DRAGSTER

OVERVIEW

Participants design, produce working drawings for and build a CO_2-powered dragster.

CHALLENGE

Participants design and produce a fast CO_2-powered dragster according to stated specifications and using only certain specified materials.

☑ The middle school event is similar to the high school event, with just a few changes in specifications.

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. The dragster and drawing are submitted at the time and place stated in the conference program.

C. Drawings and cars must be picked up at the specified time at the conclusion of the event.

ATTIRE

TSA competition attire, as described in the Competitive Events Attire section of this guide, is required.

PROCEDURE

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

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. Only the top sixteen (16) qualifying cars based on the time trials are evaluated using the rubric 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, design, and body finish points are combined with race points to determine the final standings.

I. Following the race, participants pick up their entries from the display area at the time and place stated in the conference program.

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

REGULATIONS

A. Each entry must be submitted at check-in with a full-size metric drawing of the completed vehicle. A two (2)-view (top and side) working drawing with metric dimensions is made on 11"x 17" 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 ID number, which 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. Any type of lamination will result in disqualification. Two (2) or more like or unlike pieces of wood glued together are not considered one (1)-piece, all-wood construction. 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.

ALERT: Read the new regulations closely, as there are significant changes to this event from prior years.

NOTE: For 2014, ALL wheels must be located on the exterior of the body. No "shell cars" are allowed. The wheels cannot be blocked from being removed from the outside of the body.

		MINIMUM	MAXIMUM
2.	Body length	200mm	305mm
3.	Body height with wheels		75mm
4.	Body mass (completed car without CO2)		
	*(2014) - 45g		55g
	*(2015) - 60g		70g
	* determines specific school year requirement		
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 (measured at sides)	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.

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_2 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_2 cartridge. A minimum of 3mm thickness around the entire power plant hole must be maintained on the dragster for safety. **Do not paint inside the CO_2 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 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.

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 2. and 3. 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 the wheel. ***For 2014 only - All wheels must be located on the exterior of the body.***

2. Wheel diameter ..... 30mm 40mm

3. Wheel width ..... 2mm 18mm

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 CO_2 cartridges for the race are provided by national TSA.

EVALUATION

Evaluation is based on points earned through car design and appearance, accuracy and quality of the drawing, 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 areas noted below. Please refer to the STEM INTEGRATION section of this guide.

Science, Technology, Engineering, Mathematics

LEADERSHIP SKILLS

Leadership skills promoted in this event:

- Critical thinking: Students learn and use necessary skills in order to design an effective dragster. Use leadership lessons: *Guess the Famous Leader* and *Rebus Puzzles*
- Evaluation: Students improve the dragster based on testing and time trials. Use leadership lessons: *Grading the Advertisement* and *The Great "Evaluate"*
- Problem solving: Students construct a dragster that is fast and meets all requirements. Use leadership lessons: *Finding a Way* and *Resolving Conflict*

Additional leadership skills promoted in this event:

- Communication
- Decision Making
- Organization

TSA AND CAREERS

This competition has connections to one or more of the career areas featured in the TSA AND CAREERS section of this guide. Use *The 16 Career Clusters* chart and the *TSA Competitions and 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
EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

A. Event coordinator

B. Event evaluators, two (2) or more

C. Recorder for double elimination chart

D. Assistants, two (2)

MATERIALS

A. Coordinator's notebook, containing:
   1. Event guidelines, one (1) copy each for the coordinator and evaluators
   2. Official rating forms
   3. List of entries with finalist report
   4. List of evaluators/assistants
   5. Stick-on labels for identifying entries
   6. Time trial record sheet
   7. Double elimination bracket chart or overhead projector
   8. Results envelope

B. CO_2 cartridges

C. Go/No-go gauges for all evaluators

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 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 time keeper

N. When using a computer controlled track, provide the proper computer for the software being used, all necessary connections, and a printer; place this equipment on the official time keeper's table

O. Provide for display of time trial and race brackets

P. Wind tunnel

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 to be 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. Secure the entries in the designated area.

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. Position the drawings and cars for viewing by the evaluators and assist the evaluators during the evaluation of the design, drawing, and construction categories. Participants do NOT have to be present at this time.

G. For participants who violate the rules, the decision either to 1) deduct twenty percent (20%) of the total possible points or 2) disqualify the entry, must be discussed and verified with the evaluators, event coordinator, and CRC manager, who all must initial either of these actions on the rating form.

H. Begin the time trials at the scheduled time. Test every test-worthy car. Students do not have to be present, and public viewing is allowed.

I. Position an evaluator at the starting gate to ensure that all cars are positioned in the starting gate correctly. Also position an evaluator at the finish. 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.

J. Preliminary times are recorded on the time trial record sheet. Each car is then placed in the double elimination race bracket according to the rank of its qualifying time.

K. Evaluators verify that the top sixteen (16) qualifying cars meet Regulation C specifications. Entries that do not meet specifications are removed. Cars that are damaged or broken during the qualifying round are deemed non-raceable and also are removed. Only raceable cars, as determined by the evaluators, are allowed to compete for the semifinalist category. Lower qualifying cars are moved up until there are sixteen (16) legal semifinalists.

L. Begin the semifinals at the scheduled time. Only the sixteen (16) qualifying cars are tested. Students do not have to be present, and public viewing is allowed.

M. Position an evaluator at the starting gate to ensure that all cars are positioned in the starting gate correctly. Also position an evaluator at the finish. If there is a misfire or a failure of the finish lights, a rerun may be ordered at the discretion of the event coordinator.

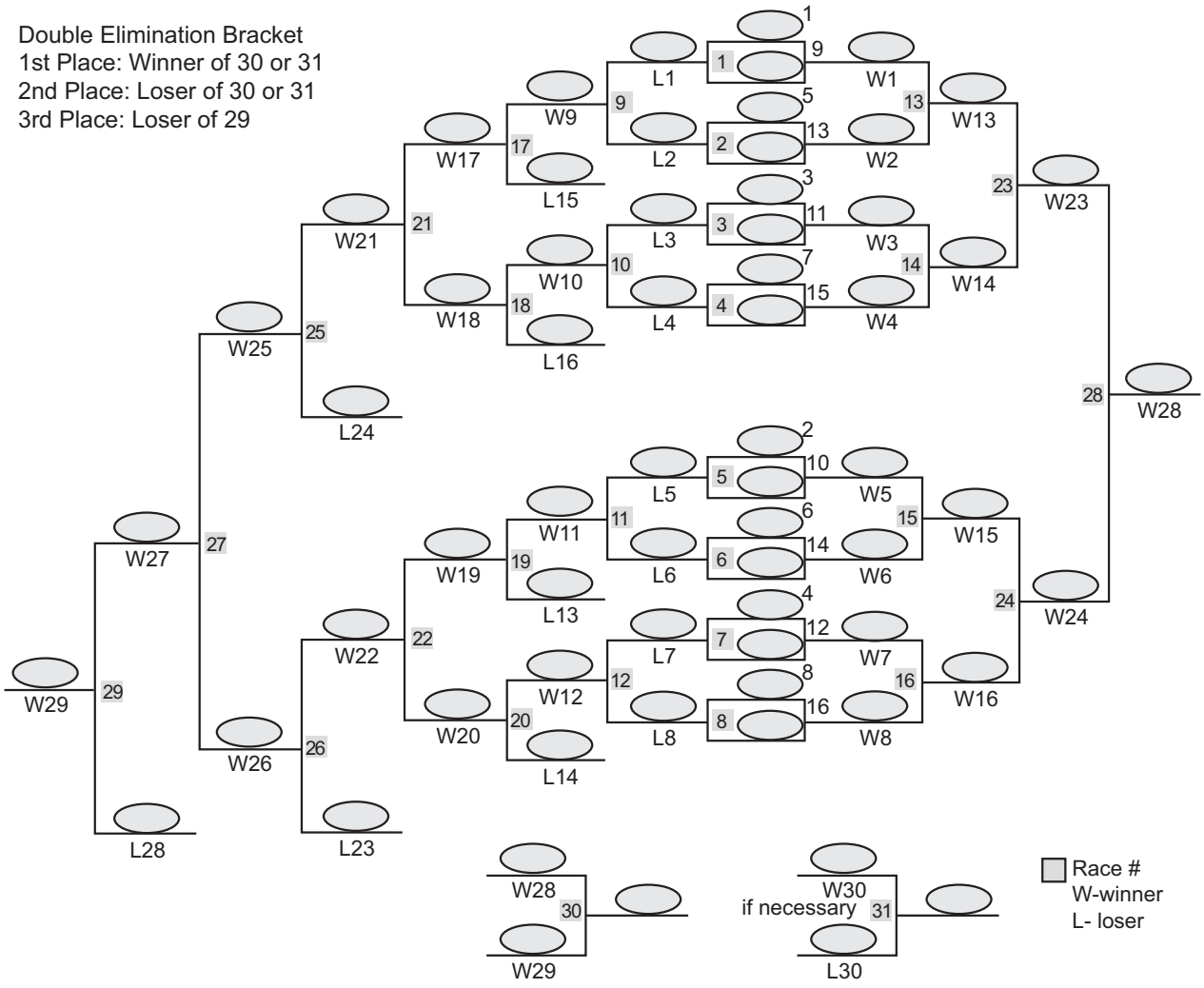
N. Test cars in the wind tunnel, record the drag coefficient, and assign points as indicated on the official rating form.

O. Secure the evaluators' signatures on their rating forms. Qualifying times are used to break any ties among the sixteen (16) qualifying cars.

P. Submit the finalist report, including a ranking of the ten (10) finalists, and all related forms in the results envelope to the CRC room.

Q. If necessary, manage security and the removal of materials from the event area.

RACE BRACKET FOR 16-CAR DOUBLE ELIMINATION



Participant/Team ID# _____

DRAGSTER

2014 & 2015 OFFICIAL RATING FORM — **MIDDLE SCHOOL**

Dragster Construction (50 points)

Tolerance violation/disqualification from race (Note rule number in the box.)			
CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points
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 far 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.)			
Dragster body production quality (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 some improvement.	Excellent production techniques are displayed in dragster; obvious attention to detail and quality is evident.
Body paint/finish (X1)	Surface preparation is inadequate; body is unprimed, with poorly applied final finish.	Dragster body is painted and finished, but it lacks quality.	Dragster body finish is exemplary; body is smooth, shiny, and exhibits quality.
Vehicle assembly (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, but it only meets adequate standards.	Dragster is properly assembled, with obvious evidence of attention to detail.
Drawing scale and dimensioning (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 is a close representation of the vehicle, and/or some dimensions are missing.	Drawing is exemplary, exact and includes all pertinent dimensions.
Drawing completion and quality (X1)	Drawing work is sloppy, missing parts and lacking quality.	Drawing is complete; quality is average.	Drawing is complete and precise, and of exceptional quality.
			SUBTOTAL (50 points)

Record scores in the column spaces below.

Wind Tunnel (5 points)

1st	2nd	3rd, 4th	5th, 6th, 7th	8th, 9th, 10th
5 points	4 points	3 points	2 points	1 point
				SUBTOTAL (5 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
							SUBTOTAL (55 points)

DRAGSTER (continued)

Rules violations (a deduction of 20% of the total possible points) must be initialed by the evaluator, coordinator and manager of the event. Record the deduction in the space to the far right. Indicate the rule violated: _____	
(To arrive at TOTAL score, add any subtotals and subtract rules violation points, as necessary. Check your math twice!) **TOTAL (110 points)**	

Comments:

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

Evaluator

Printed name: _____ Signature: _____