



DRAGSTER DESIGN

OVERVIEW


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

ELIGIBILITY

Participants are limited to two (2) individuals per chapter, one (1) entry per individual.

TIME LIMITS

- A. Entries must be started and completed during the current school year.
- B. Each dragster, drawing, and LEAP Leadership Resume must be submitted at the time and place stated in the conference program.
- C. 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.
- D. Drawings and dragsters must be picked up at the specified time upon the conclusion of the event.

 Participants must review the specifications each year, as this event is modified with each new edition.

LEAP LEADERSHIP RESUME/INTERVIEW

An Individual LEAP Leadership Resume is required for this event and must be submitted at event check-in. Semifinalists will respond to interview questions related to their submitted LEAP Resume for a maximum of five (5) minutes.

ATTIRE

Competition attire, as described in the [National TSA Dress Code](#) section of this guide, is required for this event.

PROCEDURE

- A. Participants check in their entries and collect LEAP Leadership Resumes at the time and place stated in the conference program.
- B. Entries are reviewed by evaluators to determine, among other things, safety on the track.
- C. Safe dragsters race for qualifying time on the same lane of the raceway.
- D. The top sixteen (16) qualifying entries, based on the time trials, are evaluated against the criteria for this event.
- E. 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.
- F. 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).
- G. The top sixteen (16) entries race in a double-elimination format to earn points for the race portion of the event.
- H. Drawing, design, and body finish points are combined with race points to determine the final standings.

 Read the regulations closely as there are significant changes from year to year.

It is essential that students and advisors routinely check the TSA website (www.tsaweb.org) for updated information about TSA general rules and competitive events. This information is found on the website under [Competitions/Updates](#). When students participate in any TSA competitive event, they are responsible for knowing of updates, changes, or clarification related to that event.

REGULATIONS

- A. Participants must check the national TSA website for the 2017 and 2018 specific design challenges.
- B. Each entry must be submitted at check-in with a full-size metric drawing of the completed vehicle. The two (2)-view (top and side) drawing with metric dimensions is made on drawing paper no larger than 11" x 17" in size. Drawings are developed using standard engineering practices and procedures. The drawing may be produced using traditional drafting methods or CAD. The title block includes only the participant's "entry number,"



which is assigned at registration time and is placed on the entry and drawing during check-in.

- C. The official distance between the start line and the finish line on the race track is twenty (20) meters.

Dragsters that do not meet the below specifications/ tolerances are disqualified from the race.

Dragster body

- 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.

	MINIMUM	MAXIMUM
2. Body length.....(2017) 240mm.....		250mm
.....(2018) 235mm.....		245mm
3. Body height with wheels.....		75mm
4. Body mass (completed car without CO2)..... (2017) 35g.....		N/A
.....(2018) 50g.....		N/A
5. Body width at the 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 body. (NOTE: This will be measured at the sides of the wood car body, from the bottom of the car directly beneath the axle to the bottom of the axle hole or bearing hole.)
..... 5mm.....10mm
- 3. Axle hole from front and rear of car..... 9mm.....100mm
- 4. Wheelbase (axle distance apart at farthest points)105mm270mm
- 5. Bearings, bushings and lubricants may be used.
- 6. Glue may be used to secure bearings to body.



Spacer washers/clips

1. Spacer washers.....8
2. Axle clips8
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)

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 CO2 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.

	MINIMUM	MAXIMUM
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

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

1. A dragster must have four (4) wheels, no more. Two (2) wheels must meet the requirements in #2 and #3 below. The other two (2) wheels must meet the requirements in #4 and #5 below. All four (4) wheels must touch the racing surface at the same time. All wheels must roll. Wheels



must be made entirely from plastic. Dimensions must be consistent for the full circumference of each wheel.

MINIMUM.....MAXIMUM

- 2. Front diameter 30mm37mm
- 3. Front width (at surface contact point) 1.5mm5mm
- 4. Rear diameter..... 30mm40mm
- 5. Rear width (at surface contact point)..... 12mm18mm

D. No repair or maintenance is allowed after the entries have been registered. Any entry 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 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. 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 CO2 cartridges for the race are provided by national TSA.

F. LEAP Leadership Resume (see Forms Appendix or TSA website)/Interview — Students document, in the LEAP leadership resume (see resume template), the leadership skills that they have developed and demonstrated while working on this event. Semifinalists will respond to questions about the content of their resume as part of their LEAP interview. The LEAP Leadership Resume/Interview guidelines and other resources can be found on the [TSA website](#).

EVALUATION

Evaluation is based on points earned through car design and appearance, accuracy, quality of the drawing, and points earned from the top 16 interviews and placement in the double elimination on-site race. The LEAP requirements will also be evaluated. Please refer to the official rating form for more information.



STEM INTEGRATION

This event aligns with the STEM educational standards noted below. Please refer to the STEM Integration section of this guide for more information.

Science, Technology, Engineering, Mathematics

TSA AND CAREERS

This competition connects to one or more of the career areas featured in the TSA AND CAREERS section of this guide. Use *The Career Clusters* chart and the *TSA Competitions and The Career Clusters* grid as resources for information about careers.

CAREERS RELATED TO THIS EVENT

Automotive designer
Automotive modeler
Industrial designer
Industrial engineer
Race car engineer



DRAGSTER DESIGN EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

- A. Event coordinator
- B. Evaluators, 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 evaluator
 - 2. TSA Event Coordinator Report
 - 3. List of evaluators/assistants
 - 4. Pre-populated flash drives for evaluators
 - 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 Leadership Resumes
 - 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. One (1) or more test cars
- 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

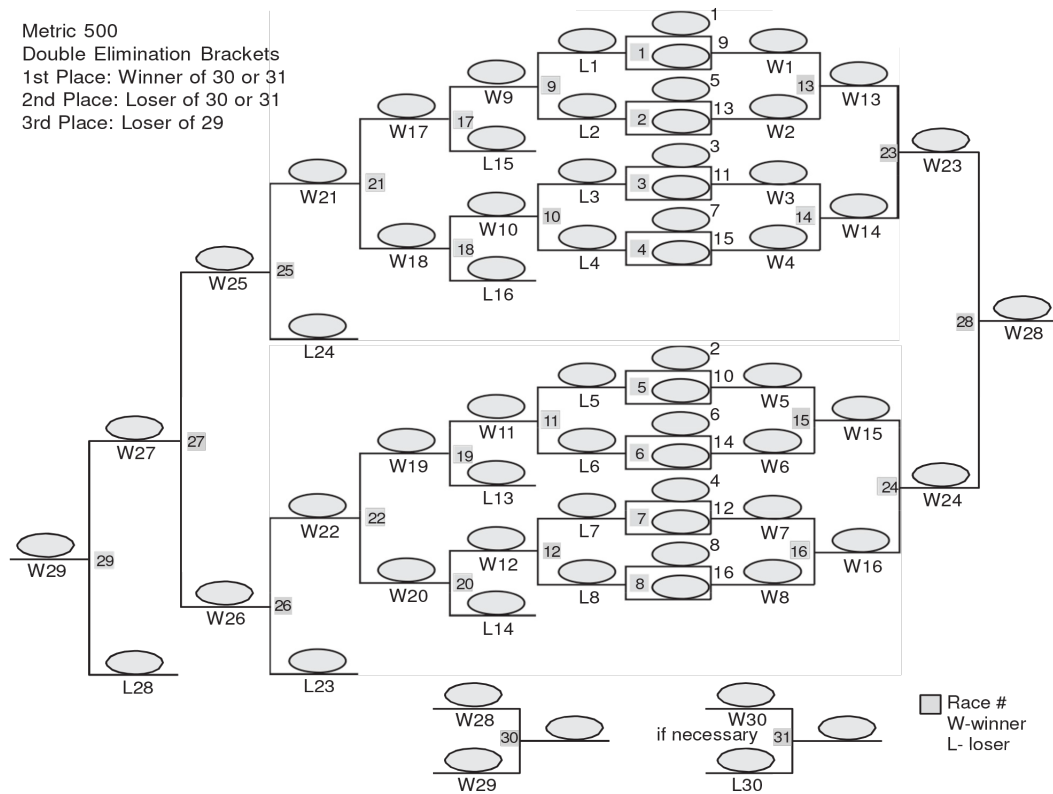
- A. Upon arrival at the conference, report to the CRC room and check the contents of the coordinator's packet. Review the event guidelines and check to see that enough evaluators/assistants have been scheduled.
- B. Inspect the area(s) in which the event is being held for appropriate set-up, including room size, chairs, tables, outlets, etc. Notify the event manager of any potential problems.
- C. Check in the entries and collect LEAP Leadership Resumes at the time stated in the conference program. Anyone reporting who is not on the coordinator's report may check in only after official notification is received from the CRC. Late entries are considered on a case-by-case basis and only when the lateness is caused by events beyond the participant's control. Requirements for attire do NOT apply during check-in.
- D. Place an entry number on each entry. Position entries for evaluation and viewing. Secure the entries in a designated area.
- E. One (1) hour before the event is scheduled to begin, meet with evaluators/assistants to review time limits, procedures, and regulations. If questions arise that cannot be answered, speak to the event manager before the event begins.
- F. Assist the evaluators during a preliminary review of cars. Participants do NOT have to be present at this time.
- G. All race-worthy cars will be tested in time trials. Each car is timed in the same lane. Cars are timed only once. It is important that each car be positioned as well as possible in the starting gate.



- If, in the opinion of the evaluators, a car misfires or a timing error occurs, the race may be rerun.
- H. The operator's preliminary times are recorded. Each vehicle is ranked according to fastest time first, second fastest time second, and so on. The fastest sixteen (16) cars that meet specifications will be run in the semifinalist race.
 - I. After testing all race-worthy cars in the time trial, evaluators verify that the top sixteen (16) cars from the time trials meet all specifications (design; drawing, and construction categories). Only raceable cars, as determined by the evaluators, are allowed to compete in the semifinalist category. Cars that are damaged or broken during the qualifying round are deemed non-raceable and are not allowed to run in a semifinalist position. Eliminated entries not meeting specifications are removed. Lower qualifying cars are moved up until sixteen (16) legal cars are determined.
 - J. Post the top sixteen (16) cars with interviews times; 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.
 - K. Conduct interviews with the qualifying top sixteen (16) car builders.
 - L. Run the semifinalist race. A sample double-elimination bracket appears after this section.
 - M. For participants who violate the rules, the decision either to deduct 20% of the total possible points or to disqualify the entry must be discussed and verified with the evaluators, event coordinator, and a CRC manager.
 - N. Evaluators verify the finalists, including their rank order, and discuss and break any ties.
 - O. Review and submit the finalist results and all items/forms in the results envelope to the CRC room.
 - P. Manage security and the removal of materials from the 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 DESIGN

2017 & 2018 OFFICIAL RATING FORM

HIGH 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. If a check mark is placed in the ENTRY NOT EVALUATED box, the entry is not to be judged.

- Vehicles meets specifications described in Regulations.
- Completed LEAP Leadership Resume is present.
- ENTRY NOT EVALUATED

Dragster Construction (50 points)

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 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)	Drawing work 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.

SUBTOTAL (50 points)

Record scores in the column spaces below.

Rules violations (a deduction of 20% of the total possible points for the section above) 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: _____



Semifinalist Interview (40 points)			
CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points
Car builder interview (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.
LEAP Leadership Resume/Interview See Regulation G and instructions on TSA website (X2)	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 LEAP Be. Know. Do. criteria.	The individual's efforts are adequately communicated, include some detail, are clear, and/or are generally convincing. Identification and/or incorporation of the LEAP Be. Know. Do. criteria is adequate.	The individual's efforts are clearly communicated, fully-detailed, and convincing. Identification and/or incorporation of the LEAP Be. Know. Do. criteria is excellent.
			SUBTOTAL (40 points)

Rules violations (a deduction of 20% of the total possible points for the semifinalist section above) 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: _____

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
							SUBTOTAL (55 points)

(To arrive at the TOTAL score, add any subtotals and subtract rules violation points, as necessary.)

TOTAL (145 points)

Comments:

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

Evaluator

Printed name: _____

Signature: _____