Delaware Technology Student Association

2019
MAGNETIC LEVITATION VEHICLES

Delaware Only Competition

"SERVING TECHNOLOGY EDUCATION STUDENTS"
SPONSORED BY THE DEPARTMENT OF EDUCATION

Updated – October 11, 2018

MAGNETIC LEVITATION VEHICLES

Overview: Delaware TSA students entering the Maglev vehicle race **are required to construct a vehicle on-site** which will race over a 16-foot long magnetic track powered by a single motor, and propeller. The track will be energized by a 12 volt dc transformer. Participants are to produce an engineering drawing of the top view and side view of the vehicle that will be used as plans for the production of the vehicle.

Contest Purpose: The Maglev contest will provide a means for TSA members to demonstrate their understanding of magnetism, aerodynamics, the design process, and propulsion through the construction of a model maglev vehicle.

Eligibility for Entry: Entries are limited to one maglev per student. The competition will be for level I Middle School) and level II (High School) students.

Time Limitations: The contest will run at the assigned time on the day of the conference. Up to a 1 hour window of time will be announced to allow students time to adjust their vehicles for maximum performance. Students who complete the on-site build early may begin testing and refinement early with prior approval of the contest coordinator. At the announced time, each entry will be tested through time trials.

TSA Regulations & Procedures:

a. The challenge in 2019 is to design and build an aerodynamic vehicle that resembles a modern bullet train using the **supplied materials** provided on-site to race at the greatest speed carrying two (2) Lego mini figures. The passengers must have easy egress for entry and removal from the vehicle.
b. The vehicle shall be suspended solely by means of magnetic levitation.
c. Conductive wires may not rest on the top of the rails.
d. Students will be allowed time to adjust magnetic polarity prior to racing.
e. Students will be allowed time to test vehicle on the track to make adjustments prior to racing.
f. The track will be 16 feet long (14 ft race length) and powered by a DC transformer.
g. Vehicle must only be constructed using the **supplied on-site materials.**
h. Once time trials begin, repairs and modifications cannot be made. If a vehicle becomes inoperative, it will be eliminated from competition.
i. Students must wear eye protection during the adjustment, testing, and competition periods.
j. DETSA will supply the contest materials on-site. **Tools will not be provided**.
k. Participants are required to provide their own tool box/container that must include identification (school name, address, and advisor cell phone number) that should not exceed twenty (20) inches (508 mm) length x ten (10) inches (254 mm) width x ten (10) inches (254 mm) height.
l. The tool box should include soldering iron, solder, mini hot glue sticks, mini hot glue gun, masking tape, double sided tape, x-acto, sandpaper, ruler, 8 ½" x 11" grid paper, pencil, and a 12x12" piece of cardboard to be used as a work surface. A station for use of hot glue and soldering irons will be provided by TSA.
m. The student will create an engineering sketch of the top, side, and front view of the maglev vehicle.
n. The student will construct the maglev vehicle based on the engineering drawing.
o. The vehicle will be judged based on the criteria established in the regulations, procedures, of the challenge and rubric.
p. Students will have three race attempts - if vehicle is no longer able to run, the time trial will be rated as Did Not Finish (DNF). Should an entry earn three (3) DNF's, the entry be disqualified (DQ).

Criteria for Judging:

a. Production Quality ..... – See Contest Rubric
b. Drawing Scale and Dimensioning ..... – See Contest Rubric
c. Drawing Completion and Quality..... – See Contest Rubric
d. Time Trial Results ..... – See Contest Rubric

Participant/Team ID# _____

MAGNETIC LEVITATION VEHICLES (Delaware Only Contest)

2018 & 2019 OFFICIAL RATING FORM — MIDDLE SCHOOL & HIGH SCHOOL

Go/No Go Specifications

Before judging an entry, ensure all items are present; indicate presence with an "X" in the box. If an item is missing, leave the box blank and place an "X" in the box labeled ENTRY NOT EVALUATED; this disqualifies the entry and it is not to be judged.

- **Maglev is present**
- **Toolbox is present**
- **Maglev project engineering drawing is present**
- **Maglev is safe to test**
- Maglev only uses materails supplied on site
- Lego figure passengers have easy egress into/out of vehicle
- **ENTRY NOT EVALUATED**

Criterion Performance Levels

CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points	Record scores in the column spaces below.
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 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.) A score of zero (0) is acceptable if the minimal performance for any criterion is not met.				
Production quality (X2)	Exhibits poor production quality; little or no attention to detail is evident; surface is crude and rough. exhibits poor or sloppy assembly of parts (ill fitting parts/sloppy construction).	Shows good evidence of quality production techniques; vehicle is adequate but needs improvement. Vehicle is well assembled, and it adequately meets standards	Demonstrates excellent production techniques, obvious attention to detail and quality is evident.	
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 it is a close representation of the vehicle; some dimensions are missing.	Drawing is exemplary, exact, and includes all pertinent dimensions. Contest entry can be replicated based on quality of drawing	
Drawing completion and quality (X1)	Drawing work is sloppy, missing parts, and lacking quality.	Drawing is complete; quality is average.	Drawing is complete, precise, and of exceptional quality.	
			MAGLEV DESIGN & CONSTRUCTION SUBTOTAL (40 points)	

Time Trial Results (60 points)							
1st	**2nd**	**3rd**	**4th**	**5th & 6th**	**7th & 8th**	**9th - 12th**	**13th – 16th**
40 points	35 points	30 points	25 points	20 points	15 points	10 points	5 points
						SUBTOTAL (60 points)	

Evaluation: Up to 3 time trials will be recorded. Upon completion of all time trials the fastest individual times will be recorded and ranked. In case of a tie, the entry that has completed all there (3) time trials with the highest calculated average will be the tie breaker.

Trial 1: Time _____

Trial 2: Time _____

Trial 3: Time _____

Average time (tie breaker) _____

Rules violations (a deduction of 20% of the total possible points for the above sections) must be initialed by the evaluator, coordinator and manager of the event. Record the deduction in the space to the right. Indicate the rule violated: _____	
(To arrive at the TOTAL score, add the PRELIMINARY SUBTOTAL and the SEMIFINAL SUBTOTAL.) **TOTAL (100 points)**	

Comments:

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

Evaluator

Printed name: _____ Signature: _____