

# 3D PRINTED DRAGSTER DESIGN



## OVERVIEW

Participants design, produce a drawing for, and print a CO<sub>2</sub>-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, ABS or PLA construction. No add-ons such as metal body strengtheners, fenders, 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.		
2. Body length	(2019) 295mm (2020) 210mm	(2019) 305mm (2020) 220mm
3. Body height with wheels		75mm
4. Body mass (completed car without CO <sub>2</sub> )	(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 (CO<sub>2</sub> cartridge hole)**

	MINIMUM	MAXIMUM
<b>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 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.</b>		
<b>2. Hole depth</b>	45mm	55mm
<b>3. Safety zone thickness</b>	3mm	
<b>4. Chamber diameter</b>	19mm	20mm
<b>5. Lowest point of chamber diameter to race surface (with wheels)</b>	26mm	40mm

**Screw eyes**

	MINIMUM	MAXIMUM
<b>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.</b>		
<b>2. Inside diameter</b>	3mm	5mm
<b>3. Distance apart (at farthest points)</b>	150mm	270mm

**Wheels**

	MINIMUM	MAXIMUM
<b>1. A dragster must have four (4) wheels, no more.</b>		
<b>a. Two (2) wheels must meet the requirements in #2 and #3 below.</b>		
<b>b. The other two (2) wheels must meet the requirements in #4 and #5 below.</b>		
<b>c. All four (4) wheels must touch the racing surface at the same time.</b>		
<b>d. All wheels must roll.</b>		
<b>e. Wheels must be made entirely from plastic.</b>		
<b>f. Dimensions must be consistent for the full circumference of each wheel.</b>		
<b>g. Measurement represents the FULL surface contact point where wheel makes contact with the track.</b>		
<b>2. Front diameter</b>	32mm	37mm
<b>3. Front width (at surface contact point)</b>	1.5mm	5mm
<b>4. Rear diameter</b>	35mm	40mm
<b>5. Rear width (at full, unbroken, surface contact point)</b>	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 CO<sub>2</sub> cartridges for the race are provided by Idaho 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
- Additive manufacturing

