

OVERVIEW

Participants design, produce a working drawing for, and build a CO₂-powered dragster according to stated specifications, using only certain materials.

ELIGIBILITY

Two (2) individuals per chapter, one (1) entry per individual.

TIME LIMITS

The top sixteen (16)-qualifying dragster builders will participate in a five (5)-minute car builder interview and a LEAP interview, which will last a maximum of five (5) additional minutes.

LEAP

An individual LEAP Report is required for this event and must be submitted at event check-in (see LEAP Program).

ATTIRE

TSA competition attire is required for this event.

PROCEDURE

PRELIMINARY ROUND

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

SEMINFINAL ROUND

1. The top sixteen (16) dragster builders will report to the track at the posted time for a five (5)-minute interview immediately followed by the LEAP interview (maximum of five [5] additional minutes).
2. The top sixteen (16) entries 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. The top ten (10) finalists will be announced at the awards ceremony.

REGULATIONS

PRELIMINARY ROUND

- A. Participants must check the national TSA website under Competitions/Themes and Problems for the current year's design challenge specifications.
- B. Drawings:
 1. The two (2)-view (top and side) drawing with metric dimensions is made on drawing paper no larger than 11" x 17" in size.
 2. Drawings are developed using standard engineering practices and procedures.
 3. The drawing may be produced using traditional drafting methods or CAD.
 4. The title block includes only the participant's identification number, which is assigned at registration time and is placed on the entry and drawing during check-in.
- C. Dragsters that do not meet the below specifications/tolerances are disqualified from the race.

Dragster body		
	MINIMUM	MAXIMUM
1. One (1)-piece, all-wood construction; any type of lamination results in disqualification. No add-ons such as body strengtheners, fenders, plastic canopy, exhausts, or air foils may be attached to or enclosed within the vehicle. Fiberglass and shrink wrap are considered body strengtheners and cannot be used on the car body for any reason. 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. Two (2) or more like or unlike pieces of wood glued together are not considered one (1)-piece, all-wood construction.		
2. Body length	(2019) 295mm (2020) 210mm	(2019) 305mm (2020) 220mm
3. Body height with wheels		75mm
4. Body mass (completed car without CO ₂)	(2019) 55g (2020) 30g	N/A
5. Body width at the point the axles pass through the body, front and back	35mm	42mm
6. Vehicle total width (including wheels).		90mm

Axles/axle holes/wheelbase		
	MINIMUM	MAXIMUM
1. Dragsters must have two (2) axles per car, no more.		
2. Bottom of axle hole or bearing above bottom of car body. (NOTE: This will be only be measured at the side surfaces of the wood car body at the axle hole.)	5mm	10mm
3. Axle hole from front and rear of car	9mm	100mm
4. Wheelbase (axle distance apart at farthest points)	105mm	270mm
5. Bearings, bushings and lubricants may be used.		
6. Glue may be used to secure bearings to body.		

Spacer washers/clips		
	MINIMUM	MAXIMUM
1. Spacer washers		8
2. Axle clips		8
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 (CO₂ cartridge hole)

	MINIMUM	MAXIMUM
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 ₂ cartridge. A minimum of 3mm thickness around the entire power plant hole must be maintained on the dragster for safety. The inside of the power plant hole must not be intentionally painted.		
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

Screw eyes

	MINIMUM	MAXIMUM
1. Dragsters must have two (2) screw eyes (no more) per car that meet tolerances. Screw eyes must not make contact with the racing surface. The track string must pass through both screw eyelets, which are located on the center line of the bottom of the car. Glue may be used to reinforce the screw eyes. It is the responsibility of the car designer/engineer to see that the screw eye holes are tightly closed to prevent the track string from slipping out. 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

	MINIMUM	MAXIMUM
1. A dragster must have four (4) wheels, no more. <ul style="list-style-type: none"> a. Two (2) wheels must meet the requirements in #2 and #3 below. b. The other two (2) wheels must meet the requirements in #4 and #5 below. c. All four (4) wheels must touch the racing surface at the same time. d. All wheels must roll. e. Wheels must be made entirely from plastic. f. Dimensions must be consistent for the full circumference of each wheel. g. Measurement represents the FULL surface contact point where wheel makes contact with the track. 		
2. Front diameter	32mm	37mm
3. Front width (at surface contact point)	1.5mm	5mm
4. Rear diameter	35mm	40mm
5. Rear width (at full, unbroken, surface contact point)	12mm	18mm

SEMINFINAL ROUND**A. Race**

1. The official distance between the start line and the finish line on the race track is twenty (20) meters.
2. No repair or maintenance is allowed after the entries have been registered.
3. Any entry damaged during the race is evaluated by the event coordinator to determine whether or not the vehicle is allowed to race again.
4. In the event that the vehicle is damaged by conference personnel, the event coordinator rules as to whether or not the vehicle may be repaired by the student entering the vehicle. This is the only reason a student is allowed to touch his/her vehicle after registration.
5. Undamaged wheels that come off during the event may be replaced as determined by the event coordinator.
6. Damaged wheels may not be replaced.
7. All CO₂ cartridges for the race are provided by national TSA.

B. The LEAP Report

1. Participants document the leadership skills they have developed and demonstrated while working on this event, and on a non-competitive event leadership experience.
2. Participants will respond to questions about the content of the LEAP Report as part of the LEAP interview, which will last a maximum of five (5) minutes.
3. Specific LEAP Report regulations can be found in the LEAP Program section of this guide and on the TSA website.

EVALUATION

1. Points earned through car design and appearance
2. Accuracy and quality of the drawing
3. Points earned from the (top 16) interviews
4. Placement in the double elimination onsite race
5. The content and quality of the LEAP Report and interview

Refer to the official rating form for more information.

STEM INTEGRATION

This event aligns with the STEM educational standards of Science, Technology, Engineering, and Mathematics.

CAREERS RELATED TO THIS EVENT

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

DRAGSTER DESIGN

2019 & 2020 OFFICIAL RATING FORM

HIGH 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.

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- Vehicle meets specifications described in Regulations.
 - Completed LEAP Report is present.
 - ENTRY NOT EVALUATED

DRAGSTER CONSTRUCTION (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	
Dragster body production quality (X1)	Dragster exhibits poor production quality, with a crude and rough surface and little or no attention to detail.	Dragster shows evidence of proper production techniques; it is adequate but may need improvement.	Dragster displays excellent production techniques, with obvious attention to detail and quality.	
Body paint/finish (X1)	Surface preparation is inadequate; the body is unprimed, with poorly applied final finish.	Dragster body is painted and finished adequately.	Dragster body finish is exemplary; body is smooth, shiny, and exhibits quality.	
Vehicle assembly (X1)	Dragster exhibits poor or sloppy assembly of parts (wheels are loose, screw eyes are loose and/or not level, etc.).	Dragster is well assembled, with adequate attention to detail.	Dragster is properly assembled, with obvious evidence of attention to detail.	
Drawing scale and dimensioning (X1)	The drawing is present, but is not to scale; dimensions are missing, or dimensioning is poorly done.	The drawing is acceptable and to scale; it is a close representation of the vehicle, but some dimensions may be missing.	The drawing is exemplary, exact, and includes all pertinent dimensions.	
Drawing completion and quality (X1)	The drawing is sloppy, missing parts, and lacking quality.	The drawing is complete, and the quality is adequate.	The drawing is complete and precise, and of exceptional quality.	
DRAGSTER CONSTRUCTION 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 SUBTOTAL (50 points)				

SEMIFINAL INTERVIEW (33 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 participant demonstrates 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 participant demonstrates some knowledge of the dragster production and has adequate knowledge of some processes or reasoning behind the vehicle design.	The participant demonstrates competence and knowledge related to the design and production of the vehicle; the student is able to articulate "reasoning" behind the decisions made.	
LEAP Report/ Interview (13 points; 10% of total event points)	The individual's efforts are not clearly communicated, lack detail, and/or are unconvincing. Few, if any, attempts are made to identify and/or incorporate the SLC Practices and Behaviors.	The individual's efforts are adequately communicated, include some detail, are clear, and/or are generally convincing. Identification and/or incorporation of the SLC Practices and Behaviors is adequate.	The individual's efforts are clearly communicated, fully-detailed, and convincing. Identification and/or incorporation of the SLC Practices and Behaviors is excellent.	
SEMIFINAL INTERVIEW SUBTOTAL (33 points)				

RACE (55 points)								
1st	2nd	3rd	4th	5th & 6th	7th & 8th	9th-12th	13th – 16th	
55 Points	50 Points	45 Points	40 Points	35 Points	30 Points	25 Points	15 Points	
RACE SUBTOTAL (55 points)								

Rules violations (a deduction of 20% of the total possible points for the above sections) must be initiated by the judge, 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 any subtotals and subtract rules violation points, as necessary. **TOTAL (138 points)**

Comments:

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

JUDGE

Printed name: _____ Signature: _____

DRAGSTER DESIGN

EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

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

MATERIALS

- A. Coordinator's packet and box, containing:
 1. Event guidelines, one (1) copy for the coordinator and for each judge
 2. TSA Event Coordinator Report
 3. List of judges/assistants
 4. Pre-populated flash drives for judges
 5. Time trial record sheet
 6. Qualifier interview time slot sheet
 7. Double elimination bracket chart
 8. Stick-on labels for entries, as needed
 9. Results envelope
 10. Envelope for LEAP Reports
 11. LEAP Interview Judging Protocol
- B. CO₂ cartridges
- C. Metric scientific scales (triple beam balance or digital)
- D. Mono-filament fishing line (suggested between 30 and 50 pound); four (4) pre-tied: two (2) on track and two (2) reserve, for the track
- E. Race track set, including a starting gate and a finish gate, with a digital timer and winning lane indicator
- F. Padding for the finish gate
- G. Extra vehicles to test and demonstrate the track
- H. Race brackets for placement of the semifinalists
- 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 timekeeper

- M. When using a computer controlled track, provide the proper computer for the software being used, all necessary connections, and a printer. This equipment is placed on the official timekeeper's table.
- N. Provide for a display of time trial and race brackets.
- O. Ultraviolet ink and light to mark cars and check for cars that have been previously entered.

RESPONSIBILITIES

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 delay is caused by events beyond participant control.
8. Check to see that each entry drawing includes the participant's identification number in the upper right-hand corner of the paper.
9. Place an entry number on each entry.
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.

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:
 - a. To deduct twenty percent (20%) of the total possible points in this round or
 - b. To disqualify the entry
 - c. 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.
 - d. Each car is timed in the same lane.
 - e. Cars are timed only once.
 - f. It is important that each car be positioned as well as possible in the starting gate.
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 sample) according to the rank of its qualifying time.
9. Judges verify that the top sixteen (16) qualifying cars meet Regulation C 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. Review and submit the semifinalist results and all related forms in the results envelope to the CRC room.

SEMIFINAL ROUND

1. Post the top sixteen (16) cars with interviews times.
2. Car builders will report to the track at the posted time for a five (5)-minute car builder interview and a LEAP interview, which will last a maximum of five (5) additional minutes.
3. Conduct interviews with the qualifying top sixteen (16) car builders.
4. Begin the semifinals at the scheduled time.
5. Run the semifinalist race. A sample double-elimination bracket follows.
6. Only the sixteen (16) qualifying cars are raced.
7. Students do not have to be present.
8. Public viewing is allowed.
9. Decisions about rules violations must be discussed and verified with the judges, event coordinator, and CRC manager to determine either:
 - a. To deduct twenty percent (20%) of the total possible points in this round or
 - b. To disqualify the entry
 - c. The event coordinator, judges and CRC manager must all initial either of these actions on the rating form
10. Judges use qualifying times to break any ties among the sixteen (16) qualifying cars.
11. Review and submit the finalist results and all related forms in the results envelope to the CRC room. If necessary, manage security and the removal of materials from the event area.

RACE BRACKET FOR 16-CAR DOUBLE ELIMINATION

