

Floating Trains: Green Design or Pipe Dream?

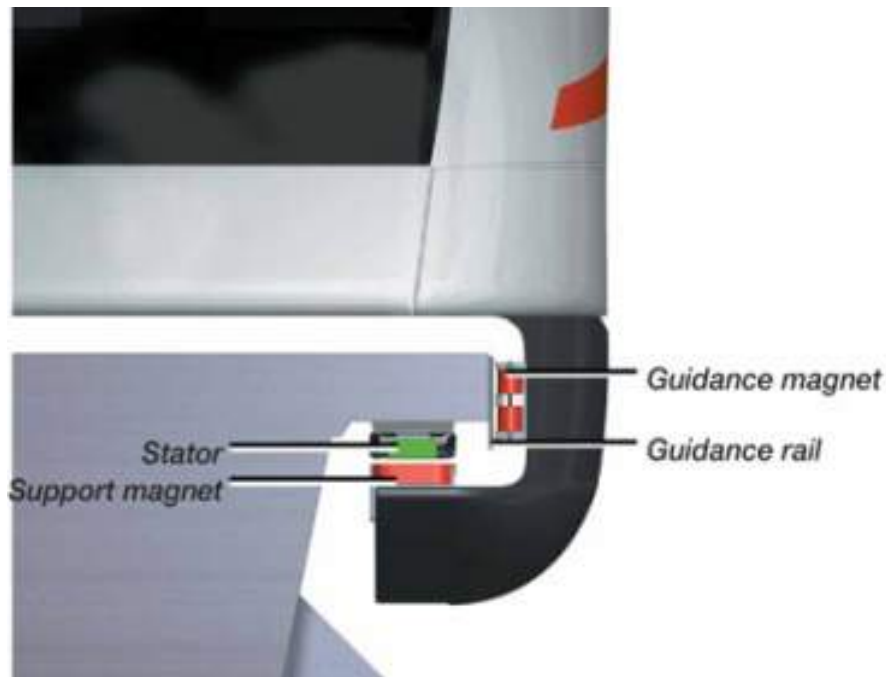


Julia Hopkins

ENVS 634

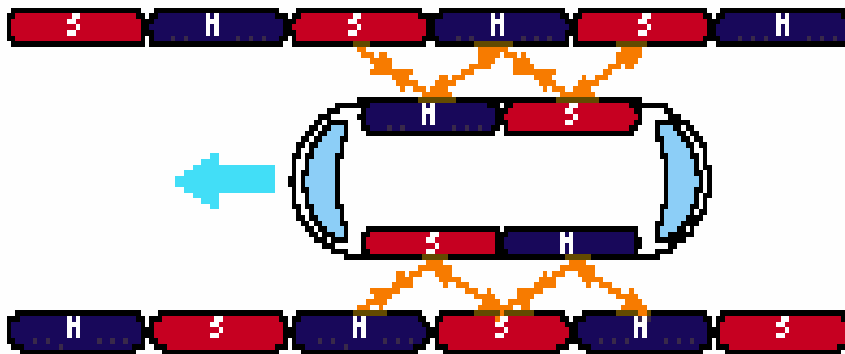
February 24, 2004

Magnetic Levitation: how does it levitate?



- Electromagnets on the underside of the guideway pull the train up into levitation position
- Powered by rechargeable battery

Magnetic Levitation: how does it move?



- Alternating current creates electromagnetic fields, which pull the train along the track

- Powered by electricity

Shanghai: The world's first commercial maglev line

- 18.6 mile track from Pudong airport to Shanghai
- Project cost: \$1.2 billion



- Top Speed: 267 mph
- Travel time: 8 min.
- Cost: \$9 (economy)
\$18 (VIP)

Current Maglev Disadvantages

- Cost: \$19.2 million - \$88 million per mile
 - Twice the cost of high speed rail
- Requires new infrastructure
 - Land use issues
- Health risks related to electromagnetic fields?

Advantages Over Cars and Planes

- Powered by electricity
 - Use no fossil fuels
 - Zero air pollution
- No delays
- No traffic

Can Trains Ever Compete with Cars and Planes?

TABLE 1. U.S. DOMESTIC INTERCITY TRAVEL BY MILES, 1995

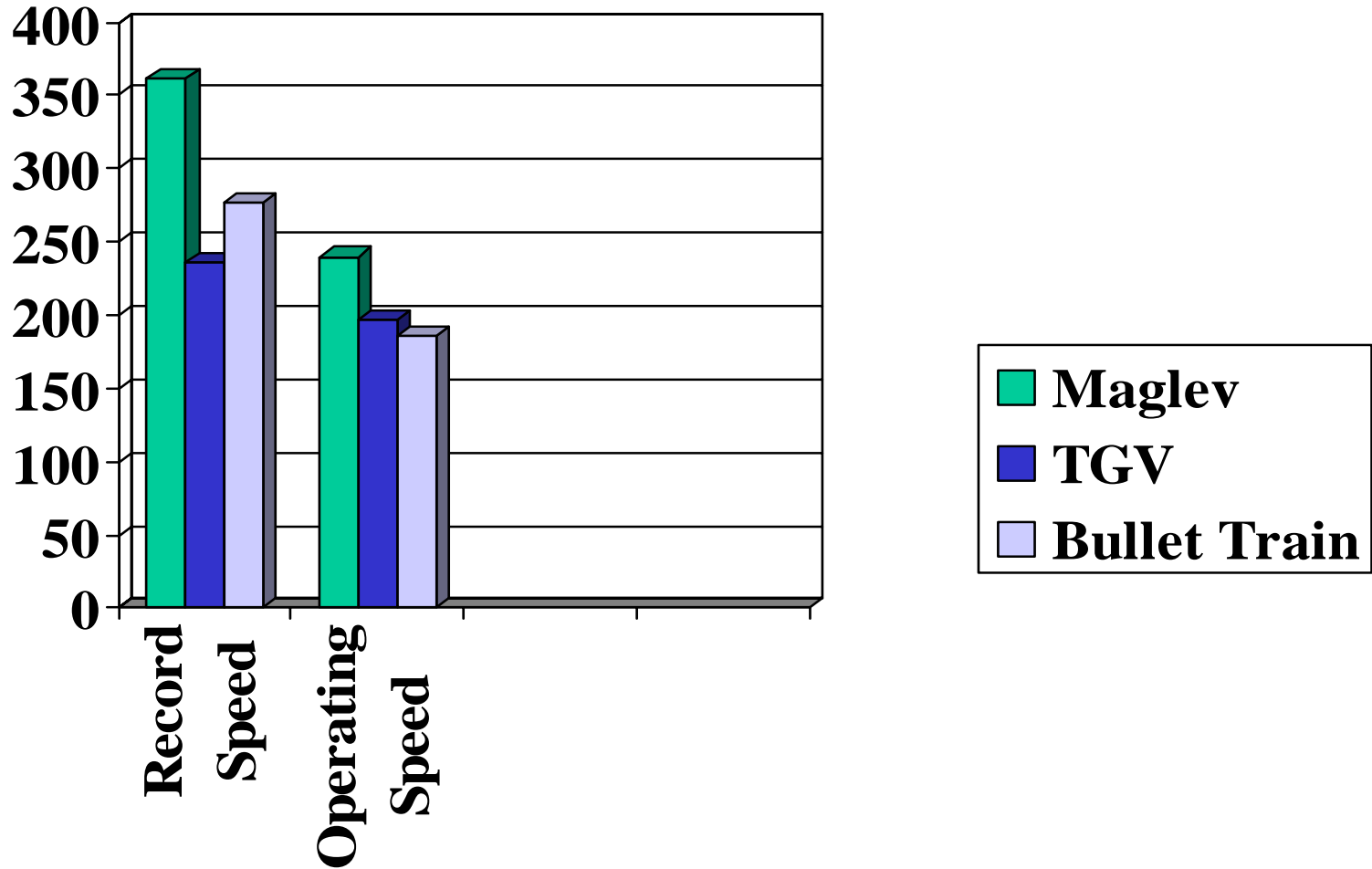
Mode	Billions of passenger miles	Percentage of total miles
Private Automobile	1898	80.6
Airlines	403	17.1
Bus	28	1.2
Rail	14	0.6
Private Aviation	11	0.5

Source: Eno Transportation Foundation. 1997. *Transportation in America*, Supplement to the Fourteenth Edition. Lansdowne, VA: Eno Transportation Foundation.

Benefits Over Traditional High Speed Trains

- Speed

HST Speeds

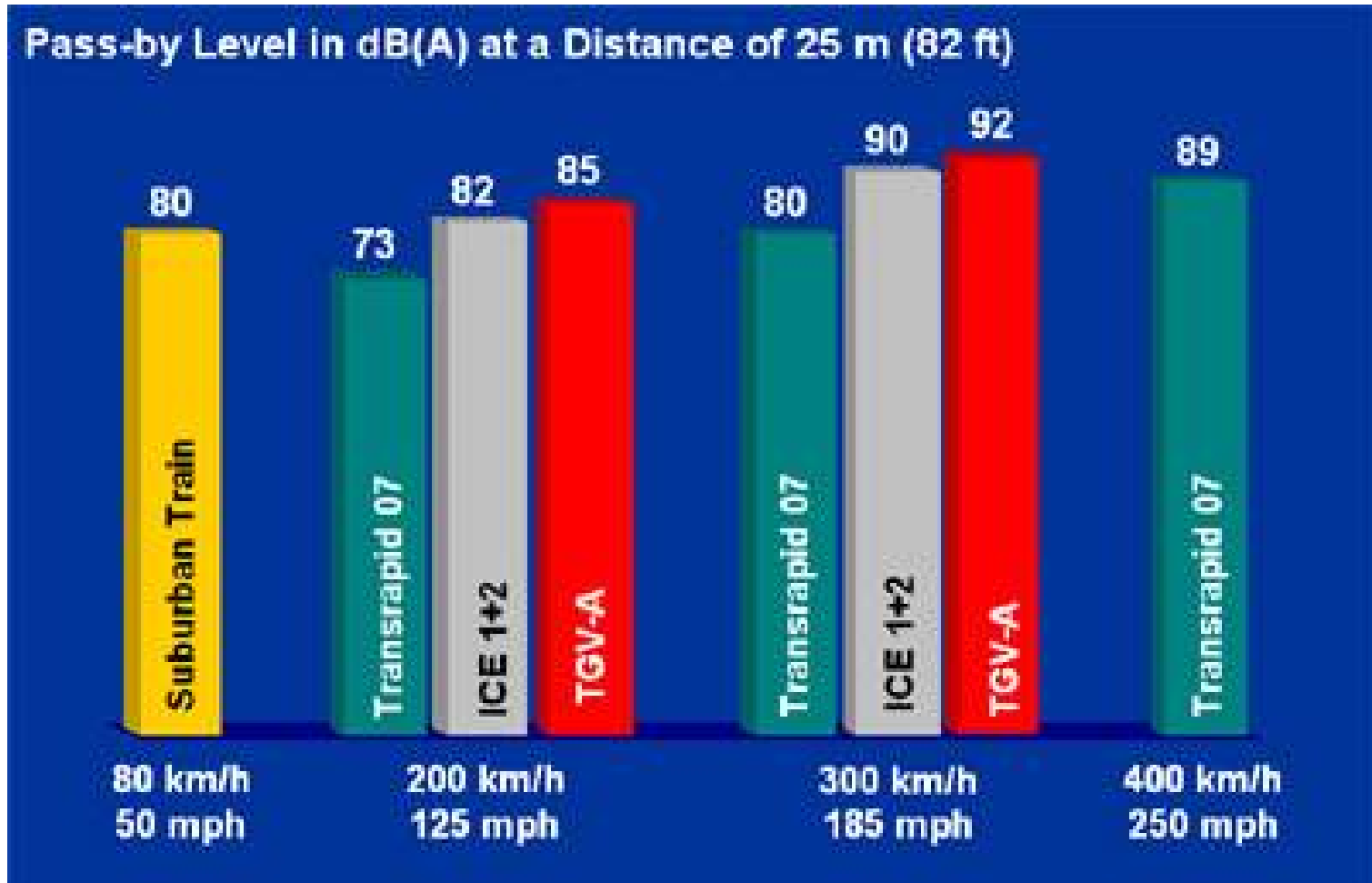


Sources: www.jinjapan.org, www.bbc.co.uk, www.bwmaglev.com

Benefits Over Traditional High Speed Trains

- Speed
- Reduced noise levels

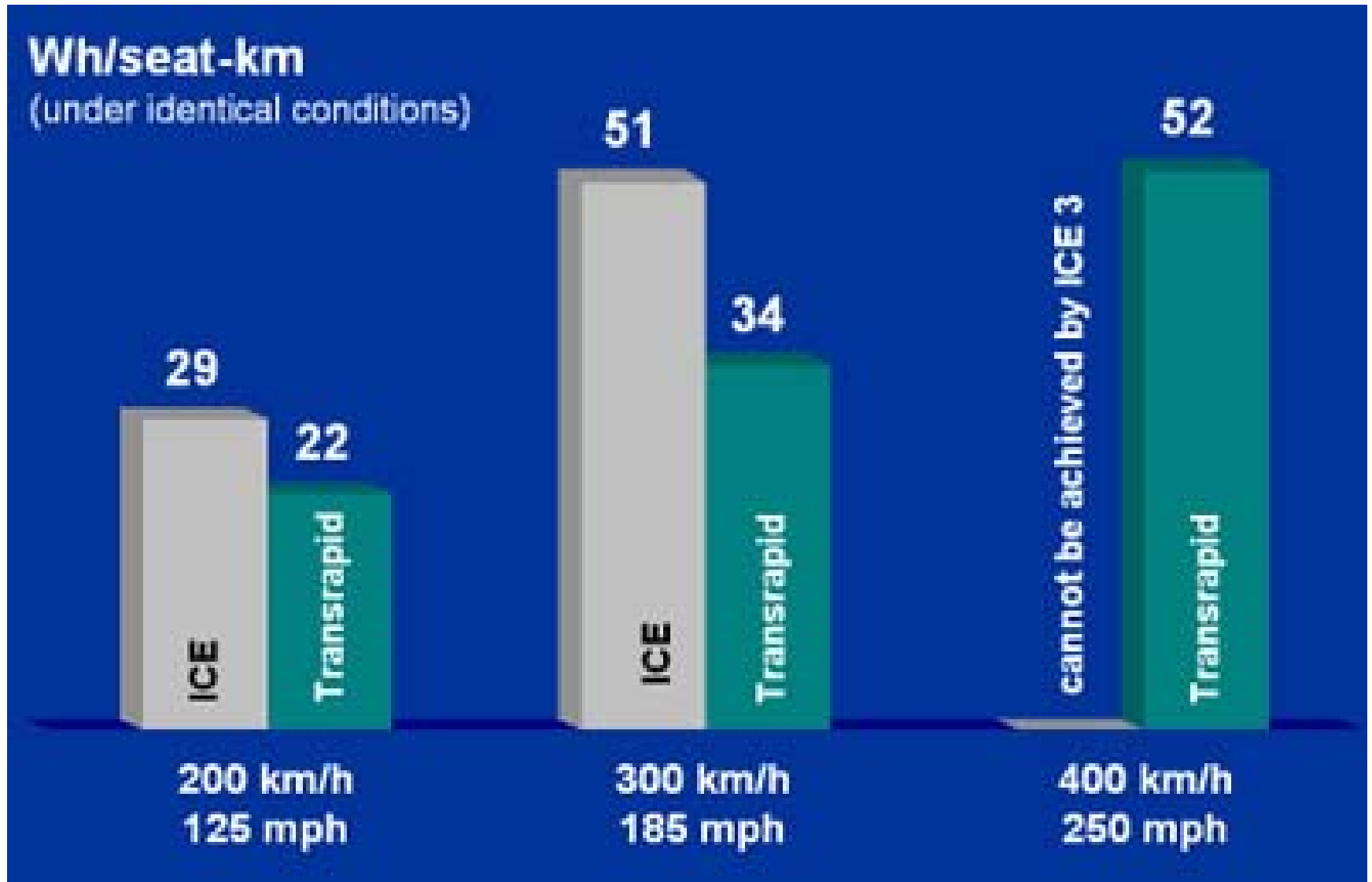
HST Noise Emissions



Benefits Over Traditional High Speed Trains

- Speed
- Reduced noise levels
- Less maintenance required
- Eco-friendly track
 - makes tighter curves, steeper grades
 - elevated
- Energy savings?

HST Energy Consumption



Inductrack: The Future of Maglev



120-meter test track at
General Atomics, San Diego

- Replaces electromagnetic coils with special arrays of super-strong permanent magnets
- More energy efficient, safer, and much cheaper

Additional References

- California-Nevada Super Speed Train Commission. “Electric and Magnetic Fields.” March, 2002. <http://www.ci.las-vegas.nv.us/Files/EMF.pdf>
- Drozdiak, William. “German Maglev Train Attracts Controversy.” *Washington Post*, April 20, 1998, A13.
- Epstein, Gady A. “China’s Commercial Maglev Train to be World’s First, Perhaps its Last.” *Baltimore Sun*, Oct 27, 2003, A1.
- Goetz, Andrew R, and Vowles, Timothy M. “Progress in Intermodal Passenger Transportation: Private Sector Initiatives. Undated. www.ie.msstate.edu/ncit
- Heller, Arnie. “Maglev on the Development Track for Urban Transportation.” *Science and Technology Review*. Nov. 7, 2003. <http://www.llnl.gov/str/November03/Post.html>
- O’Neill, Mark. “Three Reasons Why Maglev Hit the Buffers.” *South China Morning Post*, Jan 21, 2004, p. 4.
- *Toronto Star*. “Shanghai’s Maglev Train Starts to Fly.” Jan. 2, 2004, F5.
- Transrapid International. “Transrapid and Environment.” Undated. <http://www.transrapid.de/en/index.html>
- Vuchic, Vukan R. and Casello, Jeffery M. “An Evaluation of Maglev Technology and Its Comparison With High Speed Rail.” *Transportation Quarterly*, **56**, 2002.