

PITSCO

LEADERS IN EDUCATION

VINI VIDI VICI

TSA

TECHNOLOGY STUDENT ASSOCIATION



DRAGSTER DESIGN

(sponsored by PITSCO)

OVERVIEW

Participants design, produce working drawings, and build a CO₂-powered dragster.

PURPOSE

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

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 and drawing is submitted at the time and place stated in the conference program.
- C. Drawings and cars must be picked up at the specified time upon the conclusion of the event.

ATTIRE

Business Casual dress as described in Competitive Events Attire is the minimum requirement.

PROCEDURE


- A. Participants check in their entries 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 cars 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. A wind tunnel test is performed to determine relative wind resistance.
- G. The top sixteen (16) cars race in a double-elimination format to earn points for the race portion of the event.
- H. Drawing and design points are combined with race points to determine the final standings.

REGULATIONS

- A. Each entry must be submitted with a full-size metric drawing of the completed vehicle. A two (2)-view (top and side) drawing with metric dimensions is made on paper no larger than 11"x17" drawing paper. 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" that is assigned at registration time 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/ tolerances are disqualified from the race.***

 Be sure to review the specifications each year, even if you're a regular participant. This event is modified with each new edition of this guide.

Dragster body

DB1. One-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-piece, all-wood construction.

	MINIMUM	MAXIMUM
DB2. Body length.....	200mm.....	305mm



DB3. Body height with wheels75mm

DB4. Body mass (completed car without CO₂) (2009) 45g
 (2010) 60g

DB5 Body width at axles, front and back 35mm.....42mm

DB6. Vehicle total width (including wheels)90mm

Axles/axle holes/wheelbase

A1. Dragsters must have two (2) axles per car, no more.

A2. Bottom of axle hole or bearing above bottom of car body (measured at sides)
 5mm.....10mm

A3. Rear axle hole from rear of car 9mm.....100mm

A4. Wheelbase (axle distance apart at farthest points).. 105mm.....270mm

A5. Bearings, bushings and lubricants may be used.

A6. Glue may be used to secure bearings to body.

Spacer washers/clips

S1. Spacer washers8

S2. Axle clips.....8

S3. 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)

P1. 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 painted.

P2. Hole depth 48mm.....54mm

P3. Safety zone thickness..... 3mm

P4. Chamber diameter 19mm.....20mm

P5. Lowest point of chamber diameter to race surface (with wheels)..... 26mm.....40mm

Eye screws

ES1. Dragsters must have two (2) screw eyes per car that meet tolerances, no more. 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 eye screw 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.

ES2. Inside diameter 3mm5mm

ES3. Distance apart (at farthest points)..... 150mm270mm

Wheels

W1. A dragster must have four (4) wheels, no more. Two (2) wheels must meet rules W2 and W3. The other two (2) must meet rules W4 and W5. 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 the wheel.

W2. Front diameter 30mm37mm


W3. Front width (at surface contact point) 2mm5mm

W4. Rear diameter 30mm40mm

W5. 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 the conference personnel, the event coordinator rules as to whether 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.

 Read the General Rules and Regulations in the front of this guide for information that applies to all of TSA's competitive events.

EVALUATION

Evaluation is based on points earned through car design and appearance, accuracy, and quality of the drawing, as well as points earned through the wind tunnel test and placement in the double elimination on-site race.

STEM INTEGRATION

This event has connections to the STEM standards noted below. Please refer to the STEM integration section of this guide.

Science, Technology, Engineering, Mathematics

LEADERSHIP SKILLS

Leadership skills promoted in this event:

- Problem solving – fix the car after the evaluation
- Evaluation – evaluate using time trials, testing and rebuilding
- Creative thinking – produce ideas based on specifications

Additional leadership skills promoted in this event: self esteem, organization, decision making

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, four (4)
- C. Recorder for double elimination chart
- D. Assistants, two (2)

MATERIALS

- A. Coordinators box, containing:
 - 1. Event guidelines, five (5) copies
 - 2. Official rating forms
 - 3. List of entries with finalist report
 - 4. List of evaluators/assistants
 - 5. Time trial record sheet
 - 6. Double elimination bracket chart/overhead projector
 - 7. Results envelope
- B. CO₂ cartridges
- C. Go/No-go gauges for all evaluators
- D. Metric scientific scales (triple beam balance or digital)
- E. Mono-filament fishing line for track (4 pre-tied, 2 on track and 2 reserve)
- F. Race track set, including a starting gate and finish gate with digital timer and winning lane indicator
- G. Padding for the finish gate
- H. One (1) or more test cars
- I. Race brackets for placement of the semifinalists
- J. Tables for the display of cars and for evaluation
- K. Table at the starting line, for arranging and holding cars prior to the races
- L. Table at the finish gate for the placement of cars after the races and to hold eliminated cars
- M. Table for the official timekeeper

- N. 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.
- O. Provide for a display of time trial and race brackets.
- P. Ultra violet 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 notebook. 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 at the time stated in the conference program. Anyone reporting who is not on the entry list may check in only after official notification is received from the CRC chairperson. 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 the designated area.
- E. One (1) hour before the event is scheduled to begin, meet with your 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 the evaluation of the design, drawing, and construction categories. Participants do NOT have to be present at this time.
- G. After testing all race-worthy cars in the time trial, evaluators verify that the top sixteen (16) semifinalists meet all specifications. 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.



- H. 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.
- I. The operator's preliminary times are recorded on the time trial record sheet. Each vehicle is ranked according to fastest time first, second fastest time second, and so on. The top sixteen (16) cars that meet specifications are run in the semifinals. A sample double-elimination bracket appears after this section.
- J. Position one evaluator at the starting gate to check to see that all cars are positioned in the starting gate as well as possible. If the evaluator feels there is any sort of a misfire, a rerun can be ordered. Position one evaluator at the finish gate to rule on the finish of a race in case of failure of the finish lights or a very close finish. If the evaluator feels there is any sort of timing error, a rerun may be ordered.
- K. Test cars in the wind tunnel, record the drag coefficient, and assign points as indicated on the official rating form.
- L. Mark cars that have been raced with ultra-violet ink.
- M. For participants who violate the rules, the decision either to deduct twenty percent (20%) of the total possible points or to disqualify a participant must be discussed and verified with the evaluators, event coordinator, and a CRC manager. Secure the initials of the event coordinator and manager on the rating form.
- N. Secure the evaluators' signatures on their rating forms. Evaluators discuss and break any ties.
- O. Complete and submit the finalist report, which includes a ranking of the ten (10) finalists, and all related forms in the results envelope to the CRC room.
- P. Manage security and the removal of materials from the area.

