

City Council Introduction: Monday, June 30, 2003
Joint Public Hearing of the Lincoln City Council
and Lancaster County Board of Commissioners:
Thursday, July 10, 2003, 5:30 p.m.

Bill No. 03R-172

FACTSHEET

TITLE: **COMPREHENSIVE PLAN AMENDMENT NO. 03017**, by the Director of Planning, at the request of Jim Burden, to amend the 2025 Lincoln/Lancaster County Comprehensive Plan, to include a presentation of a universal transportation service known as Personal Rapid Transit or PRT.

STAFF RECOMMENDATION: Denial.

SPONSOR: Planning Department

BOARD/COMMITTEE: Planning Commission
Public Hearing: 05/21/03
Administrative Action: 05/21/03

RECOMMENDATION: **Denial** (5-1: Carlson, Larson, Duvall, Taylor, and Steward voting 'yes'; Schwinn voting 'no'; Bills-Strand and Krieser absent).

FINDINGS OF FACT:

1. The staff recommendation to deny this request is based upon the "Status/Description" and "Comprehensive Plan Implications" as set forth in the staff report on p.2-3, concluding that the PRT concept does not appear to be a feasible addition or replacement for the current transit system or a substitute for the automobile during the course of this Comprehensive Plan. Before the PRT system for the Lincoln Metropolitan Area can be seriously considered for inclusion in the Plan, all the system design details and tradeoffs will need to be calculated. Any development strategy will need to follow formidable planning and evaluation processes so that the PRT systems can be compared with other transit systems on the basis of their ability to meet well-defined public goals. Potentially, the PRT concept could be reviewed as part of the upcoming community wide study to develop a Multi-Modal Transportation Plan.
2. The applicant's testimony is found on p.4. The additional documentation submitted by the applicant at the public hearing is found on p.10-26.
3. There was no testimony in opposition.
4. On May 21, 2003, the Planning Commission agreed with the staff recommendation and voted 5-1 to recommend **denial** (Commissioner Schwinn dissenting, See Minutes, p.4)

FACTSHEET PREPARED BY: Jean L. Walker

DATE: June 23, 2003

REVIEWED BY: _____

DATE: June 23, 2003

REFERENCE NUMBER: FS\CC\2003\CPA.03017

2003 COMPREHENSIVE PLAN ANNUAL REVIEW

Comprehensive Plan Amendment No. 03017 Personal Rapid Transit

Applicant	Location	Proposal
Jim Burden	City wide	Amend the Mobility & Transportation section to include a presentation of a universal service known as personal rapid transit or PRT.
Recommendation: Denial The PRT concept does not appear to be a feasible addition or replacement for the current transit system or a substitute for the automobile during the course of this Comprehensive Plan.		

Status/Description

Personal rapid transit is a generally unknown and undeveloped subset of a class of transit systems. The PRT term is the most commonly used for a range of concept technologies that are a system of (generally) elevated one-way guideways connecting small stations spaced relatively close together. With the stations placed off of the main guideway, this will allow vehicles to by-pass the stations thus providing a non-stop trip. Current PRT designs envision small vehicles, or "pods", seating 3-6 passengers each, traveling at 25 to 50 mph from any origin station on the system to any other station in the system.

The overhead guideways (or rails) are laid out across an urban area in a grid pattern and since the guideways are elevated, PRT operations would not interfere with street level traffic or require reductions in road lanes or parking. The only street-level space required for the guideway would be room to put a two-foot diameter support pole about every 60 feet. Stations would be very small, with typical stations being only 30 to 50 feet long.

Comprehensive Plan Implications

It is important to point out that none of the PRT technologies are currently operational or ready for deployment. Several urban systems are in the planning stages and receiving attention and others are more or less dormant, without development funding.

The PRT is a public transit system and is not likely to replace the automobile. Even though the PRT system is not expected to offer serious competition for the automobile, it does propose to have service characteristics for some markets that are expected to attract a large number of riders. The service characteristics are such that it may attract significant ridership with in some markets and directly compete with conventional transit systems. PRT studies are taking place in some communities but none replace streets.

Untried new technology

The PRT system does not fit into the monorail type commuter systems. Several of monorails currently exist in the United States and Europe, but these are largely confined to airports and amusement parks. Two cities, Miami and Detroit have monorail-type automatic downtown people-movers, and Jacksonville is now building one. Japan

leads the world in monorail technology and usage with includes eight transit systems and several new hybrids using the first working urban mag-lev system (magnetic levitation, a faster, frictionless monorail variation).

Even with this, these are monorail-type transit systems and do not meet the PRT concept definition provided by the Advanced Transit Association which says the true PRT is to include: 1) small vehicles available for exclusive use by an individual or a small group traveling together, 2) direct origin to destination service, without a necessity to transfer or stop at intervening stations, and 3) service available on demand rather than on fixed schedules.

There are several concept PRT systems in the planing and development stages that are projecting a viable revenue operation. But the PRT concept is currently an untested form of urban travel and is seen as risky technology to be initiating in it's early stages of development.

Projected PRT System Costs

The cost of a PRT system is a very frequent question and one that is very difficult to answer because costs depend so much on the particular characteristics of the application, which are normally unique to each urban area. Generally, the costs of a PRT system is expected to be around \$5 Million per mile (one way) which is based on a combination of actual prototype costs and several comprehensive costing studies.

Shown below are the capital cost and operating expense estimates for a proposed PRT application in Cincinnati. Note that these are costs for a complete, mostly ready-to-go PRT system and is only used here as an example. Only when some are built will more definitive cost information become available.

This cost estimate was developed by members of the Sky Loop Committee in Cincinnati in 2001 which is the most recent and detailed estimate of the cost of a PRT system available. The Sky Loop application is for a 12.84 mile downtown circulator type system. The assumed daily trips were 37,100 and the assumed vehicles per mile was 55. More detail on the proposed PRT network and other attributes can be found at the Sky Loop website.

Proposed Sky Loop PRT Cincinnati, Ohio (12.84 miles)

<u>Capital Costs</u>		<u>Annual Operating Costs</u>	
Total Capital Costs	\$70,080,898	Total Annual Operating Costs	\$ 8,927,723
Capital Costs per mile	\$ 5,458,013	<u>Annual Debt Service</u>	<u>\$ 1,360,788</u>
		Total Annual Costs	\$10,288,511

Conclusion

The PRT concept does not appear to be a feasible addition or replacement for the current transit system or a substitute for the automobile during course of this Comprehensive Plan. Before the PRT system for the Lincoln Metropolitan Area can be seriously considered for inclusion in the Plan, all the system design details and tradeoffs will need to be calculated. Any development strategy will need to follow formidable planning and evaluation process so that the PRT systems can be compared with other transit systems on the basis of their ability to meet well-defined public goals. Potentially, the PRT concept could be reviewed as part of the upcoming community wide study to develop a Multi-modal Transportation Plan.

COMPREHENSIVE PLAN AMENDMENT NO. 03017

PUBLIC HEARING BEFORE PLANNING COMMISSION:

May 21, 2003

Members present: Carlson, Larson, Duvall, Taylor, Steward and Schwinn; Krieser and Bills-Strand absent.

Staff recommendation: Denial.

Proponents

1. **Jim Burden**, the applicant, submitted written information for the record consisting of subtitles and references and 150 pages of rebuttal. The main issue is that we can do this in Lincoln. It is cheaper to build an initial prototype than it would be to do most of the transportation studies that the state and city undertake. It would be an effective replacement of all transit we do today. Automobile use cost remains the cheapest form of transit known. It is the labor cost that makes all transit forms noncompetitive with automobile use costs. PRT eliminates the labor costs and goes to automation. About 9 years ago, higher speed systems were proposed, and then a group in Sweden viewed the self-hoist systems. The self-hoisting systems allow elevated transit to operate without elevated stations. If the network is complete, then there is no reason to use the automobile. And if it is faster, there is no longer a need for airports. The reason we do not hear about this is because it eliminates jobs for engineers and heavy contractors; it eliminates the possibility of manufacturers to produce repetitive vehicles; it eliminates real estate development options which require about 40% more land in rural areas; it is about 1/3 of all the earnings of insurance companies; and one-third to one-half of all civil engineering jobs would be eliminated. Denver, Minneapolis, St. Paul, Las Vegas, and Seattle have had it in their public records from time to time but it has always been defeated by administrative decision. Burden further discussed the costs.

There was no testimony in opposition.

COMPREHENSIVE PLAN AMENDMENT NO. 03017

ADMINISTRATIVE ACTION BY PLANNING COMMISSION:

May 21, 2003

Duvall moved to deny, seconded by Larson.

Steward believes that Mr. Burden should be commended for his persistence and his research, and he does not think we do enough forward-looking planning in terms of our transportation system. We would do well to pay a little more attention to the alternative technologies that are available, even though it might take years for us to get there. The implications are huge. They have land use implications and corridor width and right-of-way implications, and we just continue to act as if the personal auto was the only and forever form of transportation. Somebody will see a change in that regard, but the question is whether we will be prepared.

Schwinn agreed. He does not know that it hurts anything to have this concept put into a 25-year Comprehensive Plan, or at least listed as a potential so he will vote against the motion to deny.

Motion to deny carried 5-1: Carlson, Larson, Duvall, Taylor and Steward voting 'yes'; Schwinn voting 'no'; Krieser and Bills-Strand absent.



LINCOLN/LANCASTER COUNTY

COMPREHENSIVE PLAN AMENDMENT APPLICATION

The use of this application is appropriate when a change to the adopted Lincoln/Lancaster County Comprehensive Plan is desired. The required questionnaire on the reverse side of this application must be completed as well. The application and required questionnaire are due to the Planning Department no later than 4:30 p.m. on February 21, 2003.

Please print or type.

Date: Feb. 21, 2003

Applicant: Jim Burden

Mailing Address: 7000 N.W. 27th St.

City: Lincoln State: NE Zip: 68524

Phone: (402) 470-3678 (402) 470-3678

Contact (if not applicant): _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Phone: () _____

If applicable, name of general area/location/site which would be affected by this proposed change
(Attach additional sheets if necessary.)

Personal Rapid Transit applies to Transportation
and environmental sections

Applicant Signature: Jim Burden

Date: Feb. 21, 2003

Numbered questions on the Comprehensive Plan Amendment Application, Required Questionnaire. Nebraska, national and global issues, comparisons and examples are provided for the Lincoln Lancaster county PRT proposal because it is almost impossible to separate transportation systems that would have to be transcontinental and mobility needs that are often trans oceanic.

1. Proposed here is the inclusion in the comprehensive plan of a presentation of a universal service personal rapid transit system, or PRT. This is treated eventually as a full transportation replacement. This could initially be a Lincoln-Omaha area highway and street unloader.

All urban plans start with acceptance of streets as the primary means of mobility around which the other community features revolve. PRT is vastly superior to the use of private autos, trucks and aircraft while eliminating a need for parked vehicles that may make profits for many businesses but boost the cost of transportation by at least a 5% to 10% share of Nebraska's economy.

PRT is available immediately on demand, requiring no land area for stations if the vehicles are self lowering. They can load on any flat area under the guideway for freight and passenger service. Combined with full automation to eliminate the 60% to 80% typical labor share of all hired transportation, PRT costs less per ton mile or seat mile than any other form of general purpose transportation.

Unlike all other forms of transportation that have idle periods underway PRT is nonstop in route. PRT is not likely to be commonly rejected by most potential users as all mass transit systems are because of the well defined features that exceed the utility of private automobiles and aircraft. PRT is about three to five times the speed and direct trip convenience of personal auto and truck use.

After thirty five years of active PRT development it is time one city in the world adopted PRT as the primary transportation mode. Let PRT compete in the market place with the road vehicle interests by treating it as an equal in the research dedicated to it according to the comparative data and observations. This is a request that PRT receive the place it deserves in every global urban and rural area transportation plan.

Lincoln just as well as any other place in the world could become the premiere community example of an urban area without any real need for significant road vehicle use. This would leave the whole of the ground surface for land uses as needs demand, not as they can be fitted into a road grid filed with cars and trucks. It takes fewer than one tiny 150 cubic foot volume PRT vehicle to replace about six automobiles and one semi truck in hauling capacity.

2. None of the goals and mission statements, that require a transportation solution, generally described in the Comprehensive Plan, can be implemented without PRT being the primary means of mobility. PRT of the right combination of features remains the only definable form of ultimately good transportation without any utilitarian flaws.

Without a full grid coverage of PRT service at nearly every property and structure on the properties, the approximately 28% of Lincoln area residents who do not have a personal automobile lack good transportation. PRT is transportation to everywhere all people want to go, as rapidly as possible, at any time, at low cost, in perfect safety. Auto owners also do not have an ultimately safe, convenient, fast, low cost, environmentally neutral transportation. Any detailed objective study would find the ideal achievement only possible with PRT of the highest performance characteristics. The only walkable city possible with modern cosmopolitan culture is a PRT city. The only environmentally neutral rural development is a totally PRT rural development.

PRT should be ideally inside loading or at door loading access at all commercial sites and activity centers, eventually spreading to subscribing residential blocks. Eventually these lines could service all of Nebraska's approximately 8000 urban street miles. The approximately 10,000 miles of highway connections to all

towns in the state would be possible with about 500 to 1000 vehicles per day on any road. A full PRT conversion would be cheaper to build and maintain with the same tonnage of truck traffic and auto trip miles than the current average of Nebraska highways and street systems. This is with a parity in current vehicle operating cost with over 20 billion miles a year. The cost recovery point is about seven years, at about 5¢ per vehicle mile, hauling one passenger in a four to six seat vehicle or 1000 pounds of goods. The example given is a 150 cubic foot, 100 pound per linear foot GVW vehicle. The vehicles have to have less than 13 square feet of frontal area at a coefficient of drag of .06 or lower for the whole averaged area.

This is at about 30% of the cost of Nebraska's current transportation.

This is a saving of about \$3 billion to \$5 billion a year in Nebraska's current \$54 billion economy. This is during an approximately 16 to 17 year debt retirement period for the entire guideway network vehicles and electric support system. PRT pays good interest and profits to the developers but should become a self owned public service chartered industry incrementally over that period. After the debt is retired the cost of transportation drops to about 12% of current costs, counting a little for accumulating maintenance and replacement. All the cost of vehicles and the tripling of electric power production in the state would be taken care of by the share of the approximately \$8 billion we currently spend on all road vehicle use out of Nebraska's \$54 billion gross domestic product. This could be handled for less than about \$1 billion in PRT operating costs and about \$2 billion a year debt retirement. All guideway users would have to invite the guideway service to their neighborhoods to avoid eminent domain and external control of the system. The property owners and users would have to desire to reduce their cost of living and greatly increase their travel speed. For businesses, easier access by customers and faster merchandise availability would be the inducement to request service. Usually items could be received from most wholesalers in the same hour. Neither automobiles or trucks with all the future projected control and communications possibilities of fully automated highways and the radar safety systems and all improvements in running gear and body materials can achieve this possibility a thousand years from now. This was possible with lesser speed and electromechanical interlocking about a hundred years ago. PRT can be proportionally fare supported where ever the user density is high enough, about 500 to 1000 vehicles per day. For lower traffic situations special funding would have to be devised or the user would have to accept the built in higher metered fees for spur guideways. This fee system could be part of every vehicle and guideway section. Revolving funds could be created from general guideway fee revenues to pay for certain lesser used feeder grids. This is little different than gas tax funding of road ways. PRT fees can be incrementally metered for all separated costs accumulated moment by movement and at each section of the guideway. PRT is more equitable because every user pays the exact metered cost of the trips made and no more. There need be no tax support for transportation except for subsidies coaxed out of government to continue to support any repairs on the almost unused parts of the system.

The impact most feared is true; about 0.5% of Nebraskans would lose their business's value because they invested in century old obsolete technologies. Roads development was made acceptable for general use only with government mandated support and suppression of the only known alternative. As many as 80,000 Nebraska jobs might be lost to the guideways but the economic gains should replace them. This transition would happen slowly over about a twenty to thirty year period in which the new found freed up money from transportation savings in the economy would create other jobs even if no PRT production occurred in the state. This potential reality has been the reason special interests have lobbied hard to make sure PRT never even comes up for discussion.

Advanced transportation which can only be PRT is not addressed at all in the comprehensive plan. Improvements in the multi modal transportation infrastructure is supported. This is a single mode replacement for all the obsolete systems except for the less than 1% of net loads that are too large to carry on the guideways. These would have to use the existing roadways or use aircraft transfer.

PRT is excluded from the Lincoln area discussion because dependence on a fixed transit system is believed beneficial only in a dense, high traffic urban area, where congestion and parking make mass transit the allowed contender. Mass and group scheduled transit are not as desirable as personal road vehicles. Transit

development is based on the well described but flawed assumptions of large vehicle efficiencies, themselves based on the assumption that only the existing vehicle forms have any validity.

4. PRT might reduce the transportation cost share carried by the local economy from about 15% to 20% of total domestic product to about 5% in as little as fifteen years. This might be no more than 25 years to nearly total conversion. This would be a gain in the quality of life to Nebraska residents as a whole and rural areas in particular, where the yearly travel mileage per capita is higher and there is a need to get to more sophisticated urban services. These are often over a hundred miles away in the Lincoln and Omaha area.

PRT with the Swedish self hoisting proposal eliminates elevated stations and monorail drop ramps. In this way PRT becomes a totally aerial system taking up no separate right of way land. PRT would use almost no land in that the guideway piers, like street light and utility poles, allow full land uses around them. There are many aerial and buried interference points with guideway installations that might be contentious but all of these have specific technology based solutions.

PRT is not a cooperative multi modal choice intended to complement the other forms of transportation. PRT of the right design is an aggressive competitor for business, not because of promotion or government support, but because a few well thought out engineering decisions can replace millions of repetitive management decisions. PRT eliminates the great labor overhead of all the other systems. Preserving profits and jobs is not good for the community when the cost of those jobs becomes a drag on the whole economy.

PRT is the only form of transportation that can allow green environmentally neutral communities. PRT can side step all utility installations and regular services with automated batch delivery of water, pick up of sewage and garbage, plus retail direct delivery for nearly all goods and services. This changes the make up of neighborhoods which are freed from dependence on central utility grids, and nearby services and local retail. Merchandise could come directly to the home with fully automated delivery.

School children from the earliest ages can use PRT instead of busses. Fire and sheriffs departments, police and ambulance services using dual mode PRT would require fewer people as well as provide for the elimination of traffic patrols. PRT pipe line and commodity trains could deliver more irrigation or fire suppression water to any guideway connection than would be normally piped. PRT water and waste handling systems are portable and can work transcontinentally where they are most needed instead of remaining at partial capacity or as idle investments buried under the ground. PRT can deliver nearly all building materials and special construction equipment to job sites and can remove the rubble. Sources and disposal points can be hundreds of miles away from the residences and industries. The economics are as yet uncertain but initial computations show promise. The same vehicles that haul water could haul coal or grains at lower than the cost of rail service and eventually at lower than the cost of large marine carriers once the sections of the systems used were debt retired.

5. After 23 years of telling people about PRT locally, I have spent only three years in active presentations to a few groups, including three displays and booths at public events and participation in group discussions at political and environmental meetings. The following are some subjective experiences.

Several hundred people have expressed dismay that PRT does not receive any government mention or that they had never before heard of it. When seeing it has long been proposed some people feel there must be something wrong with it, that maybe it is a system that doesn't work. Actually PRT is no more difficult technology than is the internet or many appliances and automated controls which we use every day. The idea that PRT is generally unprofitable in the long term seems to draw recognition as the possible reason why it is not promoted.

A display at the state capital created interest from some viewers but no interest from state legislators. Talks with several transportation planners and executives have resulted in the typical range of opposition and zero support in spite of the potential benefits.

If a PRT initiative could be raised it would be over the opposition of almost every one in public life to whom I have talked. "Even if this was as good as you say, I could not do anything unless there was much support from others," said Doug Bereuter. There has been occasional enthusiasm from midlevel management but little support from their superiors.

Rebuttal To, The MPO Denial Of Any Mention Of PRT In The Comprehensive Plan
PRT Better Comprehensive Plan Guidelines And Goals Than All Existing Systems Together
Goal Save 10% to 15% in Cost Of Whole Area Economy
Accept Losses To Existing Jobs And Businesses As Net gain In Growth Potential
Low Input Miniature Scale Industries
Concentrate on Production Machinery And Automation Systems, Leave Rest To Other Areas
Single Transportation Network Replacement For Streets, Highways, Airlines, Railroads, Marine
Fully Automated, Miniature, Individual Service Guideways
Autonomous Automated Transportation Vending Machines
Self Managing, Self Repetitive Engineered, From Standardized Formulas and Parts
Existing Chained Guide Wheel Motor Enclosed Expansion Drive Technology Start Up
Use Motors From Three Primary Electronically Commutated Regenerative Controller Suppliers
No Identified Automation Suppliers For Staged Improvement Of Automation Package
All Local Job Shop And School Project Engineering
Some Initial Contacts And Bid Prices
Found No (Zero) Leaders Or Supporters Of Consequence
Globally One Estimate Of About 2,000 Dedicated PRT Current Workers, About Half Credentialed
Eventual Maglev Systems Goal As Pre planned Existing Structure Conversion
Found One Located Automated Dispatching And Fully Automated Management Software Supplier
16 US Suppliers With Basic Automation Dispatching Systems
Integration Currently Requires Separate Processor Networking inputs For Prototype
Planned Multiple Path including New Technologies As They Become Marketable
Secondary R&D Financed By Mobile Sales And Amusement Ride Demonstration, Then Freight Fees
Zero Government And Business Revenue Goal
No Corporate Sponsor Located, But Few Tried
For Investment Bond Assistance, Malewicki Phoenix Area Proposal Model
One Possible Automated Engineering And Management Authority
Public Trust User Property Owner Cooperative Formula Control
Self Owed E-Sign Vehicles Contract On Self owned E-Sign Guideway Automated Authorities
Suppliers Paid Off On Delivery With Guarantee Contracts By Bond covered Formula Management
Integrated Movement Of People At Aircraft Speed Inside And Between Cities
Almost No one Would Desire To Drive, studies Show 5% to 8% left Driving For Short Period
Almost No One ever Killed Or Injured Again In Transportation Accidents (Reasons In References)
Roads Remain Open As Limited Maintenance Allows For Over Sized Load Movement
Typically 20% Urban Land Areas Opened Up For Redevelopment
Cities Become Quiet Parks With Structures And Overhead Guideway Grid
Most Road Vehicle Need Lost By Second Decade
Ocean Tubes Started By First Decade
Global Connections Completed Second To Third Decade
Gravity Evacuated Tube PRT Started By First Decade (See ETT Web site)
By Second Decade Ground Trip Speed Exceeds All Airline Speeds Except Space Planes
Most Railroad And Airline Need Lost By About Third Decade
Fast Empty Response To Calling User Goal Maximum Time Rural Two Minutes Urban 15 Seconds
Load Unload Median 15 Seconds Per 150 Cu Ft, 1,000 Pound 4 Passenger Net Capacity Vehicle
0.06 Coefficient Of Drag @ Frontal Area Of 9 Sq. Ft. Standard @ 100 Pound GVW On Beam
30 HP Linear foot Intermittent To Top Speed, 7 HP Per Foot Continuous With Existing Motors
150 Pound Per Foot, 16 Sq. Ft. Oversized Vehicle Option With 75% to 80% Net Of GVW
Prototype Safe Operating Speed 250 MPH Continuous 350 MPH Intermittent 400-600 MPH?
Probable In town And Amusement Ride Safe Speed Initially About 120 MPH

2

Self Lowering Station Free Vehicles In all Of This Proposal
 For Under 35 Foot Drop In About 30 MPH Cross Wind
 10 Flat Cross Tape Cable Winch Design in Second Prototype
 From Start 4-6 Months To Demonstration Of Vehicle and Guideway Using Easiest Parts
 Possibly One To Two Years To Line Service Demonstration And Amusement Ride Sales Tool
 Marketable Products 2 to 3 Years
 Entrained And Spread Out Vehicle Load Control
 Spaced PRT Single Line Guideways \$250,000 Per mile goal, Entrained Two Way \$500,000 Goal
 3500 Mile Lincoln Omaha Area Example \$3 to \$4 billion Initial Cost Direct 95% Of Properties
 Current Replacement Yearly operating Expense About \$2.5 Billion
 Independent Vehicles High Speed Entrain Detrain To Reduced Singe Vehicle Energy Consumption
 Uncertain On Time To Develop Entrainment Options (French Aramis Project Did it in 1987)
 Unlimited Train Length Each Vehicle Self Powered Multiple Unit
 All PRT Standard Passive Switching
 Combination Multiple Anti Switch Splitting Protections
 No Commutators, No Flanges, Full Double Wall Enclosure Silent Drive
 Nearly Full Running Gear Explosion Protection In Drive Housing
 Uncertain Of Choking Internal Drag Mitigation Scheme Results
 Low Drag Air Inflated Nose And Tail Cone Streamlining Serves As Deep Collision Bumpers
 Accordion Centered Collapse To About Six Inches From Three To Nine Feet
 Flat End in Motion Full Speed Entrainment Goal
 Anti Cross Wind Buffeting Mechanism Goal And Trade Off Problems
 Permeant Maglev PMI Motor Goal And Problems
 No Upper Speed Limit But Impedance Losses And Radio Frequency Emitancy
 Self Weighing, Half Pantograph, Auto Balanced Height, Deep Suspension
 Simple Detectors Provide Multiple Redundancy Two Stage Component Idle To Gradual Failure
 Higher Specific Efficiency As System Ton miles Than Railways
 Beats Imediately Most Airline Flights Door To Door Of Residences And Businesses
 Approximately Three to Five times Urban Auto Speed
 Replaces Streets At Current Total Yearly Investment in About Seven Years
 Three Years Self Debt Retirement For Total Main Systems Share Assumes Public Acceptance
 Replaces All Transportation in About 15 to 20 Years At About Half Current Economic Cost
 Self Pick Up And Delivery Same Vehicle All General Freight And Passenger Movements
 99% Plus Saturation Of Freight and Mail utility
 Unlimited Vehicle Range Direct Pick Up electric Powered
 All Electric Distribution On Guideway Structures Not Effected By Ice Loads
 Guideway Duct Carrier For Fiber Optic Distribution At Fraction Of buried Or Pole Carried Lines
 All Wind Electric Deep Storage Power In Midwest, Lower Than Fuel Power, Full Time
 Guideway Needs Three Times Current Power Generation Capacity
 An Impetus For Full Conversion To Wind Power
 Distributed Package Internal Combustion Natural Gas Back Up About \$150 KW Installed cost
 Center Block Urban PRT Format Proposed Between All Structures Now Served By Streets
 Lower Cost Than Maintain and Operating Vehicles On Streets About Every 7 to 19 Years
 A Self Financing Pay Back, Self Sustaining, No Tax Base Support
 Nearly Complete Transportation Replacement,
 A Lincoln Area Guideway Business Plan and Development Proposal
 Same Plan Adapts To All Willing Governments
 Exportable Production Systems As Turn Key Package Plants
 More Need in Developing Countries Than Here

Mass Produced Portable Miniature Production Plant and Installation Systems
Attempt Solution To Utility Crossing And Tree Trimming Problems
Attempt Solution To Bird Strike Problem
Creating the First Practical Application Of New Global Industry
Starting Simple and Adding Complexity As Investment and Income Allows
The Automated Dispatch Jitney Alternative
Conventional Vehicle Characteristics, Whole systems And Economic Dependency Comparisons

References to be used for clarification of General personal rapid transit or PRT principles. Combining Skytran, Swedetrack, and Highway Proposal features With Spanish Talgo running Gear as applied in 1970s By SantaFe R.R. tests. Introduces duplex disc guide wheels centering elements and Chained Passive Switch Steering augmenting possible electric magnet switching and anti switch splitting deployable wedges. No guidance rollers or safety tangs in slots.

skytran.net, "Flyway" or swedetrack.com, search "Higherway (the transportation system)", "Advance Transit Association", "Transportation Alternatives", "taxi-2000", all the works on PRT by Professor Ed Anderson, the Transportation Research Board TRIS files search for "personal rapid transit" 660+ technical papers and conference proceedings, *Innovation and Public Policy* a book by Catherine Burke available from E-Text on the internet in paper or disc. See the Monorail Society web site for historical references. See the Electroautomatic high speed railway work of David G. Weems 1884 to 1889 and Electric Carrier Corporation work 1906 to 1913 information available from the National Archives and Smithsonian Institute. Crude PRT video clips of historic PRT systems and the Monorail Society video available from Jim Burden. Most PRT pictures have disappeared from the main engineering libraries except in little read conference proceedings and materials available from isolated and primary sources.

From Jim Burden, 7000 NW 27th St., Lincoln NE 68524, Not connected to any promoting organization or business interest. All public domain material no proprietary ideas used. Anyone can do this. PRT is simpler than automobiles and road construction. Simplicity required to reduce management and investor overhead share for greater user gains in the long term.

The long range transportation plan of the comprehensive plan is supposed to as stated in the plan, "promote greater modal diversity (i.e. lessening reliance on automobiles) over the life of the plan." "This includes descriptions of capital and programmatic activities encouraging travel by modes other than single occupancy cars and trucks." To justify the opposite criteria for the goals of the comprehensive plan the MPO or Allen Abbott using the current data trends points out that automobile use is ascending while the transit walking and other alternatives are a descending in modal diversity potential. This is true Because individualized vehicle service even applied to all freight movement of most smaller rearranged size and shape items is more desirable carried by PRT than by mass movement vehicle off all kinds. Freight PRT eliminates most warehousing transshipments and multiple handling stages eliminating much retail delivery cost of all goods and commodities. Fully autonomous automatic self loading and unloading vehicles are required. There is no reason at this point not to integrate most clean container freight handling into passenger carrying vehicles. This reduces the global vehicle Fleet mass to less than roughly 5% to 10% of current weight. The small vehicles simply put on more miles and pick up and deliveries each year than any other kind of vehicle and can be incrementally added to in numbers able to keep each vehicle fuller with less waiting time to accumulate shipments able to fill larger vehicles. A more life time ton mile productive full service identical vehicle fleet eliminates much of the capital investment cost of transportation. PRT vehicle also eliminate or make obsolete the infrastructure overhead costs of post offices,

truck freight, package delivery and airline terminals because of the capacity for fully automatic vehicle to vehicle transfers for less than vehicle loads and tiny vehicle able to carry loads direct door to door without requiring a transfer. The small vehicle on each end of a transcontinental or intercontinental trip act as automatic courier services just as they would for across town or in area deliveries. Once going to a distant destination each vehicle has to have the intermittent motor power to catch up to and join with long distance trains to almost eliminate air resistance relative to the resistance of multi hundred ton net capacity trains with often no more than about nine square feet of highly streamlined node frontal area.

The problem remains how to design long life vehicles that are reliable, safe, never fail in service. Required is an attitude change a philosophy that guides thinking and defines product qualities. From Joel Barkers book on paradigms and other sources the following ideas.

- "Quest For Excellence Goal"
- Design For One Century Plus Longevity
- Maintenance Self Checking Integrated Into Automation
- "Everything Works Right The First Time"
- Zero Tolerance For Failed Designs
- Past Investments and Marketing Can Not Guide Future Development To Improve old Products
- Self Maintenance Organization Built Into Automation
- Multiple Redundancy, Gradual Failure
- Zero Tolerance For All Accident Potentials
- Zero Tolerance For Automation Failures
- Humans Fallible, Need Machines That Do Not Fail
- Humans Make Mistakes The Machines Can Not Be Allowed To
- "Everyone Quests Doing It Better Today"
- Consumer Needs Met As they Would Want Them
- Providers Benefit Without Planned And Forced Consumption
- Total Ecological Neutrality Planned
- Total Single Step End Of Fuel Burning
- Must Have All Implementing Technologies Aligned
- No intermediate Stages for Hydrogen Cycle Fuel Cells Or Fusion
- Instead Lowest Specific Cost Energy Sources Possible
- Dispersed Generation, Direct Delivered, All Deep Storage Wind and Focal Point Solar Energy
- Lowers Whole Economic Cost Of Living
- "Product Works Better, Lasts Longer"
- "Waste Disappears From System"
- Lower Minimally Sustainable Life Style Cost
- "People Mostly Come To Love their Jobs And Lives"
- Lower Stress Longer Lives
- Less Need For Government
- Decentralized Institutions In Lower Cost Threshold Management Units
- Automation Of Repetitive Management Functions
- Decision Making Assistance

The approved Comprehensive Plan idea remains that the only recourse for non auto users is to follow the path led by tens of thousands of the worlds major metropolitan areas and subsidize a somewhat complete scheduled fixed route bus and train mass transit service. Train is rejected

for internal city use accept as an urban status monumental system to duplicate other urban light and commuter rail systems. All Transit requires, but never delivers, service variations, with routes close enough together for minimal walking or frequent enough in service that it will capture a fair number of trips of non auto drivers. Park and ride is just as undesirable as walk connected transit. Transit and streets and highways makes equal money for engineers and heavy contractor oriented consultants. Mass transit is the best promoter of auto industry use goals to entrap consumers and governments in continuous rounds of spending ideally with never a total solution. This protects profit consistency. A good transportation system should retire any need for it's providers after about one to two decades of implementation except for proportional growth costs.

There is no total solution or provision in the Comprehensive Plan for people do not have a parked personal auto waiting for them at every place and moment because they are (too old, too young, handicapped, lost their license, impoverished, with a personal trend as a non driver, because of personal principles against auto use and owner drivers frustrated by parking or traffic problems). These auto disadvantaged people represent between about 25% to 30% of the Comprehensive plan area's population made up of mostly auto independent people. In Schooling this is called "separate and unequal".

Why do we tolerate this in transportation? Because transportation is Big business that also includes much of the investment and banking business, real-estate conversion of maximum areas of property from rural to urban use, government administration and the insurance and engineering professions, the largest use of all materials globally, the largest labor union employer. There is enough in transportation for every one if they all stick together. Historically this was Sloan's plan in 1932 which remains now institutionalized and self sustaining in the present and is assertively integrated into all planning in future growth documents. That is simply the history of it not a conspiracy theory just a well thought out business plan. Consumers had to be lead with well thought out publicity. See all of the transportation historical videos at N.U architectural Library such as the *Divided Highway* series and *Taken For a Ride*.

Automobiles nearly all require between about 10¢ to 25¢ a vehicle mile in real direct operating costs with a median 1.1 and declining passenger load. Transit really costs between about 50¢ to over \$4.00 a typical passenger mile. In Lincoln taxi cabs are about 15% of public transportation trip miles at a cost of about \$2.50 a typical passenger mile. Startran's costs about \$3.40 a passenger mile. The University bus system about \$1.20 a passenger mile.

People around the world have been denied effective transit and could all use fast long distance, convenient transportation such as a full area coverage miniature vehicle PRT system at a real operating cost of between about 2¢ to 5¢ an operating mile.

It has long been observed that for the typical cost per transit rider per year you could lease, maintain and provide fuel for a personal car for most transit users. The problem is possibly 20% to 30% of these public transit dependent people can not or will not drive themselves anyway. Parking near their residences or jobs is sometimes a problem. Most people have no choice but to depend for the most part on some one else's automobile for mobility and cabs at about eight or more times the average cost of owning and driving. Startran's and county bus trips are as expensive per mile to deliver as most cab services even though they are slower than an all county accessing demand response cab service.

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A unlimited entry level jitney service is a fraction the aggregate cost of all the current public transportation systems. since almost no one could compete an unregulated jitney system other than safety and liability insurance would put all the existing carriers out of business and attract some personal vehicle ownership business. That unfair competitive potential of unregulated jitney service was outlawed city by city over the whole of the U. S. in the 1920s. jitney use is competitive in time and cost per passenger mile with even personal auto use at about 30¢ to 60¢ a passenger mile (estimated) and would possibly get 10% or so of private cars off the streets into typically two to three passenger road vehicles at a lower investment than PRT. The introduction of fully automated systems wide multiple user coordinated dispatching system in the last two years with over 150,000 currently operating US automated dispatched vehicles with simple features are now in operation. This means a unified all private owner jitney system might provide about 1,000 to 5,000 jobs in the Lincoln area if it became popular. This is a self supporting operation that would eliminate an unknowable number of jobs in other transportation industries. If these jitney drivers jobs are subsistence level the main cost of all transit services is reduced. The jitneys also eliminate the shop and support employees costs of big transit systems. With these costs lowered the cost of the service can be as little a half to a third the cost of urban bus or commuter rail systems in real terms. This makes the jitneys with an area wide computer dispatch system a taxi cab van that can show up in less time because there are more of them on the streets in mid route with empty seats most of the time. The greater availability is because these are small lower cost per mile hybrid regenerative braking busses offering a cheaper service than the riders control directly communicating with the owner operator instead of an expert transportation manager. The jitneys are on their own as business entities but can benefit from a small cost addition shared by them proportional to use of a fully automated dispatch and vehicle management system. On the internet search Mobility Knowledge and Trapeze Software. This is also every basic element of a PRT system applied to land vehicles including vehicle routing and guidance.

Jitneys can change form running like regular cabs in dispatched or flag down taking on individuals point to point or serial pick up and drop off group service either dispatch or flagged down. The riders on board decide for the driver how they want their service at a lower cost or as fast as possible. The vehicle proposed here operated in two to three shifts without let up costs about 15¢ to 20¢ a mile to operate but seats eight people. Buses in town cost about 60¢ to \$1.20 a mile to operate. Normally only two seats would be full on average but this is demand response in a fast low fuel use vehicle. The operators cost share is about 30¢ to 50¢ a mile depending on how many rural mile share the bus is putting on. This would be a urban rural bus system with ideally no boundaries to interfere with customer access, The Nebraska Public service laws have caused trillions of dollars in loss to Nebraskans over the last 70 plus years. these jitneys should be allowed to haul freight and move household possessions or any other service to augment their passenger service.

Just like the PRT proposal these busses should charge variable fees to proportionally cover costs for each mile driven plus the operators wages. The operator might be given a bus and hold it in public trust with the vehicle retiring it's own debt and keeping it's own maintenance histories and scheduling serves as needed.

If the service was faster and cheaper than cabs then it might become popular enough to put several hundred jitney vehicles on the road in the Lincoln area at most times during the day and several thousand during rush periods. The reason so may might be needed is this can be close to

the convenience of driving cars but with no personal responsibility or peripheral costs. If the jitney system had no territorial boundaries or service restrictions then the service access might be the same as using personal cars and trucks. Possibly 5,000 jitneys could handle all the personal and clean container commercial vehicle trips in the whole city and county area or approximate auto driving costs and speeds. Enough vehicles would have to be available so there was almost no delay in catching a ride at most times of the day. People could use their cell phones as with PRT to call up a ride. Unlike PRT the vehicle cost per mile is several times higher and the speed is at best only about one fourth as fast, similar to auto use.

With fewer vehicles on the road at any moment cross town trips would be faster than with auto dependency since the jitneys often would have several passengers unlike bus or cab service doored up the ride but can take group service vehicles. While this is intended to be an example situation in some cities it could become the most popular transit system in the US. In some places in the world this system has forever been in operation without the organizational advantage of the fully automated dispatch system. This would work as long as driver wages stayed minimized and special vehicles were used that were built to decrease the life cycle costs over the less efficient to operate vehicles made by all companies today. As the cost per passenger mile rises utility competitiveness with autos decreases to that of the existing transit systems. Speed is more important for most people than price. That is the reason they do not ride transit today. Jitneys cost less because there are no fixed facilities or large scale management and personal costs. Each owner or a group owner or lessor or trust holder is the whole business management usually with one vehicle per owner operator. An advanced automated dispatch can make hundreds of independent vehicles work as a highly organized disciplined company system. In the absence of PRT with no wage and hour, benefits, alertness or personal problem issues transportation is as low in cost as it is possible to get with a jitney system.

Station cars and group cars can not be self redistributed empties so provide little relief for parking as well as traffic problems. Think of PRT as station cars on a fully grade and land use separate guideway with total traffic and empty redistribution and no parked vehicle yards or lots.

Like handivan services all transit services are subsidized so the users never have a feeling that it costs more per passenger mile to take a bus with half a dozen average people on board than to travel one at a time in a personal automobile. Startran is about eleven times private automobile average total cost per passenger mile. Why fund it any longer?

Deregulate public transportation in all of Lancaster county except for safety and liability protections and public transportation will bloom into a weed but a weed that bears useable fruit. State law gives counties and cities control over all of their internal transportation rules. PRT can legally under state law locate on any state right of way and condemn property as needed according to state railway law. This adversarial prospect should never be needed since the property owners and users would normally want between transportation access than their automobiles and trucks can provide.

No mass transit system in the world offers significantly better service in wealthier developed countries than auto service because the roads are in pretty good shape and gas plentiful and fairly low in cost per vehicle mile compared to transit service. Vehicles last longer with every passing decade amortizing out their purchase prices with as lower depreciation loss as a proportion of their full life cycle. Only a good jitney service can come close to auto driving

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costs and speed assuming it is prolific in immediately roaming empty capacity, demand response and random pick up potential. There is no ideal jitney vehicle built anywhere in the world that is fast in loading time. This is required to reduce total travel speed in which the pick up stages are often about a third of all time consumed in motion. An ideal jitney vehicle requires a combination of about a 9 inch high low floor and multiple doors with direct seat access with a stand up ceiling height for quick entry and exist. Getting these features in a light weight under 11 passenger vehicle requires a hybrid rebuild of an existing front drive chassis. Suggested is a VW Eurovan clip with a five foot wide full length body two abreast and three abreast seats with folding arm rests and folding seats for wheel chair slots. This gives ideally a normal eight passenger semi recliner seating with a sixteen passenger peak seating in a 24 foot long 8,000 pound vehicle with electric drive on two rear axles and gas or diesel on the front axle. two vertical sliding doors face two facing bench seat passenger compartments straddling a single fixed axle with a steering axle on either end (see Swededtrack explanation of doors). To achieve 15 to 20 MPG efficiency in town requires combing a highly streamline body over the VW running gear front drive with an off the shelf electric regenerative braking rear drive axle sets to reduce brake and reacceleration maintenance for such a light weight drive train vehicle. This requires a special construction project that has no precedence. The winnebago Realta factory refused to consider it but Red Line Engineering might have been a close low bidder but apparently just went out of business. Have contacted other remanufactures but so far no positive interest.

Transportation is often the largest major urban area share of a governments general tax supported budget after schools and welfare of all kinds. Gas taxes pay for most of the governments cost of providing a road vehicle totally interconnected transportation grid that reaches nearly all properties and structures on the planet. This American two million miles of hard surfaced roads and another two million miles of soft surface roads has become unquestionably the transportation standard mobility and access system supplanting unimproved roads, railroads and marine traffic of the century before. This universality gives the illusion it is the only form of transportation that can support modern culture elimination any investigation into the only other known contender or PRT

The road system has come to be totally heavy concentrated truck and bus load compatible so is a drainage, land use and traffic hazard built at grade with wide flat shoulders and wide ditches and side of road areas. This not only uses about 25% more total developed urban land than with a PRT system that can be build over other land uses and existing right of ways but it wastes economic exchange the in a more efficient guideways supported world could be spent elsewhere. Road transportation is not self supporting. We all support transportation with about one fifth and soon to be approaching one fourth of our earnings. This is a government mandated support because without a government lifting of the restriction on guideway development by not at least acknowledging the possibilities of having a superior means of getting around their will be no guideway research from large private developers. Successful PRT results are ignored or turned down just like the poor quality prototypes. It does not pay to develop and prepare to market a product if the product is kept from being installed in public right of way space, never allowing the developer to make a living from the effort.

The problem is the gas taxes and registrations fees are relatively easy to collect to build the roads and parking areas, assures the profitable road industry will continue to maintain itself as the only general purpose form of transportation despite probable higher ton miie and passenger mile costs compared to the guideways. The result is probably a higher cost of living and doing

business and a lower over all productivity in output to benefits ratio for the economies as a whole. Just as war is said to enhance economies, which may not be true, so road vehicle waste might be said to enhance the economy and so become a necessary evil that can not be challenged lest the challenge destroy profits and jobs. The business and job losers from allowance of PRT development and installations would become political enemies of any participating politicians just as they are enemies to the better interests of all people in general. Subsidies keep transit systems from sinking of it's own costs and the mostly poor users inability to pay for the service. The fixed costs per vehicle mile of all but bus and cab systems often doubles the operating costs.

Only PRT with a low operating cost can pay off rapidly it's own fixed right of ways costs assuming PRT is faster than all and other services and so would get most of the use.

Work trips are in Lancaster County supposedly about 1.5% transit and the rest other systems, mostly auto use. This is based on the MPO's statistics. According to accumulated mileage's from the State Department or Roads for Lincoln vehicle miles and all the reported carrier estimates for all the for hire carriers of passenger miles with added estimated miles for the private carriers this transit share of passenger miles in the Comprehensive Plan area is under .2% not 1.5% as implied. This is probably because work trips are small fraction of all trips but comprise a congestion problem that the MPO seems dedicated to over come to have credibility as proving an answer. The real problem is the auto disadvantaged people are predominately poor and young old or handicapped and viewed in all government administrative decisions as second class citizens. In more than one conversation with transit users city employees have refereed to transit in the politically incorrect term as welfare transportation. Auto use is always seen as self sustaining transportation because it has no generally recognized superior competitor. That superior competition is what PRT systems to have always been about. In the 1980s the former director of Caltran told me almost monthly he would get a letter or call form someone saying in effect convert totally to PRT and not waste any more time with the other systems developments. none of this is new. The US Postmaster general in 1893 predicted fully automated pneumatic tube delivery by the turn of the century. The US Post office built 104 miles of domestic tubes between post offices while and additional 500 plus miles were in operation in England and Europe from 1958, some is still used to the present. See the capsule freight transportation web site.

The auto use growth problem is not a lack of subsidized transit. In some communities in the world transit is available every where at a low price and auto drivers still are increasing in the face of traffic congestion and parking night mares we can not dream of in Lincoln. Personal auto use is around the clock imediately avialable transportation usually at the highest area trip speeds at the lowest personally perceived cost per mile.

The problem is transit even personal automobile transit is poor quality transportation that is the number one unintentional consequence, killer in the world in terms of life years lost. In Lancaster county auto use amounts to about,001 averaged over a six year study period, life years lost per year. That is human lives terminated by auto accidents lost about,001 years against the average potential they would have lived to. In addition in the county there are severai tens of thousands of permanently disabled life years inflicted by accidents on people who are now living out their lives often with a government disability payment or extended medical assistance because their insurance ran out and for some reason they do not qualify for other coverage. It is interesting that no public health study tracks the cost of these disabilities to the

governments let alone the greater costs born by the victims. While about two thirds of accident deaths are attributable to personal risk taking by the victim, the other third of deceased individuals are innocents whose lives were terminated because of the existence at all of the road vehicle transportation system with no other substitute. In other words without a superior PRT system unless you know of another alternative about 80 to 90 traffic fatalities in Nebraska for instance are literally killed by the state enforced primary road transportation system against which no form of competition from the miniature fully automated vehicle systems is considered. 38% of fatality accidents involve alcohol but only 6% of non fatality accidents involve alcohol.

The eight painful and costly injuries per fatality and the hundreds of accident damage losses per fatality are hardships imposed in the general public and according the federal estimates are about 1.5% to 3.7% of the whole of the states economy over a range of estimates. Most accidents come about because people are fallible but are expected to be perfect in temperament, and moment to moment risk taking driving decisions, always alert driving vehicles that never fail on roads with no unforeseen traction or visibility problems in traffic where all the other drivers and pedestrians also never make mistakes. PRT eliminates all of these problems by redesigning the transportation architecture to fit the need of achieving perfection mechanistically not trying to perfect the talents of humans and make adjustments for the well known variables of driving conditions.

No loss in a transportation accident ever again has to occur if a well designed PRT were allowed to become a replacement system for all existing transportation. PRT remains because of it's mechanical and operating characteristics probably a nearly perfectly safe form of high speed low cost transportation. Read about the comparative examples in the reference materials. PRT would entice even the most auto dependent drivers to abandon their cars and trucks since they could travel only a fraction as fast at a higher cost per mile in road vehicles that were always rougher riding and noisier than an fully equalized self leveling suspended monorail .

The PRT riders would not have to take any responsibility for their movement other than dialing a four or five digit number on their cell phone for service and dialing in the number of the locatable destination you desired to go to. It would matter not whether the destination was a block away or in another country across a continent the same process would be required to use PRT vehicles. Payment would be by any commonly used credit or debit card, smart card tickets, payment transducers or in many cases cash or coins in vending machine like slots. PRT vehicle could even have on board ATM machines for cash, on board telephone communications at a lower cost than cell phone use and vending machines for refreshments in route. All PRT vehicles could be equipped with a wide array of communications services and entertainment for longer trips. We can not now foresee how complex the more expensive PRT in vehicle services would go. PRT is a personal vehicle that like automobiles can lower costs by hauling serially picked up ride sharing individuals. PRT vehicles can haul freight as well as people.

The reason for lack of PRT support has been much discussed and is available in hundreds of articles and a few books. It is generally thought that there is no organized anti PRT conspiracy in the diabolical sense. But there is heavy pressure from the many interests in the form of about 140 industry classes that over a period of time risk total elimination by the advanced transportation form that PRT could become. Whether they perceive the significance of the threats or not remains uncertain. At least some discussions of a total take over of transportation by PRT has risen on rare occasions as well as the suggestion to transportation officials.

In the mean time with the total refusal to fund or implement a pure PRT demonstration the technologies that would have made this fully automated small vehicle transit system possible have advanced to where this is no longer a major technical hurdle only a putting together the necessary pieces already in use in commercial and consumer products in the right form.

Lincoln Boosters like to brag about technology education and literacy amongst public school students and technology transfers at the University of Nebraska and the Kewit institute. We build multiple technology parks and talk of increasing the communications capacity to attract technology companies. PRT is the single largest R&D project culminating shortly in a developed product for which further development and replacement improvements will saturate the global market since no existing transpiration system can compete with the high dependancy on expensive human labor and management.

PRT gains will have to come at the sacrifice of the existing transportation jobs and businesses without a replacement in positions for humans even investors and manager within PRT sales and service. This creates a device problem in that the potentially deposed businesses, unions and professional associations will lobby government to join with them in opposing PRT for all of the above stated reasons mostly the loss of existing jobs and long standing businesses. The greater total economic efficiency means nothing because it is as yet unproved wile the losses are certain.

The anti PRT strategy since the Denver, Minneapolis and Trenton N. J. proposals of the 1970s have always been not to say, " this will eliminate my job or my business," but to say, "This will make the city ugly, kill birds, ruin the look of trees, will require great additional expenses by utility companies to modify their intersections with the guideways. Transportation consultants were always called in as supposedly neutral arbitrators, becoming more like traitors to the public interest in the name of enhancing a collection of self serving business interests. Instead of seeking positive inputs in Government, france and america they always over designed the systems based on mass transit operation assumptions and practices then made the approved systems design so large and ugly and the right of way which should be over a side walk larger than a rail line to the point that the citizens in the neighborhoods rejected the proposals. PRT supporters will not at any time in the foreseeable future, with the prohibition of an example well designed system be able to afford the legal and presentation effort to counter the greater established funding and influence brought against it. Public citizen front groups will find it lucrative to to come out against any wide spread distribution of the guideways. This happened in denver and in the well documented Las vegas proposals for PRT as well as monorail. The existing transportation providers have at times demanded that the new system that was to put them out of business also buy them out. This happened with the horse car lines transitioned to electric street railways in the 1880s. The losses have to be accepted as obsolete technologies in the road and air vehicles being supplanted by modern technologies for the benefit of every body in every community and connected urban density areas.

In Nebraska the largest urban areas get disproportionately the most money from state taxes. with the exception of certain rural highways. PRT has to be able to retire it's own debt without tax payer assistance based on competitive fares alone. Competitive means as low as people think they are currently paying for slow road and transit service but at several times the speed, comfort, low stress and convenience as perceived by the users.

The thought that the PRT robotic vending machine vehicles can own and manage themselves is uncomfortable as this is replacing humans with machines. We do this with every automatic

elevator or automatically switched verses operator switched telephone call. Why not go full automation with all transportation?. We have replaced over half of Lincoln's work force every few decades by attrition such as telephone switching, elevator operators, steam locomotive service people. The most likely twenty year loss to a full UAVs replacement of road rail and air transportation in Lincoln by PRT would be about 7,000 to 10,000 jobs. Transportation service jobs as a share of total employment is declining every year but the cost of transportation is increasing mostly because we have higher expectations for speed and convenience. The gain to the local economy in efficiency should be around 10% to 15% in a lower cost of living and doing business. The greatest losses would occur to people dependent on the oil industry and the heavy construction and construction materials business. PRT takes less material but higher value material to build a line mile and almost no labor if it is properly done.

Already the Honda domestic servant robot programing can serve PRT functions since PRT in all of it's complexity is simple by comparison. We can not know how far each of the fully automated services will advance. The market is there to justify the whole package of PRT features but the fear of failure is great, as complexity rises with a wholly new system, not based on any working previous system.

PRT installations and vehicles can be sold to the worlds largest single market of any new product in human history, to provide all of our transportation. Yet, nobody wants to take the plunge into PRT. Even for fully capability aero space companies PRT seems a formidable challenge. Do they fear PRT or just believe PRT is not possible. Not commonly hearing about it from mainstream sources is enough to convince well educated individuals that it must not be good or it would have been developed by now.

Well designed PRT vehicles are a total replacement for nearly all road, air and rail vehicle uses only if the PRT vehicle are independent of elevated stations that limit access in all ways. Well conceived PRT should be able to carry sidewise loading, Electrothon racer scale, internally carried dual mode personal vehicles. The bodies of the PRT vehicles have to be lowering on each vehicle hoists with thin floors and drive on threshold ramps.

With known improvements such as gravity evacuated tube lines, separate from the above ground lines, but possibly using the same internal cars as for above ground and dual mode service, PRT should be viable several thousand years from now. Unlike road and air vehicles their is no known superior replacement or reasonably practical upper limit of performance and efficiency. As technologies improve, short of some unlikely almost metaphysical discovery in the nature of our surroundings, PRT is ultimate transportation as an operating system. We should have known this over a hundred years ago with the first fully automated externally routed vehicle systems.

The problem is no city wants to be the first city to abandon the auto which is such an integral part of the economy and suffer the embarrassment to the world of exposing the whole pattern of street construction and mass transit provisions as possibly a total fraud or at least a total error in engineering judgment. What the auto culture has brought on is a lucrative way of making many professional and business incomes and a political power tool.

The problem is almost nobody really wants the services of buses at the cost of ths services. Everybody would want the services of a very high speed self lowering or station free PRT

system if it was designed not based on past examples but purely in a scientific or systems engineering manner to become ultimate transportation past which there was no known gains.

An ideal PRT system can replace all auto and truck use in the Lincoln economy at a savings of about one third in average passenger trips about one sixth to one seventh the cost of all transportation expenditures (Currently About \$480 to \$520 Million a year brought down to roughly \$70 million a year with total PRT conversion) Operating Savings pays for the whole New infrastructure. PRT might eliminate Nearly All civil engineering and transportation management jobs in county. More jobs for electrical and mechanical engineers. 7,000 jobs lost mostly drivers few jobs gained in transportation. Economy booms but hardships for about 1% of population in poor transition experiences. Mostly directly effected business owners and investors.

There is an undefinable savings in human suffering from total PRT conversion in the absolutely inevitable auto accidents which are delicately not mentioned in the Comprehensive Plan but according to County health are the major source of trauma in the county (1001 Average current Human life years Lost in Lancaster county each year) see County Health report. There is a somewhat definable savings in human stress outcomes on longevity See British bus driver and conductor 1953 comparative study and follow ups.

Personal rapid transit or PRT is a generic name for a class of vehicles and right of ways who's operation and character is so different from all other mobility forms it is a class of transportation not "a sub class of transportation", as the MPO Allen Abbott says. It is also unique in that PRT is the only form of transportation that in the whole world never gets any official support for very long untill the program is canceled by the supporters for no important reason. The first fully automated systems were proposed in the 1850s in various Pneumatic tube forms, first in a working high speed prototype in 1889, first in a useable urban linear motor system in 1913 first in a fully autonomous automated working PRT prototype in 1969 untill the present frequently repeated in eight to nine subsequent test tracks that were operationally successful as far as the avialable data shows.

Not one PRT system has been allowed to be installed anywhere in the world except for the flawed Morgantown group transit system often mistakenly called PRT but too expensive per mile to used as a PRT system. As the judas goats of the auto industry that can tolerate all forms of mass and group transit and taxi cab use even profit from them soon Morgantown is to be displaced by the Sky loop or any other taxi-2000 or Raytheon PRT 2000 system as the worst case example for debunking purposes. They do not want a successful PRT system so the best systems remain orphans without any willing backers. Business investors soon learn of they have done their home work that PRT is not allowed ina economical form in the global market place. Yet daily the need is better defined for it to become the predominate form of transportation. The People at the federal transit administration have money for eligible systems but PRT is absolutely excluded. find a loop hole and the criteria is changed or the bar for entry is raised.

The headings at the top are very radical claims requiring more than a simple explanation and references. This is a study of comparative ideas, service and engineering principles that are the only transportation ten commandments equivalency developed specifically for PRT systems because nothing else qualifies to meet PRT goals including road vehicle systems. The argument for PRT is based on statistics, engineering and economics data as much as it can be applied with the little resources avialable and not on self proclaimed expert opinions. In his speech to the

Kewit Institute Abbott seemed to be transportation mode neutral and claimed a bit of personal bias towards transit applications. He seems to be a nice individual but ruthless in supporting road vehicle applications. Transportation planners like Abbott, in all the public records so far seen of PRT hearings, argue anti small vehicle PRT generalities or bring in a PRT hit man from one of the better known transportation engineering consulting firms, a big gun to set up a smoke screen that ignores the smallest systems defines PRT as a deck or slot beam rider requiring same level elevated station platforms with often three abreast seating, then applies railroad operating rules and heavy construction principles to the design of the guideways and make the resultant PRT system so undesirable that most PRT supporters would reject it.

PRT presentations have one flaw, the lack of a fully developed and operational pure verses hybrid PRT systems example. Many examples and comparisons have to be assembled from other areas of achievement and incerted as component or verified performance examples to understand how a best PRT systems approach might work.

The purpose as repeatedly stated here is to forget about the overwhelming odds and the wall of complacently uniformed denials and to eventually build a very high performance multiply redundant, ultimate high speed PRT system example using at first the easiest safest off the shelf components. Assuming enough success to attract investment then refine it with the best small scale close pole gap maglev system that is possible to formulate from the many possibilities. This might be done here in Lincoln or somewhere that will not refuse a challenge to road vehicle use as sacrilegious. Several hundred metropolitan areas that have been coached to reject PRT systems.

The rejections of PRT in general without one all inclusive scientific study implicating unsolvable problems, not one single federal level study of the principles and various levels of application over the last thirty five years have been attempted. Aero space corporations work in the 1970s was not a federal study but an independent institutional study.

Most PRT proposals have been barely competitive with auto travel and truck shipment and some times not really competitive with mass transit systems that are so poor in service world wide there is a yearly decline in transit readership share, even as in some places there is a slight rise in total readership. Mass transit of all kinds is bankrupt, a dead issue for the future. Have you ever wondered why the only alternative to auto use is always projected as a subsidized system that is higher in cost and slower in speed.

At any time the smallest of the PRT systems amongst the nine prototypes and thousands of pages of engineering studies have proven themselves superior in almost every case to the mass transit systems that were willingly accepted by governments without ever one comparative systems economics analyses from the many suppliers. The Metatran system study in 1968 drew wrong conclusions for the technically ideal system but stated the desire lines verses public planning process mismanagement and the fact that sine the late 1890s the chicago transit riot proved that governments and industries cared not whether they satisfied the needs of the customers only whether they could get the customers to tolerate systems designed to produce profits and positions of authority.

Today's PRT is different, especially in the last nine to ten years with the introduction of the Skytran, Highway and Swedetrack proposals. None of these proposals are yet ideal but a combination of the best ideas amounts to a systems engineering demonstrations of perfect

transportation limited only by the materials and physics that we can certainly achieve. Nothing is left to invent or refine just the building of a real systems for testing and installation.

This is a contrast to most PRT proposals that are absolutely locked into the 1960's variations as if no new thinking or calculations had happened in the mean time. Reviewers of PRT most often feel comfortable with the slow view because they do not trust the automation at high speeds and look to production automotive efficiencies to justify the idea that high speeds mean massive power consumption. This is not true of the bodies are sized and shared right to reduce air resistance. The nose angles of the fast vehicle have to be tapered like a fast anti aircraft missile not only to reduce resistance but to reduce bug attachments that increase friction of a vehicle that will regularly put on one to three thousands miles a typical day of service between cities.

The PRT systems proposed here is not to normally exceed 100 pounds as an arbitrary starting point in gross vehicle load on the guideway per linear foot. The top speed is limited only by approximately 30 intermittent and 5 continuous horse power per linear foot pushing a 9 square foot .06 coefficient of drag body. Every general freight and passenger service PRT vehicle would have a hoist system to lower the body quickly to ground level or just above it with a maximum floor height of about 2 inches above a surface rested on. This eliminates any need for elevated stations. The vehicle could load and unload at any point under the guideway that is flat and designated for such use.

Passengers freight or personal goods shippers use the national transportation 511 number and an additional one to three digits to call up a personal service or group service empty PRT vehicle that might be self owned, municipally or national fleet owned or a private service provider. The call up code numbers indicate the type of vehicle owner and service desired. All users would have to pay the same proportional vehicle mile occupancy fees. That would amount to about 1/2¢ a mile to 1¢ a mile for maintenance about 1¢ to 4 ¢ a mile for electricity and about a nickel a mile for debt retirement on high use guideways about equivalent to main streets and between about 10¢ to 30¢ a mile for little used side street miles. These accumulated fees would be added by the vehicle to initially about 1¢ for three years to retire average vehicle manufacturing debt and about 1/2¢ a mile for vehicle maintenance and cleaning. The vehicles pay their power bills, guideway use, communications and dispatching services, maintenance and cleaning charges. transactions amount to accounts just as individuals run businesses and pay bills. No current programing integrates all the needed features but separate networked programs appear to be possible to run a self managed robotic business. Occasional audits would be mandatory. No human run businesses should be able to participate in this as there are too many ways that money might be taken from people under false pretenses as it is in many of the transportation and communications services we use today.

Each neighborhood should be able to regularly vote to increase or decrease the rate of debt retirement in their access sections of the guideways. Taking longer means more interest paid and higher average fares for a longer period. Taking less time to pay back the guideway means higher initial fares only on the access sections and lower fares sooner. Transient populations would possibly vote a longer pay back more settled and wealthier populations might vote a quick pay back. No matter how the votes turn out every person and freight user would pay almost exactly what the cost of providing their service was. We are so use to the socialist method of organizing transportation with central planning and control and ill proportioned distribution of charges through taxes and benefits. The biggest deference is that with a PRT system all of the cost of the system less any purchased power is the systems cost were currently about 90% of

all transportation costs are private costs born in many transactions between individuals at the mercy of companies who conspire to offer the most profitable product and not necessarily the best product. The companies have to compete for price in a market place which only four basic products are allowed, road, rail air and marine vehicle systems. The cities and rural county area property owners and renter users should be able to occasionally vote on the debt retirement of the main urban area guideway sections and states or larger national area with similar interests should be able to vote on ever larger sections of the guideways.

The information we now seek to understand transit applications and highway traffic flow which does not exist in any regular collection of raw traffic flow data exists in every vehicle DVD type one time written memory that records like a detailed log every trip route and user charge maintains problem compliant by the users against the vehicles service. guideway flaws measured . Computer Can regularly down load internal to vehicle reviews of data collected and make management decisions free of human biases off of resulting data. The data storage capacity to do this has become very compact and very stable. This data can be down loaded and reprocessed on board each vehicle to collectively answer questing about when to order more vehicle or on board user surveys as to which routes and services should be offered next. This data should be accessible by every user and adjacent property owner over the internet accept for personal trip information of the users.

Entrained PRT vehicles would use less energy per mile at higher speeds 300 MPH to 400 MPH in longer trains on average than the common individual fast service PRT vehicle does at speeds of 125 to 175 MPH which would likely become the common operating speed range.

Lowering the charges only works if the vehicles put on as many miles a day so they can to pay off the debts as fast as possible. Because these vehicle are 10 to 20 times more energy efficient that trucks and cars per ton or cubic foot hauled they can travel faster and actually lower the cost per mile for energy. The vehicle would have mostly solid state components, initially designed to last possibly 30,000 hours between overhauls but as describe eventually intended to last over a hundred thousand hours between major overhauls with the best materials and maglev possibilities. There is a long list of component and materials specific reasons this longer service life can be had with a suspended monorail vehicles while impossible with any improvements in typical rubber tired ground vehicle, conventional rail and supported monorail vehicle or aircraft.

All the major and minor manufactures that have tried to introduce over the last three decades had their offerings rejected not because of a failure to perform adequately but because PRT is a threat to the automobile and petroleum industry culture that seems to sustain the worlds economies. PRT is destine at first to create natural enemies that will not like any PRT political supporters. Untill built as an extensive intercity grid PRT will not find much citizen support. The public needs to be able to ride the vehicle to get the idea. PRT is not understood as an advantage over auto and truck use without an example to show. PRT is understood as a threat to all the existing public transportation systems including airlines and freight carrying trucks in that it is seen as minimally a dilution of funding for existing projects that are seen as necessary to meet social commitments. It will not initially be understood that PRT will exceed any possible expectations for those commitments that future transportation problem making future solver jobs and institutions obsolete. Such a total threat as PRT can not be tolerated so it was subtly opposed in such a way that the controversy that emerged in hundreds of recorded hearings would not go beyond the limited attendees. This is documented in may proceedings and

the professional journal and local new that was generated from them.

A comparative example is there were never any written orders to fire bomb japan so that no one could be held responsible except curtis Lemy who was told to in effect do the best with what you are given or be replaced. approximately 1.5 million Japanese civilians were incinerated in their cites.

The PRT controversy was lost in the deluge of other events even though this single issue of a transportation replacement could theoretically reform the politics and economic problems of the planet simply by eliminating the social overhead and internal production equipment cost. The most powerful foreign policy influences and the wealth system that supported them of the major governments. Cut of from a source of funding for political control the control of the new major global transportation industry would be required so the capital value and management control could be transferred to something of the scale of the petroleum, auto manufacturing and heavy construction industries. The problem is PRT can be duplicated and marketed one freed from the prohibitions of installation by many different consortiums of companies. PRT requires no formal management structure once the automation has passed certain threshold which have already been demonstrated in mass produced and mass marketed consumer products.

The rest of the story will have to be continued as I ran out of time on this spell check.