

## Technology I – Transportation Modeling

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### OVERVIEW

Using only certain materials and following required specifications, participants design and produce a CO<sub>2</sub>-powered scale model of a vehicle that fits the annual design problem and that takes appearance and performance into consideration.

-To create a concept [Motor Home/Recreational Vehicle](#) based on the definition from Wikipedia

### PURPOSE

Experience the automotive design process from conceptualizing a design to making and testing a scale model.

### ELIGIBILITY

Entries are limited to one (1) individual per team.

### TIME LIMITS

Entries must be started and completed during the two week time period your teacher assigns

### PROCEDURE

- A. Participants check in their entries at the time and place stated in the conference program.
- B. Evaluators review entries. Neither students nor advisors are present at this time.
- C. Race-worthy models are timed in a single lane test run with points awarded according to the list below.

#### *Transportation Modeling*

D. Depending on the vehicle type each year, the coordinator determines whether or not the wind tunnel is included. If it is, drag coefficient is determined for each model in a wind tunnel with points awarded according to the list below. If it's not, every entry is awarded the ten (10) points.

E. Time trial and wind tunnel points are awarded as follows.

1st place .....	ten (10) points
2nd place .....	nine (9) points
3rd place .....	eight (8) points
4th place .....	seven (7) points
5th - 8th place .....	six (6) points
9th - 12th place .....	five (5) points

F. Notebook, model, time, and drag coefficient points are combined to determine final standings.

### REGULATIONS

- A. Chapter entries must include a scale model and a notebook.
- B. The event coordinator determines the distance between the start line and finish line on the test track on site.
- C. Model and notebook must meet the following specifications:

#### **Model**

M1. The scale model must reflect the annual design problem (see above).

M2. The body itself must be made from wood.

\*Additional parts such as body strengtheners, fenders, plastic canopy, exhausts, air foils, mirrors, and antennae may be attached to or enclosed within the vehicle and may be constructed from materials other

than wood, excluding glass or liquids. These parts must be fastened securely unless they are to be removed prior to the timed run. Any removable parts must be identified as removable on the drawings.

	MINIMUM	MAXIMUM
M3. Body total width (including wheels).....	none.....	4"
M4. Body height with wheels when raced (after non-fixed parts have been removed) .....	none.....	5"
M5 Body mass (completed model without CO <sub>2</sub> ) .....	none.....	2 pounds

### Cartridge hole

C1. The power plant hole must be at the farthest point at the rear of the car and must be drilled on center and parallel to the race surface to assure proper puncture of the CO<sub>2</sub> cartridge.

Additions to the rear of the car that obstruct the launch mechanism must be removed for the timed run or the vehicle is considered "unraceable" and receives no time points. A minimum of 1/8" thickness around the entire power plant hole must be maintained on the vehicle for safety.

C2. Hole depth.....	2"	2 1/8"
C3. Safety zone thickness .....	1/8"	
C4. Chamber diameter .....	3/4"	13/16"
C5. Lowest point of chamber diameter to race surface (with wheels) .....	1 1/8"	1 5/8"

### Eye Screws

ES1. Vehicles must have two (2) screw eyes per car that meet tolerances, no more. They must not make contact with the racing surface. The track string must pass through both screw eyelets, which are to be located on the centerline 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 adjustments, this must be done prior to event check-in.

ES2. Inside diameter .....	1/8"	1/4"
ES3. Distance apart (at farthest points).....	5"	none

### Wheels

W1. Dimensions should be consistent with the scale of the body.

### Notebook

The submitted notebook must be bound and may not exceed 12" x 18". It must include the following items in this order:

	Maximum pages	Maximum size
NB1. Table of Contents .....	1 page .....	8 1/2" x 11"
NB2. Written report on the results of research about the vehicle category. Include photo examples of current or past vehicles that are similar to this year's problem or that were used as inspiration for this entry. ....	2 pages .....	8 1/2" x 11"
NB3. Thumbnail sketches .....	1 page .....	8 1/2" x 11"
NB4. Concept drawings (pictorial-isometric or 3D) .....	2 pages .....	11" x 17"
NB5. Photos of the clay, foam, or wax mock up .....	1 page .....	8 1/2" x 11"
NB6. Final model drawings (orthographic – CAD).....	2 pages .....	11" x 17"
NB7. Photos of the production of the model .....	1 page .....	8 1/2" x 11"
NB8. Description of designer's vehicle/model including the scale of the model. Comparison of the participant's vehicle to current vehicles, noting how the participant's vehicle meets or exceeds these criteria. Include vehicle name and intended consumer market. .....	1 page .....	8 1/2" x 11"

### Display

The model may be presented for evaluation on a display not to exceed 12" tall x 12" deep x 24" long (including the model). The notebook is not considered part of the display but is placed with it.

D. No repair or maintenance on entries is allowed after the entries have been registered. In the event the vehicle is damaged by the conference personnel, the event coordinator determines whether the vehicle may be repaired by the student entering the vehicle.

Designated accessories that are to be removed prior to the race may be removed by the participant prior to the timed test. In the event the participant cannot be present to remove parts, the participant may designate someone to do this for him/her. The participant or his/her advisor must notify the event coordinator if someone is designated. This is the only reason a student may 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<sub>2</sub> cartridges for the event are provided by the event coordinator

## **EVALUATION**

Entries are evaluated by a combination of points earned from the notebook, model, and time trial

# TRANSPORTATION MODELING EVENT COORDINATOR INSTRUCTIONS

## PERSONNEL

- A. Event coordinator
- B. Assistants, two (2)
- C. Evaluators, three (3) or more

## MATERIALS

- A. Coordinator's notebook containing:
  - 1. Event guidelines, one (1) each for coordinator and evaluators
  - 2. Official rating forms
  - 3. List of entries with finalist report
  - 4. List of evaluators/assistants
  - 5. Official vehicle time sheet
  - 6. Summary sheets
  - 7. Results envelope
- B. CO<sub>2</sub> cartridges, one (1) per entry plus spares on site
- C. Go/No-go devices for all evaluators
- D. Monofilament fishing line for track (4 pre-tied, 2 on track, 2 reserve)
- E. Race track set, including a starting gate and finish gate with digital timer
- F. Wind tunnel with drag coefficient meter
- G. Padding for the finish gate
- H. Tables for the display and evaluation of entries (cars and notebooks)
- I. Table at the starting line for arranging and holding cars prior to the time trials
- J. Table at the finish gate for the placement of cars after time trials
- K. Table for the official timekeeper
- L. When using a computer-controlled track, provide the proper computer for the software used, all necessary connections, and a printer. This equipment is placed on the official timekeeper's table.
- M. Provide for display of time trial.

## PROCEDURE

- 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. 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. For participants who violate the rules, the decision either to deduct twenty points (20) or to disqualify the entry must be discussed and verified with the evaluators, event coordinator, and a CRC manager. Secure the initials of the coordinator and manager on the rating form.
- G. Collect and position the Transportation Modeling notebooks and models for viewing by the evaluators, and assist them as necessary during the event.

H. Set up the racetrack prior to the time trials. Make necessary adjustments. Determine the length of the track. (The size of the vehicles should be taken into consideration, i.e. larger vehicles may require a shorter track.)

I. Test all race-worthy vehicles in the time trials, and assign points as stated in the event rules, Procedure E.

J. Test cars in the wind tunnel, record the drag coefficient, and assign points as stated in the event guidelines, Procedure E.

K. When it is necessary to move cars, only race evaluators and official personnel should handle the cars. Extreme care should be taken to avoid damage to the cars.

L. Station at least one (1) evaluator at the starting gate to position all vehicles in the starting equipment. Station at least one (1) evaluator in the finish gate to verify timed finishes in case of track equipment failure. This evaluator is also responsible for the proper set-up of the finish line between each time trial. A third evaluator must be stationed as the official timekeeper for the purpose of managing information, starting, verifying, and recording the race times. If any of the evaluators feel that there has been a misfire or a track malfunction, the coordinator may disallow that race and order another race.

M. 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.

N. At the designated time, return models and notebooks to student owners after verifying official conference identification.

