

RETHINKING TRANSPORTATION

The Dream of Fast, Safe and Clean Transportation Is Now Within Reach



THE ADVANCED TRANSIT ASSOCIATION

This report was prepared by the Advanced Transit Association (ATRA) an international association of active and retired transportation professionals, engineers, transit suppliers, planners, and consultants, architects, urban planners, students, educators, and enthusiasts. It is a diverse group of people brought together by the common realization that the transportation systems of the past cannot meet the transportation needs of the future, or even the present. A non-profit corporation, ATRA's purpose is not to promote the interests of its members, but rather to encourage the development and deployment of advanced transportation systems that will be a boon to everyone. Membership is open to anyone who is willing to take a fresh look at new ways to meet our transportation needs. We do not endorse any particular company or product, but we can serve as an objective information resource to help people navigate the often complex issues surrounding transportation choices.



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SUMMARY

All of the major forms of metropolitan transportation that we use today – cars, buses, trains, subways, and light rail – have been with us for over a century, with only superficial changes during that time. In many ways they have served us well, but at the cost of crashes, air pollution, greenhouse gas emissions, dependence on foreign and deep-sea oil, congestion, and cities that are often more hospitable to cars than to people.

The solutions currently being implemented – electric and alternative fuel cars, wider roads and more freeways, congestion pricing and self-driving cars – each address only a part of the problem. And mass transit is so expensive it strains public budgets, and is so slow and inflexible that most people refuse to use it. Our best efforts so far have succeeded only in arresting further decline. In most respects we are still losing ground. So there is a pressing need to look for a better approach.

We are already on a path to almost completely rebuild our transportation systems. But to achieve a breakthrough in mobility will require the introduction of a new kind of infrastructure. This is not only possible, it happens routinely, as it has with railroads, the interstate highway system, television, cell-phones, and the Internet. With that in mind, we can take a broader look at new opportunities.

Chief among these is a new, more advanced, form of transit, known as **Personal Rapid Transit (PRT)**. It uses automatic personal electric vehicles to provide on-demand service directly to your destination without stopping. These vehicles, called pods, travel unimpeded over a network of narrow guideways, that can be elevated to keep them separated from pedestrians and other traffic. Practical, safe, and energy efficient, PRT combines the advantages of the automobile and public transit, without the disadvantages of either.

PRT has been designed with affordability in mind. It keeps construction costs down by using less land, less site preparation, and less building material. And it keeps operating costs down by using less labor and less energy. But the key to making any transportation system pay for itself is to attract lots of riders. The unparalleled quality of service that PRT can provide is sure to win over more riders than older forms of public transit. PRT systems can be built without any increase in current levels of transportation spending – merely by reallocating expenditures from less effective modes of transport.

The first demonstration system has been a resounding success in over thirty-five years of passenger service. Support for PRT is rapidly building, and new systems are coming into operation in several countries. Currently there are three companies that have commercially-available PRT systems, and more are on the way.

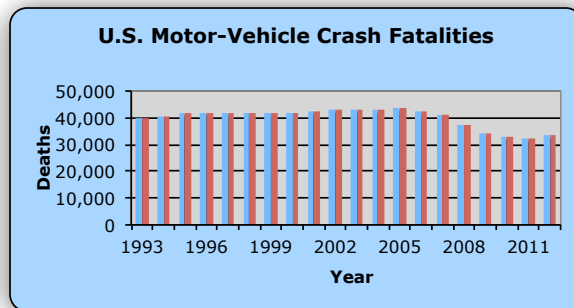
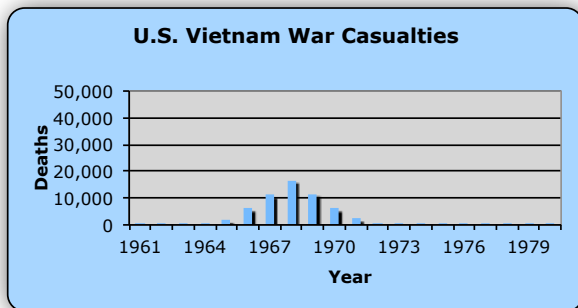
PRT is cleaner, faster, safer, quieter, and more enjoyable to ride than any ground transportation system currently in use. It is proven technology that is available now, and if properly designed, it can effectively address the full range of transportation problems that plague us today. The Advanced Transit Association invites you to preview the exciting future of transportation described in the remainder of this report. We're confident that the more you know about PRT, the more you'll like it.

THE PRICE WE PAY

Automobiles and public transit have provided residents of the modern city unprecedented personal freedom and mobility. But these benefits have come at a high cost. To understand why the time has come to consider new kinds of transportation systems, let's begin by taking a hard look at what's wrong with how we get around today in the modern metropolis. There isn't a universal consensus that each of these issues represents a significant problem, but everyone can agree that, taken together, these problems justify a serious reexamination of transportation tradition.

Crashes

Notwithstanding some recent improvement, there are still more than 5.6 million motor-vehicle crashes on America's highways each year, injuring some 2.3 million people. Worse still, more than 33,000 of those people will die of their injuries within six months.¹ To put that in perspective, compare it to deaths in the Vietnam War.² Every two years we lose as many lives on American streets and highways as were lost in the war in Indochina, plus the 9/11 attacks.



The U.S. National Highway Traffic Safety Administration (NHTSA) estimates that deaths and injuries resulting from motor-vehicle crashes are the leading cause of death for persons between the ages of 4 and 33 in the United States.³ The World Health Organization estimates that worldwide nearly 1.2 million people die, and at least 20 million are injured or disabled each year as a result of road traffic injuries.⁴

In another study⁵, NHTSA estimated that crashes cost Americans \$871 billion annually in economic loss and societal harm. No statistic can convey the heartbreak and anguish suffered by crash victims and their friends and families. But we have come to accept crashes as “just one of those things” – an ongoing tragedy that we must accept because there is no alternative.

Air Pollution

The average passenger car in the U.S. produces 77 pounds of hydrocarbons, (HC), 575 pounds of carbon monoxide (CO), and 38 pounds of oxides of nitrogen (NO_x) each year. So called “light trucks” such as SUVs and minivans, which have become increasingly popular as personal vehicles in recent years, emit about half again as much.⁶ In the U.S. today, highway vehicle emissions account for 47% of the carbon monoxide (CO), 20% of the volatile organic compounds (components of smog), and 33% of the nitrogen oxides (NO_x) in the nation's air.⁷ While new cars may be cleaner than they used to be, that gain is offset by the fact that there are more cars on the road now than ever before.

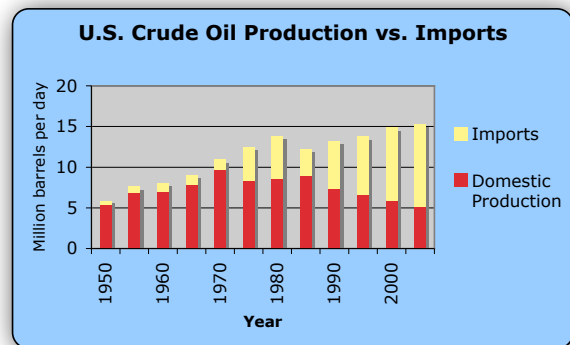
Greenhouse Gases

Each gallon of gasoline consumed releases 19.4 pounds of carbon dioxide into the atmosphere.⁸ The average passenger car emits 11,450 pounds of carbon dioxide every year. For light trucks the figure is 16,035 pounds.⁹ The strategies for reducing carbon emissions that have been promoted so far have all been more costly, and so the idea of a carbon tax has been proposed to encourage their adoption. Resistance to these measures, both in industrialized and developing nations, revolves around the concern that higher energy costs will damage the economy. If new methods to reduce GHGs cost more to produce the same effect, then certainly there will be a negative impact on growth. And the more quickly those methods are implemented the greater the drag on prosperity. That impact must be weighed against the costs, both economic and non-economic, of the effects of global warming.

But providing an *incentive* to reduce GHGs accomplishes nothing unless we also have the *means* to do it. Indeed, if a way could be found to reduce GHG emissions while decreasing costs, incentives would not be necessary. In this scenario the more quickly the new methods are deployed, the greater the boost to the economy, and reduction of GHG would be a no-cost side effect.

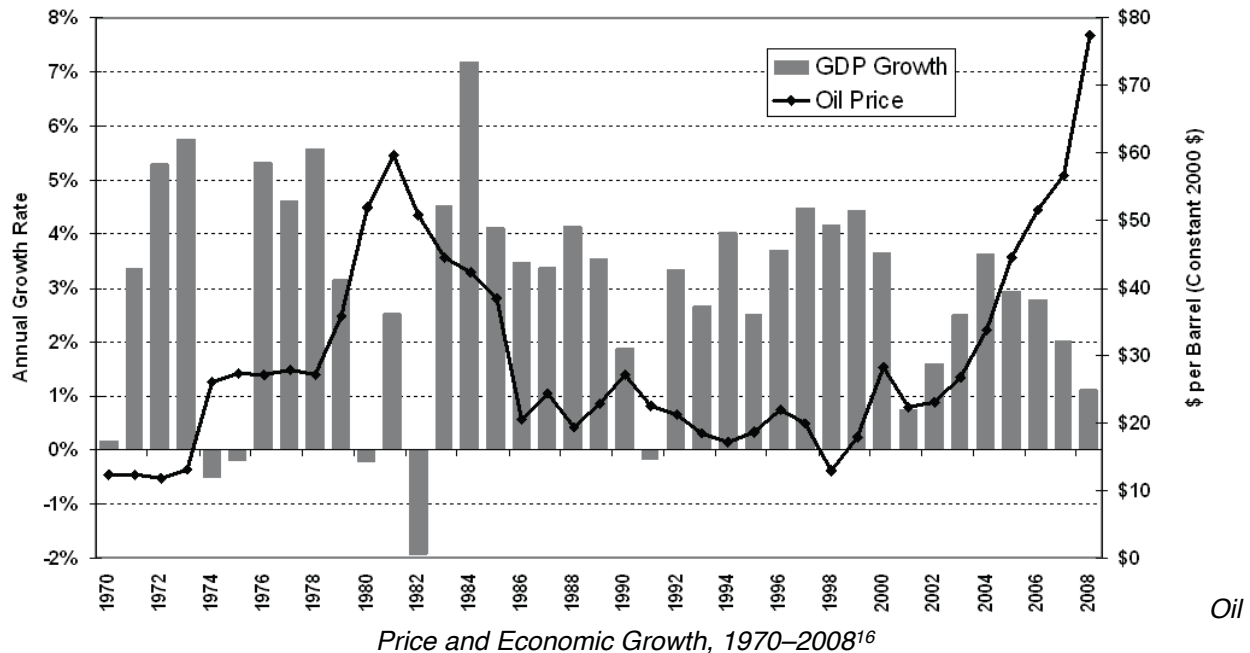
Dependence On Imported Oil

In 2007, the U.S. consumed 20.68 million barrels of petroleum per day¹⁰, while it produced only 6.85 million barrels.¹¹ So the U.S. would need to triple its petroleum production to meet current needs. But with only 2% of the world's known crude oil reserves¹², this is a dubious proposition. At the same time, the Organization of Petroleum Exporting Countries (OPEC) accounted for 43.6% of world petroleum production, versus only 8.5% for the U.S.¹³ Oil prices are notoriously volatile, and there is debate about when peak oil will occur, or whether it has occurred already, but everyone agrees that world oil reserves are being drawn down at the rate of 80 million barrels per day¹⁴, and no new reserves are being created. The most accessible reserves are already exhausted, and what remains can often be tapped only at the risk, or even the certainty, of severe damage to the environment. Increasingly, fuel must be imported from countries that are hostile or unstable, and the economic and strategic landscape of the world has been altered as a result. At the same time our economy is critically dependent on an uninterrupted supply of petroleum. Temporary oil price spikes or supply disruptions have destabilized world energy markets five times in recent years (1973-74, 1979-80, 1990-91, 1999-2000, 2008), in most cases followed by an economic recession in the United States. 39% of U.S. petroleum consumption is used for passenger travel in personal vehicles.¹⁵



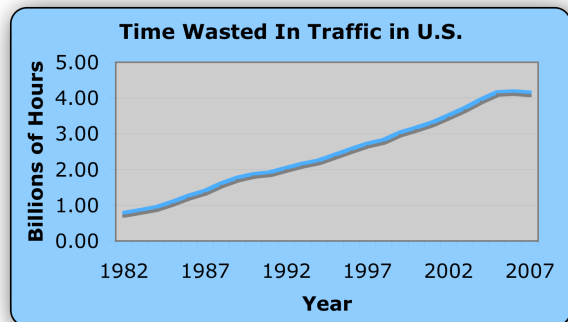
"Oil is the lifeblood of America's economy. Currently, it supplies ... more than 99% of the fuel we use in our cars and trucks."

U.S. Department of Energy, www.energy.gov



Traffic Congestion

What we used to call “rush hour” now lasts 6 hours in the largest metropolitan areas. And approximately 40 percent of traffic delay occurs outside of the peak hours of 6 to 10 a.m. and 3 to 7 p.m. Americans spend 4.8 billion hours a year stuck in traffic – more than four full work days (or vacation days) for every traveler, at a cost of \$101 billion a year – \$713 per motorist, wasting over 1.9 billion gallons of fuel.¹⁷ 36% of the nation's major urban highways are congested.¹⁸ Even worse, congestion can be fatal when it impedes the movement of emergency vehicles,



“Congestion is worse in areas of every size – it is not just a big city problem.”

Texas Transportation Institute
2011 Urban Mobility Report

Unlivable Cities

Automobiles use up a huge amount of valuable real estate, which in turn contributes to urban sprawl. The massive seas of asphalt in our cities raise summer temperatures (the “heat island” effect), and transform rain into polluted runoff. And busy multi-lane streets and freeways make walking and biking dangerous and unpleasant.

Inaccessibility

About 12% of Americans 15 years or older do not drive.¹⁹ For these people the automobile infrastructure must be supplemented with a subsidized transit system. Even so, the poor or disabled, or those who are too young or too old to drive are at a serious disadvantage by being limited to public transit that is slow, complicated, has little or no service at night or on weekends, and doesn't go very many places.

Is This The Best We Can Do?

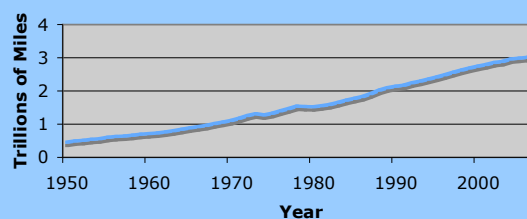
All of these problems have been with us for so long, and are so widespread, that we have come to accept them as the inevitable price we must pay to live in a modern society. And if we continue to rely solely on the same old transportation systems, there is no reason to expect a change for the better. In the U.S., the amount we drive, measured by traffic engineers in Vehicle-Miles Traveled (VMT), is growing at a faster rate than the number of vehicles, and at more than twice the rate of population growth.²⁰ So even if we continue to make incremental improvements in vehicles, roads, and mass transit, the benefits will be offset by the increase in VMT.

Up till now, these problems have been seen as separate and unrelated. Crashes were blamed on bad drivers, oil shortages on faulty energy policy, traffic jams on inadequate roads, etc. But in fact they can all be traced to our continued reliance on outmoded transportation systems. If we hope to make progress on these problems, or even just keep them from growing worse, we will have to find new ways of getting around.

"By mid-century, there will be some 2 billion older persons ... a tripling of this age group in a span of 50 years. ... The fastest growing age group in the world is the oldest-old, those aged 80 years or older."

United Nations, *World Population Ageing: 1950-2050*

Vehicle-Miles Traveled in U.S.



"The Nation needs transformational energy-related technologies to overcome the threats posed by climate change and energy security, arising from its reliance on traditional uses of fossil fuels and the dominant use of oil in transportation."

Financial Assistance Funding Opportunity
Announcement

U. S. Department of Energy

Advanced Research Projects Agency, April 27, 2009

HALFWAY MEASURES

Many initiatives have been proposed that have the potential to help with some of the shortcomings mentioned above, but none address the full range of transportation-related problems. Alternative fuels can reduce our dependence on imported oil, but do nothing to reduce traffic jams. Electric cars can cut air pollution, but they don't prevent crashes. Compact fuel-efficient cars save on gas, but are at a disadvantage in a collision with a heavier vehicle. Wider roads, and more freeways may add capacity, but they also add to air pollution. Congestion pricing aims to relieve downtown gridlock by charging extra to drive in a congested area, but without making our cities more

accessible for pedestrians, cyclists, or the disabled. Research into automatic collision-avoidance systems may lead to safer cars, but leave us dependent on imported oil. All these ideas are good, but not good enough.

Alternative Fuels

[Natural-gas fuel tanks are larger, heavier, and more expensive than gasoline tanks. – Knittel, Christopher; "Leveling the Playing Field for Natural Gas in Transportation", The Brookings Institution, June 2012, http://www.brookings.edu/%7E/media/research/files/papers/2012/6/13%20transportation%20knittel/06_transportation_knittel.pdf]

While it is true that natural gas burns cleaner than gasoline or diesel fuel, the long-term outlook for domestic natural gas supplies is not much better than it is for oil. The U.S. has only 3% of the world's known natural gas reserves, and already consumes 21% of the world's production.²¹ The U.S. has very few refueling stations for alternative fuels: 842 for natural gas, 652 for Biodiesel, 541 for Electric, 58 for Hydrogen. And many of these are private facilities, not available to the public.²²

Electric Cars

Most electric cars can only go 150 miles (or less) before recharging, while gasoline vehicles can go over 300 miles before refueling. The battery packs are bulky and heavy, and can take 4 to 8 hours to recharge. And the batteries are expensive and usually must be replaced one or more times over the life of the vehicle.

Congestion Pricing

Several cities, such as Singapore, Stockholm, and London, have tried to relieve downtown gridlock by assessing a surcharge on any vehicle driving in a congested area during periods of peak demand. In most cases this fee or toll is charged automatically using electronic toll collection. But people who live just outside the congestion zone have expressed concern that it will turn their neighborhoods into parking lots. It is particularly disadvantageous for those who work downtown, but cannot afford to live there.²³ And downtown business owners have complained that it increases costs for their employees, while discouraging customers from visiting.²⁴ While it may be reasonable to adjust prices according to demand, congestion pricing uses technology only to discourage use of the transportation system that commuters prefer, not to provide a better alternative. It's all stick, and no carrot.



Electronic Road Pricing gantry in Singapore
Photo courtesy of Mailer Diablo



Congestion pricing gantry in Stockholm.
Photo courtesy of Mats Halldin

More Freeways

Freeways can increase traffic capacity, but only by funneling lots of vehicles into a high-density corridor. This creates a man-made traffic bottleneck. But what's worse is that they also cut the city in two, so that people who must cross the freeway can do so only on streets that have overpasses – more man-made bottlenecks. And because overpasses are expensive there will never be enough of them. Add to that that freeways are extremely expensive to build, and require huge amounts of land, and it's easy to see why many cities that have built extensive freeway networks continue to suffer from regular traffic jams.

Self-Driving Cars

Recent developments in self-driving cars have caused a great deal of excitement. But there are still significant challenges relating to technology, law, insurance, and regulation, that must be resolved before cars will be allowed to roam the streets without a driver's supervision. For example, if you've ever used voice-recognition or handwriting-recognition software, you know that computers still cannot interpret sensory information as well as people do. Present day laws hold drivers responsible for accidents. But if car companies are required to accept liability for every crash that occurs while the automation system is turned on, they will have a significant disincentive to bring this new technology to market. Insurers will be reluctant to write automobile policies until they have a lot of reliable data on the frequency of accidents and the magnitude of legal settlements. And regulators are reluctant to approve new transportation systems that have not been proven in passenger service. But new systems cannot be proven in passenger service until they have received regulatory approval.

If these obstacles can be overcome, self-driving cars may have great potential, particularly if fleets of driverless taxis provide economical on-demand service without the need to own a car. This scenario also has the potential to significantly reduce parking needs, as well as the time and fuel wasted in hunting for a parking space. But it does little for pedestrians and cyclists. It does not eliminate the need to stop at intersections. It does not keep traffic-slowing obstacles off the road. And extra space must be allowed between vehicles, and speeds must be reduced, to allow for unexpected actions by human drivers. But there is another way to use automation that is inherently simpler, safer, and faster. To find out more, read on.

MASS TRANSIT IS NOT THE ANSWER

Up till now, all public transit has been mass transit, i.e. large vehicles traveling on fixed routes, and stopping everywhere anyone wants to get on or off. The designers of these services are faced with three dilemmas that cannot be solved using the systems of the past. First, to minimize the number of expensive drivers, you have to minimize the number of vehicles – so the vehicles have to be big. But the larger the vehicle, the more empty seats you have during off-peak times. Since a mostly empty train, trolley, or bus costs as much to run as a full one, operators are forced to reduce the frequency of service when demand is lower, even shutting down entirely at night. By reducing the frequency of service they can fill more seats, and thus lose less money, but at the cost of making people wait, sometimes after dark, or at deserted transit stops. In other

words, the transit systems of today can be good at carrying lots of people, but are not at all good at carrying just a few. The result is that they have no way of adjusting to varying demand while maintaining a high quality of service.

The second dilemma is that in order to reduce the distance people have to travel to the nearest station stop, the stops need to be closer together. But the more stops there are, the slower the service becomes. Even when the vehicles are capable of attaining impressive speeds, the constant stopping and starting makes the average speed maddeningly slow. Adding to the delays, you also have to wait for the next departure, and wait again at each transfer point.

The third dilemma is that, while public transit can be reasonably good at carrying lots of people to fixed points along a set route, most trips either begin or end someplace that is not near any station stop. Another way to look at this is that a commuter train cannot function without some other means of getting people to and from the stations. So each station needs something like a park-n-ride lot and/or links to lower-capacity transit systems like buses. All of this adds travel delays and extra costs that make that commuter train look a lot less attractive than it might seem at first. Transit professionals call this the “Last Mile Problem”; in other words, people will not use transit unless it comes close to where they are, and can take them close to where they want to go. If people have to drive to the nearest transit stop, most would just as soon drive all the way to their destination.

But the flaws of mass transit don't stop there. There are also complicated routes and schedules to learn, and you never know if you're going to get a seat, or miss the last ride home. All these drawbacks are inherent in the nature of the public transit systems of today, and are not the result of bad management or a “lack of commitment”. Increasing funding to build more of these systems will not improve them, but merely replicate their shortcomings on a larger scale. And because fare-box revenues only cover 29% of expenses²⁵, the more you spend to expand service today, the more you will need to spend on operating subsidies tomorrow.

Is it any wonder that only 1.5% of trips in the U.S. use public transit?²⁶ Cities have tried to lure people into mass transit by subsidizing fares, and to push them into it by charging punitive fees for driving into downtown areas. They have tried to usher people into transit corridors by blocking alternate routes. While trains can be a highly effective means of quickly transporting large numbers of people over longer distances, such as between cities, as a means of traveling within a city, mass transit has failed to attract many riders beyond those who have no choice.

All Of The Above

Could a combination of all these partial solutions make the grade? Say we replace America's 240 million cars with alternative-fuel or electric models, and install millions of pay-for-use charging stations, and equip gas stations with battery exchange facilities for those times when you can't wait around while your car charges, and retrofit gas stations, refineries, pipelines and delivery trucks for new fuels. And equip all these new cars with computerized collision-avoidance systems. And then install new sensors and communications equipment in all the roads to better manage traffic. And increase subsidies for mass transit.

This is the path we are on – huge expenditures to almost completely rebuild our transportation infrastructure. But even that will not reduce travel times, make parking easier, or help those who cannot, or should not drive. Regardless of whether or not we upgrade our transportation systems, we will need to rebuild them over the coming years. The Transportation Research Board estimates that an annual capital investment of \$130.7 billion would be needed just to maintain the condition and performance of existing highway and transit systems.²⁷ And cars are replaced on average every nine years.²⁸

So the real question is, as our infrastructure wears out, do we rebuild it similar to the way it was, or make it better? Before we begin such a massive undertaking, we ought to take a serious look at the alternatives. If we can set aside our preconceptions and start with a clean slate, we may find new opportunities that offer better results for less money.

THERE'S GOT TO BE A BETTER WAY

We cannot assume that if we continue to do things as we always have, that we will continue to get the same results. Established trends such as population growth, deforestation, depletion of oil reserves, and soaring demand for oil in developing nations, ensure that the future will not be like the past. Properly managed, the coming changes can present an opportunity to improve our health, enrich our lives, and propel our economy forward.

It does not follow that because cars, buses and light-rail have dominated our cities for a hundred years, they will continue to do so in the future. For example, for more than a century ocean liners were *the* way to travel between Europe and America. And there was a vast infrastructure in place to support that industry. Nevertheless, when transatlantic airline service became available, the entire ocean liner industry almost completely evaporated inside of ten years.

The fact is, new kinds of infrastructure have been introduced on a regular basis, and once they are generally accepted as being beneficial and affordable, they go from curiosity to ubiquity in just a few short years. We have seen this with railroads, natural gas, the interstate highway system, electricity, telephones, radio, television, cell-phones, and the Internet. In each case, when a new technological capability intersected with a social need, the result was a period of exceptional economic growth. In fact, it is no exaggeration to say that it has been our eagerness to embrace change that has been largely responsible for the impressive gains in our standard of living. After all, for something to be better, it must be different.

We are now long overdue for a top-to-bottom reexamination of our options. With everything “on the table” we may find a better solution than we could ever achieve by making superficial adjustments to familiar systems. A different future is not only possible, but inevitable.

THERE IS A BETTER WAY

Imagine a narrow overhead guideway, not much larger than a monorail track. But instead of a train, it has personal electric vehicles, or pods, that seat three to six people. And instead of running in a line like a train, the guideway is connected in a network, like a grid. Each pod is routed by computer control directly to its destination without intervening stops or transfers. When the pods arrive at their destination, they don't stop on the main line, but rather pull off onto a siding, known as an off-line station, so that other pods can pass. This is the concept that has been called Personal Rapid Transit (PRT), Automated Transit Network (ATN), or Podcars, and it will be the focus of this report.



Off-line Station
Rendering courtesy of gettherefast.org

Variations on this concept have been developed. One of these is called Group Rapid Transit (GRT), which is similar to PRT except the vehicles are larger – carrying up to twenty passengers – and stop at every station where anyone wants to get on or off. Another is known as dual-mode transit. It's like PRT, except that its pods have driver controls that enable them to leave the guideway and drive on surface streets like an ordinary car. In some places, it may be advantageous to locate the guideways at ground level or underground, as long as they are strictly separated from pedestrians, animals, and other traffic.

Riding PRT is more like using an elevator than driving a car. You go to the nearest station and call a pod, for example, by swiping a magnetic card. When the pod arrives you get in, punch in your destination, the door closes, and the pod accelerates under computer control onto the main guideway. While in transit, you can talk on your cell phone, send text messages, look after the kids, read, listen to music, watch a movie, or whatever. The computers make subtle speed adjustments to maintain a safe distance between all the pods. Your pod is automatically routed to your destination, where it leaves the main guideway, pulls into the station, and the door opens. Now the pod is available for the next rider. For safety, all of these operations are continuously monitored by supervisors in a control center.



Interior of the 2getthere “VIP” Pod

People accustomed to public transit will appreciate that you rarely need to wait more than five minutes

for a pod, and that there can be more stations, not just arrayed along major thoroughfares, but distributed throughout the city, so you're more likely to find a station close to where you want to go. You'll always get a seat, there are no routes or schedules to learn, and you'll never be stranded by missing the last departure of the day. No transfers, no intermediate stops, no surly drivers. All in all, it's more like having a chauffeur than riding a bus. And if you get a pod that is not clean, you simply press a button to reject it. It is automatically rerouted to a maintenance facility for cleaning, and a new pod is immediately dispatched to pick you up. It's easy to see that each one of these features would attract more riders than conventional public transit, and that taken together they would make PRT the transportation system of choice.

But PRT has benefits that will appeal to motorists as well. There are no stop signs or traffic lights, no getting lost, no parking meters or hunting for a parking space, no horns, traffic jams, gridlock, road rage, tickets, speed traps, radar detectors, or tow-away zones, no drag racers, drunk drivers, jaywalkers, or road kill. And you never have to stop for gas.

With PRT, children don't have to miss after school activities because they need to catch the school bus, and parents don't have to chauffeur the kids. The elderly needn't fear the loss of independence that comes when they can no longer drive. The blind and disabled will be able to take control of their own transportation, and those who can't afford a car will have greater access to employment. Even pedestrians and cyclists will benefit, as reduced road traffic makes the city a safer and more pleasant place to walk or bike.

Less space would be needed for parking because instead of having one car per person, you only need one pod for each party traveling at the peak travel time. And each pod only needs one parking space – not one at home, one at work, one at the store, etc. Many of the pods can be left in stations when not in use, waiting for the next passenger. Any additional out-of-service pods can be parked in storage facilities that are small and inexpensive because you don't need access to each pod, just the first one in line. Finally, since the pods park themselves, parking does not have to be on expensive land right next to homes, offices, and stores, but can be off in less-traveled areas.

PRT has the unique potential to simultaneously and dramatically reduce petroleum use, greenhouse gas emissions, air pollution, traffic congestion, and vehicle crashes. In designing a new transportation system, no matter where you start, once you add features to address each of these challenges, you end up with something that looks very much like PRT. If you take away the automation, there is no way to keep traffic flowing and avoid crashes. If you replace the guideway network with fixed routes, then you have to add multi-level transfer stations that add cost and slow people down. If you put the system on surface streets, you cannot provide non-stop service. If you make the pods too big and heavy, overhead guideways become unaffordable.

All of the features of PRT work together synergistically to make a system that is practical, safe, and reliable. Automated vehicles need to be kept away from pedestrians and other traffic, which means that they often need to run overhead, which means they must be lightweight, which means they must be personal. If you omit one part of the concept, it's like sawing off one leg of a table – it no longer works.

And so, this is PRT: a network of narrow guideways, separated from other traffic, with off-line stations, over which automatic personal electric vehicles provide on-demand service, directly to the destination, without stopping. PRT is not the solution in every situation. It's too expensive for rural areas, and it's not big enough to carry heavy freight. In some large cities PRT may be best used as a way to get people to and from metro stations. But for transporting people and light freight in the metropolitan environment, PRT is cleaner, faster, safer, quieter, and more fun to ride than any transportation system currently in use.

How It Works

No technological breakthroughs are needed to bring PRT to market – present-day technology is more than sufficient. In fact, the first system was put into passenger service in the mid 1970s, and continues to provide safe and reliable service to this day. Advancements over the last 35 years enable higher capacities and lower costs. The design and construction of PRT systems is neither trivial nor foolproof, but engineering projects of greater complexity and scale are routinely completed successfully. Without getting too technical, let's examine a few of the major benefits of a well-designed PRT system, and how they are achieved.

No Traffic Jams

PRT systems don't need traffic signals or stop signs because the guideways never cross at the same level. The control systems are designed so that the pods rarely need to stop until they reach their destination. Only very slight speed adjustments are needed to create openings for merging vehicles. These speed changes can be subtle because the pods are in communication even before they are within sight. Even when there isn't a red light or stop sign, cars must come almost to a complete stop before they can turn. But PRT guideways are designed with wider turns so pods can take turns faster – which really keeps things moving.

Road vehicles have only turn signals, break lights, and horns to notify other drivers of things they need to know. These don't provide much information, and there is a significant lag time for drivers to react. So there needs to be lots of space between vehicles to allow drivers enough time to assess a changing situation and respond to it. But PRT pods can travel closer together because they communicate to all surrounding pods precisely what they are going to do before they start to do it. PRT control systems can be more efficient because they know in advance the route that each pod will take. So congestion can be detected before it happens, and pods can be rerouted to keep traffic flowing.

To save money, transportation engineers are often obliged to design systems with only enough capacity to meet demand *most* of the time. This means that there will be occasions when the system is overloaded. Unfortunately, when this happens on roads or highways, the capacity actually decreases, just when you need it the most. This is because when too many cars are on the road, the spacing between cars gets too small, so drivers slow down, and there are more crashes. This phenomenon is well known to traffic engineers, and is the reason that ramp meters are installed on some freeway on-ramps. By keeping some people waiting a little while, everyone gets to where they're

going a lot faster. PRT uses a similar strategy, but much more effectively, and not just at on ramps, but everywhere. When a PRT network becomes saturated, departing pods are placed in a queue, and wait in the station for the first opening that can take them all the way to their destination. People tend to be a lot more patient when they know that once they start moving, they won't have to stop again.

Energy Efficiency

Because less space is needed for mechanical systems, the pods can be small, and still roomy inside, so there's less aerodynamic drag. For the same reason, the pods are lighter, so they have less inertia to overcome. And since a pod normally doesn't come to a stop until it reaches its destination, you save a vast amount of power needed to bring a vehicle back up to speed after each stop. By eliminating intermediate stops, PRT vehicles can get to where they're going faster even if they travel at lower speeds – thus reducing aerodynamic drag even further.

PRT systems that are powered by the guideway are more efficient than electric cars because batteries are heavy even when they are mostly drained, and they never give back all the power you put into them. PRT uses less power than mass transit because the number of pods in service is adjusted to suit current demand. And its lower energy needs can be more easily met with clean, renewable, domestic sources of energy.

Narrow Guideway

Elevated roadways are extremely expensive because they often must have several lanes, each lane must be wide enough to accommodate the widest vehicles plus a margin of error, and the structure must be strong enough to support the heaviest vehicles, such as fully-loaded cement mixers. PRT pods are light and compact, so the guideways can be narrow and inexpensive. In some designs, the guideway is actually narrower than the pods. And to simplify intersections, PRT networks can often be configured using only one-way guideways.



Rendering courtesy of Beamways, AB

Anytime, On-Demand Service

A viable transportation system must be able to operate effectively all day long, not just at peak periods. It is its ability to dynamically adjust to the current level of demand, that really sets PRT apart. PRT can provide anytime service because the cost of carrying a passenger at 1 AM is scarcely more than it is at rush hour. Of course it will be necessary for portions of a system to be taken out of service briefly at night for guideway maintenance or station cleaning. There may also be the occasional system-wide shutdown, for example to perform software upgrades. Some operators might even choose to shut down the entire system during times of extremely low demand, just to save the cost of the control room staff. But round-the-clock service *is* possible and economical because PRT is not mass transit – it's personal transit.

Direct-to-Destination Service

Two features that are unique to PRT are that the guideways are interconnected into networks, and the pods have computer controlled “switches” that determine which way a pod will go at each branch point. That allows the system to route each pod over the network directly to its destination without any need for fixed routes or transfers.

More Stations

Conventional metro or light rail stations must be big enough to accommodate the longest trains. That makes them too big and expensive to be practical for most neighborhoods. But with PRT, each station can be sized to accommodate the demand in that area. This flexibility allows PRT to economically serve lower density neighborhoods. PRT stations can fit into spaces that are too small for any other form of public transit. They can even be built right into building lobbies. And PRT can reach into areas with inadequate parking. In most cases, many small PRT stations are preferable to a few large ones, because for the same amount of money you can get people closer to where they want to go. And because the stations are off-line, you don’t have to stop at every station, so they can be more closely spaced without slowing you down.

You Always Get a Seat

The interior of pods are designed more like cars than buses. They are not tall enough for a passenger to stand up inside, and there’s no need to, because when a new pod arrives to pick you up, all of the seats are available. Shorter vehicles have many advantages including reduced weight, wind resistance and visual impact. And if there aren’t enough seats in one pod for everyone in your party, you just call another one.

Rarely Wait More Than Five Minutes for a Pod

When a pod lets passengers off in a station, it remains there unless it is needed elsewhere, so in many cases you will find an empty pod waiting for you when you arrive. The central control computers of a PRT network collect statistics on typical traffic patterns, and can pre-position empty pods to meet anticipated demand. And to handle normal variations in demand, the system tries to keep a few empty pods scattered throughout the network, so there’s usually an available pod nearby. When it is necessary to summon a pod, the nearest one is dispatched.

CAN WE AFFORD IT?

It would take a PRT manufacturer to quote a price, but we can highlight a few factors that contribute to making PRT less expensive than you might imagine. The cost to build a system can be relatively low because very little land is needed, the ground does not have to be leveled, and the streets don’t have to be torn up. The guideway can be mostly pre-fabricated in factory-controlled conditions, and installed on site with minimal site preparation. The lightweight of the pods allow the guideways to be built with less construction material, and smaller columns and foundation footings. As mentioned previously, fewer vehicles are needed because you only need enough pods to meet rush hour demand, not one for every person in the city. And vehicle storage facilities can be small, inexpensive, and out of the way. The operating costs are also lower than

conventional public transit because there are no drivers to pay, and the energy cost is much less.

But to really understand the cost issue, you have to look at the cost per passenger-mile.

Take air travel as an example. Jets are very expensive. So are jet fuel, maintenance, cabin crews, and cockpit crews. Add to that the cost of airports, air-traffic control, gate agents, ticket agents, baggage handlers, and security. Even with all that, air travel is usually the most economical choice because lots of people use it, so all the expenses are amortized over a huge number of trips.

Conversely most bus systems lose money despite their low initial costs because very few people use them. So the cost per passenger-mile has a lot more to do with how many people use a system than its construction or operating expenses. It is inevitable that PRT's higher quality of service and longer hours of operation will lead to more riders than is typical of public transit.



Compare the size of the ULTra Heathrow two-way guideway with the automobile road above it.

And underpricing the car is a lot easier than most people realize. Americans spend on average more than 60¢ per mile to drive a sedan.²⁹ Of course the cost of taxi service is even higher – over \$3 per mile.³⁰ Transportation currently accounts for 17.6% of expenditures for the average American household, more than three times what we spend on health care.³¹ But these are just the expenses paid directly by the motorist. Federal, state, and local governments spend another \$46 billion each year on highways, beyond what they collect in highway taxes and fees.³² The American Road & Transportation Builders Association estimates that it costs about \$5-6 million per mile to construct a new 2-lane road in an urban area.³³ There are also indirect expenses such as the cost of “free” parking, and time wasted in traffic. The health costs associated with pollution from motor vehicles has been estimated to be about 30¢ per gallon for gasoline and 60¢ per gallon for diesel.³⁴ And because many people can't drive, there is the additional expense of subsidizing public transportation and para-transit systems. The federal government makes grants of nearly \$10 billion each year to state and local governments for transit projects.³⁵

It is estimated that the annual cost of motor vehicle crashes in the U.S. is \$230 billion.³⁶ Since insurance only covers about half of that³⁷, this alone adds another 4¢ per mile to the cost of driving a car. And don't think that if you are a good driver you are exempt. People not directly involved in crashes pay for nearly three-quarters of all crash costs, primarily through insurance premiums, taxes and travel delays.³⁸ And this is just the economic cost of crashes. It is impossible to put a value on the pain and suffering of crash victims and their loved ones.

PRT can lead to other savings as well. Many school buses and convention center buses could be retired. And to the extent that people arrive by PRT, businesses that have had to dedicate prime real estate to automobile parking would have the opportunity to redevelop that land for more attractive, or more profitable uses. The prospect of this benefit would be a powerful incentive for private investors to contribute to the construction of a PRT system. The remainder could be funded by redirecting spending from outmoded systems to state-of-the-art ones, without any increase in current levels of transportation spending.

SUPPORT IS BUILDING

A 2006 study by the European Union³⁹ concluded that, “PRT contributes significantly to transport policy and all related policy objectives. This innovative transport concept allows affordable mobility for all groups in society and represents opportunities for achieving equity. The demonstration of the PRT prototype system ‘ULTRA’ at a test site in Cardiff, four accompanying case studies at different cities and the overall European assessment indicated high overall benefits. The specific urban transport problems ... could be alleviated significantly at a lower cost than any other transport system. PRT is ... the first public transport system which can really attract car users and which can cover its operating cost and even capital cost at a wider market penetration.”

A 2007 report commissioned by the New Jersey Legislature⁴⁰ stated, “The core technical elements of PRT control, communication, power and propulsion are commercially available today. The development of a fully operational PRT system is currently possible given the current state-of-the-art and generally requires only the engineering and application of proven technologies.”

“... on average, a PRT system could be expected to be half as expensive as a comparable light rail system.”

Viability of Personal Rapid Transit in New Jersey, p. A3-11

In 2008, the Santa Clara Valley Transportation Authority estimated it would cost \$640 million to build a two-mile people mover to connect San José Mineta International Airport to two transit stations on either side of the airport. Finding that uneconomical, San José, the tenth largest city in the U.S., decided to explore the possibility of an Automated Transit Network (or ATN – another name for PRT). Their conclusion? “From its investigation, the City of San José has concluded that ATN technology is viable and would advance a number of high-priority San José goals. These goals include reducing fossil fuel consumption, expanding the use of renewable energy and creating new Clean Tech jobs.”⁴¹ The city has retained the Aerospace Corporation to assist them in the planning of this project.

In a November 2009 report *Personal Rapid Transit – Winona Is Ready*, Jerry Miller, the Mayor of Winona Minnesota wrote, “Efficient, sophisticated, and green, Personal Rapid Transit is the future of public transportation, and it is only a matter of finding model

“PRT implementation in the United States is no longer a matter of if, but of when and where.”

Personal Rapid Transit – Winona Is Ready

communities in which to study PRT's operations before it can be successfully launched nationwide and worldwide. ... With widespread support from elected officials, business and community leaders, and other stakeholders, Winona is prepared to host and be the research center for a fully functional PRT system."

A Request for Interest: Personal Rapid Transit (PRT) Viability and Benefits issued in February 2010 by the Minnesota Department of Transportation observed that, "A wide variety of public and private efforts such as incentives to increase transit use, carpooling, telecommuting, land use and economic development planning are helping to address congestion issues, but they are not sufficient to ensure efficient, timely, and predictable travel as growth continues."

FIRST STEPS

USA

In the 1960s, as West Virginia University outgrew its original campus in Morgantown, it established two new satellite campuses outside the river valley in which the town is located. At first, students were transported between campuses in buses, but the resulting traffic jams made that impractical. And with the harsh winters in the area, there was also great concern about buses skidding on steep icy roads. The University asked for federal assistance to implement an experimental PRT system, and in 1970 the newly formed Department of Transportation agreed.

Contractors hired by DOT altered the original design to use vehicles that are much larger and heavier, so the result is more of a Group Rapid Transit system. But it is still referred to as the "Morgantown PRT". The current system has a single line, 3.6 miles long, with five stations, and a fleet of 71 vehicles, each seating eight passengers and up to an additional 12 standing.⁴²

Since it went into passenger service in 1975, more than 80 million people have used the Morgantown PRT, without a single reported injury. On a typical school day, around 15,000 people ride. It has been in continuous operation since the Phase II expansion was completed in 1979, with 98% availability, exceeding the design goal of 96.5%.

And all this was achieved using mid-1970s



technology, so for example, each station required a climate-controlled building to house the racks of minicomputers needed to control it. A typical laptop computer today costs 0.5% as much, is 10,000 times faster, has 40,000 times more memory, and is more reliable. So building PRT systems today is much easier and less expensive.

United Kingdom

A British firm, Ultra Global PRT, was formed in 1995 to commercialize a PRT concept developed at the University of Bristol. In an initial study for BAA, the operator of London Heathrow Airport, it was determined that four separate Ultra tracks could be fitted into the space of a single lane taxi tunnel at Heathrow. In June 2006, BAA let a contract to Ultra Global PRT to install the first system at Heathrow to connect the new Terminal 5 to two stations in a remote parking lot. It has 1.2 miles of guideway and 21 vehicles. Renamed the "Heathrow Pod", the system opened to the public in 2011, and has now carried over 1.2 million passengers over 1.5 million miles (2.5 million kilometers). An expansion to thirty miles of guideway and fifty stations is being studied.⁴³

Abu Dhabi, United Arab Emirates

A Dutch company, 2getthere, has installed a PRT system below the pedestrian level in Masdar, the ambitious new \$22 billion carbon-neutral city currently under construction in Abu Dhabi. The first phase of the project opened for service on November 28, 2010, and carried over 230,000 passengers in its first year of operation.⁴⁴ It has five stations (2 for passengers, 3 for freight), ten passenger vehicles, and three freight vehicles. When completed, the pedestrian-friendly city will have 40,000 residents and no fossil fuel vehicles. Instead it will have 3,000 pods providing up to 130,000 trips a day to 85 stations distributed throughout the 1,500 acre development.⁴⁵

The freight pods can each carry two pallets with a total weight of up to 3,500 pounds. The availability of automated freight delivery will dramatically reduce costs. This, in combination with on-line ordering, has the



potential to create a revolution in commerce.

Korea / Sweden

In 2005, the Korean steel giant POSCO, established a subsidiary called Vectus to develop and market a new PRT system. In 2006, in cooperation with Uppsala University, a full-scale test track with a two-berth station was constructed in Uppsala, Sweden. After extensive safety testing, the Swedish Railway Authority certified Vectus for passenger service in September, 2008.

In September 2009, a report was issued by Kjell Dahlstrom, a Special Investigator appointed by the Swedish Minister of Infrastructure, recommending steps towards a “pioneer” PRT project. Dahlstrom concluded that PRT has “the right level of maturity” to provide a “sustainable, safe and accessible” form of mobility.

A study released in 2010⁴⁶ concluded that average travel times in Swedish cities would be reduced from 44 minutes by bus to 18 minutes on a PRT network. “Podcar technology appears to have reached the right level of maturity to enter a market that is seeking sustainable, safe and accessible alternatives to existing transport systems. Technical and financial analyses show good functionality and profitability that can match established forms of transport. Podcars can contribute considerably to the policy objectives set for the transport sector.”⁴⁷

About thirty Swedish cities and towns have expressed interest in hosting a pioneer project. Five have been singled out as especially promising – an academic district in Stockholm known as Via Academica, Uppsala, Södertälje, Trollhättan, and Umeå. A national decision on where to build the first pilot track in Sweden is expected in fall, 2010.⁴⁸

On June 24, 2011, a groundbreaking ceremony was held for a new Vectus system in Suncheon, South Korea. The Suncheon project will connect Suncheon Bay, a scenic agricultural and industrial city of around 250,000 people, to the Suncheon International Gardening Festival site. Forty vehicles, traveling over 2.8 miles of bi-directional guideway, are planned to be in operation by 2013.⁴⁹



FREQUENTLY ASKED QUESTIONS ABOUT PRT

It is natural for people to have questions and concerns about new developments that will affect their lives. Here are answers to some of the questions that are often raised about PRT.

- **“It looks really complicated. How could you keep it working reliably?”**

Actually, most PRT designs have fewer moving parts than automobiles. PRT control systems automatically bring pods into a maintenance facility for regular preventive maintenance and inspections. Some parts would be replaced on a regular schedule, well before they wear out. Modern inspection methods are capable of identifying many other failures before they happen.

When there is an operational breakdown in a PRT system, most vehicles can be automatically routed around the problem within seconds without any inconvenience to the passengers. Even without this capability, the Morgantown PRT, which is configured as a single line rather than a distributed network, has achieved an exceptional record of reliability. No one is claiming that PRT will be immune to mechanical failures – no transportation system can make that claim. But there is every reason to believe that it can equal or exceed the reliability of other systems.

- **“I’m not sure I would feel safe without my hands on the wheel.”**

You may be confident of your driving ability, but the real threat to you is all those other drivers who may be reckless, distracted, sleep-deprived, or inebriated. You will be much safer in a system that keeps those other vehicles a safe distance away from you. Since PRT does not rely on a driver’s vision to monitor the surroundings, there are no blind spots, and fog is not a hazard. Sensors throughout the system constantly monitor its operation. And if any sort of anomaly is detected, specially trained supervisors in the control center are automatically alerted. In addition, some PRT designs use linear motors for propulsion and breaking, so a loss of wheel traction doesn’t lead to a loss of control.

- **“My personal computer crashes all the time. I don’t trust those things to drive my car.”**

Computer systems intended for high-reliability, safety-critical applications are designed using more rigorous procedures. Then they are tested by independent quality-control specialists before they ever go into service. The computers can use fault-tolerant designs, and can be configured in redundant arrays so a failure in one computer will be immediately detected by the others.

There are already 150 automated people movers in operation around the world today, serving 5.8 million passengers daily, with an outstanding record of safety and reliability.⁵⁰ As mentioned above, the Morgantown PRT has attained an impressive safety record despite using 1970’s vintage computers. With the advancements that have been made since then, this high level of performance can be extended to larger systems at lower cost.

Studies have suggested that more than 90% of motor vehicle crashes are caused by driver error. Only about 2% can be attributed to failure of vehicle systems.⁵¹ No transportation system is immune to design flaws, but given a choice between automatic or manual operation, experience has shown that the automated option is much safer and more reliable.

- **“What if the power goes out? Wouldn’t the whole system grind to a halt?”**

PRT systems should always be equipped with backup power systems (known as Uninterruptible Power Supplies) with at least enough capacity to get every vehicle safely stopped at the nearest station.

- **“Unexpected delays are common in mass transit systems. Will this be a problem with PRT?”**

When a train encounters a delay, such as a passenger having difficulty boarding, all the trains on that line must also be delayed. But because PRT uses personal vehicles, and the stations are off-line, a delay involving one vehicle need not affect the others. And because the guideway is configured in a network, if there’s a malfunction in one segment, traffic can be automatically routed around the problem area.

- **“I have heard that there are transit experts who are not convinced that PRT can live up to its promise. Is there something they are missing?”**

The essence of what transit professionals have been taught to do is to look for traffic corridors with enough throughput to “justify” mass transit. City planners also have been trained to lay out cities to usher people into these high-density corridors, thereby creating the traffic density needed for mass transit to be practical. Their experiences with manually-operated transit have led them to believe that the higher the capacity of the vehicle, the more economical it is to operate. So the idea of using small personal vehicles seems counterintuitive to them. And 150 years of railroad tradition has created the notion that the only way for trains to be safe is to keep them very far apart.

But PRT is a radically different concept that requires a new approach. Modern sensors and control systems allow for more precise control and faster reaction times that allow for safe operation with vehicle spacing similar to cars. As transportation professionals gain experience with advanced transit, they will learn to use it to provide an unprecedented level of service at an affordable price. In the mean time, decision makers will need to appreciate that transit planners schooled in the design and operation of manually-operated line-haul mass transit systems may not yet grasp the opportunities made possible by an automated network of personal vehicles.

- **“Would PRT be susceptible to attacks by terrorists?”**

There is no transportation system that is completely invulnerable to attack, but there are several features of PRT that make it less attractive to miscreants. Because PRT uses a decentralized network, damage in one area need not affect the rest of the system. And because there are only a few people in a vehicle or a station, there would not be massive casualties from a single bomb. The control systems can automatically detect faults, and instantly reroute vehicles around trouble spots. The vehicles are inherently safer because they don’t carry any fossil fuels that can burn or explode. (Most of the

damage in the 9/11 attacks was not due to the aircraft impact, but to the burning of jet fuel.) While automobiles can be packed with explosives or weapons in the privacy of a garage, the only access to a PRT system is through stations with video surveillance. Finally, one of the best ways to combat terrorists is to cut off their sources of funding. Reducing our dependence on imported oil could go a long way toward accomplishing that.

- **“It seems like the network would get clogged up with empty vehicles traveling to where they’re needed.”**

This issue is not unique to PRT. While you don’t normally see empty automobiles going about with no driver, many drivers are not actually going anywhere themselves, but rather they are going to pick up someone else – fetching the kids from school, going to get grandma to take her to the doctor, picking up a spouse at the airport, etc. In addition, there are taxi drivers trolling for fares, and drivers who have already arrived at their destination, and are now circling, looking for parking.

With PRT, if people are traveling to every part of town, then pods will remain well distributed throughout the system. When a customer calls for a pod, the nearest empty pod is automatically dispatched, so it doesn’t need to come from across town. If most people are traveling in one direction, then the guideway going in the opposite direction will have plenty of capacity for returning empty pods. Finally, it is a simple matter for PRT control software to collect statistics about typical traffic patterns, and pre-position pods so they will be waiting at the station when the passengers arrive.

- **“With my car I can drive right to where I want to go. What if I don’t want to have to walk to a station?”**

You might be able to drive right to where you want to go, but you probably won’t be able to park there. In some places the nearest parking is so far from where people want to go that a shuttle bus or tram must be provided at extra expense to ferry people back-and-forth. Since the pods are quiet and exhaust-free, PRT stations can even be integrated right into building lobbies. And because PRT’s off-line stations allow pods to stop without slowing down other traffic, stations can be closer together. So in many cases a PRT station will be closer than the nearest available parking space. And you save the time and frustration of hunting for parking. It’s like having free valet parking everywhere you go. At the same time, PRT encourages walking by creating a safer and more pleasant pedestrian experience.

- **“But people love their cars. They’ll never give them up.”**

Yes, people have loved, and still love, every transportation system we’ve ever had – stage coaches and steam trains, tall ships and paddlewheel river boats, ocean liners and biplanes. And they are all still available to those who have the inclination, the time, and the money to seek them out. But when people just want to get somewhere, they choose the fastest, safest, and cheapest method they can find – every time. Once people experience PRT, you can bet they’ll love it too.

- **“This is real Buck Rogers stuff. Maybe my grandchildren will have something like this, but right now we have to work with what we have.”**

If you accept that change will come someday, then the question becomes, when is the right time? Is it when the old ways become unsustainable? Or is it when new opportunities become available that have advantages that outweigh the costs? Either way, the time has come for Advanced Transit. Currently, there are three companies offering commercial PRT systems, and more are under development. No technology beyond what is available to us today is needed to build these systems. And they can be designed and built using time-tested processes and materials.

- **“Wouldn’t all those overhead tracks be unsightly?”**

Certainly adding an overhead traffic jam to a ground-level traffic jam would be a step backward. But in many cases, adding a PRT option would allow the removal of one or more lanes of asphalt at ground level, and in many cases an additional lane of on-street parking, allowing more open space for greenery, and creating a much more pleasant environment.

Guideways can be styled to complement their surroundings. And utilities, lighting, and signage can be integrated into them, allowing the removal of many utility poles, overhead wires, lampposts, and signposts. Alternately, the guideway can be integrated into buildings, or into a portico that can provide a pleasant all-weather pedestrian shelter. In other cases, the best option may be to locate guideways at ground-level or underground.

- **“Would PRT be able to operate in snow?”**

Yes, various approaches have been used to deal with snow. The Morgantown PRT has snow melting equipment built into the guideway. The Taxi 2000 system has an enclosed guideway with only a narrow slot in the top, and a wider slot in the bottom that allows snow to fall through. A “bogie” runs inside the guideway, and is connected to the pod through the upper slot. In some designs, such as BeamWays, the pod rides underneath the guideway, so snow on top of the guideway has no effect. The Vectus system has narrow running surfaces that cannot collect a lot of snow. What little snow does accumulate can be easily pushed out of the way by a snow plow-like mechanism built into each pod. The Vectus and Taxi2000 systems also feature linear motors, which maintain precise magnetic control of the pods, both for moving and stopping, even on slippery guideways. Notice that none of these techniques require snow plows or road salt – providing all-weather mobility, lower operating costs, and less damage to the environment.



Vectus PRT plowing through snow.

“I don’t see why we need a whole new infrastructure. Isn’t there some way we can build on what we have?”

You could try to transform our existing infrastructure into something it was never designed to be, but the result would be more complicated, more expensive, and less effective. In particular, many of the advantages of PRT are only possible because the guideway can be kept separate from pedestrians, animals, and other traffic. Our roads just weren’t built that way. Other advantages come from the opportunity to remove asphalt from the city, and what is a road but asphalt on the ground?

• “If PRT is such a good idea, why aren’t we moving forward with it?”

A 141 page report on PRT commissioned by the New Jersey State Legislature in 2007 proposed four possible courses of action. The de-facto choice was the first option: “Under Option 1, State officials would play no active role in advancing the development of PRT. The State would monitor PRT development activities conducted by private developers and other governmental organizations around the world and reconsider the State’s role in the future, as appropriate.”⁵² In other words, they are waiting for somebody else to take the first step. Unfortunately, with the few exceptions noted previously in this report, that’s what everyone is doing. And without a solid expression of interest from the public sector, private developers cannot raise the capital needed to build the kind of demonstration projects that might attract the interest of lawmakers.

• “What can I do to help make PRT a reality?”

Decision-makers will need to perceive broad-based community support before they will be willing to commit to a fundamental change in how we get around. Hold your elected representatives accountable for the failings of our present-day transportation system. Make sure that they are aware that PRT can address those shortcomings more effectively than any other initiative they could pursue. Be polite, but do not let them forget that people are looking for meaningful action, not just fence sitting. You may also find it helpful to join with others by becoming a member of the Advanced Transit Association, or by starting a local advocacy group.

CONCLUSION

We now have the capability to build transit systems that are faster, cleaner, safer, quieter, and more pleasant to ride than anything that is in use today. At the same time there’s a desperate need for solutions to problems like traffic delays and traffic fatalities, global warming and air pollution, dependence on imported oil and the automobile’s insatiable appetite for more and more land. The transportation systems of today have failed us, and the need for an improved infrastructure is now widely accepted. Personal Rapid Transit is affordable, requires no new technology, and provides advantages that cannot be matched by any other system. Small PRT systems are being built now, but to make the leap to a full-scale demonstration project in a metropolitan setting will require political leadership and grass-roots support. The potential benefits clearly justify the effort.

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