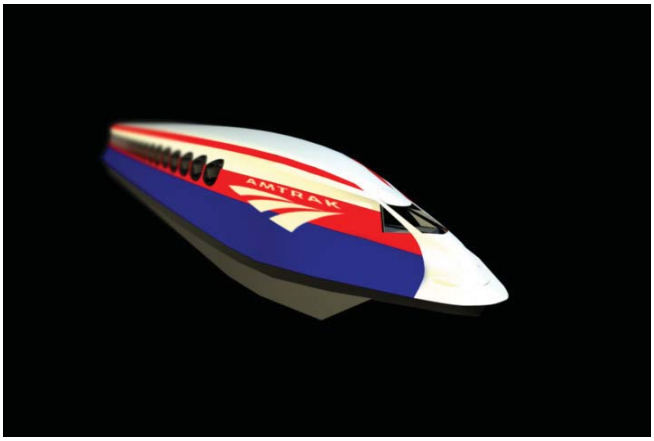

Amtrak: A Crucial Component in America's Transport Future

How Amtrak Can Be Evolved to a 300 mph National Maglev System and Create Over 2 Million U.S. Jobs in a New Sustainable Maglev Industry.

James C. Jordan
July 2009

Overview of America's Transport Imperative

The message:

- Oil fueled autos, trucks, airplanes and trains dominated 20th Century transport;
- Electrically powered autos and Maglev will dominate 21st Century transport.

The transition from oil-fueled transport to electric transport is inevitable. Oil is running out and the feasible substitutes such as synthetic fuel created from tar sands, oil shale and coal would be environmentally catastrophic. Biofuels, which are subsidized by the U.S. and other governments, threaten world food security because using the nutrients contained in arable land for fuel will diminish the global capability to feed a growing population. Natural gas is a cleaner, easier to transport fuel and is therefore a good source of fuel for home heating, cooking, industrial production, and chemical feed stock. It is now being used as a transport fuel but the supply of natural gas is limited and its use adds to the global warming gases in the atmosphere. There are several bioengineering and genome modifications research efforts in progress to produce oil from algae.[1] It is not likely that this research will be successful in producing the volume required.

Is there a practical, environmentally safe transport alternative to synfuels, natural gas and biofuels? Yes – clean, non-polluting, electric transport using renewable energy. Electric autos for trips of 100 miles between recharges, and electrically powered Maglev for longer distance, faster, better, and cheaper transport of passengers, highway trucks, freight containers, and personal autos.

1st generation electric autos and Maglev systems are already operating on a small scale. Much more capable and much lower cost 2nd generation electric auto and Maglev systems are in development and will be deployed within a few years.

[1] New Scientist Opinion, July 25, 2009 Human Genome pioneer Craig Venter has teamed up with Exxon Mobil to turn living algae into hydrocarbons, for processing into gasoline, diesel fuel and jet fuel.

A Brief History of American Transportation

In the 1700's, if you were wealthy, you rode in a carriage. Otherwise, you walked. In the 1800's, even ordinary folks could travel by steamboats and railroad, powered by steam engines. The development of the canal system lasted 30 years and peaked around 1836. Its paradigm shift took place in 1825 with the opening of the Erie Canal and its maturity and decline was caused by the emergence of a more flexible and efficient land transport system: rail. The growth of rail in the later part of the 19th century took off with the completion of the transcontinental railroad in 1869 marking its paradigm shift. By the late 19th and early 20th century most of the American territory was serviced by rail.

Road transportation emerged in the beginning of the 20th century, especially after the introduction of the Model T in 1913. The growth of the road transport system marked the maturity and downfall of rail transport, especially for short and medium distances. Surprisingly, the development of the Interstate Highway System marked the maturity of the road transport system as national trade was increasingly taking place along major high capacity road corridors between major metropolitan areas, lessening the need for regional road construction. The latest wave of development is related to air transportation that peaked around 2001. A key event that marked the dominance of air transport was the introduction of the Boeing 747 in 1969, which opened travel to the masses. The next transport technology is likely to be Maglev and all-electric autos and light trucks because oil scarcity is triggering a paradigm shift.

The following schematic depicts the growth rate peak years of the various modes of transport in US history. The historical paradigm shift years are also shown. The future paradigm shift is shown around 2050 A.D., which corresponds to the Energy Information Agency's very optimistic estimate for the time that remains before World production of oil begins to decline, a.k.a. "peak oil"

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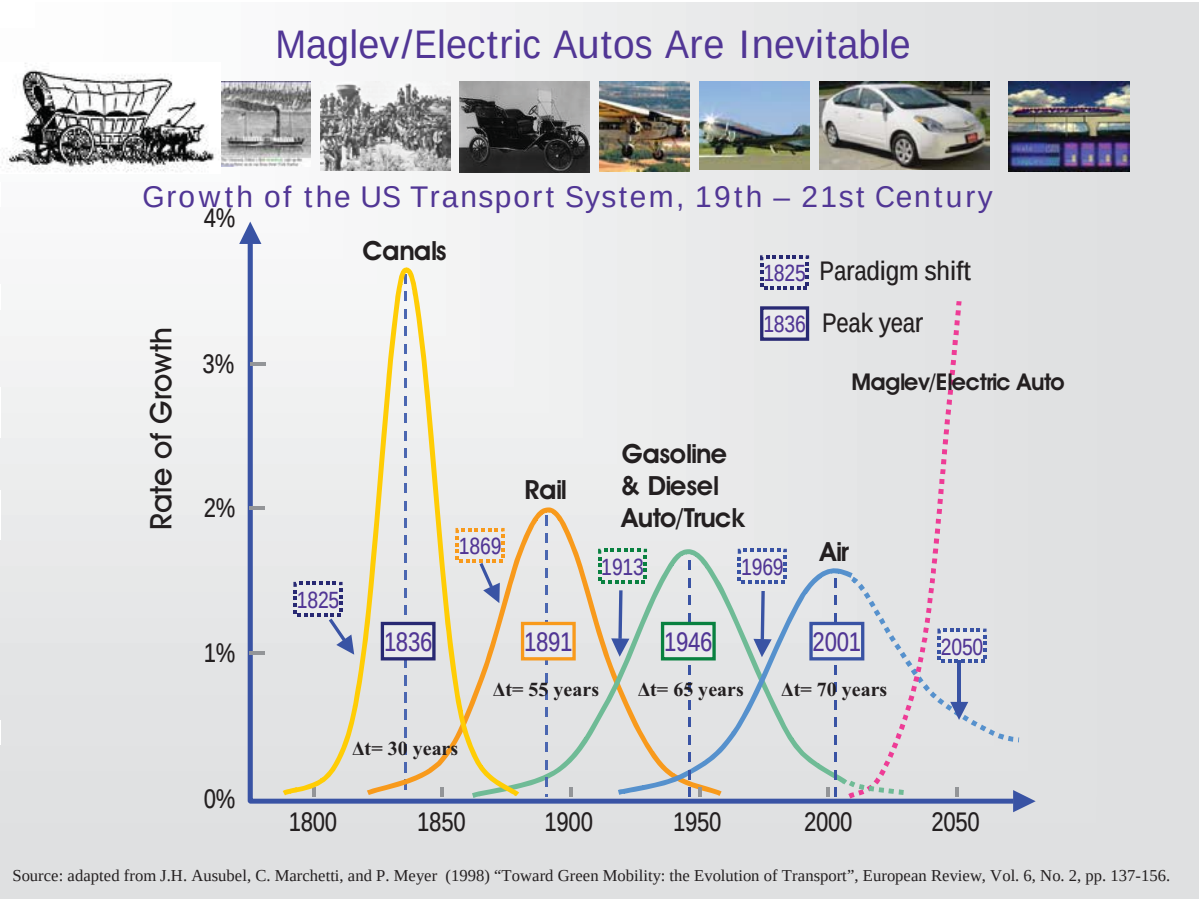


Source: adapted from J.H. Ausubel, C. Marchetti, and P. Meyer (1998) "Toward Green Mobility: the Evolution of Transport", European Review, Vol. 6, No. 2, pp. 137-156.

The Amtrak Solution

America's transportation systems are in trouble and deteriorating at an accelerating rate. Airlines are going belly up. Trucks and autos clog the highways, turning a 30-mile drive into a 2-hour torture trip. Every day a hundred Americans are killed and thousands injured on the roads. Until the recent deep recession, oil prices were rapidly climbing. Just yesterday, it took $60 to fill up our SUVs. High diesel fuel prices hurt highway freight carriers impacting every American consumer.

The recent recession has cut the cost of oil and travel. However, personal incomes and consumer purchases are dropping even faster. When the economy does recover, oil prices and travel costs will soar back to even higher levels. It appears that World oil production has reached its peak. Even if it continues at a plateau, however, the U.S. will have an ever-shrinking share of World oil production as other countries like China and India rapidly industrialize. Today, the U.S. consumes 600% more oil per person per year than the rest of the World (25 barrels per person per year vs. 4). This is not sustainable and the U.S. share will drastically shrink.

The Good News is Amtrak. If we act quickly and wisely, Amtrak can *evolve* to provide the lowest cost, most energy efficient and most practical way to meet America's future transport needs in a scarce oil future by changing its transport equipment and passenger service infrastructure to the new ultra-high-speed, 2nd generation Maglev transport system. This equipment, which has been invented and developed in America, but has not developed the required manufacturing capability. If Amtrak, the Administration and the Congress send a clear message to the global transportation equipment market that it will establish a program to deploy the advanced, highly energy efficient and much faster Maglev surface transport system, the investment dollars will flow to this new manufacturing industry.

The rights-of-way, tunnels, and bridges for our highways and railroads are our national patrimony worth trillions of dollars. The rights-of-way of our railroads and highways, which knit together our far-flung centers of commerce into a coherent and vital national network, should not be squandered. A vital factor for our present National Railroad Network was President Lincoln's Executive Order to rip up 6 of the 7 different rail gages that had proliferated in the nation, mostly in the South, and build railroads to a single 4 feet 8 1/2 inch gage to speed the formation of a more perfect union. Similarly, developing a Maglev *guideway gage standard* is important to the vision for a much faster and much more effective guided surface transport system that Amtrak can evolve to.

An ultra-high-speed (300 mph) Amtrak could help America sustain its energy and economic capabilities. A new high-speed Maglev intercity passenger and freight network managed by Amtrak could use existing railroad and highway rights-of-way and transportation infrastructure to build an advanced ultra-high-speed guided surface transport network based on American manufactured 2nd generation superconducting Maglev technology. A National Maglev Network would yield enormous benefits for America: faster, cheaper, more comfortable travel to anywhere in the U.S. than by driving or flying, with no emissions of greenhouse gases and pollutants, much greater energy efficiency, reduced congestion and deaths on the highway, improved health for millions of Americans by reducing diesel particulates, brake dust and other health harming emissions, oil imports, and the creation of hundreds of thousand of new jobs, and many Billions of dollars of Maglev equipment exports per year.

Ironically, if the Congress had acted in 1990 to engage in a U.S. superconducting Maglev development program, we would have the National Maglev Network in place and would not have experienced the economic stresses that we are now enduring. It is compellingly urgent that we demonstrate the new Maglev transport system, attract the required private investment and begin to build the National Maglev Network. Evolving Amtrak to Maglev makes good sense and should be a high priority national initiative.

Land Transportation Rights-of-Way: Our National Patrimony

The following three maps of the rights-of-way of (1) the national railway system at the highpoint of railway development in the U.S. (1958), (2) the national highway system, and (3) the current National Passenger Rail System (Amtrak) show how extensive the land rights-of-way are in the United States.

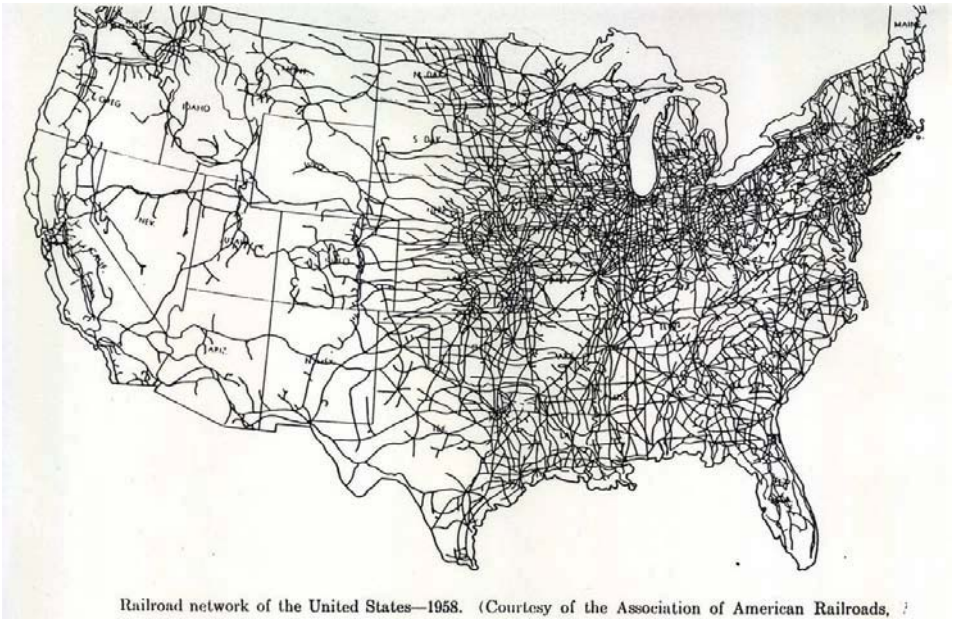


Exhibit 1. U.S. Railroad Network of the United States in 1958

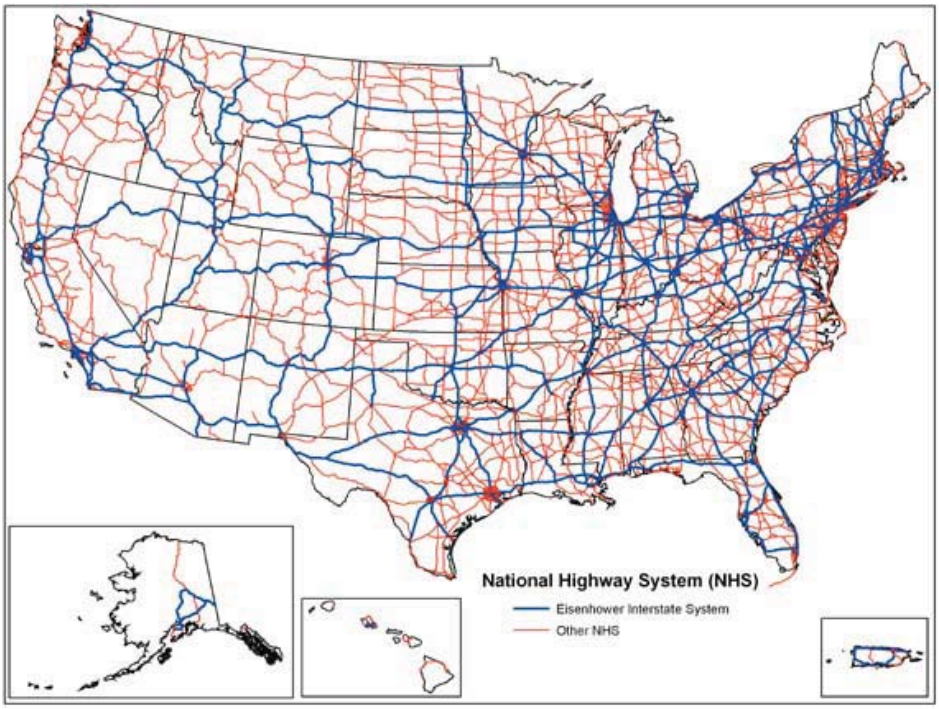


Exhibit 2. U.S. National Highway System

Exhibit 3. U.S. National Passenger Rail System (Amtrak)

A Brief History of America's Maglev

The late Senator Daniel Patrick Moynihan was an early champion of Maglev. As a member and Water, Transportation and Infrastructure Subcommittee Chairman of the Senate Environment and Public Works Committee around 1987 he introduced and successfully passed legislation in the Senate to implement a $750 million dollar Maglev R&D program but the measure was defeated in the U.S. House of Representatives by strong opposition of existing transport interests.[2] In deference to the intellect of Senator Moynihan, who first proposed increasing the capacity of our national transportation system by constructing a National Maglev Network, I will let him tell the story by quoting from an article written by him in the November, 1989 Scientific American magazine:

"The idea for maglev was thought up by Dr. James R. Powell on a Friday night in February 1960, while he was stuck in that permanent traffic jam that awaits anyone trying to leave Long Island over the Bronx-White Bridge. Powell and Dr. Gordon T. Danby, a colleague at Brookhaven National Laboratory, presented the first paper on superconducting maglev transportation at an engineering conference in 1966, and the race was on."

The US started the Maglev race but stepped out when Secretary of Transportation John A. Volpe of the Nixon Administration declared it no longer a priority in 1975. Thanks to the late Senator Moynihan, several attempts were made to jump start the technology over the years but they all stalled due to lack of political urgency. The Japanese and Germans, however, embraced the concept and invested multi-billions of Yen and Deutsche Marks in its development. The investments have resulted in two systems that have begun commercial operations (as in the case of the German system) or have Governmental approval for commercial operations (Japan).

[2] October 16, 1987 Senator Moynihan introduced S.1794, *Federal Advanced Superconducting Transportation Act* – The Act expresses the intent of the Congress that the development of a *magnetic levitating superconducting technology* for the purpose of constructing a national super high-speed transportation system.

Powell and Danby have not been idle with respect to Maglev technology. They have developed a 2nd Generation Maglev System that improves upon the research done by the Japanese and added features that make the system ideal for operation in the United States. The new Powell and Danby system is extremely energy efficient, and powerful enough to carry highway truck freight and much lower in capital construction costs than both the Japanese and German 1st Generation Maglev systems and European steel-wheeled HSR systems. Its low construction cost is due to the flexibility of its Maglev guideway systems designs, which include unique and Powell and Danby patented (1) prefabricated narrow beam guideway design, (2) a unique capability to *electronically* switch to off-line stations and (3) dual-use of conventional rail trackage and existing railroad tunnels and bridges. These features provide planners with exceptional flexibility to deploy the system without having to destroy the existing built environment.

High-speed steel-wheel rail programs (i.e. HSIPR program under the ARRA) and Maglev test routes authorized under current law are leading the United States into a mass transport system that will be too slow, too inconvenient, and much too costly to build and operate and will require a permanent subsidy except in the few corridors with high population densities.

The promotion of the German Transrapid Maglev system, which provides the needed speed, as the technology of choice for the few routes that have elected to deploy Maglev would establish a defacto Maglev "gage" standard based on the much higher construction costs and less capable German Transrapid Maglev system.

The high price tag on last generation Maglev has opened the U.S. market to the high speed rail equipment manufacturers in Spain, France, Germany and Canada -- exporting capital and jobs. With the best of intentions U.S. transportation officials have made trips to Europe to ride the steel-wheel systems, which average 138 mph. Despite the warning of the GAO that these systems require subsidy to construct and operate and are a high cost maintenance nightmare, the Congress has acted to approve High Speed Intercity Passenger Rail systems for 10 Corridors in the U.S. Many admirers of the European HSR systems forget that France, Germany and Spain, the principal European HSR countries, would fit inside Texas and New Mexico. The travel distances in the U.S. are much greater than in Europe and Japan. The fastest train in Europe, which has reached nearly 200 mph in a special test run, only averages 138 mph. 138 mph is too slow and the fares too high per passenger mile (50 cents) to compete with commercial regional air carriers (15 cents).

HSR can only play a limited role in America. With HSR, it would take 24 hours to go from New York City to Los Angeles at a round trip cost of 3000 dollars. Maglev II at an average speed of 280 mph and 10 cents per passenger mile comes closer to meeting America's transport system requirements than any of the steel-wheeled systems.

The neglect of resolving the Maglev guideway gage standard as a national research, development test and evaluation issue coupled with the Government's failure to level the global playing field by investing in a test facility for its own Maglev system is a perfect storm of bad policy harming our economic prosperity. This needs to be resolved by building a National Maglev Test and Certification Facility (NMTCF) to demonstrate the superior performance and cost of the 2nd generation Maglev system invented and developed by American, Franklin award winning scientists, Drs. James Powell and Gordon Danby.

The Congress has *not* acted to fund a test facility, and the various Administrations since the program was first proposed by Senator Moynihan have not acted to propose such a program. The purpose of this paper is to underscore the need to demonstrate the lower cost and higher performance of the 2nd generation Maglev system. Demonstration of this system, in addition to creating hundreds of thousands of new jobs, will generate cost and performance data to assist transportation officials make cost effective decisions for the future of sustainable green transport in a scarce oil future.

The Obama Administration: A Time for Change

In good times — or good-enough times — the political will to beat back dysfunctional trade and competitiveness policies simply doesn't exist. Their negative effects are too diffuse, and their benefits to the fortunate too concentrated. An economic crisis changes the dynamic. It's an opportunity to do things you could not do before. Trade, investment, and regulatory policies that foster innovation, inventiveness and competitiveness need to be reviewed and changed to benefit the American people who create and produce the goods and form the foundation of a new sustainable American economy. Now may be the time.

President Obama senses the need to take on the challenge of rebuilding America by fostering industries based on making real things and restoring American leadership. He understands that we must globally and domestically compete in manufactured goods and nutritious food, as well as services, based on our (1) comparative natural resource advantages, (2) ingenuity, and (3) innovation and bring real added value to the global marketplace. Historically, all that American entrepreneurs and workers need is a level playing field.

On several occasions before and after the election, President Obama has referred to Maglev systems in China and Japan as the kind of high speed rail (HSR) system that we can build in America. While he probably does not know that the 300 mph high speed rail system he admires in Japan is based on the inventions of Drs. Powell and Danby. And probably does not know the potential of their new 2nd generation supercomputing Maglev system for uniquely and quietly moving freight as well as passengers at 300 miles per hour in all weather, using a very energy efficient, all-electric 2nd generation superconducting Maglev transport system.

Independent engineering analyses and fabrication and testing of the major components indicate that the 2nd Generation Powell and Danby system is much less costly to construct and operate than 1st generation Maglev and steel-wheel HSR systems operating in foreign countries. Maglev eliminates the rolling friction and the noisy and dangerous rail distortion generated by the anvil effect of high-speed steel wheel-on-steel rail high-speed systems like those operating in Europe and Japan. Steel wheel systems are a costly maintenance nightmare. As GAO recently reported, all HSR systems require government subsidies to cover their construction and operating costs. The new high speed but yet undemonstrated 2nd generation Maglev system can be built and operated without a public subsidy by uniquely carrying high revenue highway freight trucks in special roll-on, roll-off Maglev vehicles and operating in both a planar and monorail mode which uniquely gives the 2nd generation Maglev the capability to electronically switch and operate in a levitated mode on conventional railroad trackage.

Recently, President Obama has suggested a vision for a more convenient, higher speed rail system. The stimulus (American Recovery and Reinvestment Act) contained $1.3 Billion for Amtrak and $8.1 Billion for high-speed intercity rail projects. The Secretary of Transportation announced a plan for the allocation of this money on April 16, 2009.

President Obama said at the announcement ceremony, ***"What we need, then, is a smart transportation system equal to the needs of the 21st century. A system that reduces travel times and increases mobility. A system that reduces congestion and boosts productivity. A system that reduces destructive emissions and creates jobs.***

What we're talking about is a vision for high-speed rail in America. Imagine boarding a train in the center of a city. No racing to an airport and across a terminal, no delays, no sitting on the tarmac, no lost luggage, no taking off your shoes. (Laughter.) Imagine whisking through towns at speeds over 100 miles an hour, walking only a few steps to public transportation, and ending up just blocks from your destination. Imagine what a great project that would be to rebuild America.
Now, all of you know this is not some fanciful, pie-in-the-sky vision of the future. It is now. It is happening right now. It's been happening for decades. The problem is it's been happening elsewhere, not here.

In France, high-speed rail has pulled regions from isolation, ignited growth, remade quiet towns into thriving tourist destinations. In Spain, a high-speed line between Madrid and Seville is so successful that more people travel between those cities by rail than by car and airplane combined. China, where service began just two years ago, may have more miles of high-speed rail service than any other country just five years from now. <u>And Japan, the nation that unveiled the first high-speed rail system, is already at work building the next: a line that will connect Tokyo with Osaka at speeds of over 300 miles per hour. So it's being done; it's just not being done here.</u>

There's no reason why we can't do this. This is America. There's no reason why the future of travel should lie somewhere else beyond our borders. Building a new system of high-speed rail in America will be faster, cheaper and easier than building more freeways or adding to an already overburdened aviation system –- and everybody stands to benefit."

Given our economic situation and trade deficit, it would be irrational to stop the developers of the American 2nd generation superconducting Maglev transport system from demonstrating its lower costs and higher performance because of opposition by the established competitive interest lobbies, mostly foreign manufacturers of high-speed rail equipment and domestic airlines, that are using the Congress and the Department of Transportation to stop demonstration of the Powell and Danby's 2nd generation Maglev system and prevent its deployment to form an urgently needed National Maglev Network.

President Obama's reference to Japan's 1st generation Maglev system, which is based on Drs. James Powell and Gordon Danby's original superconducting Maglev inventions, has carried many thousands of passengers at speeds up to 361 mph, the World Record. Even during a very long recession, Japan plans to build a 300 mile Maglev line between Tokyo and Osaka, to carry 100, 000 passengers daily with a trip time of 1 hour.

In a recent article by Dr. Yoshiyuki Kasai, the Chairman of Japan Railways, the operator of the fastest and most extensive high speed steel wheel rail system in the World, and the constructor of Japan's Maglev line and operator of the Maglev Test Facility at Yamanashi, recommends that ***"the most effective future train system for the United States would be a maglev transit line. If such a network was in place, people in New York would be able to participate in an early-morning meeting in Washington without the bother of having to go to and from airports at both ends. Likewise, transcontinental maglev services could supersede aviation networks."***

Dr. Kasai recognizes that Japan's steel-wheeled High Speed Rail (HSR) system is a fully mature technology, and any advances in its technology will only be marginal. In contrast, Maglev technology is still evolving. The 1st generation German (i.e. China) and Japanese systems are still too expensive and limited in capability and revenue potential to be implemented in the U.S. Like HSR, they must be government subsidized. In effect they are like the pre-World War II DC-3 airplanes. If passenger air travel had remained at that level, instead of evolving to modern jet airliners, air travel today would be an oddity.

Evolving Amtrak to an All-Electric, All-Weather, Pollution Free, Quiet, Comfortable and Affordable, Convenient, Ultra-High-Speed Guided Transport Service For Passengers and Freight

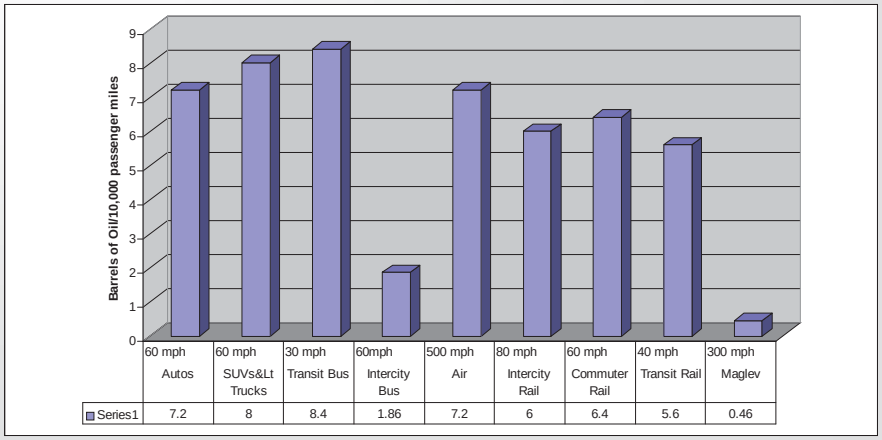
To make Amtrak financially self-sustaining and a major portion of the future U.S. transport system, it must be able to operate at much faster speeds – 300 miles per hour – and be much more convenient and accessible. Developing an all-electric, high-speed, advanced guided surface transportation system (AGSTS) will increase economic productivity, reduce foreign oil dependence and be self-supporting from a combination of freight and passenger transport revenues. Moreover, a U.S. AGSTS manufacturing industry will generate billions of dollars in exports and hundreds thousands of jobs.

The envisioned Amtrak AGSTS system is based on the U.S. 2nd generation Maglev system invented by James Powell and Gordon Danby, the "Wright Brothers" of Maglev transport. Their guideway system costs much less than the 1st generation Maglev systems developed by Germany and Japan. Moreover, it is cost competitive, superior in speed (average speed of 280 mph vs average speed of 140 mph) and quality of ride, and much quieter than conventional high-speed steel-wheel trains.

The Powell-Danby 2nd generation Maglev carries both passengers and highway freight trucks on elevated weather and flood proof guideways as well as conventional railroad trackage that has been adapted for travel of levitated Maglev vehicles. (See illustration above) The modified conventional trackage can also be used by standard steel-wheel-on-rail trains with appropriate scheduling. This unique capability is a very important feature of the Powell-Danby AGST System because it enables access to U.S. metropolitan areas on existing railroad trackage at very low cost -- about 4 million dollars per mile -- without having to tear down major portions of existing infrastructure in urban/suburban regions at very high cost if new guideways were required.

Exhibit 4 Energy Efficiency by Transport Mode

Energy Efficiency by Transport Mode
In Barrels of Oil or Oil Equivalent Per 10,000 Passenger Miles
Basis: Transportation Energy Data Book, 25th edition; Stacy Davis and Susan Dregel, Center for Transportation Analysis, Oak Ridge National Laboratory, ORNL-6874 (2006)



The proposed Amtrak AGSTS is very energy efficient. Per passenger mile, at 300 mph, it uses 1/10th of the energy consumed by a 20-mpg auto with driver, and 1/5th of the energy used by a jet airliner. Maglev transport cost is much less than by highway or air. (See Exhibit 4) For a very modest annual investment of about $120 million dollars per year, Amtrak could test and certify this system for operation at speeds up to 300 mph within 5 years.

Passengers would travel in first class airline type seating for less than economy air travel. Built as a 25,000-mile national network along the rights of way of U.S. Interstate Highways and railroads, 70% of the U.S. population would live and work within 15 miles of an Amtrak AGSTS station. *Maglev uses individual vehicles, or in 2, 3 or 4 coupled vehicle consists. It is not a long train of many cars pulled by a locomotive.* From local stations (which in the Powell-Danby system could be the familiar railroad station) travelers could reach any point in the U.S. within a few hours at most, and travel to other stops in their local region within a few minutes. Maglev passengers in most cases can take *direct non-stop* trips.

Maglev travel is comfortable, smooth, friction and noise-free, like riding in your favorite living room chair. It is fast, at speeds twice as fast as European TGV type rail travel, with door-to-door travel times comparable to that of airplanes. There are no delays for weather and congestion, and no hassles of waiting to board and takeoff. **Moreover, Maglev can carry truck type freight at much higher speed and much less cost and much more safely than by highway**. Amtrak AGSTS freight service increases the profits of both truckers and Amtrak. Less truck traffic on the highways will reduce fatalities and injuries, and reduce pollution and congestion.

For example, one could take the Amtrak Maglev Passenger service from Washington, D.C. on a direct non-stop trip to Jacksonville, Florida and could complete the 706 mile trip in 2 and a half hours for a one-way ticket cost of $71.00. In contrast, there is no current Amtrak connection to compare, but if one drove the trip the time, according to *Google Map* would be 10 hours and 49 minutes. The driving trip cost would be about $350 using the Government approved reimbursement rate. Flight time would be 2 hours and 5 minutes at a cost of $316 dollars. While the Maglev time would be a little longer, about 25 minutes, there would not be tarmac delays and long-lines that are common to air travel. The cost difference is huge. The Maglev low fares (about 10 cents a passenger mile) assumes that the route would also be used for carrying highway freight trucks.

This vision for Amtrak would develop a strong U.S. transportation industry based on AGSTS transport. However, government policy needs to be revised to encourage U.S. industries to compete with foreign Maglev suppliers. Current policy has permitted Amtrak to buy its Acela trains from foreign suppliers, the U.S. government in a separate program is funding a Maglev system developed by Germany, and our metro rail type commuter systems are also imported.

The current transportation bill provides 45 million dollars of initial funding for the German Transrapid Maglev system on a route in Southern California to Las Vegas, Nevada. The problem is that the German system is more than twice as expensive to build as the U.S. 2nd generation system and its revenue potential is much less. How did this happen? Simply put, Germany invested in a demonstration, our government did not, and thus we are continuing to subsidize Germany's system. If this continues, Germany will establish a defacto "guideway gage" for its 1st generation, high-speed, higher priced system – without competition.

The $12 Billion dollar Transrapid project is projected to cost 45 million per mile for the 269 miles from Anaheim to Las Vegas. These costs are very likely far too low. The proposed Transrapid line from Munich to its airport, a distance of 24 miles, was recently cancelled when its cost rose to 5 Billion dollars – about 200 million dollars per mile. The U.S. 2nd generation Maglev would cost less than 1/2 as much and receive greatly increased revenues from its unique capability to carry intercity trucks. Moreover, the

German Maglev System cannot travel on the existing conventional tracks that enter all U.S. metropolitan areas.

Because 1st generation Maglev has proved to be very expensive, the market and many transportation policymakers have turned to the next best solution, European electric high-speed, steel-wheeled rail train equipment vendors to provide passenger only rail service in densely populated corridors. **Recent passage of the Amtrak reauthorization act provided funds to study the development of these corridors but did not provide for the demonstration and certification of the 2nd generation Powell and Danby system so that it can compete against the foreign vendors who are subsidized by their governments.** This tilted playing field should be corrected before the U.S. transportation authorities spend public funds to build rail systems that are slower than Maglev, serve only passengers, are not convenient, and require expensive maintenance. Not only will the system very likely require government financing to build and equip the high-speed trackage with an electric cantilevered catenary system, it will continue to require costly maintenance and subsidy over its operating life.

California's recent voter approval of a $9 Billion bond issue as a down payment on a High Speed Rail system from Los Angeles to San Francisco is an example of how the absence of a U.S. Maglev Test Facility has biased the U.S. market toward a foreign high-speed system that will be much slower in average speed (about 130 mph) and more costly than the Powell-Danby 2nd generation Maglev Transport System. **The increase in investment costs for HSR compared to 2nd Generation Maglev for this one route would be many times greater than the cost of the Maglev Test Facility (~$120 million a year for 5 years).** Moreover, the Maglev route would be privately financed and not need government subsidies while the passenger only High Speed Rail systems in Europe require government financing and continued subsidies.

Summary of the National Benefits of Evolving Amtrak to the National Maglev Network

Realistic projections of current trends in population growth, oil production, the vital need to stimulate our manufacturing and industrial base, and the global trade deficit justify evolving Amtrak to Maglev. Evolving Amtrak is doable and a political "no-brainer."

- Amtrak ridership and revenues will dramatically increase as speed and convenience improves.
- Amtrak's employees would smoothly transition to the National Maglev Network and sustain the employee's and management experience in providing uninterrupted passenger service.
- Using *existing* Railway and Interstate Highway rights-of-way for quiet, non-polluting guided surface transport is good land use policy and would be much more popular than building new highway lanes with the attendant toxic smog, noise pollution, and the historically protracted environmental permitting delays.
- Using Maglev transport system guideways (elevated, surface, and converted rail) would eliminate present problems of Amtrak with regard to its conflict with conventional freight trains on the heavy-use freight routes that are currently part of the present Amtrak national system as well as the deaths and injuries at Amtrak road crossings. This can be achieved by evolving Amtrak to dedicated Maglev guideways. Freight rail will then be able to increase its average speed and improve the productivity of rail freight.
- 300 mph Amtrak service between metropolitan areas will reduce congestion in the airways around the Nation's airports.
- 300 mph Highway Freight Truck Maglev Ferrying service will relieve the highway congestion around our Metropolitan area and will improve commuting conditions.

National Economic Benefits: Short and Long-Term

The science and engineering community is very concerned that the United States technical competency is declining and may not be able to meet future challenges in the global marketplace. Evolving Amtrak to a totally new transportation system, the first since the airplane, will galvanize U.S. science and engineering, creating hundreds of thousands of new jobs.

Evolving Amtrak to a totally new transportation system -- the first since the airplane -- will galvanize U.S. science and engineering, creating hundreds of thousands of new sustainable iobs.

The Maglev industries created by the stimulus of evolving Amtrak to Maglev passenger and freight service would create a strongly competitive U.S. industry in the global marketplace. The market demand for this highly efficient mode of transport will grow because of the need for non-oil transport and the urgent need to constrain the emissions of global warming gasses. Because of the decline in oil reserve discovery, the rapid decline in existing reserves (about 9% according to the latest IEA report), and unlikelihood of finding a substitute for oil (synthetic, hydrogen, and biofuels) that would not pose a catastrophic increase in emissions global warming gasses, interfere with global food security or be technically infeasible, **electrification of transport is inevitable**. The inherent productivity and economic value of high-speed Maglev passenger and highway freight compared to existing modes of transport will sustain jobs and economic returns far into the future.

Maglev will be a major mode of World Transport in the 21st Century because of its many important benefits in terms of:

- Much higher energy efficiency
- Independence from oil
- Elimination of greenhouse gas emissions
- Much lower transport cost than other modes, including highways, airways, and high-speed rail
- Does not need government financing and subsidies
- Reduced accidental deaths and injuries and damage to public health from pollutants
- Faster, more convenient transport
- Improved economic productivity

In the U.S., Amtrak's new 25,000-mile National Maglev Network, in combination with electric automobiles, could completely eliminate oil imports by 2030 AD. It would interconnect all major U.S. metropolitan areas by 300 mph Maglev vehicles operating on elevated monorail guideway erected on the rights-of-way alongside the existing Federally funded highway system. In urban/suburban regions, Amtrak Maglev vehicles would operate on existing RR trackage on which thin, ultra-low cost aluminum loop panels have been attached to the crossties, enabling levitated travel of the Maglev vehicles.

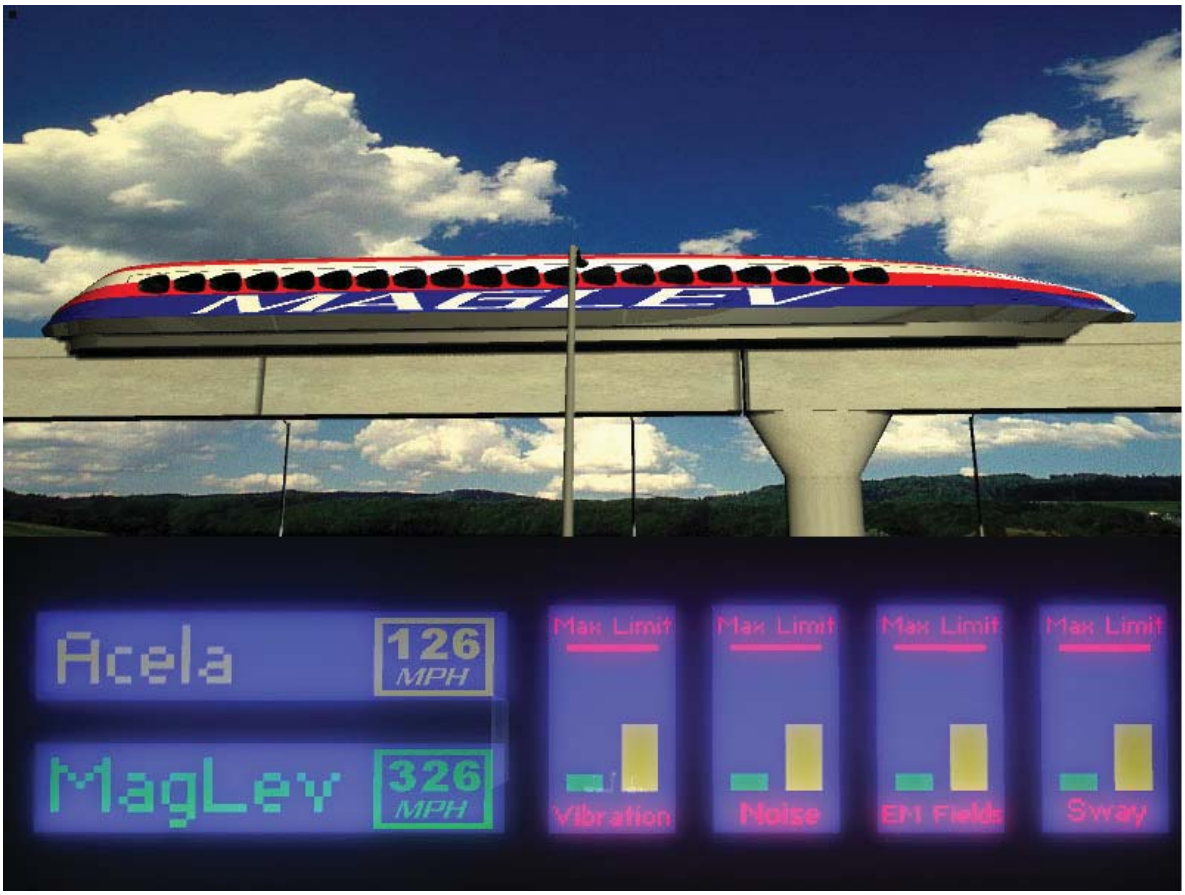
The unique electronic switching capability of the Powell-Danby 2nd generation Maglev system enables vehicles to electronically switch off the main guideway route to off-line stations for unloading and loading operations. P-D Maglev vehicles can then travel at full speed along the main guideway, switching off to the stations they are scheduled to stop at, and by-passing these that are not scheduled for stops. In this manner, high average vehicle speed can be maintained, even where there are multiple closely spaced stations for convenient access.

Maglev vehicles can be configured to carry different types of transport – passenger only, highway trucks, freight containers, and personal autos. **The revenues from transporting freight trucks on Maglev--just**

1/5th of the highway trucks now on traveling Interstate Highways--will pay back the cost of a Maglev route in less than 5 years. As a result, the Amtrak Maglev National Network can be privately financed once it has been demonstrated at the Maglev Test Facility.

By developing a U.S. based 2nd generation Maglev System, America has the opportunity to become the World leader in 21st Century Transport. An American Maglev industry would generate 1.2 million jobs in the construction of the U.S. network and vehicle manufacturing. As many Billions of dollars in annual exports are developed the number of U.S. jobs could double. One container ship can carry 20 miles of pre-fabricated P-D Maglev-guideway along with Maglev vehicles. However, the container ships can either sail out of U.S. Seaports, or into them, bringing Maglev guideways and vehicles from abroad.

The U.S. still has the opportunity to develop the 2nd generation Maglev system. If it does not act now to seize this opportunity, the advanced Maglev system will be developed abroad and exported to the U.S., adding to our trade deficit and the job loss resulting from a declining manufacturing industry.



Please review the short Maglev Vision video at:
http://www.readinessresource.net/maglev/2000.html