The Death of Oil – The Birth of Electric Transport

James Powell, Gordon Danby, and James Jordan

Rest in Peace, Oil. Although not yet completely dead, you soon will be, well within our lifetimes. We hate to see you go. In 100 years, thanks to you, we have gone from horse drawn wagons and coal fired trains to marvelous automobiles, long distance trucks, and jet airliners. We go where and when we want at low cost – at least until recently. We cross the continent in a few hours, and fly across the oceans to distant lands.

Each year, the average American drives 10,000 miles, flies 2000, and delights in the 5000 ton miles of food and goods trucked to him/her. Without oil fueled autos, trucks, and airplanes our living standards would collapse. We would look back to the Great Depression and sigh, "They really had it good."

As much as we love you, we don't want to die with you. Right now, panic is setting in as we begin to realize that World Oil is running out. Some refuse to accept this reality, believing that there will always be enough oil if we just drill everywhere. Others grab at straws, like biofuels or hydrogen cars – anything that might substitute for oil. However, very few think through the long term catastrophic consequences if these substitutes were implemented on a large scale. More and more, short term thinking and actions are hurting America's long-term future.

A new form of transport based on electricity, not oil, is being born. Electric transport will be cleaner, safer, faster, cheaper , and more convenient than oil-based transport. For short trips, up to 100 miles or so, electric autos are practical. For longer trips take Maglev, the first new mode of transport since the airplane. Maglev (Magnetic Levitation) vehicles are magnetically levitated and propelled along guideways at hundreds of mph without mechanical contact or friction. Maglev uses electricity, not oil, emits no pollution and greenhouse gases, and is much cheaper and more energy efficient than auto and airplanes.

The 25,000 mile National Maglev Network, built alongside existing Interstate Highways and railways , will carry passengers, personal autos, highway trucks and freight containers at airplane speeds. The Network will connect all lower 48 states in a seamless web. 70% of the U.S. population will live and work within 15 miles of a Maglev station, from which they can go anywhere in the U.S. at less cost than driving, flying, or taking a train.

1st generation passenger Maglev systems already operate in Japan, Germany, and China. The new 2nd generation Maglev 2000 system will be much cheaper to build, and can be privately financed without government funding and subsidies.

Because of its environmental and economic benefits, electric transport needs to happen quickly. Today, America spends 700 Billion dollars a year on imported oil. When oil reaches $200 a barrel in a couple of years, our oil trade deficit will be 1000 Billion

dollars per year. To pay for imported oil, we borrow from other countries and sell off pieces of the U.S. – toll roads, airports, seaports, companies, real estate, public works, etc. Soon we will sell off our farmland and America will be bankrupt.

Three powerful forces prevent the U.S. from transitioning to Electric Transport.

1. Denial that World Oil is running out
2. Belief that alternative fuels – biofuels, hydrogen or synfuels – can take over from oil
3. Lobbying against electric transport from existing transport industries.

Am example of the lobbying opposition to Maglev is the fate of Senator Daniel Patrick Moynihan's proposal to develop a U.S. Maglev System for a 25,000 mile National Maglev Network on the rights of way of the U.S. Interstate Highway System. We (Powell and Danby) served as co-chairmen of the Maglev Task Force that provided technology input to the Committee.

Senator Moynihan's $750 million Maglev program (twice that in today's dollars) passed the Senate in 1990 but was killed in the House by vested transport interests. Had it become law, the U.S. would now have a National Maglev Network, with little or no oil imports, and a multi-Billion dollar Maglev industry with hundreds of thousand of high paying jobs.

Denial that World Oil is Running Out

Many refuse to acknowledge that World oil is running out. They believe that somewhere, somehow, enough new oil will be discovered to keep our autos, trucks, and airplanes operating far into the future.

Here are the facts. For every 10 barrels of oil consumed only 4 new ones are discovered. The 10 largest new oil fields found in the last 10 years will only supply 1 years worth of World oil consumption. The Tupil oil field recently discovered in the deep waters off the coast of Brazil, hailed as a major find, holds only 5 Billion barrels, about 2 months of supply at the current World consumption of 30 Billion barrels annually.

More facts. Oil production in countries outside the Middle-East has already peaked and is in decline. Total World production has plateaued, and will start to decline in the next few years. World oil demand is rising as countries like China and India rapidly industrialize. The U.S., which consumes 25% of the World's oil, has a per capita consumption of 25 barrels per person per year. The rest of the World only averages 3.7 barrels per person per year.. As globalization continues and more countries industrialize, America's per capita share of the World Oil will shrink precipitously. In 2050, with a World population of 9 Billion and an optimistic oil production of 20 Billion barrels annually, World average consumption will be only 2 barrels per person per year – over 10 times less than current U.S. consumption. The U.S. economy, with its sprawling, long distance transport requirements, cannot function at such a low level of oil consumption.

The Unintended and Catastrophic Consequences of Alternative Fuels

Biofuels, which were the rage just a short while ago, are now seen as a major mistake. They only supply a tiny fraction of transport fuel needs, and dramatically drive up food prices, causing increased hunger and food riots in many countries.

20% of the present U.S. corn crop goes to making 6.5 Billion gallons of ethanol annually. 1 gallon of ethanol does *not* equal 1 gallon of gasoline, a fact that ethanol advocates neglect to mention. In fact, 1 gallon of ethanol equals 2/3 of a gallon of gasoline in combustion energy, and only 1/4 of a gallon of gasoline after the fossil energy needed to fertilize, grow, harvest, transport, and process corn to ethanol is deducted, according to USDA analyses.

So the 6.5 Billion gallons of ethanol is really only equal to 1.6 billion gallons of gasoline. The U.S. consumes 180 Billion gallons of gasoline and diesel fuel per year, over 100 times greater than 20% of the U.S. corn crop can supply. Ethanol *cannot* meet U.S. transport fuel needs.

Ethanol advocates dodge the issue of its impact on food availability and price, saying that ultimately, it will come from non-food crops like switch grass. However, as World population swells to 9 Billion, every acre of arable land will be needed for food. Moreover, world soil fertility is declining alarmingly – topsoil is washing away (1% per year in the U.S.), desertification and salting up of irrigated lands is increasing, and soil nutrients are depleting. What grew on the American prairie before farmers plowed it for corn? Switchgrass! When Parisians rioted for bread, Marie Antoinette said "Let them eat cake". It didn't work then and "Let them eat switch grass" won't work today.

Growing biofuels to meet even a small fraction of transport fuel needs will lead to the starvation of millions of people and revolution in many countries.

Hydrogen sounds great – "only water out of the tail pipe". Snazzy hydrogen cars are already on the road. However, serious problems will prevent large scale use. Hydrogen is not found free in nature, but must be manufactured using enormous amounts of energy. Electrolyzing water to produce hydrogen fuel equivalent to current U.S. consumption of gasoline and diesel fuel would require doubling U.S. electrical output from 4 Trillion Kilowatt Hours per year to 8 Trillion Kilowatt Hours. Hydrogen safety and security is an even greater problem. Hydrogen cars carry large tanks of high pressure (5,000 psi) gas or thermally insulated liquid hydrogen at 420 degrees below zero.

If a car's hydrogen leaks into the surrounding air to form a detonatable mixture, the resulting explosion can have the power of hundreds of pounds of TNT. 200 million hydrogen cars traveling at 70 mph on congested highways is scary enough, but far worse is hydrogen cars in the hands of terrorists. Amazingly, no one seems to have worried what terrorists and criminals could do with hydrogen cars. Why bother to steal explosives or mix fuel oil with fertilizer? Just steal a hydrogen car – a million are stolen in the U.S. each year – attach a small package to the fuel tank and park the car in an underground garage beneath a building or on a city street, and leave. The package, when

triggered by a cell phone call or a preset timer, would drive a high velocity projectile into the hydrogen tank, causing its contents to spew out and mix with the surrounding air in a few seconds. A separate ignition trigger would then detonate the hydrogen-air mixture. The resulting damage and loss of life would be horrendous. The initial detonation would cause a cascade of secondary detonations in the nearby hydrogen cars in the underground garage, possibly bringing down the building above.

Even easier, don't steal a car. Just slide the small trigger package under an adjacent hydrogen car as you prepare to leave the garage. 2 or 3 explosions per day with time out for lunch. The trigger package could easily be made from available gun shop materials and sold on the black market for a tidy profit, no questions asked. Not just terrorists, but ordinary criminals would probably be buyers. Want to get rid of a business, political or sexual rival? Want to expedite an inheritance or life insurance payout? Just step up to the counter! His car exploded? It must have been a terrorist! There are 30,000 murders a year in the U.S. There probably would be lots more if it were easy to do and a terrorist could be blamed.

Society could not function in the face of frequent hydrogen explosions, and the many real and false-alarms - both deliberate and accidental - that would occur.

Before hydrogen cars are implemented on a large scale, it must be demonstrated that there are no serious safety and security problems. Hydrogen cars should be provided to a number of "Red Teams" whose members want to blow them up. The Red Teams should be completely independent of the car manufacturer, the government and any group advocating hydrogen cars. If a Red Team can blow up hydrogen cars, terrorists surely can do the same.

Synfuels from coal, tar sands, and oil shale are practical and affordable. Available fossil reserves could meet world transport fuel needs for at least 100 years.

The problem with synfuels is their carbon dioxide emissions. Today, each of America's 200 million cars emits 10 tons of carbon dioxide per year from its tailpipe, for a total U.S. emission of 2 Billion tons per year. Fueling the 200 million cars with synfuels would generate an additional 2 Billion tons of carbon dioxide per year at the synfuel production plants, resulting in a total of 4 Billion tons annually from America's 200 million cars.

By 2050, if the World continues to industrialize at its present pace, there will be 2 Billion cars and trucks in the World. Using synfuels, global production of carbon dioxide, just for transport alone, would be 40 Billion tons annually. The recent meeting of the G-8 leaders called for cutting carbon dioxide emissions, now at 25 Billion tons per year in half, down to 12.5 Billion tons, to keep global warming from becoming a catastrophe. Such reduction would be impossible using synfuels, even if all other sources of carbon dioxide – fossil fueled power plants, fertilizer production from natural gas, plastics production, home heating with gas and oil, etc, were to go to zero.

Achieving the goal of 12.5 Billion tons per year of carbon dioxide emissions would be impossible, even if the massive amounts of carbon dioxide from the synfuel production plants could be stored safely underground, a very uncertain possibility. There is no practical way to capture and collect carbon dioxide emissions from individual cars for underground storage.

Sustaining oil based transport systems with synfuels will accelerate global warming and ocean acidification, and risks environmental catastrophe.

So, there appears to be no way out for our present oil fueled autos, trucks, and airplanes. Gasoline and diesel fuel will be ever scarcer and more expensive as World oil runs out. Alternative fuels cannot take over from oil. Biofuels supply only very small amounts of fuel, while dramatically increasing World hunger and the cost of food. Hydrogen has insurmountable safety and security problems, and synfuels lead to environmental catastrophe. Electric transport is the only safe , secure, socially stable,, and environmentally acceptable long-term solution.

What will travel by electric transport be like?

Riding on Maglev

Despite the many stories about Maglev being a "faster train", it is nothing like a conventional train. Instead of a long string of cars pulled by a heavy locomotive along a steel rail track, individual Maglev vehicles are magnetically levitated above and propelled along a guideway with no physical contact. Two 1st generation versions of Maglev are now operating: the Superconducting Maglev system in Japan, which was invented by Powell and Danby in 1966, and Electromagnetic Maglev, called Transrapid, developed in Germany and operating in Shanghai, China. The two versions are very different. The Japanese Maglev uses powerful superconducting magnets located on the vehicles to induce currents in loops of aluminum wire located on the guideway. The magnetic interaction between the vehicle's magnets and the aluminum loops levitate the vehicle 4 inches above the guideway. The levitation process is inherently and passively completely stable – no external force, whether hurricane winds, up or down grades, or curves, can make the vehicle contact the track.

In contrast, the Transrapid electromagnetic maglev uses conventional electromagnets on the vehicle that are attracted upwards to iron rails located on the guideway. The gap between vehicles and guideway is very small, about 3/8 of an inch. Moreover, the suspension, unlike superconducting Maglev, is inherently unstable, requiring fast servo control of the electromagnetic current, on the time scale of thousandths of a second, to maintain the 3/8 inch gap between vehicle and guideway.

The Maglev vehicles are magnetically propelled along the guideway by a small AC current in the guideway loops. There is none of the mechanical rolling friction experienced with conventional trains, only aerodynamic drag that is minimized by streamlining. Vehicle speed is controlled by the frequency of the AC Drive current – to accelerate, frequency increases, to decelerate, frequency decreases, and the vehicles

kinetic energy goes back into the electrical grid. Vehicle speed cannot change, regardless of head or tail winds, or up and down grades, and the distance between vehicles always remains constant.

Japanese 1st generation superconducting Maglev vehicles at the Yamanashi test facility have carried over 50,000 passengers at speeds up to 361 mph (the World record). (See Photo) 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. The route will run through the mountains in Central Japan, with 60% in deep tunnels.

The 1st generation Maglev Systems, though technically and operationally successful, have major limitations that prevent them from being applied on a large scale in the U.S. They are very expensive to construct, they only carry passengers and not truck type freight, they cannot electronically switch at high speed to off line stations for loading and unloading, and they cannot use existing railroad tracks in dense urban and suburban areas.

The new 2nd generation Maglev 2000 system developed by Powell and Danby overcomes these limitations. (See drawing of M-2000 vehicle) The M-2000 vehicles can operate on low cost prefabricated monorails as well as planar surfaces, be configured to carry fully loaded highway trucks, freight containers or passengers, electronically switch at high speeds to off-line stations, and travel levitated along existing railroad tracks by attaching thin panels that contain aluminum loops to the RR crossties (Conventional trains can still use the same tracks with appropriate scheduling).

For the high-speed portions of a Maglev route between metropolitan areas an elevated monorail type guideway is used. To minimize construction time and cost, prefabricated guideway beams and piers with their attached aluminum loops, controls, etc., can be transported by truck or rail to the Maglev 2000 construction site, then to be quickly erected by cranes onto pre-poured concrete footings. Total guideway construction cost is then only 20 million dollars per 2 way mile, much less than the 60 million dollars or more per mile for the 1st generation systems. For the export trade, one container ship can carry 20 miles of complete Maglev 2000 guideway, ready for quick erection at any site in the World.

The major components of the 2nd generation Maglev 2000 system that distinguish it from the 1st generation system have been designed, built at full scale, tested, and documented. These components, include: the new Quadrupole Magnets assembled into Magnet Pods, guideway loop assemblies, a 72 foot long guideway beam, and an aluminum chassis and a plywood fuselage for a 60 foot Maglev suburban commuter vehicle. The Quadrupole Magnet Pods give the Maglev 2000 transport system the unique capability to carry heavy highway freight trucks at high speeds, and operate in a planar mode as well as a monorail mode. This unique planar capability gives the new Maglev 2000 system the advantage of electronically switching at high speeds, a capability not available to 1st generation Maglev systems. They must switch by physically moving long and heavy sections of guideway. Using the planar mode capability of the new Quadrupole Magnets, levitated

Maglev vehicles can travel on existing railroad tracks. This gives the Maglev-2000 transport system a clear advantage in cost and performance over the European high-speed steel wheel trains such as the French TGV, the German ICE, and the Japanese "Bullet" train. It is faster, smoother, and more energy efficient and costs less to build, operate and maintain. The Maglev 2000 system makes wheeled high speed rail systems obsolete.

U.S. National Maglev Network Can Be Built Without Government Funding and Subsidies

The big transport market in the U.S. is intercity trucks. America spends over $300 Billion dollars annually on intercity truck transport, compared to only 60 Billion dollars for air passengers and 3 Billion dollars for rail passengers. The revenues from carrying 3000 highway trucks per day on a Maglev route – just 1/5 of the daily truck traffic on a typical U.S. Interstate Highway – equals the revenue from 180,000 passengers per day. Just the revenues from carrying trucks will pay back the cost of a Maglev route in less than 5 years, making it possible for private investment to build and operate the U.S. National Maglev Network without government funding and subsidies. People could ride for free, if the owners were feeling generous.

Maglev 2000 is also unique in that it will travel along existing railroad tracks in dense urban and suburban regions. The cost to modify existing trackage to enable levitated travel by Maglev vehicles is very small, only 3 or 4 million dollars per mile. No Boston Big Digs needed – no very expensive tearing down and reworking of existing infrastructure. Just use the existing RR infrastructure to rapidly move people inside a given metropolitan area. The new high speed guideway, built along the existing Interstate Highways, would transport people from one metropolitan area to another.

The National Maglev 2000 Network would interconnect all of the U.S. metropolitan areas with populations of several hundred thousand persons or more into a seamless web. A traveler boarding a Maglev vehicle at any point in the web could quickly reach any other point in the U.S. at speeds up to 300 mph.

As they travel, Maglev passengers will feel like they are sitting in their living room – a quiet environment with no engine or rail noise, no vibration from rails or jet engines, comfortable seats with lots of leg and aisle room, no ear-popping pressure changes, no turbulence, no scary landings, and no delays due to weather or flight cancellations. Departures and arrivals would be every few minutes, instead of a few times per day for airplanes and trains, and always on time.

As examples of what it would be like to travel on Maglev, we describe 3 typical trips on this National Maglev Network:

- Henry J, traveling as a passenger from New York City to Chicago, a distance of 810 miles
- Tom W, taking his family of 4, plus their personal auto from San Diego to Seattle, a distance of 1265 miles

- Frank M, a trucker carrying a load of fresh produce from the Central Valley in California to Philadelphia, a distance of 2800 miles.

Average travel speed on the Maglev Network will be somewhat less than cruising speed, due to the time to accelerate and decelerate, plus time for intermediate stops. An average travel speed of 250 mph is readily achievable.

Henry J. would make the trip from NY To Chicago in 3 hours and 15 minutes – an hour or so longer than if he flew. On the other hand, Chicago bound Maglev vehicles would leave every half hour, while airplane flights would be less frequent. Moreover, Henry J's Maglev station is much closer and more convenient than the airport, and he doesn't have to get there 2 hours ahead of time. Regardless of foul weather, he would depart and arrive on schedule instead of experiencing a flight delay.

If Henry J. drives from NYC to Chicago it would take 14 hours at an average speed of 60 mph. He would probably have to stop at a motel, unless he was young and full of energy. He would also have to buy 40 gallons of gas for his 20 mpg auto. Cost by Maglev? $80 (10 cents per passenger mile.) Cost by airplane? $219 for an average fare and probably much more, depending on availability. Cost by Amtrak? $175 and 19 hours on the Lake Shore Limited. Cost by driving? $250 ($170 for gas @ $4.25/gallon, plus $80 for a night at a motel) plus the wear and tear on the car and Henry J. Which option will Henry choose? It's Maglev, of course, – a no-brainer.

Now think of Tom W. and his family on their trip from San Diego to Seattle. Air travel is not an option for Tom – it's difficult to take a personal auto on an airplane. By Maglev, it will cost $200 one way for the family and their car, with a trip time of 5 hours. The Maglev vehicle would carry 15 cars with the passengers seated in a separate cabin. Driving from San Diego to Seattle would take 3 days (21 hours at 60 mph). Assuming 8 hours driving per day – the maximum with kids – the family would have to stay 2 nights at a motel. Total trip cost would be $430 (2 nights at $80 per night plus 63 gallons of gas at $4.25 per gallon), plus the wear and tear on the car and the family. Plus, driving a round trip would use up half of a 2 week vacation that could be better spent seeing Grandma and Grandpa in Seattle. Again, a no-brainer – take Maglev.

Finally, to Frank M and his 2,800 mile truck trip from central California to Philadelphia. Driving by highway would take almost 5 days, assuming 10 hours driving per day and 60 mph on congested highways. By Maglev, it would take only 11 hours and he could sleep during the trip. During the 5 days it would take to drive one-load across the continent, Frank could deliver 5 loads using Maglev and the same truck. The payoff is obvious whether Frank is an independent trucker or a driver for a shipping company. Frank would choose Maglev.

How Much Will It Cost and How Long Will It Take?

The projected construction cost for the 25,000 mile National Maglev Network is 500 Billion dollars to be built over a 20 year period. While a lot of money, it is tiny in comparison to the 20,000 Billion dollars that America will spend on imported oil over the

same 20 year period at an average – and conservative – price of $200 per barrel, if the National Maglev Network is not built. The payback time for the construction cost is less than 5 years, so the National Network can be privately financed, without the need for government funding and subsidies.

The initial phase of the National Network, termed the Maglev Golden Spike Project (Map attached) would be completed by May 19, 2019, the 150th anniversary of the completion of the Transcontinental railroad in 1869 at Promontory, Utah. The 6,150 mile Golden Spike routes would connect the East and West coasts, plus having North-South routes along both coasts. The full 25,000 mile National Network would be completed by 2030. The pace of construction while rapid, would actually be substantially slower than that of the Interstate Highway System, which was built in the 1960's and 70's.

The long-term benefits of electric transport appear so great, as compared to continuing with oil based transport, that it is difficult to understand why policy makers and the public's are failing to begin the transition.

With electric transport – electric cars and Maglev – America can become independent of imported oil, eliminate our enormous trade deficit, which is primarily due to imported oil, greatly reduce greenhouse gas emissions and their effect on global warming, save energy, save thousands of lives now lost in highway accidents and to the impact of toxic particulates and pollutants on the public, reduce travel time and cost, reduce congestion and provide hundreds of thousands of new, high paying jobs.

Staying with oil-based transport, America will pay ever higher prices for gasoline, diesel fuel, and home heating oil - $7 a gallon will seem cheap in a few years - greatly increase our already enormous trade deficit, further depreciate the dollar, increase greenhouse gas emissions, drive up food prices because of biofuels production, harm peoples' health from toxic pollutants and particulates from cars and trucks, and on and on.

The choice is clear and simple, America should begin the transition to electric transport now, and make it a national priority. If we move on the electric transport initiative quickly we can capture a global market, arrest the decline in manufactured exports, and head off U.S. bankruptcy.

U. S. Transport Firsts
1820 - The first toll is collected on the Erie Canal.
1869 – Transcontinental Railroad
1903 – Wright Brothers
1914 - The Panama Canal is formally opened to traffic.
1956 – Interstate Highway
1969 – Moon Landing
2019 – Superconducting Maglev Golden Spike
Unless U.S. acts soon other nations (e.g. China) will manufacture 2nd generation Superconducting Maglev & export it to U.S.

James R. Powell, Ph.D. served as a senior scientist at Brookhaven National Laboratory (BNL) from 1956 through 1996. His experiences have led to significant advances in the design and analysis of advanced reactor systems, cryogenic and super conducting power transmission, plasma physics, mine safety, fusion reactor technology, electronuclear (accelerator) breeder systems, transmutation of nuclear wastes, space nuclear thermal propulsion, electromagnetic hypervelocity guns, hydrogen and synthetic fuels, and transportation infrastructure.

He holds patents for the Particle Bed Reactor (PBR) for nuclear rocket propulsion, the use of aluminum structure in fusion reactors; blankets employing solid lithium ceramics and alloys for tritium breeding; and, demountable super conducting magnet systems and the advanced vitrification system for high-level nuclear and toxic wastes, as well as many recent patents on their 2nd Generation Advanced Maglev System. He and Dr. Danby are the holders of the first patent for superconducting Maglev in 1968, as well as many recent patents on their 2 nd Generation advanced maglev system.

Dr. Powell holds a Bachelor of Science in Chemical Engineering from the Carnegie Institute of Technology and a Doctor of Science in nuclear engineering earned in 1958 from the Massachusetts Institute of Technology. Dr. Powell has published almost 500 professional papers and reports. He is a member of the American Nuclear Society.

Gordon Danby, Ph.D. together with Dr. Powell, was awarded the Franklin Institute Medal 2000 for Engineering for their Maglev inventions. He retired from Brookhaven National Laboratory where he worked on the theory and experimental development of accelerators and magnetic detectors for the study of basic properties of matter. Gordon Danby is widely respected for his contribution to the practical application of theoretical science to technology. His peers have recognized his achievements in changing the magnetic resonance imaging and transportation industries.

From the Franklin Award citation, *"Danby's pioneering research efforts in magnetic technology led to the production of open Magnetic Resonance Imaging (MRI) machines that are better, faster and more patient friendly than their tunnel-style predecessors. Danby, along with James Powell, also invented the Superconducting Maglev, a magnetically levitated, high speed train system. The practical and efficient design of the Maglev provides mixed freight and passenger service and interfaces easily with other transport modes."*

Dr. Danby received his B.S. in physics and math from Carleton University in Ottawa, Canada, and his Ph.D. in nuclear physics from McGill University in Montreal, Canada. He is a fellow of the American Physical Society. In 1983, the New York Academy of Sciences honored Danby with the Boris Pregel Award for Applied Science and Technology..

James C. Jordan, The national energy crisis of the late 1970s focused the Navy career of James Jordan. The new era of scarce oil and rapid increases in oil prices dramatically underscored the growing dependence of the U.S. economy on imported oil. Commander Jordan, served as the first director of the Navy Energy R&D program office in the Pentagon. As director, he developed strategies and technologies aimed at sustaining military and national economic security in the new oil reality.

In 1979, Mr. Jordan retired from the Navy and became a senior policy advisor to Senator John C. Stennis. In this capacity, Mr. Jordan was a Senate staff leader in energy, environmental, transportation and agricultural policy.

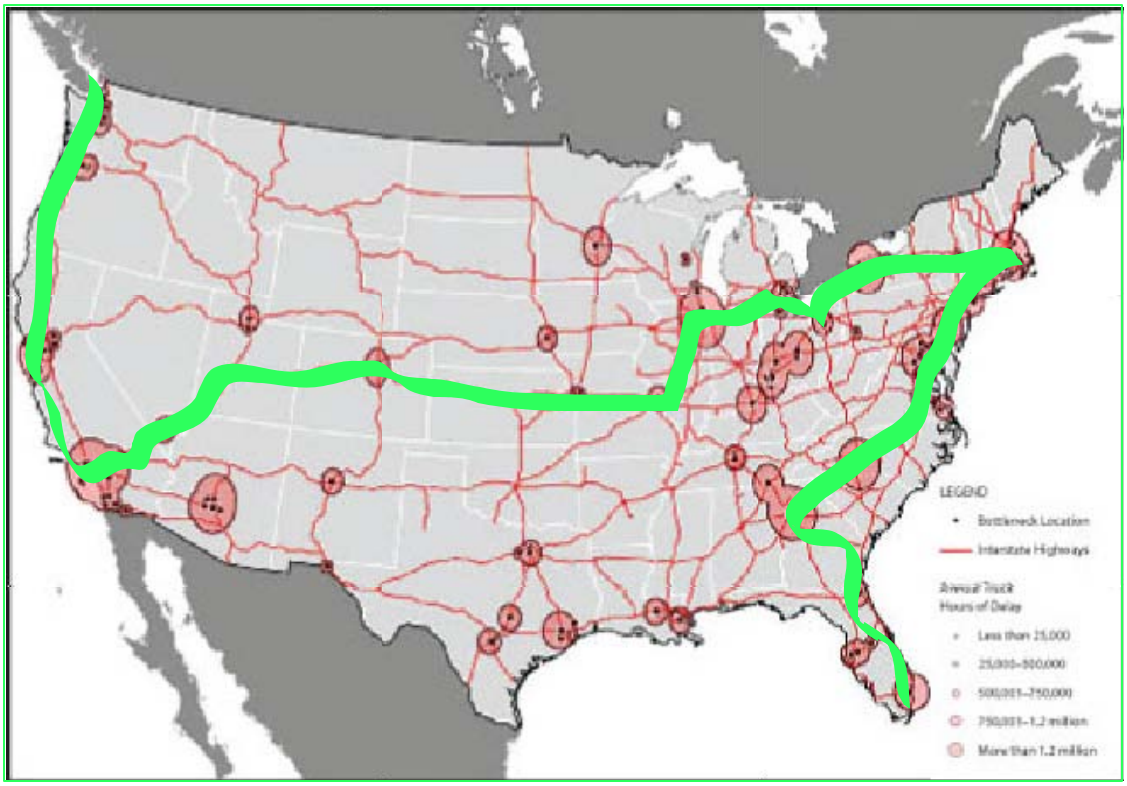
In 1989, after leaving U.S. Senate service, Mr. Jordan founded James Jordan Associates, Inc. (JJA), a company that provided strategic advice to private businesses involved in the development and implementation of advanced technologies. JJA's achievements have been notable in the field of earth science, energy, transportation, water and agriculture.

Currently, Mr. Jordan is Executive Vice President of Maglev 2000 and President of the Interstate Maglev Project, (IMP) (www.magneticglide.com). IMP was founded to raise funds to demonstrate Maglev 2000, a 2nd generation super conducting magnetic levitated transport system.

Mr. Jordan and James Powell co-authored, "The Wolf is at the Door, A Common Sense Approach to Sustaining the U.S. and other Advanced Economies After Global Oil Production Peaks", a white paper. presented to the Secretary of Transportation in 2004; "After the Oil Runs Out" published in the Washington Post, June 6, 2004; and "The False Hope of Biofuels, For Energy and Environmental Reasons, Ethanol Will Never Replace Gasoline", published in the Washington Post on Sunday, July 2, 2006. These Op-Ed articles were excerpts from a book, which they are authoring, working title, "Maglev: the Pathway to The Electric Century". They make the case that the practical and lowest cost way to end World dependence on scarce oil and sustain civilization is to evolve oil fueled autos, trucks, rail and cargo ships to electric transport, eliminate emissions from coal-fired electric plants, expand renewable electric generating technologies, isolate radioactive waste from the biosphere and build 4th generation nuclear power systems, based on a sustainable Thorium fuel cycle.

Education: MBA, Harvard Business School, Cambridge, MA; Distinguished Graduate Industrial College of the Armed Forces at the National Defense University, Washington, DC; B.A., University of North Carolina, Chapel Hill, NC

Drawings & Photos for Article


LEGEND
Bottleneck Location
Interstate Highways
Annual Truck Hours of Delay
Less than 25,000
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500,001–750,000
750,001–1.2 million
More than 1.2 million