Spot On Science & Technology

Opinions About MAGLEV TRAINS

by Kathy Furgang

Are high-speed magnet trains worth the high price tag?

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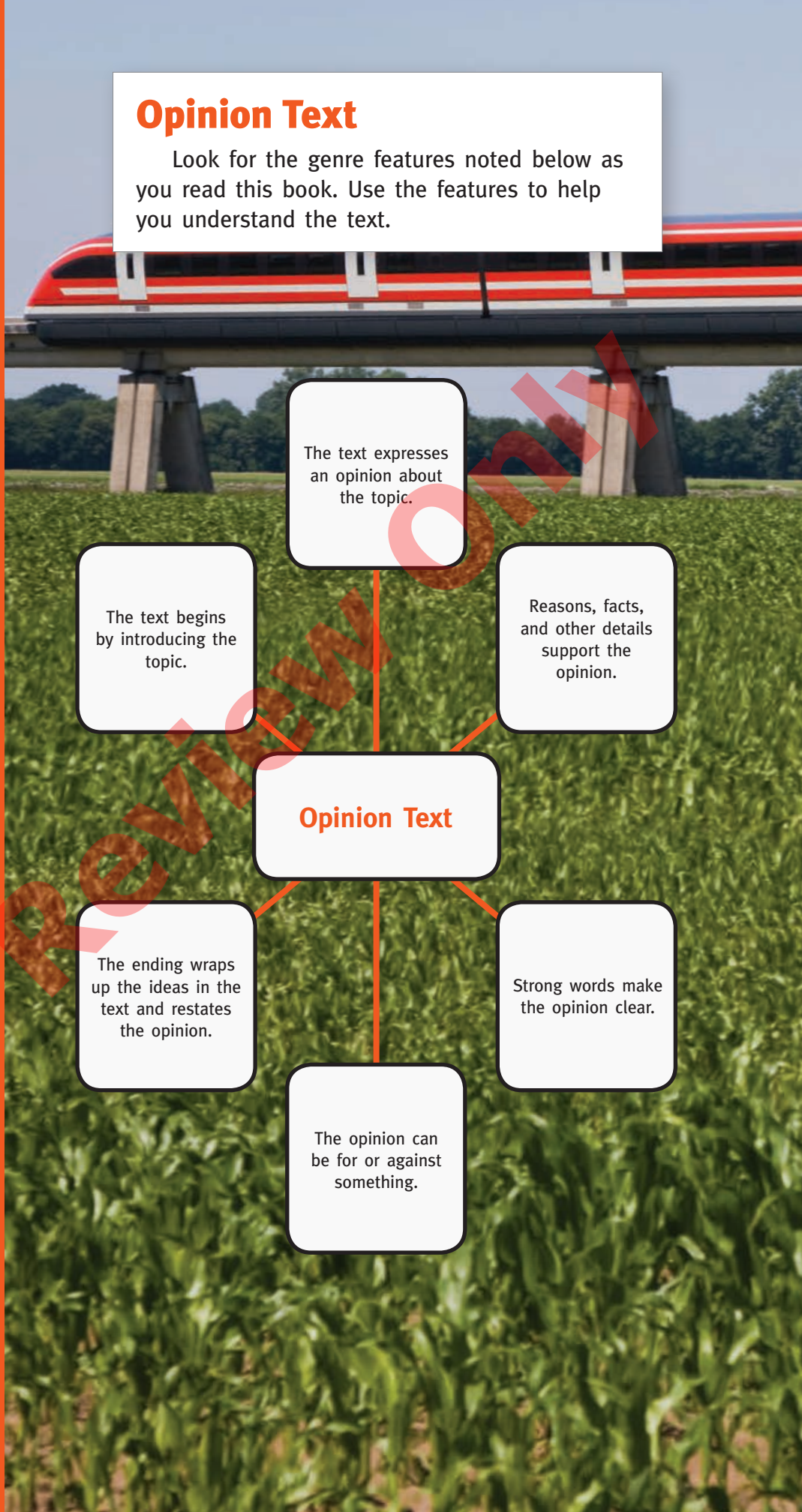

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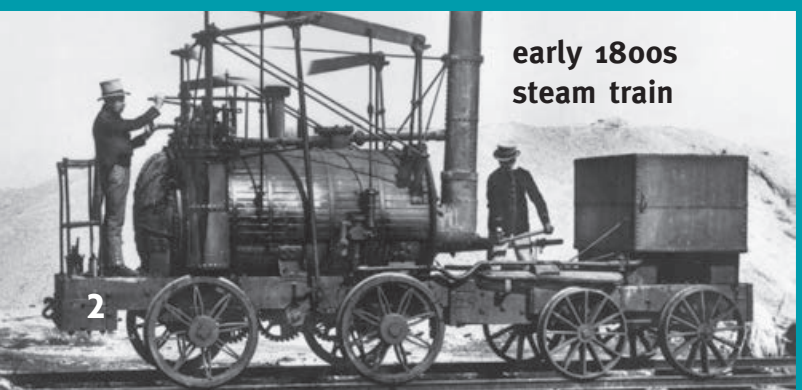
TRAINS

From the Past to the Future



early 1800s steam train

regular passenger train

In 1804, the first railway train journeyed across Wales, carrying ten tons of iron. The train was powered by a steam engine. It moved slower than most people walk.

Over time, trains traveled faster and farther. People built railways across the continents. By the late 1800s, trains were used to transport both goods and passengers.

Today, most passenger trains travel at about 100 kilometers per hour (62 miles per hour). That is about the speed of cars moving on a highway.

Some trains can move even faster. These high-speed trains have a pointed nose. This design helps the train go faster. The air flows over the pointed front end instead of pushing against a flat front, as with other trains.

But today, an even faster train exists. The maglev train can travel up to 603 kph (375 mph).

The maglev train travels about six times faster than regular passenger trains. In addition, maglev trains can be quieter than other trains. They also use less energy.

The maglev trains need special tracks. The tracks are expensive to build. And some people have concerns about the safety of this super-high-speed train.

So most countries have not invested in maglev trains. But is that a mistake? Are maglev trains the future of railway transportation?

Read the two informational chapters and the three opinions about the topic. Then form your own opinion about maglev trains.


high-speed train

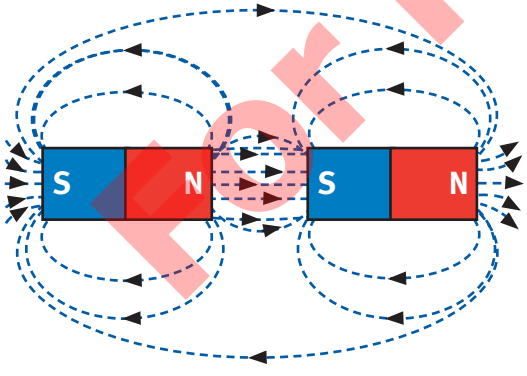

maglev train

The Science of MAGLEV TRAINS

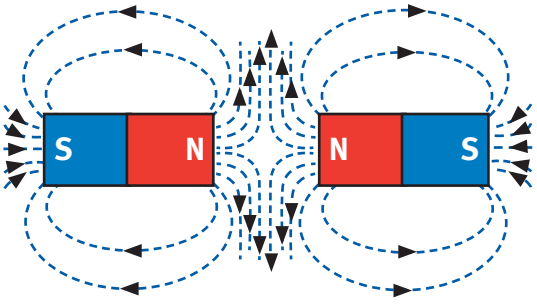
A maglev train does not have an engine or wheels. So how does it zoom along faster than other trains? The answer is in its name. Maglev is short for *mag*netic *lev*itation. Magnets make this train **levitate**, or float, and **propel** the train forward.

All magnets have a north pole and a south pole. Opposite poles **attract**. They pull toward each other. The same poles **repel**. They push each other away. This pulling and pushing is what moves maglev trains.

▼ Opposite poles attract each other.



▼ Like poles repel each other.



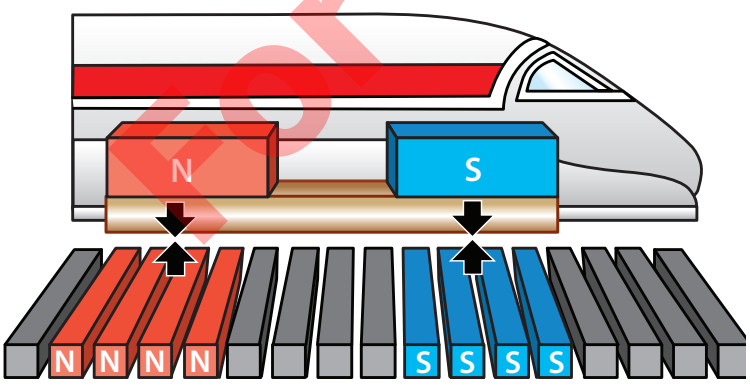
Magnet Power

Instead of rails, a maglev train travels along a guideway. A long magnetic coil lines the floor of the guideway. Large magnets with like poles also line the bottom of the train. The magnets used with maglev trains are powerful **electromagnets**. They become magnetic only when an electric current is run through them.

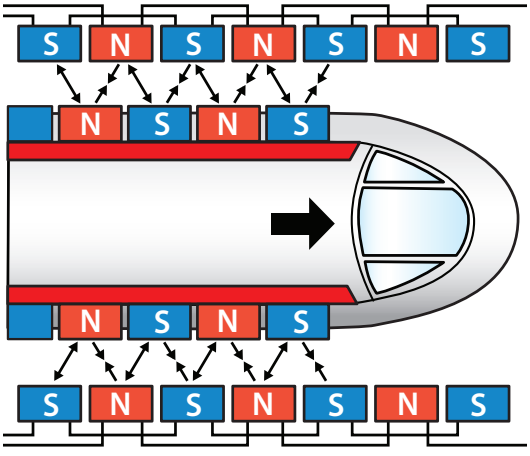
The magnetic coil along the guideway repels the magnets on the bottom of the train. This causes the train to float about 1–10 centimeters (0.4–4 inches) above the guideway.

Once the train is floating, magnets along the sides of the guideway are turned on. The electric current alternates, reversing the poles. The like poles along the guideway push the train forward. And the opposite poles pull the train forward. This steady push and pull propels the train, moving it forward.

▼ **This diagram shows the design for magnets on the guideway and the bottom of the train.**



▼ **This diagram shows the design for magnets on the side of the guideway.**



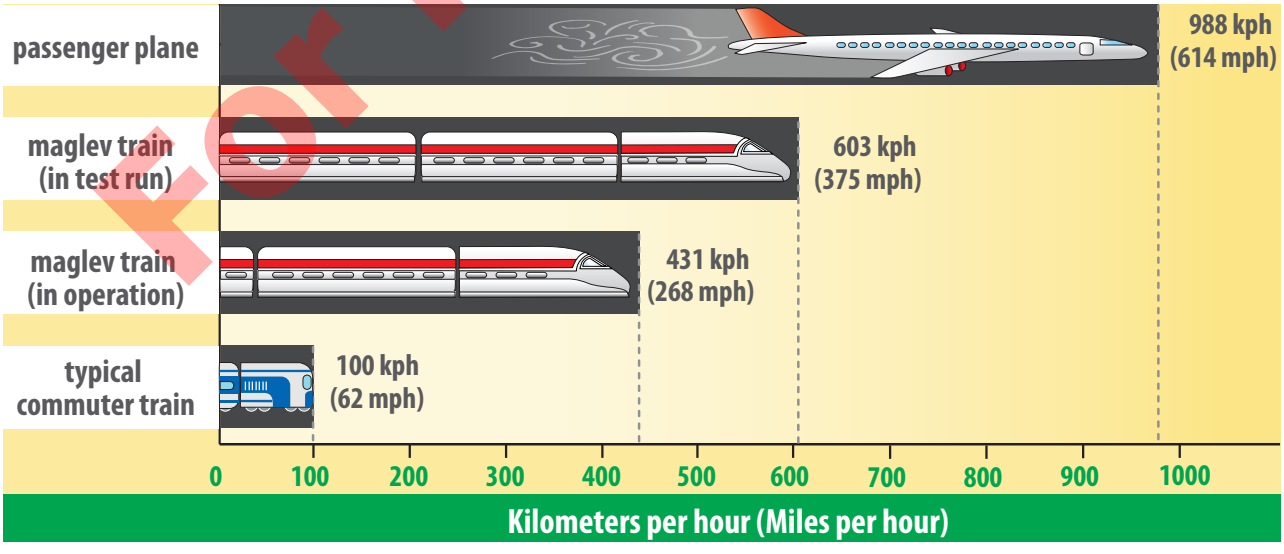
No Wheels

A railway train has wheels that roll along a track. The wheels and track rub against each other. This causes **friction**. Friction is a force that slows down an object in motion. When someone pushes on the brakes of a train, the brakes rub against the wheels. The friction slows the wheels and soon stops the train.

▲ The wheels on this train cause friction.

A maglev train, however, has no wheels. It floats in the air above its guideway. So it is not slowed down by friction. A maglev train also has a more **aerodynamic** design. It has a sloped front and smooth, curved edges. This design helps reduce air and wind resistance. These factors make maglev trains move faster than railway trains. Maglev trains can move almost twice as fast as high-speed trains that have wheels.

COMPARING SPEEDS



No Tracks

Bad weather can affect trains. The tracks can become icy. Switches between tracks can freeze. This can stop a train from switching tracks. Bad weather can delay trains for hours or days.

In March 2018, trains between Scotland and England were halted for up to two days because of one bad storm. But icy or frozen tracks do not stop maglev trains. This is because maglev trains do not have tracks. As a result, maglev trains do not have as many weather delays as railway trains, explains an Institute for Systems Research report.

Maglev trains have a guideway, not a track.

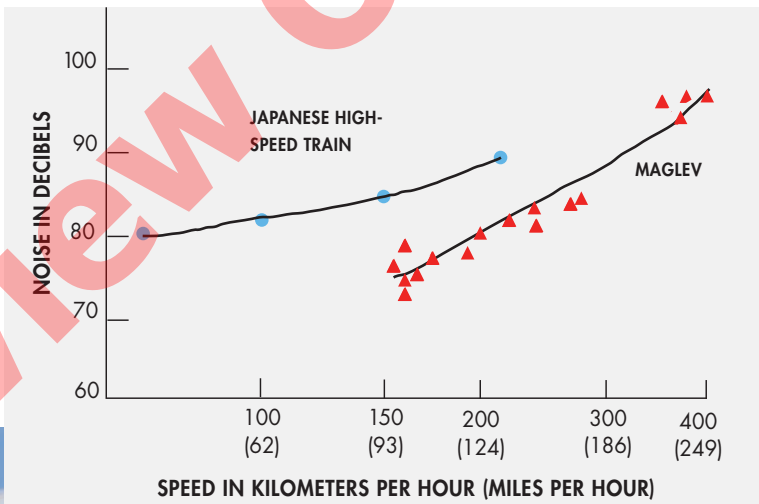
Less Noise

The rumbling wheels and screeching brakes of a railway train can be very noisy. But there is no screeching with maglev trains. That is because they have no wheels, tracks, or noisy brakes. To stop a maglev train, the magnets are reversed. Instead of pushing and pulling the train forward, they pull and push the train to slow it until it stops.

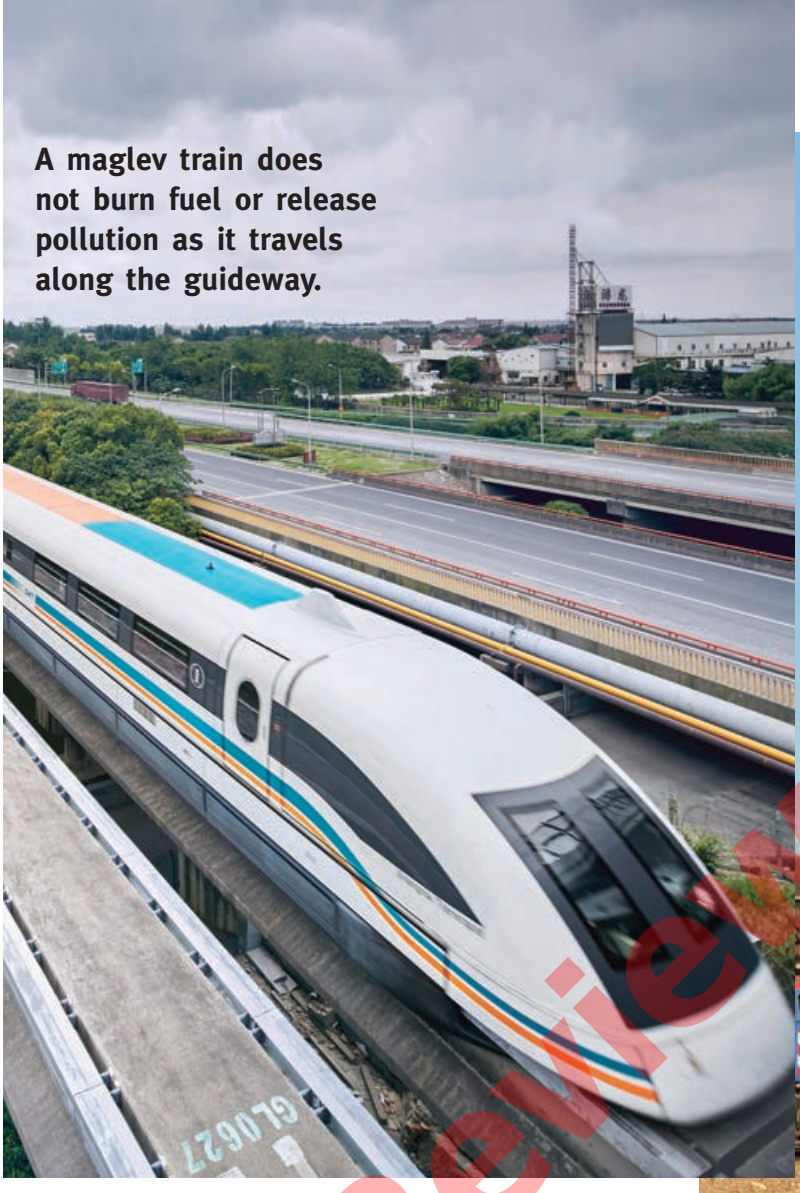
However, the air rushing past any train does cause noise. One study shows that at high speeds, maglev trains are about 4–8 decibels quieter than other trains.

Some farmers who work near the routes of maglev trains in Asia agree. They have commented on how quiet they are. They say they do not hear the trains pass by when they are working in their fields.

▼ **At a speed of 155 kilometers per hour (96 miles per hour), a maglev train is 4–8 decibels quieter than a high-speed train.**



Maglev trains are slightly less noisy than conventional trains.



A maglev train does not burn fuel or release pollution as it travels along the guideway.

The first car on a traditional railway train is the engine. It burns fuel and releases pollution, in the form of exhaust, into the air.

No Exhaust

Maglev trains do not have engines to propel the train forward. Instead, electromagnets push and pull the train forward. Therefore, maglev trains do not burn fuel to power an engine. As a result, the train does not release harmful **exhaust**, or pollution, as it moves on its path.

Instead, maglev trains are powered by electricity. This is supplied by a power plant. Less fuel is burned to generate this power. One study calculates that maglev trains cause 23 percent less pollution than railway trains.