

TRANSPORTATION MODELING

School Bus

OVERVIEW

Using the materials allowed by the rules and following required specifications, participant's design and produce a CO₂-powered scale model of a vehicle that fits the annual design problem and that takes appearance and performance into consideration.

The problem for 2004 is to design a new School Bus.

PURPOSE

Transportation Modeling provides the opportunity for TSA members to 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 chapter.

TIME LIMITS

- A. The completed model and its required portfolio is submitted at the assigned time and place designated in the official conference program. Portfolios and models must be picked up at the specified time upon conclusion of the event.
- B. The model and portfolio must be produced during the school year immediately preceding the conference in which it is entered.

PROCEDURE

- A. Participants check in their entries at the time and place stated in the conference program.
- B. Entries are reviewed by evaluators.
- C. Race-worthy models are timed in a single lane test run with points awarded according to the list below.

- D. Drag coefficient is determined for each model in a wind tunnel with points awarded according to the list below.
- 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
 - 13TH - 16TH place..... four (4) points
 - 17TH-20TH place..... three (3) points
 - 21ST- 30TH place..... two (2) points
 - 31ST place and up..... one (1) point
- F. Portfolio, model, time, and drag coefficient points are combined to determine final standings.

REGULATIONS

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

Model

- M1. The 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 removable parts have been removed)	none	4"
M5. Body mass (completed model without CO2)	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 parallel to the race surface to assure proper puncture of the CO2 cartridge. Additions to the rear of the car that obstructs 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 depth2" -----2 1/8"
- C3. Safety zone thickness1/8" -----none
- C4. Chamber diameter3/4" -----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 diameter1/8" -----1/4"
- ES3. Distance apart (at farthest points)..... 5" -----none

Wheels

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

Portfolio

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

	Max. pages	Max. size
P1. Photo examples of current or past vehicles that are similar to this year's problem or that were used as inspiration for this entry	1 page	-----8'-1/2" x 11"
P2. Thumbnails	1 page	-----8'-1/2"x 11"
P3. Concept drawings (pictorial).....	2 pages	-----11" x 17"
P4. Photos of the clay, foam, or wax mock up	1 page	-----8-1/2" x 11"
P5. Final technical illustrations (orthographic)	2 pages	-----11" x17"
P6. Photos of the production of the model	1 page	-----8-1/2" x 11"
P7. Description of designer's vehicle. Comparison of the participant's vehicle to current vehicles noting how		

his or her 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 portfolio 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 that the vehicle was 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 CO2 cartridges for the event are provided by TSA.

EVALUATION

Entries are evaluated by a combination of points earned from the portfolio, model, time trial, and wind tunnel test.

TRANSPORTATION MODELING EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

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

MATERIALS

- A. Coordinator's box 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 event evaluators/assistants
 - 5. Official vehicle timesheet
 - 6. Summary sheets
 - 7. Results envelope
- B. CO2 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 portfolios).
- 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 time keeper
- 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 box. 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 chairman. Entries turned in late are NOT considered unless the lateness has been caused by the oversight or negligence of the conference coordinators. Secure the entries in the designated area.
 - D. One (1) hour before the event is scheduled to begin, meet with your evaluators/assistants to review time limits, procedures, regulations and all other details related to the event. If questions arise that cannot be answered, speak to the event manager before the event begins.
 - E. For participants who violate the rules, the decision either to deduct twenty points (20) or disqualify the entry must be discussed and verified with the event evaluators, event coordinator, and a CRC manager.
 - F. Collect and position the Transportation Modeling portfolios and models for viewing by the event evaluators, and assist them as necessary during the event.
 - G. Set up racetrack prior to time trials. Make necessary adjustments. Determine the length of the track.
 - H. Test all race worthy vehicles in the time trials, and assign points as stated in the event rules, Procedure D.
 - I. Test cars in the wind tunnel, record the drag coefficient, and assign points as follows.
 - J. 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.
 - K. 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 a rerace.
- L. Complete the finalists report, including evaluators' signatures. Evaluators discuss and break any ties that affect the top three (3) placements.
 - M. Submit the finalists report, including 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 portfolios to student owners after verifying official conference identification.

TRANSPORTATION MODELING

2004-2005 OFFICIAL RATING FORM

Level I or II

ENTRANT'S ID #										
EVALUATIVE CRITERIA										
Portfolio (40 pts.)										
Research report 5 pts.										
Thumbnail drawings 5 pts.										
Concept drawings 5 pts.										
Preliminary working drawings 5 pts.										
Clay model (photos) 5 pts.										
Final technical illustrations 5 pts.										
Construction (photos) 5 pts.										
Description of vehicle 5 pts.										
Model (40 pts.)										
Scale 5 pts.										
Appropriateness to problem 15 pts.										
Model appearance 20 pts.										
Wind tunnel 10 pts. See the point allocation list in the event rules, Procedure D.										
Time trial 10 pts. See the point allocation list in the event rules, Procedure D.										
SUBTOTAL 100 pts.										
Rules violation (if any) minus 20 pts.										
TOTAL 100 pts.										

Evaluator's comments/notes:

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

Evaluator's signature _____