

MAGNETIC LEVITATION DESIGN CHALLENGE



PROBLEM

A local transit company is planning to construct a transportation system based on magnetically levitated vehicles. The new system will provide commuters with fast, economical, and safe transportation to and from work. As a member of the design team, your responsibility is to design and construct a maglev model that will travel the eight-foot length of the magnetic guide way in the lab, as fast as possible. Variables such as weight, shape, distribution of the load, resistance with the track, guidance, height of levitation, number of magnets, and aerodynamics should be considered.

CHALLENGE

Design a maglev vehicle that will travel as fast as possible down the 8' track carrying the most passengers possible (our passengers will be pennies).

MATERIALS

- 4-6 magnets
- cardboard
- elmer's glue
- craft sticks
- cardstock
- hot glue
- styrofoam
- bottle caps

TOOLS

- scissors
- hot glue gun
- ruler

SPECIFICATIONS

1. Your vehicle can be propelled by gravity or a motor/propeller.
2. The vehicle should be no longer than six inches.
3. Your vehicle must operate without being touched, pushed or otherwise interfered with once started.

HINTS

1. Guidance is best achieved if the magnets, not the vehicle body, rub against the track rails. The body can be much narrower than the track if the magnets stick out on each side for guidance. The magnets should be exactly 1" apart from side to side.
2. Usually, the higher the vehicle levitates, the better it performs.
3. The load (weight) should be distributed evenly. Vehicles that ride level do very well.
4. Aerodynamics of the vehicle body affects performance very little. However, since you are constructing models of actual maglev vehicles, you should consider aerodynamics when designing your vehicle body.

EVALUATION

1. The following are required:
 - thumbnail sketches/rough sketch = 10 pts
 - maglev vehicle creativity/originality = 15 pts
 - maglev vehicle workmanship = 15 pts
 - maglev vehicle performance (speed) = 15 pts
 - efficiency calculation = 5 pts

EFFICIENCY

$$\text{Efficiency} = \frac{\text{Number pennies} \times \text{distance}}{\text{time}}$$

$$\text{Example: } \frac{20 \text{ pennies} \times 8 \text{ feet (distance of track)}}{1.22 \text{ seconds}} = \frac{160}{1.22 \text{ s}} = 131.15$$

*The bigger the number the better! A larger number signifies better efficiency!