A "Made in America" Maglev System for U.S. Transportation

Mike Simon
Director, Commercial Business Development
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Maglev Concept Overview

- Magnetic levitation used to:
  - Ø Elevate a vehicle 1 inch (or less) above a fixed guideway
  - Ø Enable vehicle to be efficiently pushed along guideway using electric current

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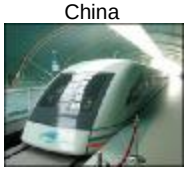
General Benefits of Maglev

- Zero contact between vehicle and track results in:
  - Ø High energy efficiency (no friction)
  - Ø High speed
  - Ø Low noise
  - Ø Less wear & tear on vehicle and track
- Electric propulsion results in:
  - Ø Clean, zero-emission operation (at point of use)
  - Ø Promotes energy independence by allowing use of renewable electric power

Maglev Technology: Global Status

China



- First fully operational, in-service system in Shanghai, China
  - Ø German "Transrapid" technology
  - Ø Initiated service in December 2003
  - Ø Operates at speeds up to 260 mph

Japan

South Korea

- Other maglev technologies
  - Ø Japan (HSST)- Linimo Line, Nagoya (in service since 2005)
  - Ø South Korea (UTM – 1.2 km test track)
  - Ø U.S. (General Atomics/Livermore "Passive Maglev" System)

General Atomics Maglev Test Track

- San Diego, CA
  - Completed in September 2004
  - 400 ft. long
  - Accelerates vehicles to 22 mph
  - *Only operational maglev system in U.S.*

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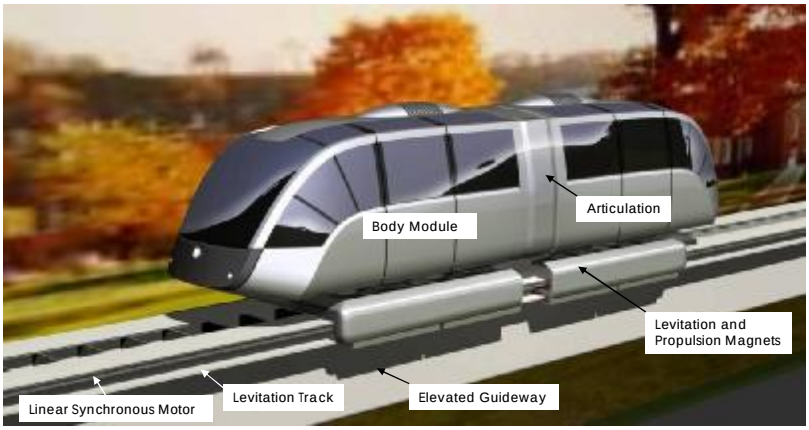
General Atomics Fully Operational Maglev Concept



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General Atomics Passive Maglev Technology: Key Features & Advantages

- No active power system on vehicle – only magnets
  - Ø Lighter, cheaper vehicle design
  - Ø Less energy required to move vehicle
  - Ø Allows use of guideway tracks that are lighter, cheaper, and less intrusive

- "Halbach Array" magnet configuration adds to benefits
  - Ø Increased magnetic field strength
  - Ø Very low magnetic fields in passenger compartments and near stations

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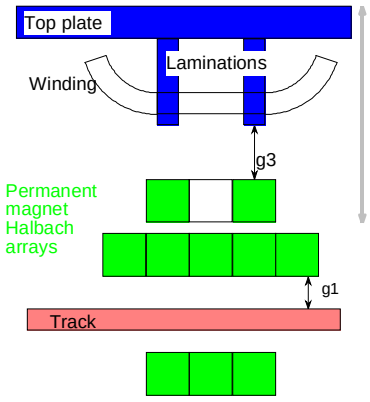
General Atomics Maglev: Components



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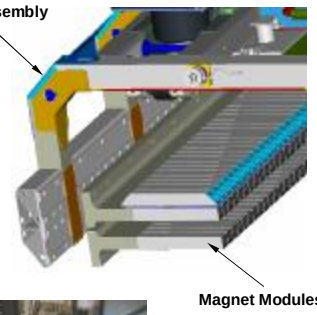
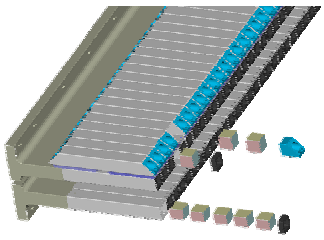
GA Maglev: Magnet Modules

- Magnet blocks
  - Neodymium-Iron-Boron (NdFeB)
  - Subdivided into sub-assemblies
  - Loaded into the magnet modules
- Chassis Assembly
  - Magnet modules are then mounted to the chassis supports





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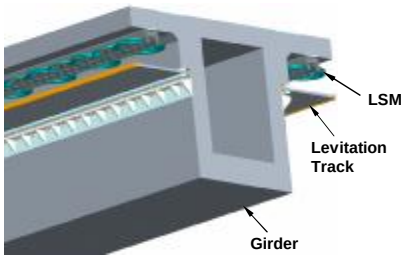
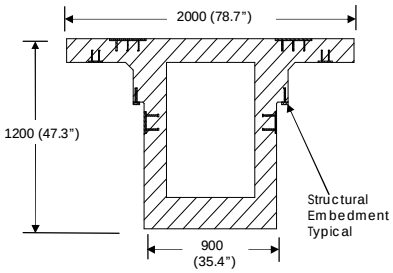
GA Maglev: Guideway Modules

- Guideway Modules
  - Hybrid Guideway Girder
    - Steel Fiber Reinforce Concrete (SFRC)
  - Linear Synchronous Motor
  - Levitation Track
  - High Speed Turns (144 km/hr, 90 mph)
    - 800 meter min. turn radius
    - 11.5^0 Cant Angle





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GA Maglev System Performance

- High speed
  - Ø Up to 150 mph in "urban maglev" applications
  - Ø Much higher speeds in long-distance mode
- Rapid acceleration (up to 0.25g)
- Virtually unlimited hill-climbing ability
- Low internal and external noise
- All-weather operation
- Automated train control, driverless option
- Safety features (e.g., wraparound design)

GA Maglev System: Basic Economics

- Investment
  - Ø Vehicle costs comparable to conventional rail
  - Ø Major investment is in guideway
    - § Higher cost than grade-level rail or highways
    - § Comparable or lower cost than other elevated systems
- Return on Investment
  - Ø Lower fuel/energy costs
  - Ø Reduced personnel costs (automated operation)
  - Ø Reduced maintenance costs
  - Ø Lower social costs (pollution, noise, congestion delays)

Current GA Maglev Activities

- Continuing development of Passive Maglev Technologies
  - Ø FTA-funded "Urban Maglev" Program
  - Ø Addressing controls, electrical systems, vehicle design, and girder/track design
- Actively pursuing opportunities to build working maglev systems
  - Ø Passenger transport (California, Pennsylvania, Colorado)
  - Ø Goods movement (Ports of Los Angeles and Long Beach, CA; Gulfport, Mississippi)

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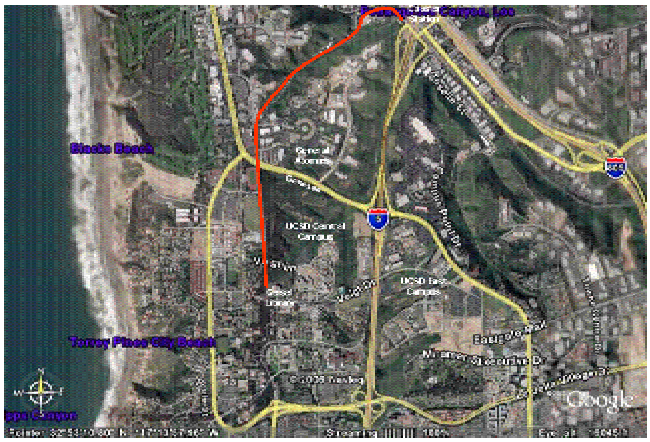
Proposed San Diego System



- Would connect local rail station and campus of University of California, San Diego (UCSD)
- Length: 2.5 miles

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Proposed Pennsylvania System

- Would link two campuses of California University of Pennsylvania
- Length: 4.5 miles
- Would demonstrate 7% grade and all-weather operation

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Proposed Goods Movement System for Ports of Los Angeles & Long Beach

- Would link ports with long-haul freight (truck & rail) terminals
- Length: 4.7 miles
- Port-funded feasibility study completed in June 2006

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Maglev Cargo Conveyor Concept

- Demonstrated on General Atomics test track
  - Ø Same track and system architecture as used for passenger transport
  - Ø Similar environmental, economic, and national security benefits

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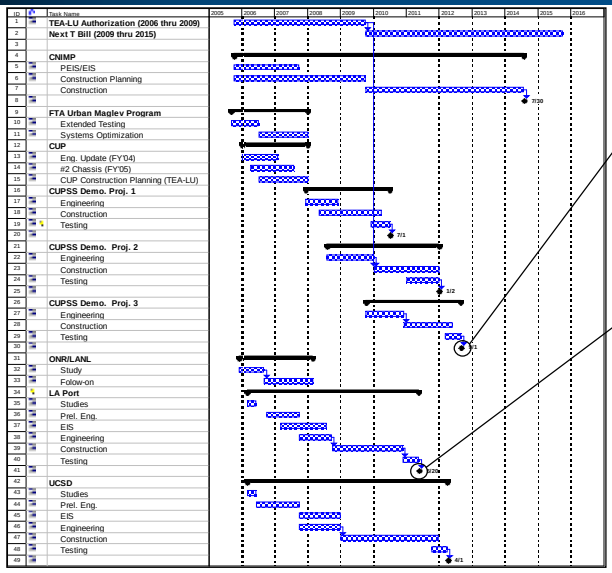
Sample Development Schedule

ID	Task Name
1	**TEA-LU Authorization (2006 thru 2009)**
2	**Next T Bill (2009 thru 2015)**
3	
4	**CNIMP**
5	PEIS/EIS
6	Construction Planning
7	Construction
8	
9	**FTA Urban Maglev Program**
10	Extended Testing
11	Systems Optimization
12	**CUP**
13	Eng. Update (FY'04)
14	#2 Chassis (FY'05)
15	CUP Construction Planning (TEA-LU)
16	**CUPSS Demo. Proj. 1**
17	Engineering
18	Construction
19	Testing
20	
21	**CUPSS Demo. Proj. 2**
22	Engineering
23	Construction
24	Testing
25	
26	**CUPSS Demo. Proj. 3**
27	Engineering
28	Construction
29	Testing
30	
31	**ONR/LANL**
32	Study
33	Follow-on
34	**LA Port**
35	Studies
36	Prel. Eng.
37	EIS
38	Engineering
39	Construction
40	Testing
41	
42	**UCSD**
43	Studies
44	Prel. Eng.
45	EIS
46	Engineering
47	Construction
48	Testing
49	



Passenger service by September 2012

Cargo transport by May 2011

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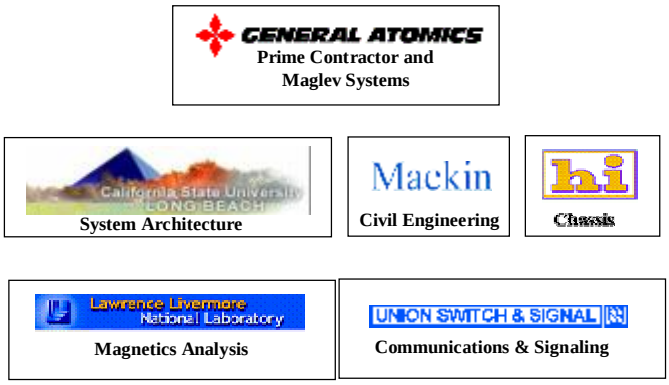
The General Atomics Maglev Team



Conclusions

- Need for transportation modernization is urgent
  - Ø Existing infrastructure is aging, overburdened
  - Ø Air quality and global warming trends are ominous
  - Ø "Addiction to oil" must be cured
- General Atomics Maglev solution
  - Ø Energy efficient
  - Ø Environmentally friendly, zero-emission operation
  - Ø Quiet and aesthetically appealing
  - Ø Flexible and affordable
  - Ø Made-in-America technology is available now