track, provide the proper computer for the software being used, all necessary connections, and a printer (placed on the official time keeper's table)
- N. A method for displaying the time trial and race brackets

### RESPONSIBILITIES

- A. At the conference:
  - 1. Attend the mandatory coordinator's meeting at the designated time and location.

2. Report to the CRC room and obtain the coordinator's packet; check the contents.
  3. Review the event guidelines and check to see that enough judges/assistants have been scheduled.
  4. Inspect the area(s) in which the event is to be held for appropriate set-up, including room size, chairs, tables, outlets, etc. Notify the event manager of any potential problems.
  5. Check-in the entries at the time stated in the conference program.
  6. Anyone reporting who is not on the entry list may check in only after official notification is received from the CRC.
  7. Late entries are considered on a case-by-case basis and only when the lateness is caused by events beyond the participant's control.
  8. Requirements for attire do NOT apply during check-in only on the first day of the conference.
  9. Check to see that each entry drawing includes the participant's identification number in the upper right-hand corner of the paper.
  10. Position each entry (dragster and drawing) for evaluation and viewing.
  11. Secure the entries in the designated area.
  12. At least one (1) hour before the event is scheduled to begin, meet with judges/assistants to review time limits, procedures, and regulations. If questions arise that cannot be answered, speak to the event manager before the event begins.
- B. Preliminary Round:
1. Assist judges with evaluation of the design, drawing, and construction categories.
  2. 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.
  3. Begin the time trials at the scheduled time.
    - a. Every race-worthy car should be tested.
    - b. Students do not have to be present.
    - c. Public viewing is allowed.
  4. Position a judge at the starting gate to ensure that all cars are positioned in the starting gate correctly.
  5. Position another judge at the finish line.
  6. If there is a misfire or if a time is not properly recorded, a rerun may be ordered at the discretion of the event coordinator.
  7. Record preliminary times on a time trial record sheet.
  8. Place each car in the double elimination race bracket (see next page for sample) according to the rank of its qualifying time.
  9. Judges verify that the top sixteen (16) qualifying cars meet Regulation D specifications.
  10. Entries that do not meet specifications are removed.
  11. Cars that are damaged or broken during the qualifying round are deemed non-raceable and also are removed.



12. Only raceable cars, as determined by the judges, are allowed to compete for the semifinalist category.
13. Lower qualifying cars are moved up until there are sixteen (16) legal semifinalists.
14. Submit the semifinalist results and all related forms in the results envelope to the CRC room.

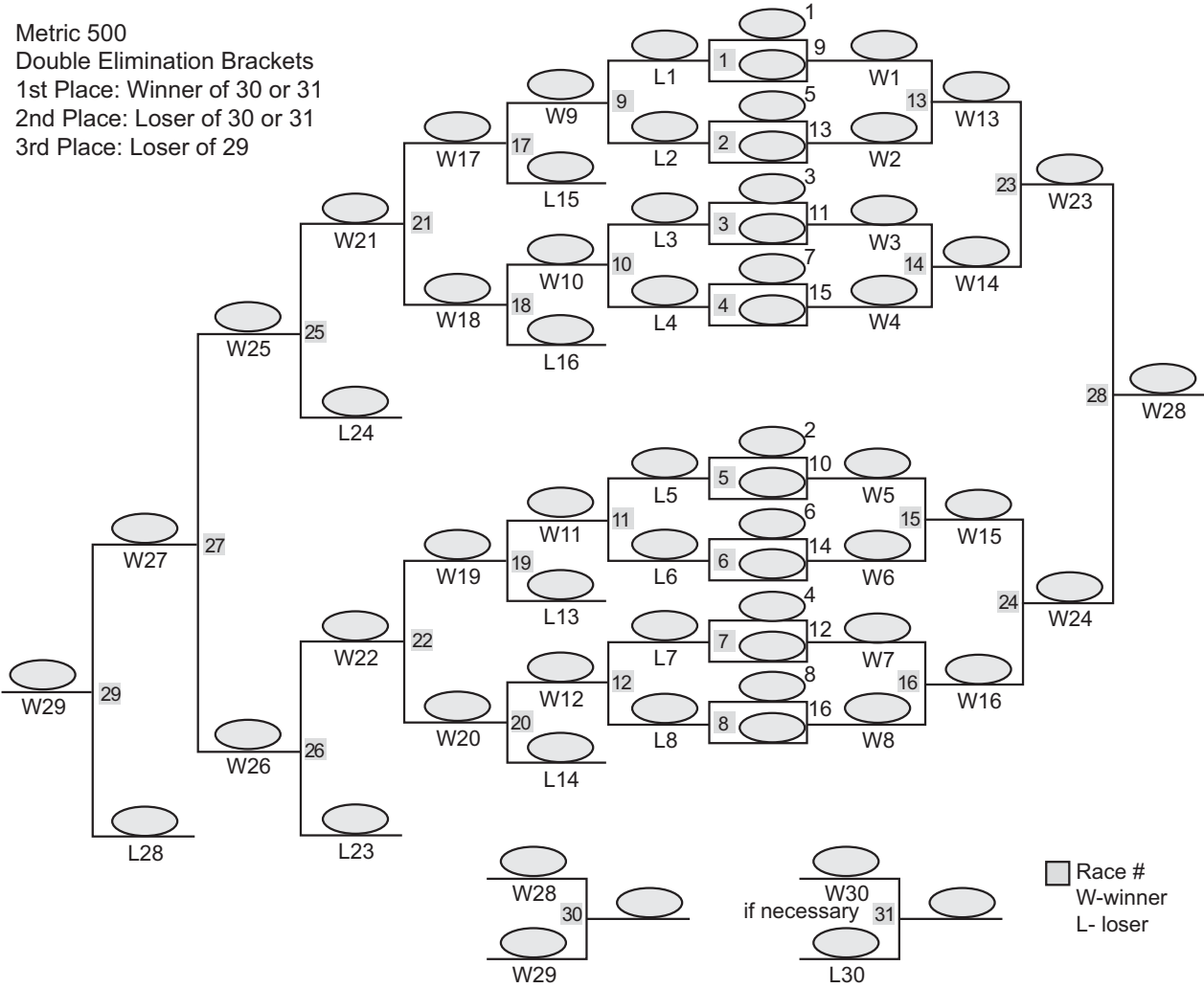
C. Semifinal Round:

1. Begin the semifinals at the scheduled time.
2. Only the sixteen (16) qualifying cars are raced.
3. Students do not have to be present.
4. Public viewing is allowed.
5. 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.
6. Judges should use qualifying times to break any ties among the sixteen (16) qualifying cars.
7. Submit the finalist results and all related forms in the results envelope to the CRC room.
8. If necessary, manage security and the removal of materials from the event area.



# RACE BRACKET FOR 16-CAR DOUBLE ELIMINATION

Metric 500  
 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# \_\_\_\_\_

# DRAGSTER

2018 & 2019 OFFICIAL RATING FORM

MIDDLE SCHOOL

## Go/No Go Specifications

Before judging an entry, ensure all items are present; indicate presence with an "X" in the box. If an item is missing, leave the box blank and place an "X" in the box labeled ENTRY NOT EVALUATED; this disqualifies the entry and it is not to be judged.

- Car is present
- Technical drawing is present
- Car is safe to race
- Completed LEAP Response is present
- ENTRY NOT EVALUATED

## Criterion Performance Levels

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

## Dragster Construction (50 points)

Tolerance violation/disqualification from race (note rule number in the box).

<b>Dragster body production quality</b> (X1)	Dragster exhibits poor production quality; little or no attention to detail is evident; surface is crude and rough.	Dragster shows evidence of proper production techniques; dragster is adequate but needs improvement.	Excellent production techniques are displayed in the dragster; obvious attention to detail and quality is evident.
<b>Body paint/finish</b> (X1)	Surface preparation is inadequate; body is unprimed, with poorly applied final finish.	Dragster body is painted and finished but not in a quality way; body is dull and sticky.	Dragster body finish is exemplary; body is smooth, shiny, and exhibits quality.
<b>Vehicle assembly</b> (X1)	Dragster exhibits poor or sloppy assembly of parts (loose wheels, eye screws are not level, and/or they are loose, etc.).	Dragster is well assembled, and it adequately meets standards.	Dragster is properly assembled, with obvious evidence of attention to detail.
<b>Drawing scale and dimensioning</b> (X1)	Drawing is present, but it is not to scale; dimensions are missing, or dimensioning is poorly done.	Drawing is acceptable, true to scale, and it is a close representation of the vehicle; some dimensions are missing.	Drawing is exemplary, exact, and includes all pertinent dimensions.
<b>Drawing completion and quality</b> (X1)	Drawing work is sloppy, missing parts, and lacking quality.	Drawing is complete; quality is average.	Drawing is complete, precise, and of exceptional quality.

**DRAGSTER CONSTRUCTION SUBTOTAL (50 points)**

Record scores in the column spaces below.



Interview (20 points)							
CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points				
<b>Car builder interview</b> (X2)	The student shows very limited knowledge of (and has difficulty articulating) how the car was produced or decisions made during the production; there are signs of the student not being involved in the dragster production.	The student demonstrates some knowledge of the dragster production and has adequate knowledge of some processes or reasoning behind the vehicle design.	The student shows competence and knowledge related to the design and production of the vehicle; the student is able to articulate "reasoning" behind the decisions made.				
<b>INTERVIEW SUBTOTAL (20 points)</b>							
<b>PRELIMINARY SUBTOTAL (70 points)</b>							
LEAP RESPONSE (13 points)							
CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points				
<b>LEAP Response</b> (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.				
<b>LEAP RESPONSE SUBTOTAL (13 points)</b>							
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
<b>RACE SUBTOTAL (60 points)</b>							

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

Indicate the rule violated: \_\_\_\_\_

(To arrive at the TOTAL score, add the PRELIMINARY SUBTOTAL and the SEMIFINAL SUBTOTAL.) **TOTAL (143 points)**

Comments:

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

Evaluator

Printed name: \_\_\_\_\_ Signature: \_\_\_\_\_