

SILVER STREAK

THE CHALLENGE

Design a futuristic transportation device that will hold the most people (pennies) as possible and move across the room as fast as possible.

GRADE LEVEL

Middle school

DISCUSSION

Thousands of years ago we had only one way to move: on foot. In today's cities there are lots of ways to get around, including bikes, cars, mass transit, escalators and walkways. Engineers design solutions like these to transport people quickly, safely, and using the least amount of energy. But there are bound to be safety problems, like crashes, environmental impacts, air pollution, and health impacts.

In the future, engineers will need to think even more creatively to keep people moving.

CONSTRUCTION MATERIALS

General supplies available to everyone.

- balloons, various sizes
- straight straws
- paper and binder clips
- pipe cleaners
- cardboard, scissors, masking tape
- pennies (passengers)
- decorative materials (foil, felt, markers, etc.)

TESTING MATERIALS

- fishing line
- masking tape
- stop watch

DESIGN CONSTRAINTS

- Carry a minimum of 4 people
- Fast moving
- Looks aesthetically pleasing
- Able to be attached and removed again and again for testing

SET UP

Tie or tape the fishing line from a chair at one end of the room to a chair at the other end of the room. Make sure the line is taut.

ACTIVITY

Divide class into groups of 3-4. Ask: "How can you use these materials to make a device that carries passengers quickly along the line? The carrier should also be easy to put on and take off the line." After discussing the design constraint and student ideas, have them sketch their designs.

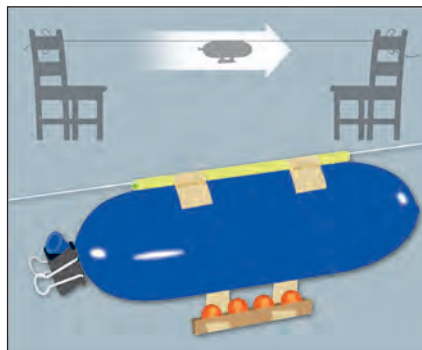
BUILD, TEST, EVALUATE, AND REDESIGN

Give students time to test their designs before the "final run." The design which carries the most passengers safely (without crashing at the end, or spilling), and without stopping along the line, is the winner. In case



of a tie, the fastest carrier is the **Silver Streak!**

Tips: If the pennies fall out of the carrier: *make sure the carrier has a big enough place to hold the pennies and is well-balanced.*



If the carrier goes slowly or stops partway: *see if kids have reduced friction as much as possible. To do this, they can: (1) make the part of the carrier touching the line as slippery as possible by using a smooth, hard material like plastic; or (2) adjust how hard the carrier presses on the line by hooking it on at two or more points.*

If the line sags. *Check the tension of the line. Tighten, if necessary. If a carrier is very heavy, encourage ways to lighten it.*

DISCUSS WHAT HAPPENED

Ask questions such as:

- What helped your carrier travel quickly along the line? (*Carriers go faster when they're evenly weighted and when there is little friction.*)
- How did you minimize friction in your carrier? (*Answers will vary.*)
- What was the hardest part of making a carrier with good balance? With little

friction? With a secure way to carry the balloon? (*Answers will vary.*)

- What did you learn from your model that could help make a real transporter safer/faster/stronger, etc?

VARIATIONS

Provide more materials or increase length of the fishing line for older students or decrease it for younger students.

CONNECT TO ENGINEERING

Richard McLean Dilworth led the development of a train called the Pioneer Zephyr, named after the Greek god of the west wind and christened in April 1934. The Pioneer Zephyr was faster than any other train because of its diesel engine and streamlined, stainless steel body (previous trains relied on steam engines). Its futuristic look fired the imaginations of thousands of travelers, and salvaged the railroad's role as a carrier of passengers.

Middle school students participating in this year's Future City Competition are designing a future transportation system. Compare your solutions to theirs, online after competition finals in February: <http://futurecity.org/> in the "Showcase" section.

This activity is based on one of a series of engineering design challenges in Heroes of Engineering from ASME.

DISCOVER



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