

# Welcome to a Game-Changing Technology

St. Louis Port Working Group

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“What is now proved was once only imagined.”

-- William Blake (1757-1827) English Poet

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# Overview

- My opinion (Rick Canine, CEO Federal Maglev) is that they need to:
  - appreciate and get excited about the technology
  - know that freight is involved and how, and
  - that they will have a part and be a part of the transportation solution.

- Characteristics
- Focus on Freight
- Opportunity

**What is**

**Maglev ?**

**Mag**netic **lev**itation

# Current status

Shanghai, China line currently is the **ONLY** commercial Maglev line in the world. It began operations in December, 2003 and runs 19 miles from the airport to an outlying subway station.



**Twice** as fast as Amtrak's Acela “high-speed” train in the Northeast corridor. The maximum speed of the Acela is 150 mph, but it only goes that fast for 18 out of 456 miles. Average speed is 86 mph.

<http://www.youtube.com/watch?v=y-54gBLwK3s>

# Federal Railroad Administration Definition #1

Maglev “is the first new mode of transportation to be considered for deployment since the introduction of the airplane in 1904. Besides very high-speed capabilities, maglev features **high acceleration and braking** capability, an **ability to climb steep grades, automated operation**, variable train length, high system capacity, light vehicle weight, **excellent ride quality**, and safe, quiet, clean operations.”

FRA, Five-Year Strategic Plan for Railroad Research, Development, and Demonstrations, March 2002

# Federal Railroad Administration Definition #2

“Maglev is an advanced transport technology in which magnetic forces lift, propel, and guide a vehicle over a specially designed guideway. Utilizing state-of-the art electric power and control systems, this configuration can reduce or **eliminate the need for wheels** and many other parts, thereby minimizing mechanical friction and permitting excellent acceleration, with cruising speeds on the order of **300 mph** or more.”

FRA, Report to Congress: Costs and Benefits of Magnetic Levitation, Sept 2005

# Los Alamos National Laboratory

LANL.gov

“The modern conventional train is no faster (~110 mph) than those of the late 1890s. So **conventional trains have reached the end phase of their development.**

“However, this [bullet train] technology has also reached the end phase of its development. One limiting factor for these trains is the expensive and time-consuming maintenance of the rails.\* So **it is the mechanical friction between train wheels and metal tracks that limit this technology.** This leads us to the development of the magnetically levitated (no friction) trains”

\* Kurashi – News from Japan, Shinkansen History, January 21, 2010

Note: In 1930s, British Mallard achieved 128 mph, NYC Commodore Vanderbilt 123 mph

# Safety

Maglev is “**grade separated**” and is always elevated for safety with two exceptions

Separated from:

cars & trucks  
people & bicycles  
animals except birds



# Speed

Compared to car, high-speed railroad, and most airplanes,  
Maglev is the **fastest way** from point A to point  
B.

Commuter speed = over **150** mph

Inter-city speed = over **300** mph

Transportation is about speed.

In this global economy, **speed is everything.**

# Community friendly

People can use the area **under** the Maglev.



Maglev does not divide neighborhoods, communities, or fields.

Mitigates damage to wildlife habitat and ecosystems.

# Environmentally friendly

Maglevs are **electrically powered**

Maglevs are **quiet**:

No engine or wheel noise, only the sound of air.

No train horns at crossings.

No vibration of the surrounding landscape.

Maglevs **conserve land**:

Occupies less land than any other transit system,  
except aircraft.

# Operational costs

Without friction, the only resistance to movement is from air resistance, gravity and inertia.

No moving parts = No wear  
(except doors & HVAC)

According to Shanghai Maglev officials in a November 2010 meeting, the entire 19 mile dual-track guideway has only needed two weeks worth of labor for maintenance in its entire 8 years of operation!

# Proven Reliability

The one commercial Maglev in the world has an on-time trip reliability of **99.98%**, regardless of weather conditions.

*businessfn.com*

# **Maglev differences**

Not all Maglevs are the same.

## **Levitation**

There are pros and cons of each version.

# Levitation

**Japan:**

**Electrodynamic suspension (EDS)**  
Superconducting repulsive  
electro-magnetism

Shinkansen MLX01



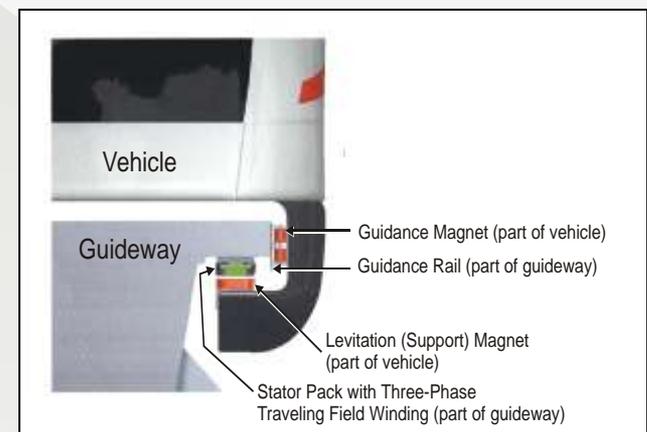
# Levitation

Germany

Electromagnetic suspension (EMS)

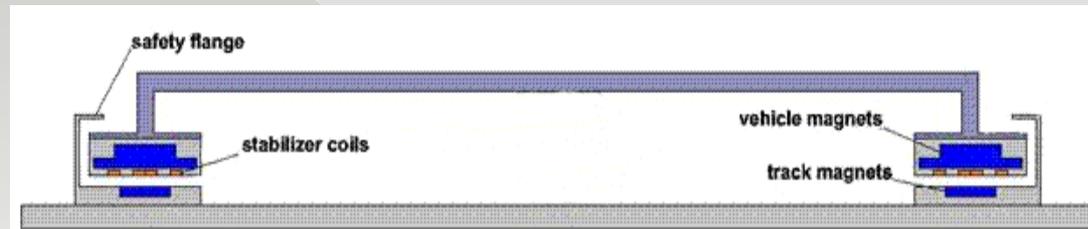
Attractive electro-magnetism

Transrapid



# Levitation

Our Maglev uses **permanent magnets** and repulsive magnetism, which is the latest technology.

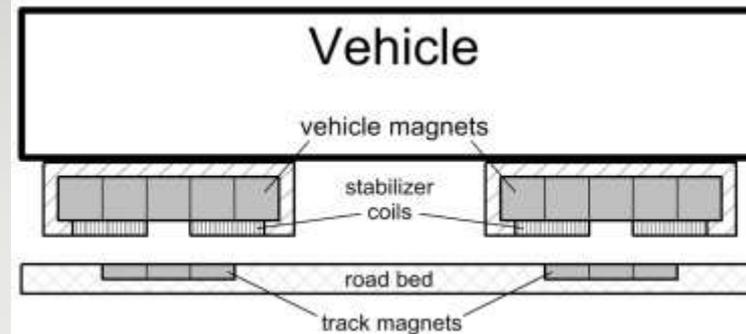


Permanent magnets are the **KEY** to success.

- Simple
- Light weight
- Cheaper to build and operate

# Levitation

Our **proprietary stabilization system** keeps vehicles centered with minimal power requirements, up to a speed of 1,300 mph.



# Maglev similarities

## Propulsion

All Maglevs use linear synchronous motors

# Propulsion

Linear synchronous motors have been used in industry for decades.

“The quick launch of a roller coaster is often due to magnetic propulsion.”  
Magnetic braking is also used to slow down and stop a roller coaster.

[wisegeek.com/  
how-are-magnets-used-in-roller-coasters.htm](http://wisegeek.com/how-are-magnets-used-in-roller-coasters.htm)



Kingda Ka roller coaster at Six Flags, New Jersey



To test scramjets, NASA will use “a horizontally launched craft” that accelerates to Mach 10 along an electrified track similar to those used on roller coasters.”

FoxNews, Sept 15, 2010

# Freight service is our primary market

Intercity freight = \$300 billion

Intercity air passengers = \$65 billion

We want to get semi-trucks off of the interstates.  
Therefore, we want to put semi-trailers onto Maglev.  
Freight = truck freight < 35 tons

**No subsidy** required: freight subsidizes passenger

Passenger service gets the limelight,  
freight service pays the bills.

# Freight Railroads

Want ***NO PART*** of “high-speed rail”

Which is defined as 110 mph

# Freight Railroads

"Our goal is to get as much [freight] on the rails as possible." Adding passenger trains traveling 110 mph would cut the amount of freight traffic the railroad could handle. **Each 110 mph Amtrak train would displace six freight trains.** The railroads would only permit passenger train speeds up to 90 mph, and that only after publicly funded improvements are made to tracks and signals.

Why CSX doesn't want high-speed passenger trains on its tracks, timesunion.com, June 23, 2010

Michael Ward, CEO of CSX "is resisting government efforts to solve what he calls a "societal issue" by moving people by rail, when it conflicts with shareholder interests."

CSX CEO fighting high-speed rail, TBO, July 27, 2011

# Freight Railroads

According to Matt Rose, CEO of Burlington Northern Santa Fe Railway, passenger **trains that run faster than 90 mph are not compatible with freight trains** because “managing the flow of train traffic with such differences in speeds would make the joint use of track uneconomic and impracticable.”

Why Missouri taxpayers should not build high-speed rail, by *Randal O'Toole*, Sept 29, 2010

# Freight Railroads

“Union Pacific agreed to allow 110 mph passenger trains on the tracks being rebuilt mostly with federal stimulus funds between Chicago and St. Louis only because it inherited the obligation when it bought the track along the Southern Pacific Railroad in 1996.

“If I had a choice, I wouldn't be doing this investment (in high-speed rail),’ Union Pacific Chief Executive Officer James Young told the Bloomberg news agency in July. ‘We need to **focus on freight** for our good and for the good of the country.’”

Legislators urge 150+ mph bullet trains, not 110 mph trains, Chicago Tribune, August 30, 2010

# Maglev Freight

- Maglev will not compete with freight railroads.
- Railroads carry freight up to 100 tons/car.
- Maglev must limit freight to <35 tons.
- If railroads could attract the loads that are carried by trucks now, there would be no truck freight.
- Maglev can haul a semi-trailer safer, faster, and cheaper than pulled with a tractor.
- Trucking companies could be more profitable.
- We need to plan the location of the intermodal freight yards.

# Maglev Freight

- Maglev freight trains will travel 300+ mph.
- Maglev freight cars will be 'open-top', aerodynamically-shaped vehicles.
- Able to load or unload trailer in <1 minute.
- Able to maintain that rate robotically.
- Can send 1 car or 30 cars every few minutes.
- One of two places where Maglev is ground level.

# The Project

Build a Maglev line from

O'Hare to Chicago to  
Champaign to St. Louis



**Phase I** – construct 5 mile high-speed **demonstration** section  
To demonstrate SAFETY and performance.

**Phase II** – construct the inter-city line between Chicago and St.  
Louis with ~25 mile commuter sections in Chicago and St. Louis

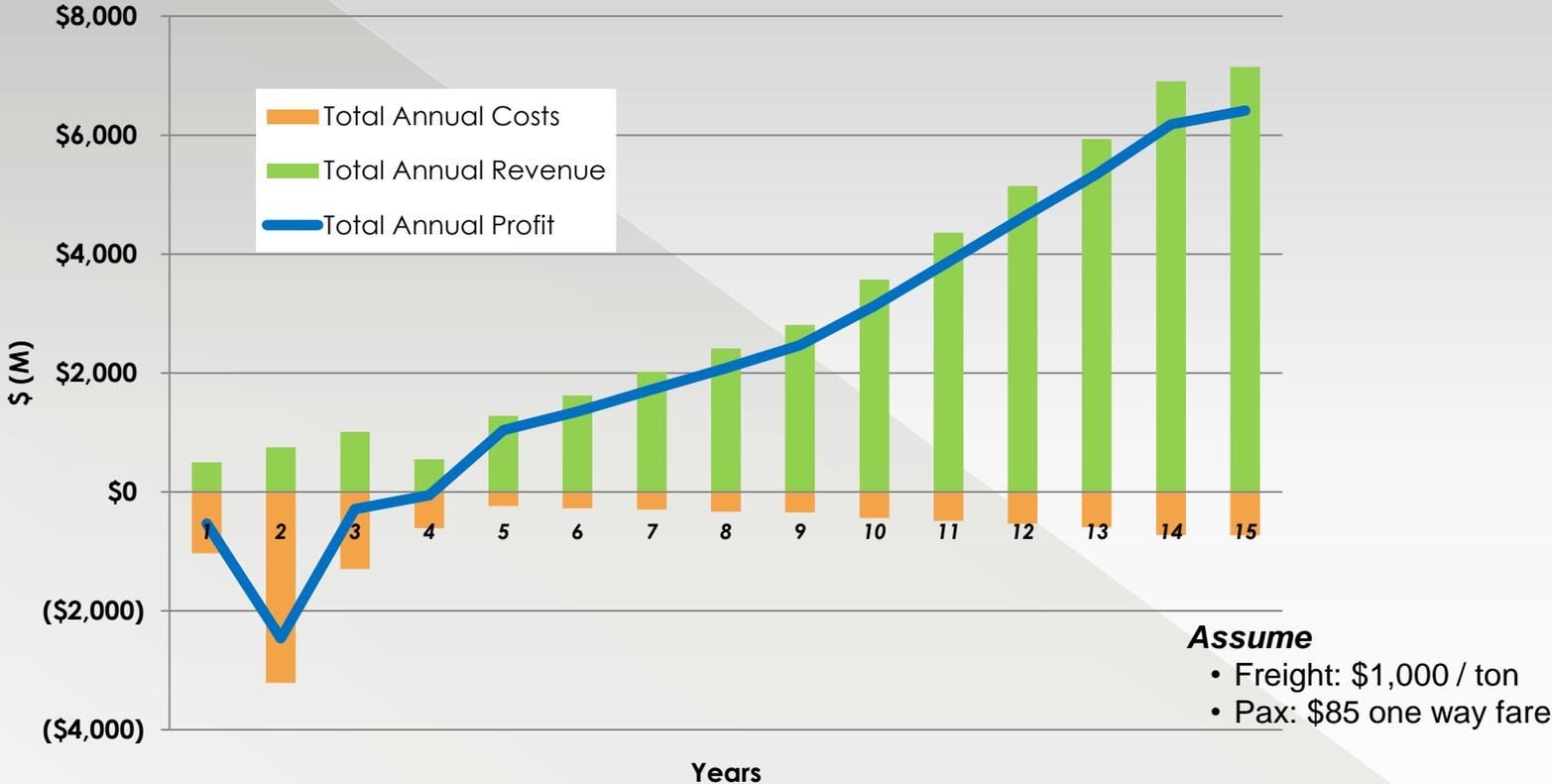
# Construction costs

## Preliminary Estimates:

Maglev costs:	\$7.0 M/mile
includes magnetic rails, switches, control system, and power supply	
Guideway costs:	\$5.0 M/mile
'Rolling' stock costs:	\$2.7 M/mile
20 – 2-car commuter trains, 4 – 3-car intercity trains, 150 freight cars	
Engineering costs:	\$0.5 M/mile
Easement costs:	\$0.6 M/mile
Station costs:	\$2.5 M/mile
10 commuter stations @ \$25M, 3 intercity stations @ \$125M	
Management costs:	\$0.9 M/mile
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Capital Cost:	\$19.2 M/mile

# Freight Revenue is 8x Passenger

## Federal Maglev 15-Year Business Case



# Maglev cost comparisons

## Steel-on-Steel versus Maglev

	Taiwan	L.A.- SF	Tampa- Miami	Boston -D.C. HSR	Raleigh- Richmond HSR	Chicago -Twin HSR	Chicago -St. Louis HSR	O'Hare -St. Louis Maglev
<u>Distance</u>	208	800	320	450*	162	434	284	284
<u>Cost</u>	\$15.0B	\$45B +	\$25B	\$117B	\$2.3B	\$9.6B	\$4.5B	\$5.5B
<u>Cost/mile</u>	<b>\$72.1 M</b>	<b>\$56.2 M+</b>	<b>\$78.1 M</b>	<b>\$260 M</b>	<b>\$14.2 M</b>	<b>\$22.1 M</b>	<b>\$16.0 M</b>	<b><u>\$19.2 M</u></b>
<u>Top speed</u>	186	200	200	200	110	110	<u>110</u>	<u>310</u>
<u>Travel time</u>				3		2	4.7	1.1

\*Green News Roundup, Sep. 23, 2010

# Maglev cost comparisons

What do the people of Illinois want?

100 mph at \$17 million / mile

200 mph at \$75 million / mile

300 mph at \$19 million / mile

# Passenger travel times Chicago to St. Louis

	<u>Time</u>	<u>Cost</u>
<u>Maglev</u>	65 minutes	\$65
<u>Airline</u>	70 minutes	\$82
<u>Auto</u>	4 hours and 40 minutes	\$50
<u>Amtrak</u>	5 hours and 40 minutes	\$66
<u>Bus</u>	6 hours and 30 minutes	\$50

A maglev train line can safely transport the same number of people as an uncongested 4-lane freeway – about 12,000 passengers per hour in each direction.

24 trains/hr X 500 passengers/train

# What is Federal Maglev?

The business with the best technology rules.

We have that technology.

# Why should the St. Louis Port Working Group get involved?

1. This is a unique project of national interest.
2. Maglev will benefit St. Louis, Illinois, and the nation for centuries.
3. Through your planning, you will ensure that the Maglev network will maximize your vision for freight movement in St. Louis.

# Illinois Maglev Project



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