STATE OF NEW JERSEY

MONORAIL AUTHORITY STUDY COMMISSION

ASSEMBLYMAN ROBERT E. LITTELL
CHAIRMAN

SENATOR THOMAS F. COWAN
VICE-CHAIRMAN

REPORT
July 23, 1985

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The Chairman and members of the New Jersey Monorail Authority Study Commission wish to acknowledge the outstanding contributions and efforts on behalf of the Commission provided by:

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MONORAIL AUTHORITY STUDY COMMISSION

CN-042
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July 23, 1985

Governor Thomas H. Kean
President of the Senate
Speaker of the General Assembly
Members of the Legislature

Ladies and Gentlemen:

The Monorail Authority Study Commission, created by P.L. 1983, c. 295 (approved August 4, 1983), herewith respectfully submits its final report.

Respectfully submitted,

Assemblyman Robert E. Littell
Chairman

Senator Thomas F. Cowan
Vice-Chairman

Senator C. Louis Bassano

Senator S. Thomas Gagliano

Senator Walter Rand

Assemblyman John O. Bennett

Assemblyman Wayne R. Bryant

Assemblyman Nicholas J. LaRocca

MEMBERS OF THE NEW JERSEY MONORAIL AUTHORITY STUDY COMMISSION

(Seated, l. to r.) Senator S. Thomas Gagliano; Assemblyman Robert E. Littell, Chairman; Senator Walter Rand. (Standing, l. to r.) Senator Thomas F. Cowan, Vice-Chairman; Assemblyman Nicholas J. LaRocca; Assemblyman John O. Bennett.
(Not shown) Senator C. Louis Bassano; Assemblyman Wayne R. Bryant.

Introduction

THE NEW JERSEY MONORAIL AUTHORITY STUDY COMMISSION was created by Chapter 295 of the Laws of 1983 (P.L. 1983, c.295, approved August 4, 1983), to study and evaluate "the practicability and feasibility of establishing a New Jersey Monorail Authority to own and operate a Statewide monorail system." According to the legislative findings set forth in the first section of the enabling legislation, the establishment of such an authority might be appropriate on the grounds that:

a. New Jersey is one of the most densely populated states in the nation;

b. New Jersey's highways are overburdened with traffic; and,

c. The establishment of a Statewide monorail system can make a significant contribution to public transportation and ease highway congestion.

From our first meeting on February 27, 1984, and throughout our deliberations, the Commission's eight legislative members realized that while the density of New Jersey's population and the congestion of its roadways were obvious and indisputable, the wisdom of establishing a Statewide monorail system would have to be proven. Even less self-evident than the establishment of such a system was the creation of a presumably permanent New Jersey Monorail Authority to own and operate it.

Confronted with the widespread recognition of New Jersey's transportation problems, the substantially less than universal recognition of the relevance of monorails to their alleviation, the inevitable questions concerning the propriety of a State authority in this area, and confusion surrounding the meaning of the very term "monorail" itself, the Commission determined to conduct its study by first developing a meaningful definition of the term "monorail," and on the basis of this definition, to seek answers to the following three questions:

1) Is the state of the art in monorail technology capable of making a significant contribution to the alleviation of a variety of public transportation problems?
2) Given its technological soundness, can monorail transportation contribute significantly to the alleviation of the particular public transportation problems confronting the citizens of New Jersey?
3) What is the most effective way to bring the benefits of monorail technology to the people of this State?

Section I of this report contains the Commission's working definition of the term "monorail," and a brief description of the types of transportation technologies it encompasses. Sections II, III and IV, respectively, deal with an analysis of monorail technology in terms of service capability and costs; its potential relevance to the particular public transportation problems confronting New Jersey; and the recommendations of the Commission regarding the steps required to develop and implement monorail systems in the State.

SECTION I - "MONORAIL": THE MEANING

A recent (1977) edition of Webster's Encyclopedic Dictionary of the English Language defines "monorail" as "a railway whose cars run on or are suspended from a single rail." While not disputing the literal accuracy of that definition, we do not consider it sufficiently descriptive of the various types of innovative transportation technologies we have reviewed in the course of our study.

Under this definition we include such technologies as AUTOMATED GUIDEWAY TRANSIT (AGT)—in which unmanned vehicles are automatically controlled, and which is designed to serve urban travel needs that fall between rapid rail transit and bus service. Vehicles employed in AGT systems may be elevated, at, or below grade. The key is that these guideways must be fixed along exclusive easements or rights of way.

There are at least four types of AGT systems which may be categorized according to the service they are intended to provide:

* SHUTTLE LOOP TRANSIT (SLT) - systems which are designed to provide service along a fixed route with little or no switching. Such systems move groups of 20 to 100 passengers per vehicle back and forth on a short length of guideway (shuttle), or around a closed path (loop).

* GROUP RAPID TRANSIT (GRT) - systems which utilize switches to provide multi-stop service for groups of 6 to 50 passengers per vehicle with similar origins and destinations on a variety of routes.

* PERSONAL RAPID TRANSIT (PRT) - systems which provide non-stop origin-to-destination service for individuals or groups of 6 or less over a complex network of guideways and switches.

* ADVANCED GROUP RAPID TRANSIT (AGRT) - systems which combine the carrying capacity of GRT systems with the efficiency offered by PRT systems.[1]

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[1] AGT definitions and descriptions derive from a recent report of the Urban Mass Transportation Administration entitled, "AGT Socio-Economic Research," March, 1983, and from "Cost Experience of Automated Guideway Transit Systems," April 1984, also by UMTA.

As defined herein, the term "monorail" also includes transportation systems commonly referred to as PEOPLE MOVERS. As is the case with AGT systems, the key is that the system, whether AGT or PEOPLE MOVER, operate on a fixed guideway along an exclusive easement or right of way. This definition intentionally *excludes* trolley coach buses and other forms of hybrid light rail transit that share city streets with automobiles and other vehicular traffic. It also excludes conventional railroads.

SECTION II - MONORAIL TECHNOLOGY: DOES IT WORK?

Of the many types of transportation technology encompassed within our definition of "monorail" only AUTOMATED GUIDEWAY TRANSIT (AGT) has been widely implemented in the United States. In approximately 40 locations throughout the world, of which at least 27 are in the United States, "monorail" transportation systems of the AGT-type are in operation, under construction or in the final stages of planning and contract writing. An average of one such system is being built every eight months, or approximately three complete systems every two years.

In 1982, AGT-type monorail systems in the United States carried as few as 62,693 passengers and as many as 23,542,500 (Atlanta). They operated at a system availability of between 92% and 99% in a variety of settings, including airports, amusement and theme parks, hospitals, zoos, universities, shopping centers and cities. While some systems operated for as few as 7 hours a day on as few as 124 days a year, others operated 24 hours a day, every day. Many such systems run along guideways less than a mile in length, but others run along guideways as long as 12 miles (Dallas/Fort Worth Regional Airport). The costs of these systems—including the total costs of all guideways, stations, maintenance and support facilities; power and utility facilities; vehicles; command, control and communications facilities; and engineering and project management—range from a low of $2,006,000 for a 400-yard long system operating in a shopping center in Hawaii, to a high of $167,579,000 for the extremely sophisticated 8.6-mile long demand and scheduled service system linking the campuses of the University of West Virginia with downtown Morgantown. The monorail AGT systems we have studied maintain as few as a single station (as is the case in Disneyworld, the Minnesota Zoo, and King's Dominion Amusement Park in Virginia) and as many as 28 stations (as in the Airtrans system operated at the Dallas/Fort Worth Regional Airport). While at least one system (University of West Virginia at Morgantown) operates as many as 73 vehicles, each capable of carrying a maximum of 20 seated and standing passengers, others operate as few as two vehicles, each of which consists of a three-car train with a total passenger carrying capacity per train of 297 (Vehicles designed for the German Cabintaxi system carry as few as three passengers.).

While most of these systems operate along guideways which are elevated or at grade, several (such as the airport systems operated in Houston, Atlanta and Seattle-Tacoma) operate in specifically-constructed underground tunnels. The vehicles in these systems cruise at speeds that range from 7 to 30 miles per hour, and the French VAL system in Lille will cruise at 48 miles per hour when it is fully operational. Minimum headways (or the time/distance between trains) range from 15 seconds (University of West Virginia at Morgantown) to 5 minutes and more at several amusement parks and zoos (the German Cabintaxi system is being designed to run at 1.4 second intervals). Line capacity (or the number of passengers that can be moved past a given point on a guideway in one direction in an hour) ranges from a low of 98, in the Cabinlift system installed in a hospital in Schwalmstadt, Germany, to the theoretical capacity of almost 8,500 passengers per hour (and a practical working capacity of 5,070) along a lane of the Airtrans system at Dallas/Fort Worth (to provide some perspective, a single modern highway freeway lane has a carrying capacity of 2,400 vehicles per hour).

As should be obvious from the above, the monorail systems in operation, under construction, or in planning stages today represent a wide range of technology options, site conditions and performance characteristics. The specific technological configuration of each system depends on the specific design approach adopted by the system manufacturer, and the mobility requirements of the population to be served. And as the description above reveals, the operational and performance characteristics of these systems also vary, a fact that reflects the adaptability of monorail systems to the service needs of different sites.

Given the obvious success of these systems in serving the airports, amusement and theme parks, zoos, hospitals and other "activity centers" which constitute, by far, the largest number of monorail installations, it is logical to question the applicability of these systems—in terms of both service and costs—to suburban, urban and downtown locations. The relatively restricted environments in which monorail systems currently operate are vastly different from the densely populated, highly congested environments in which conventional transit systems, such as Motor Bus, Trolley Coach Bus, Heavy and Light Rail, are usually required to perform. In addition, there is a wide range of procedural and regulatory re-

quirements involved in the deployment of any form of urban public transportation that existing, privately-owned-and-operated monorail systems do not have to meet. Consequently, it is difficult to accurately transfer the documented operating experience and cost and service statistics of current monorail systems to urban, downtown settings.

At present, only the Morgantown University of West Virginia system in the United States and the Lille VAL system in France are operating in genuinely urban contexts. Today, these systems are safely, efficiently and comfortably carrying millions of passengers annually with a system availability in excess of 98%. However, by the end of 1985, the Central Automated Transit System (CATS), being built by the Urban Transportation Development Corp., Ltd. of Canada, in Detroit, and the Downtown Component of Metrorail in Miami, being built by Westinghouse, will be fully operational. These two systems, particularly the very extensive Miami system, which will link up with the Metrorail commuter rapid rail system in Miami, will represent the first real application of monorail technology in a genuine urban environment in this nation. We will be able to provide much more comprehensive answers to the questions of monorail urban applicability when we have some detailed experience with the Detroit and Miami systems.

Notwithstanding the constraints and complexities associated with an urban deployment of monorail technology, the New Jersey Monorail Authority Study Commission believes that existing monorail systems have exhibited a range of technology and performance sufficient to comply with most urban requirements. However, objectivity demands that we repeat here a warning posed by a recent report of the Urban Mass Transportation Administration entitled, "Cost Experience of Automated Guideway Transit Systems: Costs and Trends for the Period 1976-1982," April 1984, to wit:

> The point to be made, however, is that although extensive qualitative and quantitative analyses have been performed on the data herein, the total capital and operations and maintenance costs are not directly transferable. Any attempt to extrapolate the data for

estimating the costs of an urban application of AGT ("Monorail," in our definition) without carefully considering the site-specific factors and operating needs which characterize urban, downtown settings will be misleading.

MONORAIL COSTS

Given that monorail systems "work," in the very practical sense of carrying large numbers of passengers safely, efficiently and comfortably in a wide variety of settings, it is necessary to compare their costs to those of more conventional transportation systems before making any final judgment on monorail practicability and feasibility.

In making these cost comparisons the fact that monorail systems operate in relatively isolated environments at present is just as important to remember as it is in evaluating monorail technology. Nevertheless, UMTA concludes *that monorail systems are competitive* with conventional transportation systems in terms of both initial capital investment and annual operations and maintenance costs.

The afore-cited 1984 UMTA report on costs claims that monorail systems cost an average of $17.5 million per lane mile, and $14.9 million per equivalent elevated lane mile, to build, while the El Monte (California) and Shirley Highway (Virginia) busways cost $14.3 million and $1.5 million per equivalent elevated lane mile, respectively; the San Diego Light Rail System cost $11.5 million per equivalent elevated lane mile; and the San Francisco BART system cost $25.8 million per equivalent elevated lane mile. (UMTA believes that the use of Equivalent Elevated Lane Mile costs normalizes the significant cost disparities that would otherwise impede the comparison of different systems built at different levels on, over or under vastly different terrain and topography. Actual lengths of at-grade, elevated and underground guideways are converted to Equivalent Elevated Lane Miles by the use of the following factors: 0.4 - at-grade; 1.0 - elevated; and 3.0 - underground).

UMTA estimates that the capital costs of 15 monorail systems studied in the afore-cited report are distributed among seven major cost categories, as follows:

GUIDEWAY	— 26%
STATIONS	— 11%
MAINTENANCE and SUPPORT FACILITIES	— 5%
POWER AND UTILITY FACILITIES	— 7%
COMMAND, CONTROL and COMMUNICATIONS FACILITIES	— 13%
ENGINEERING and PROJECT MANAGEMENT	— 19%
VEHICLES	— 19%

UMTA notes that major variations within these major cost categories can result from a large number of design and site-specific variables, including the length of the system, the size and number of stations and vehicles, the type of power supply, the type of vehicle command controls and the degree of regulatory requirements.

UMTA calculates that OPERATIONS and MAINTENANCE costs are distributed among four major cost categories, as follows:

LABOR	— 61%
UTILITIES	— 8%
MATERIALS and SERVICES	— 28%
GENERAL and ADMINISTRATIVE	— 2%

As was the case with capital costs, UMTA notes that the major determinants of operations and maintenance costs are the operational capabilities and site-specific factors characterizing each individual monorail system. These characteristics include system length, site location, technology employed, system design, and particularly, the level of service desired, that is, the amount of interruption or degradation a system can

withstand without seriously inconveniencing its passengers. In this context, it is obvious that an airport-based system requiring virtually 100% availability, 24 hours a day, 365 days a year, is going to incur higher operations and maintenance costs than an amusement park system requiring a mere 80% availability, 10 or 11 hours a day, 140 days or fewer a year.

To make valid operations and maintenance cost comparisons, UMTA has averaged the operations and maintenance costs of five monorail systems which closely approximate conventional public transportation systems in terms of service provided, and compared their costs per vehicle mile traveled and per passenger carried with four conventional transit systems. The five monorail systems chosen are Airtrans (Dallas/Fort Worth), Disneyworld, Morgantown (West Virginia), Seattle/Tacoma Airport and Tampa Airport.

UMTA calculates that the five monorail systems studied cost $1.82 per vehicle mile traveled, while 1,029 Motor Bus systems studied cost an average of $3.27; eleven Heavy Rail systems cost $4.40; five Trolley Coach Bus systems cost $5.17; and, ten Light Rail systems cost $6.32.

The five chosen monorail systems cost an average of $0.39 per passenger carried, while the five Trolley Coach Bus systems cost $0.69; the 1,029 Motor Bus systems cost $1.24; the eleven Heavy Rail systems cost $1.32; and the ten Light Rail systems were the most expensive, on average, at $1.43.

On the basis of these comparisons, UMTA states that monorail systems compare favorably with conventional transportation systems in terms of both cost per vehicle mile traveled and cost per passenger carried. UMTA notes that the lower monorail cost per vehicle mile traveled may be due to more vehicle miles being generated by monorails for their relatively small size. At the same time, monorail costs per passenger carried may be less than those of conventional systems because average trip length per passenger is shorter on monorails, and because conventional urban public transportation systems incur significant general and administrative expenses for marketing and advertising activities.

CONCLUSION

On the basis of all the information contained in this section concerning monorail serviceability and cost-effectiveness, the answer to the question posed at the outset of this section is obviously "Yes." Monorail technology does work, is cost-effective and ought to make a significant contribution to the alleviation of many of the most serious public transportation problems confronted by citizens in both urban and suburban areas of this nation. Careful study of the Detroit and Miami systems will be required in order to see how monorail technology can be adapted to urban settings. The New Jersey Monorail Authority Study Commission is confident that these systems will be a positive influence on future monorail development.

SECTION III - MONORAIL TECHNOLOGY: WILL IT WORK IN NEW JERSEY?

As noted above, monorail capability and potential in the abstract does not necessarily guarantee monorail relevance to the particular public transportation context of New Jersey. The Commission recognizes that the case remains to be made as to the applicability of monorail technology to New Jersey and this section is devoted to the presentation of relevant evidence.

While a modern monorail public transportation system might be an attractive amenity in many urban and suburban settings in New Jersey, and in several of the major transportation corridors of this State, the New Jersey Monorail Authority Study Commission believes that a combination of transportation needs and physical and demographic attributes makes the following seven locations particularly appropriate for consideration as potential monorail sites:

1) The northern New Jersey commuter corridor, stretching along Route 80, from Sussex through Warren, Morris, Essex, Passaic and Bergen counties, up to the Trans-Hudson bridge, tunnel, and rail facilities operated by the Port Authority of NY and NJ.

2) The New Jersey Sports and Exposition Complex.

3) The Hudson River Waterfront Development area in Hudson County.

4) Downtown Newark to Newark Airport.

5) The City of Atlantic City.

6) The Route 1 Corridor between Trenton and New Brunswick.

7) A Trans-Hudson crossing loop.

These areas are, of course, quite different, and each possesses its own particular transportation problems. However, each shares a common need to efficiently move large numbers of people on a daily basis in and

through highly congested regions of New Jersey where economic, social and environmental conditions make it difficult (if not impossible) to construct additional roadways, and where it seems appropriate (if not essential) to discourage additional private automobile traffic. The New Jersey Monorail Authority Study Commission believes that these common characteristics constitute a convenient "Litmus Test" to demonstrate the relevance of monorail technology in a given location. Where these common characteristics exist, the Commission believes that a monorail system should be diligently studied in any serious consideration of practical public transportation alternatives. Such a system may not be the only, or even the best, transportation alternative in any given instance. But the existence of these transportation conditions and characteristics calls for at least the consideration of monorail technology in an effort to improve transportation in these areas.

In posing this Litmus Test the Commission does not at all mean to suggest that monorail transportation is relevant everywhere the aforesaid conditions are evident; or that monorail technology cannot significantly improve transportation flows in regions with equally serious transportation problems, but with quite different characteristics. In fact, in identifying these conditions and characteristics, the Commission does not seek to limit the consideration of monorail transportation in New Jersey, but, rather to indicate the existence of several important areas of this State where monorails may be immediately applicable. We now turn, briefly, to discussion of four "test cases" for monorail technology in New Jersey.

NORTHERN NEW JERSEY

It is widely recognized that several hundred thousand New Jersey citizens cross the Hudson River twice each day, at least 5 days a week, in automobiles and buses, and by railroad and PATH train, between their homes and their businesses in New York City. It is less widely recognized that additional thousands daily commute between their homes and business locations in other communities within New Jersey. In fact, the greatest increase in commuter trips nationwide during the last 15 years has occurred *not* between cities and suburbs, or even suburbs and cities, but, rather, between suburbs and suburbs. Nowhere is this suburban-to-

suburban commuter trend more obvious than in Northern New Jersey, where since 1960 major economic and residential development has led to a virtual population explosion, particularly in the formerly rural counties of Morris, Somerset, Hunterdon, and Sussex. The New Jersey Department of Labor estimates that these counties will experience major population increases at least up to the year 2000 (25% in Morris, for a total population of 511,300 by the year 2000; 39.8% in Somerset, for a total of 284,000; 29.1% in Hunterdon, for a total of 112,800; and 48.6% in Sussex, for a total of 172,600). These trends will inevitably lead to even more serious transportation problems than are currently evident in this region.

It is extremely difficult to see how additional (or even significantly expanded) highways and roadways could be constructed (even if such were deemed to be advisable) in Northern New Jersey, particularly in Bergen, Essex, and Hudson counties. Right-of-way costs alone, to say nothing of the social and environmental objections that would inevitably be raised against such construction, would appear to make highway construction impractical, at best, in this region. Nor is it likely that additional tunnel or bridge lanes can be constructed to increase the capacity of the Port Authority's Trans-Hudson crossings. Finally, any substantial extension of the existing PATH and railroad facilities in this region would most likely confront the same economic, social, and environmental objections that would be raised against the other transportation alternatives considered herein.

While Morris, Somerset, Hunterdon, Warren, and Sussex counties ostensibly appear to be much more suitable for substantial highway construction, recent public reaction to proposed new road building projects indicates that the people of this Northern and Western New Jersey region are no more amenable to additional concrete ribbons running through their valleys than their counterparts in Bergen, Essex, Passaic, and Hudson counties. Where right-of-way costs are most likely to be less in the suburban counties of Morris, Somerset, Hunterdon, Warren and Sussex than in urbanized Bergen, Essex, Passaic and Hudson, the environmental costs (and, therefore, objections on environmental grounds) would be at least as great, and perhaps even greater, in the suburban region.

And yet, the problems, costs, and inevitable objections to the contrary notwithstanding, hundreds of thousands of our fellow citizens will continue to move between their homes in New Jersey and their businesses in New York and within New Jersey. For these reasons, and in light of these conditions and characteristics, monorail technology may be particularly appropriate in this region. Utilizing existing highway and rail right-of-way, monorail systems present obvious economic and environmental advantages over other transportation alternatives in this region. Specific routes and sites will, of course, require comprehensive analysis and much detailed planning. But conceptually, at least, this Northern New Jersey region, with its virtually self-evident transportation needs, seems especially suitable for monorail activity.

HUDSON RIVER WATERFRONT

The Hudson River Waterfront in Hudson County is today the scene of some of the most exciting economic development activities in the nation. Here, in what may well be the most valuable real estate in the United States, an area hitherto known only for its degree of deterioration, is being transformed into a region of beautiful waterfront parks, thriving commerce, and extremely desirable residential development.

Because of its location in the midst of the most densely populated section of New Jersey, and at the very heart of the Trans-Hudson River transportation complex, the transportation service ultimately to be provided in the Waterfront Development area presents an enormous challenge to urban and transportation planners.

The goals of transportation service in this region encompass a wide variety of objectives. To the degree that those objectives include the promotion of public transit, the segregation of purely Waterfront and Trans-Hudson automobile traffic, the utilization of existing PATH transit service in the Waterfront region, monorail technology appears to be particularly worthy of the most serious consideration.

NEWARK-NEWARK AIRPORT

The problem of limited access to Newark Airport has been widely recognized for more than 15 years. In fact, there may not be any single transportation problem in New Jersey that has been the subject of more studies and proposed solutions. Unfortunately, most of those studies have been futile, and few of the proposed solutions have been implemented. A 1968 Tri-State Transportation Commission study examined eight alternatives to improve service between Newark Airport and downtown Newark. A 1969 study was devoted to an airport people-mover. A 1974 study considered the extension of direct rail service to Newark Airport. In 1975, the Port Authority and the New Jersey Department of Transportation studied potential rail and bus links to the airport. And in 1978 yet another study considered an extension of PATH to McClellan Street and the construction of a people-mover to the central airport terminals.

The fruits of these studies are relatively few—a van shuttle service between Pennsylvania Station in Newark and the airport; the introduction of direct NJ Transit bus and private limousine service to the airport from both mid and downtown Manhattan; and the opening of Exit 13A on the New Jersey Turnpike.

And while these studies have been yellowing with age, Newark Airport has been growing. In 1978, the airport served 8.5 million passengers. By 1983, more than 17 million were served; and in 1984 the Port Authority believes that Newark will replace LaGuardia as the region's second busiest airport. According to Louis J. Gambaccini, Assistant Executive Director of the Port Authority (in testimony given before the Commission on July 26, 1984), "This passenger growth and the ten-year growth projections indicating an estimated 35 to 40 million annual passengers using Newark International Airport, coupled with the revitalization efforts of downtown Newark and the planned development, including major office facilities like the Legal/Communications Gateway project, have provided the critical mass and density to reexamine landside access to Newark International Airport."

So it is that we appear likely to be treated to yet another study on how

to improve access to Newark Airport. Whether this new study will prove any more fruitful than its predecesors is yet to be determined. What is not in doubt, however, is the certainty that any rational consideration of alternative forms of improving access to Newark Airport *must* include monorail technology. While a monorail system may not provide the unchallenged best answer to the airport's access problems, it is definitely one of the most viable alternatives—most viable and long-standing.

ATLANTIC CITY

An understandably extraordinary amount of attention has been devoted to the effects of casino gaming on the rehabilitation and redevelopment of Atlantic City since 1978. Millions of words have been written about the billions of dollars of casino-hotel capital investments; about the billions of dollars of casino cash flow provided by eager gamblers; about the hundreds of millions of dollars in casino tax revenues generated by casino activity; about the more than 30,000 jobs that have been created by the casino industry; and about the more than 27,000,000 visitors to Atlantic City in 1984, and the fact that Atlantic City is the single largest tourist destination in the United States.

Unfortunately, an almost equal amount of attention has been devoted to the persistence of blight and decay in Atlantic City; about the inadequacy of its housing, the incapacity of its municipal government, and the seeming intractability of its crime, pollution and congestion problems.

And, in the clash between the positive pronouncements and negative denouncements, it is, perhaps, inevitable that little public attention outside Atlantic City has been directed to the fact that every day, 7 days a week, 365 days a year, approximately 1,000 charter and regular route casino bound buses rumble through the streets of Atlantic City carrying an average of 35 passengers—1,000 buses daily, more than 12,000,000 passengers a year!

Any visitor to Atlantic City in the last six years knows the noise, the pollution, the congestion, the danger and the damage caused by casino

bound buses. And, every Atlantic City citizen could comment at perhaps excessive length on the "suffering" he or she has endured at the sounds of diesel engines revving noisily in the night. And, on the other hand, every casino executive will provide in great detail the statistical proof of the indispensibility of casino bus patronage to the prosperity of the entire casino industry. Regardless of the season, the weather, the state of the economy, or, for that matter, any other identifiable factor, the basic "bread and butter" of casino business is provided by the patronage brought by casino bus traffic. The statistics also show that the difference between those casinos that merely survive and those that genuinely thrive is the degree of sophistication of their intensely competitive bus programs, and the incentives, promotions and "perks" they lavish upon casino bus patrons.

And so it would appear that what we have here is an irreconcilable conflict between the obvious economic needs of the casino industry for additional casino bus patronage, and the equally obvious negative social, economic and environmental implications of incremental casino bus traffic for the health and well being of the citizens of Atlantic City, and for the quality of life provided by this most famous of resorts.

In the resolution of this conflict, monorail technology may prove useful. If it proves possible to transport passengers within Atlantic City without the buses, few objections may be anticipated from the casino industry. Equally, the citizens of Atlantic City have few objection to the *people* attracted to their community—in fact, these visitors are widely perceived to be essential to the livelihood of virtually every member of this community. The objections are to the *buses* that bring these visitors. If those buses could somehow be eliminated, or at least limited, one may anticipate a greater welcome for the visitors. Nor need this issue be considered anti-bus under any and all circumstances. Since buses are the only form of transportation capable of bringing so many millions of visitors to Atlantic City from so many very different directions, there is no doubt that bus traffic *TO* Atlantic City will be necessary as long as casino gaming is a lawful activity in that community. But while such bus traffic is necessary *TO* Atlantic City, there is no real reason why it is necessary *IN* that community. Technologically, there is no reason why a monorail system cannot be designed to operate between a central bus passenger

terminal (at which all bus passengers would disembark upon arrival at Atlantic City) and the individual casinos (to which these passengers would be carried in individually programmed monorail vehicles). And, of course, this monorail system would serve equally effectively to deliver passengers arriving via train, upon the completion of a rail link between Atlantic City and Philadelphia. Finally, such a system could be expanded to serve "Intercept Parking" areas set outside Atlantic City, so that visitors arriving by private passenger automobile could avoid the dangers and delays of driving in Atlantic City, and the difficult and sometimes expensive search for parking.

In sum, it is difficult to conceive of any site in New Jersey (or, perhaps, in the United States) where a monorail system may be more appropriate, at least conceptually, than Atlantic City.

CONCLUSION

As the analysis and discussion above is intended to convey, the New Jersey Monorail Authority Study Commission believes that many of the most serious transportation problems evident in this State may very well be capable of resolution or, at least, amelioration, by one or more variations of the monorail technology currently being deployed or proposed in numerous jurisdictions throughout the United States, Europe, or Japan.

Once again, the Commission wishes to stress that the 4 examples of potential monorail applicability considered herein are merely that—*examples*; they do not, in the Commission's view, exhaust the list of potential monorail sites in New Jersey. They do not, in fact, include numerous shorter transportation corridors in New Jersey — in Passaic, Middlesex, Hudson, Essex, and Bergen counties — where monorail technology may very well be capable of making a significant contribution to the alleviation of traffic congestion, noise, air pollution, and travel inconvenience.

And, of course, while the Commission strongly believes that monorail technology is particularly relevant to the transportation problems evident in the specific examples cited herein, it is important to stress that

the ultimate determination of the practicability and feasibility of a monorail system in any given instance and the particular type of monorail system to be deployed, should be made only after the most comprehensive and detailed study in which the greatest possible degree of expertise by professionals in many relevant disciplines is employed, and in which the greatest possible degree of public participation is encouraged.

In the Commission's view, New Jersey may be accurately characterized as a perfect (perhaps *the* perfect) "Transportation Laboratory." This is to say that in New Jersey there exists, in microcosm, numerous individual examples of virtually every imaginable transportation condition and circumstance. Because there is so much and such clearly physical and demographic diversity in this 9th smallest, 3rd wealthiest, and most densely populated State in the nation, it *OUGHT* to be the case that New Jersey is in the forefront of innovative transportation planning, experimentation, and implementation.

Section IV of this report contains recommendations which the Commission believes will provide a framework for the development and deployment of monorail systems in New Jersey, and allow the State to realize its potential as a leader in the field of innovative transportation technology.

SECTION IV - MONORAIL TECHNOLOGY: THE NEXT STEP

As will be abundantly clear by this point in our report, the Commission believes that monorail technology "works" in every meaningful sense of the word; is cost effective, both in capital investment and operations and maintenance terms; and is capable of making significant contributions to the alleviation of a wide variety of serious public transportation problems. The Commission believes that this capacity exists both at the level of abstract scientific theory, and at the level of concrete, practical, day to day implementation. In the course of this study effort the Commission has reviewed numerous scientific papers and government agency reports on various aspects of monorail technology, and we have studied the physical, service, and demographic details of most of the monorail projects in service in the United States and abroad. The Commission concludes from all this research that monorail technology and the construction of monorail transportation systems should be given the most serious consideration in several specific areas of this State.

To the Commission, in other words, the question at this time is not whether monorail technology "works," or whether it is relevant to New Jersey's transportation problems, but, rather, how monorail technology may be brought from the proposal stage to actual deployment in specific instances in New Jersey in the foreseeable future. This section is devoted to the Commission's answer to that question.

We, the members of the New Jersey Monorail Authority Study Commission, are well aware of the less than spectacular track record of legislative study commissions in the past. We recognize that most commission reports are greeted with a high degree of skepticism because they all too frequently merely restate conclusions that were implicit in the very creation of the commission, simply confirming preconceptions of the sponsoring legislators without any truly objective analysis of the questions raised and the problems involved in the relevant issue areas.

We also recognize that in advocating the implementation of monorail technology and the deployment of monorail public transportation systems in New Jersey, our report is likely to attract all the customary skepticism.

Nevertheless, in spite of the anticipated skepticism, we are fully committed to presenting a report that will provide a solid basis for immediate, substantive legislative action in an area we deem vital to the future prosperity of New Jersey and the well-being of all our citizens.

Our hopes of fulfilling this commitment rest in our sincere belief that this report does not merely restate pre-determined conclusions, but, rather, that it presents a convincing case for the merits of monorail technology and its relevance to the transportation problems of New Jersey. In essence we recommend that the Department of Transportation should be responsible for assisting in the development of monorail technology, and within the Department, that the Assistant Commissioner for Transportation Services and Planning be designated by statute as the person with specific and exclusive jurisdiction and authority for the deployment of monorail systems. We believe that this designation will, for the first time, give formal State recognition to this technology, and will eliminate the long-standing official indifference to the monorail alternative by public transportation planners.

The Assistant Commissioner's principal responsibilities will lie in the area of approving or rejecting proposed monorail projects and assisting the developers thereof in securing permit approvals, property acquisition, and where relevant, public financing. We stress that the ownership and actual operation of approved monorail projects will reside in their developers; in existing public entities in the jurisdictions to be served; or in any single-purpose public authorities that may be created to effectuate these projects with tax-exempt, revenue bond financing.

Obviously, any such public authorities will require special statutory authorization. In those cases where existing public entities and authorities already possess public transportation responsibilities and have their own revenue raising capacity for these purposes [as, for example, in the case with the N.J. Expressway Authority], the Assistant Commissioner will be involved only in approving or rejecting proposed monorail projects and assisting with the permit approval process. And in any event, we trust that the Commission will closely oversee the work of the Assistant Commissioner, and we strongly recommend that the greatest possible opportunity be provided for meaningful public participation in the As-

sistant Commissioner's deliberations and decision-making processes.

Convinced as we are of the virtues of monorail technology, and of its significance for New Jersey, we recommend the designation of an Assistant Commissioner to deal with monorail technology only because we recognize that no private developer can or should be permitted to implement major monorail projects without public authorization at the very highest level. It is important to note that we believe that it is equally essential to block monorail projects that are deemed to be ill-conceived or impractical, as it is to approve and assist those projects which are deemed capable of making a significant contribution to the alleviation of the public transportation problems of New Jersey. Monorail technology can, we are convinced, provide an extremely efficient and effective transportation alternative in many jurisdictions of New Jersey. It is not, nor have we ever claimed it to be, a panacea to every public transportation problem in every section of this State.

In the course of our study we have confronted a frustrating and extremely unpleasant combination of bureaucratic and institutional inertia, lack of imagination and vision, and the existence of strong vested interests in particular aspects of transportation strategy — all of which, in our view, make it highly unlikely that existing public entities in this State will prove willing or able to successfully undertake monorail projects in the foreseeable future.

In Atlantic City, for instance, we see a municipal government which may well possess the "will" to undertake monorail projects, but which has lost most of its substantive public transportation prerogatives to an entity called the Atlantic County Transportation Authority. This agency has a vested interest in the perpetuation of casino bus traffic because a large part of its revenues derive from the fees this traffic generates. The fact that the Atlantic County Transportation Authority also operates revenue producing automobile parking facilities in Atlantic City constitutes yet another vested interest which works to discourage the Authority from undertaking any monorail project, on the grounds that such a project might serve to reduce automobile traffic in Atlantic City.

While we do not see any necessary conflict between a monorail system in Atlantic City and the existence of bus and private automobile traffic *TO* Atlantic City, as opposed to such traffic *IN* Atlantic City (as we have considered above, in Section III); and while we believe that a carefully designed monorail system could provide a solid revenue base for the Atlantic County Transportation Authority, we have little confidence in the willingness of that public agency to take any bold steps to bring the potential benefits of monorail technology to Atlantic City.

With respect to North Jersey and the territory within the jurisdiction of the Port Authority of New York and New Jersey, the New Jersey Monorail Authority Study Commission is very pleased to note the seriousness with which that major public agency has begun to view the monorail alternative to meeting the transportation needs of this most densely populated region of New Jersey. The Commission has been advised that New Jersey Transit and the Port Authority are currently undertaking a study to determine the practicability and feasibility of constructing a monorail link or other fixed guideway facility serving Newark International Airport and New Jersey Transit's Penn Station in downtown Newark. The Commission looks favorably upon this study and is confident that the responsible public agencies will take the initiative to construct such a monorail link if, indeed, its study provides objective evidence as to its advantages.

Notwithstanding the Port Authority's openness over the possibilities of monorail transportation in North Jersey, the Commission is convinced that a public agency specifically charged with monorail responsibilities is required to bring the benefits of this transportation technology to the people of this region. The fact remains that the Port Authority, with massive transportation responsibilities throughout its North Jersey area of operations, will never be able to devote the energies and resources that will be required to bring major monorail projects to fruition. There is no question or doubt that the Port Authority of New York and New Jersey is one of, if not THE, most successful public transportation and economic development agencies in the world. But its massive commitments to the area's airports, trans-Hudson crossings, and other projects will preclude the type of dedication and application that will be necessary to comprehensively plan and implement substantive monorail projects.

The Commission believes, therefore, that the possible Newark Airport-Penn Station monorail project is the most that may reasonably be expected from the Port Authority at this time, and for the foreseeable future. Any more extensive application of monorail technology in the North Jersey region will, in the Commission's view, need to be placed in the hands of an agency solely committed to that single end.

Finally, in order to maximize the benefits of monorail technology in the State, the commission recommends that its membership be expanded by five members to include representatives from State agencies with transportation interests. These new members should include the Commissioner of Transportation, the Executive Director of the New Jersey Transit Corporation, the Executive Director of the Port Authority of New York and New Jersey, and the President of the Delaware River Port Authority, or their designees, and the executive directors of the turnpike, highway, and expressway authorities, or their designees, who would serve one-year rotating terms. Working with the Department of Transportation and other State agencies, the Commission will continue to study and to facilitate the utilization of monorail systems in New Jersey, and will provide oversight for all monorail projects which are initiated.

The Commission believes that the recommendations contained in this section will provide a framework and the means to begin the construction of monorail systems in the State. At some time in the future, however, it may be appropriate to establish a single-purpose authority both to own and to operate a Statewide monorail system.

APPENDIX A

P.L. 1983, C. 295

CHAPTER 295

AN ACT creating a commission to study the practicability and feasibility of establishing a New Jersey Monorail Authority to own and operate a Statewide monorail system and making an appropriation therefor.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

1. The Legislature finds and determines that:

a. New Jersey is one of the most densely populated states in the nation;

b. New Jersey's highways are overburdened with traffic;

c. The establishment of a Statewide monorail system can make a significant contribution to public transportation and ease highway congestion; and

d. It may be appropriate to establish an authority to fund and operate such a system.

2. There is created a commission to be known as the New Jersey Monorail Authority Study Commission. The commission shall consist of eight members, four to be appointed from the membership of the Senate by the President thereof, not more than two of whom shall be from the same political party, and four to be appointed from the membership of the General Assembly by the Speaker thereof, not more than two of whom shall be from the same political party.

3. The commission shall organize as soon as may be practicable after the appointment of its members and shall select a chairman from among its members and a secretary who need not be a member of the commission.

4. It shall be the duty of the commission to study and evaluate the practicability and feasibility of establishing a New Jersey Monorail Authority to own and operate a Statewide monorail system.

5. The commission shall be entitled to call to its assistance and avail itself of the services of such employees of any State, county or municipal department, board, bureau, commission or agency as it may require and as may be available to it for its purposes, and to employ such stenographic and clerical assistance and incur traveling and other miscellaneous expenses as it may deem necessary in order to perform its duties, within the limits of funds appropriated or otherwise made available to it for its purposes.

6. The commission may meet and hold hearings at a place or places it designates during the sessions or recesses of the Legislature and within one year of the effective date of this act shall report its findings and recommendations to the Legislature with any legislative bills it may desire to recommend for adoption by the Legislature.

7. There is appropriated $5,000.00 to the commission from the General State Fund to effectuate the purposes of this act.

8. This act shall take effect immediately.

Approved August 4, 1983.

APPENDIX B

RECOMMENDED LEGISLATION

ASSEMBLY, No. 4100

STATE OF NEW JERSEY

INTRODUCED AUGUST 28, 1985

By Assemblymen LITTELL, LaROCCA, KAVANAUGH, BENNETT, HAYTAIAN, WEIDEL, RANIERI, CUPROWSKI, VAINIERI, CHARLES, DORIA, HENDRICKSON, CHINNICI, MUZIANI, LOVEYS, ALBOHN, Assemblywoman COOPER, Assemblymen FRELINGHUYSEN, PALAIA, SHINN, MILLER, Assemblywoman OGDEN, Assemblymen SHUSTED, GENOVA, Assemblywoman PERUN, Assemblymen FRANKS, HARDWICK, KOSCO, SCHUBER, FELICE, ROONEY, ZECKER, KLINE, Assemblywoman MUHLER, Assemblyman MARTIN, Assemblywomen RANDALL, GARVIN, Assemblymen KERN, ROD, ROCCO, GIRGENTI, PELLECCHIA, LONG, DEVERIN, RILEY, FLYNN, S. ADUBATO, McENROE, PATERO, HERMAN, MAZUR, PELLY, BOCCHINI, THOMPSON and MARSELLA

AN ACT concerning monorail transportation, amending P. L. 1983, c. 295, supplementing P. L. 1966, c. 301 (C. 27:1A-1 et seq.), and making an appropriation.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

1. Section 2 of P. L. 1983, c. 295 is amended to read as follows:

2. There is created a commission to be known as the New Jersey Monorail Authority Study Commission. The commission shall consist of **[**eight**]** *13* members, four to be appointed from the membership of the Senate by the President thereof *for the member's term of office*, not more than two of whom shall be from the same political party**[**, and**]**; four to be appointed from the membership of the General Assembly by the Speaker thereof *for the member's term of office*, not more than two of whom shall be from the

EXPLANATION—Matter enclosed in bold-faced brackets [thus] in the above bill is not enacted and is intended to be omitted in the law.
Matter printed in italics *thus* is new matter.

same political party*; the Commissioner of Transportation ex officio, or his designee; the Executive Director of the New Jersey Transit Corporation ex officio, or his designee; the Executive Director of the Port Authority of New York and New Jersey ex officio, or his designee; the Executive Director of the Delaware River Port Authority ex officio, or his designee; and the Executive Directors of the Turnpike, Highway, and Expressway Authorities ex officio or their designees who shall serve one-year rotating terms in the following order: New Jersey Turnpike Authority, New Jersey Highway Authority, and New Jersey Expressway Authority.*

2. Section 4 of P. L. 1983, c. 295 is amended to read as follows:

4. It shall be the duty of the commission to study and evaluate the practicability and feasibility of establishing a New Jersey Monorail Authority to own and operate a Statewide monorail system, *to work with the Department of Transportation and other public agencies to maximize the benefits of monorail technology, and to exercise oversight for all monorail projects.*

3. Section 6 of P. L. 1983, c. 295 is amended to read as follows:

6. The commission may meet and hold hearings at a place or places it designates during the sessions or recesses of the Legislature and [within one year of the effective date of this act] *annually* shall report its findings and recommendations to the Legislature with any legislative bills it may desire to recommend for adoption by the Legislature.

4. (New section) As used in P. L. 1983, c. 295 and this 1985 amendatory and supplementary act, "monorail" means any type of transportation system in which manned or unmanned vehicles are operated on fixed guideways along an exclusive easement or right-of-way, but excluding conventional railroads.

5. (New section) Notwithstanding any other law to the contrary, the Department of Transportation shall have exclusive responsibility for assisting in the development of monorail systems. The Assistant Commissioner for Transportation Services and Planning, at the direction of the Commissioner of Transportation and in cooperation with State departments, commissions, authorities, and other State agencies and with interested private individuals and organizations, shall be the exclusive coordinator of plans and policies for the utilization of monorail systems.

6. (New section) The Assistant Commissioner for Transportation Services and Planning, at the direction of the Commissioner of Transportation, shall have the following functions, powers and duties:

a. Approve or reject any proposed monorail project, including its route;

b. Assist the developers of any monorail system approved pursuant to subsection a. of this section in property acquisition, public financing, and the securing of permit approvals and easements;

c. Set fares for monorail systems; and

d. Establish safety standards for the operation of monorail systems.

7. (New section) Any monorail system authorized pursuant to section 6 of this act shall be exempt from the zoning and planning ordinances of the several municipalities of the State.

8. (New section) The New Jersey Monorail Authority Study Commission, created by P. L. 1983, c. 295, shall exercise oversight for all monorail projects.

9. (New section) The Assistant Commissioner for Transportation Services and planning shall adopt rules and regulations pursuant to the "Administrative Procedure Act," P. L. 1968, c. 410 (C. 52:14B–1 et seq.) to effectuate the purposes of sections 5 through 8 of this act.

10. (New section) In addition to the amount appropriated by P. L. 1983, c. 295, there is appropriated $30,000.00 to the commission from the General Fund to effectuate the purposes of this act.

11. This act shall take effect immediately.

STATEMENT

This bill amends P. L. 1983, c. 295 which established the New Jersey Monorail Authority Study Commission, and assigns exclusive responsibility for the development of monorail systems to the Department of Transportation.

Membership of the commission is expanded to include representatives of public agencies with transportation interests. The bill provides that the commission will work with the Department of Transportation in promoting monorail technology. It also includes a definition of "monorail" and makes an additional appropriation to the commission.

Within the Department of Transportation, the Assistant Commissioner for Transportation Services and Planning, at the direction of the Commissioner of Transportation and in cooperation with other State agencies and interested private parties, shall be the exclusive coordinator of plans and policies for the utilization of monorail systems. Any authorized monorail system will be exempt from local zoning and planning ordinances, and the commission will exercise oversight for all monorail projects.

SENATE, No. 3250

STATE OF NEW JERSEY

INTRODUCED AUGUST 28, 1985

By Senators COWAN, RAND, GAGLIANO, BASSANO, O'CONNOR, JACKMAN and WEISS

Referred to Committee on Transportation and Communications

AN ACT concerning monorail transportation, amending P. L. 1983, c. 295, supplementing P. L. 1966, c. 301 (C. 27:1A–1 et seq.), and making an appropriation.

A-4100 passed in the General Assembly and was amended in the Senate by the Senate Transportation and Communications Committee. The bill, as amended, was merged with its Senate version, S-3250, and passed in the Senate. Following approval of the amendments by the General Assembly, Governor Kean signed A-4100, as amended, on January 21, 1986 as P.L. 1985, c. 538.

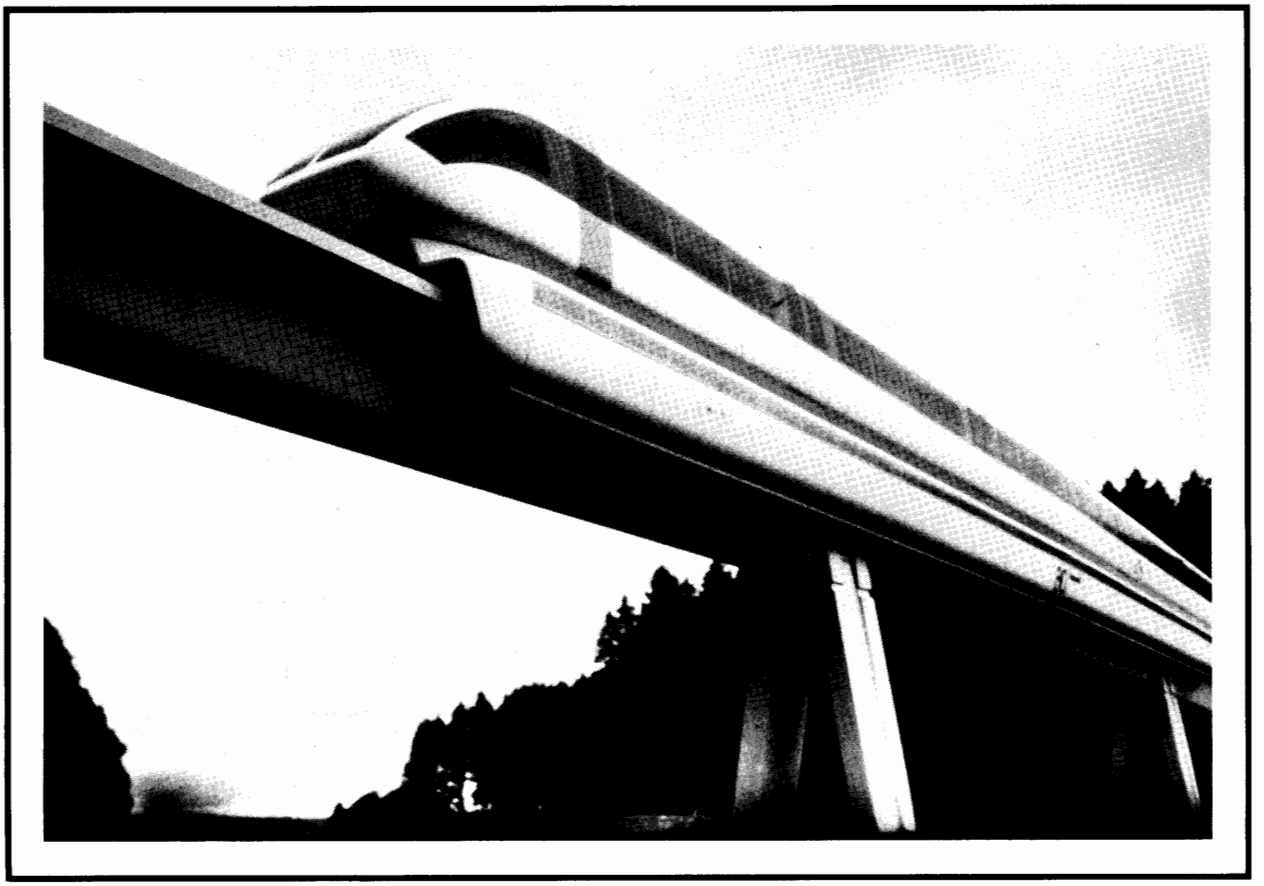
APPENDIX C

STATEMENTS AND PHOTOGRAPHS SUBMITTED BY COMPANIES WHICH MADE PRESENTATIONS AT COMMISSION MEETINGS

AMERICAN MAG-LEV

P.O. BOX 29 -:- PITMAN, NJ 08071-0029

(609) 589-4090



AMERICAN MAG-LEV TRANSRAPID 06
HIGH SPEED MAGLEV VEHICLE

AMERICAN MAG-LEV

P.O. BOX 29 -:- PITMAN, NJ 08071-0029

(609) 589-4090

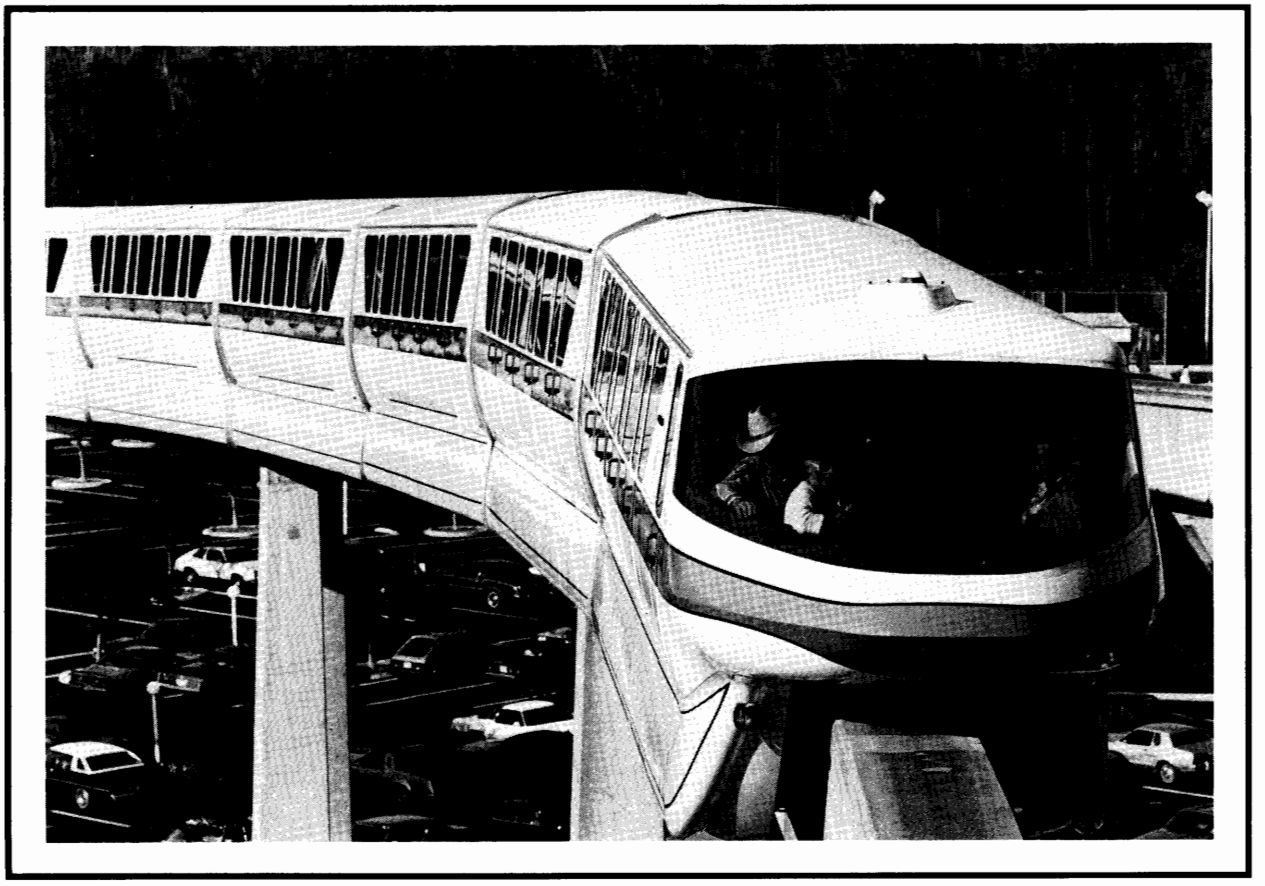
American Mag-Lev, a Pitman based company, is a developer of magnetic levitation (maglev) transportation in the United States. AML plans to use private enterprise financing to install maglev slow speed people-mover and high speed transportation systems throughout North America. Maglev vehicles have much to offer over conventional railroads. They do not rely on the friction of steel wheels on rail: they operate quietly without contact - producing no vibration or pollution. In addition, the systems would be built along existing highway and railroad rights-of-way, precluding the destruction of homes and property. The systems are also elevated preventing dangerous grade-crossing accidents.

American Mag-Lev is working with Atlantic City to install a $300 million downtown people-mover. The system would intercept casino busses at a terminal on the outskirts of the city and transport the passengers to their final destination. The implementation of a downtown people-mover system would relieve the growing casino bus traffic congestion from Atlantic City's narrow streets and allow for the orderly expansion of the city's casino, business and residential districts.

Additionally, AML is one of the two remaining bidders for the Florida High Speed Rail system and is currently involved in several other people-mover projects throughout the nation.

Bombardier Corp.
Mass Transit Division

201 South Orange Avenue
Suite 1000, Barnett Plaza
Orlando, Florida 32801
(305) 425-6888



BOMBARDIER MARK IV MONORAIL AT
WALT DISNEY WORLD IN ORLANDO, FLORIDA

Bombardier Corp.
Mass Transit Division

201 South Orange Avenue
Suite 1000, Barnett Plaza
Orlando, Florida 32801
(305) 425-6888

THE DISNEY MONORAIL

THE MOST WIDELY RECOGNIZED MONORAIL IN THE WORLD IS THE MARK IV MONORAIL THAT HAS BEEN IN DAILY OPERATION AT WALT DISNEY WORLD IN ORLANDO, FLORIDA, SINCE OCTOBER, 1971. IN CARRYING MORE THAN 500 MILLION PASSENGERS OVER 8 MILLION TRAIN MILES, THESE SLEEK RUBBER TIRED ELECTRIC POWERED VEHICLES HAVE MAINTAINED AN AVAILABILITY RECORD OF BETTER THAN 99% FOR THEIR 13 PLUS YEARS OF OPERATION.

WITH ONE OF THE LARGEST PARK AND RIDE LOCATIONS IN THE WORLD (OVER 20,000 PAVED SPACES), THE MARK IV MONORAIL SERVES AS THE SPINE OF AN INTEGRATED TRANSIT NETWORK OF BUSES, BOATS AND TRAMS. CARRYING UP TO 185,000 PASSENGERS DAILY, THIS PRIVATELY FINANCED, BUILT AND OPERATED SYSTEM ACTUALLY SERVES AS A PROFIT CENTER FOR DISNEY.

AS A RESULT OF A RECENT LICENSING AGREEMENT BETWEEN DISNEY AND THE BOMBARDIER CORPORATION, NORTH AMERICA'S LARGEST MASS TRANSIT MANUFACTURER, THESE TRAINS ARE NOW AVAILABLE FOR THE FIRST TIME. AS PART OF A BROAD PRODUCT LINE INCLUDING AUTOMATED PEOPLEMOVERS, HIGH SPEED RAIL TRAINS, LIGHT RAIL VEHICLES AND OTHER TYPES OF URBAN RAIL VEHICLES, THESE HIGHLY PRACTICAL MONORAILS ARE BEING OFFERED BY THE TRANSPORTATION GROUP INC., (TGI) A SUBSIDIARY OF BOMBARDIER.

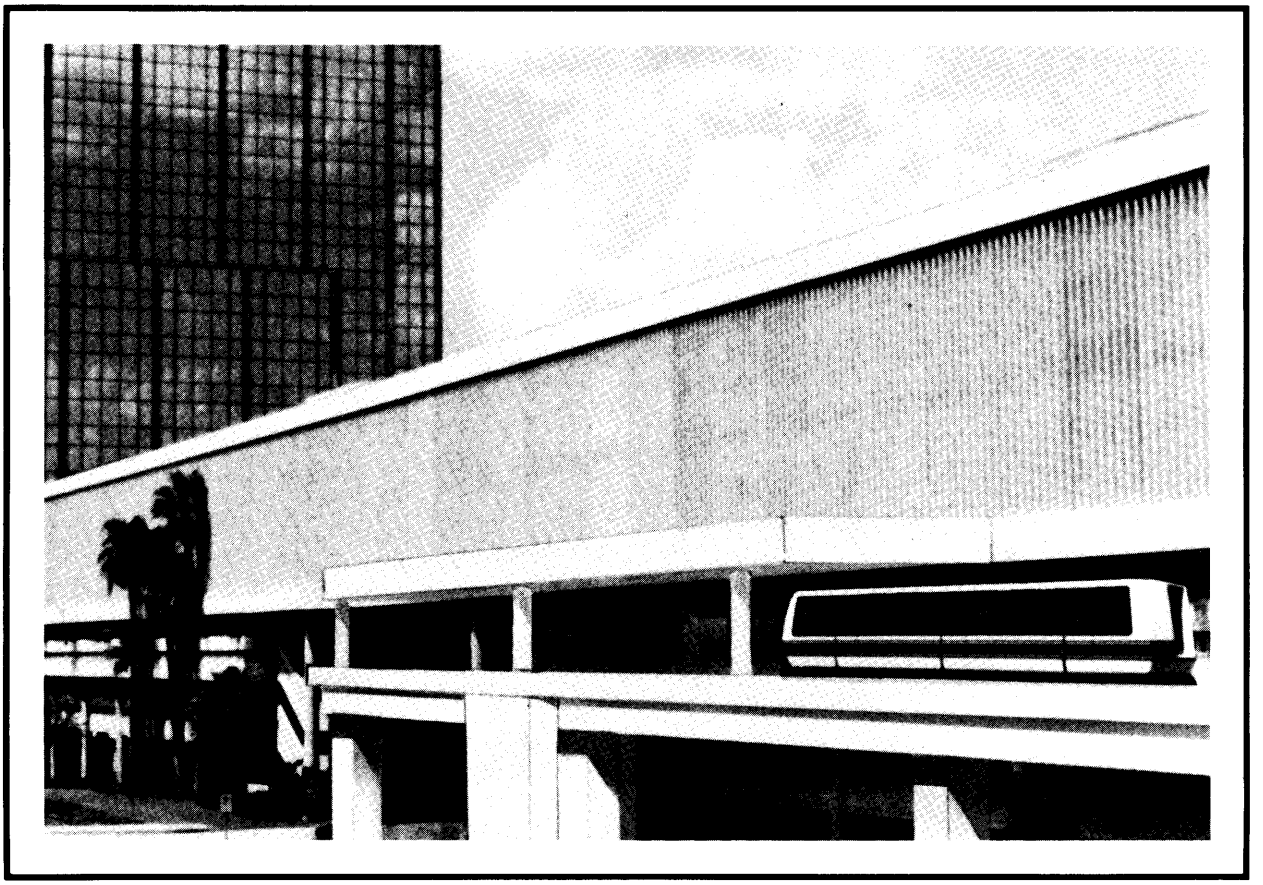
IN ADDITION TO APPLYING BOMBARDIER'S YEARS OF VEHICLE BUILDING EXPERIENCE TO COMPLETELY "TRANSITIZING" THE MONORAIL, TGI STANDS READY TO HELP POTENTIAL CLIENTS WITH ALL PHASES OF THEIR TRANSIT NEEDS INCLUDING PLANNING, FINANCING, CONSTRUCTION, INSTALLATION, OPERATIONS AND MAINTENANCE.

HEADQUARTERED IN ORLANDO, FLORIDA, WITH 2 EXISTING UNITED STATES MANUFACTURING PLANTS, TGI AND BOMBARDIER REPRESENT THE MOST SIGNIFICANT INVESTMENT IN NEW U.S. MASS TRANSIT MANUFACTURING FACILITIES IN OVER A DECADE.

UNITED TECHNOLOGIES OTIS ELEVATOR

Otis Elevator Company
Transportation Technology Division

11380 Smith Road
P.O. Box 7293
Denver, Colorado 80207
303/343-8780



OTIS SHUTTLE TRANSIT INSTALLATION:
DOWNTOWN TAMPA STATION AT THE FORT
BROOKE PARKING GARAGE

UNITED TECHNOLOGIES OTIS ELEVATOR

Otis Elevator Company
Transportation Technology Division

11380 Smith Road
P.O. Box 7293
Denver, Colorado 80207
303/343-8780

OTIS NETWORK AND SHUTTLE TRANSIT SYSTEMS

Otis Elevator Company, Transportation Technology Division, Denver, Colorado, provides two forms of automated transit -- the OTIS SHUTTLE and NETWORK TRANSIT Systems.

The OTIS NETWORK TRANSIT is very versatile. It is applicable to loop and network installations, including on- or off-line stations, with speeds up to 40 MPH. The system employs self-propelled vehicles, using linear induction motors for electromagnetic propulsion and service braking—with no moving or wearing parts. An OTIS NETWORK System has been in service, since 1980, at the Duke University Medical Center, Durham, North Carolina.

The OTIS SHUTTLE TRANSIT is the best choice for shuttle applications--including grades and curves. It can provide excellent service for relatively low capital and O&M costs by virtue of its simplicity, using long-proven components. The light weight vehicles are propelled by cable, using standard Otis gearless elevator drives and, in many cases, can be applied over existing structures. Speeds range from 15 to 30 MPH. OTIS SHUTTLE Systems are currently being installed in Tampa, Florida, Serfaus, Austria, and Sun City, Republic of Bophuthatswana in Southern Africa.

Both Otis systems are fully automatic and non-traction dependent, enhancing all-weather operation. A wide range of modular equipment allows the use of different vehicle sizes, drive combinations and controls to closely match a given need. Common structural interfaces permit future retrofit of OTIS SHUTTLES into OTIS NETWORK installations, where appropriate. This feature allows the use of lower cost shuttles today, without compromising possible future growth into loops or branching networks.

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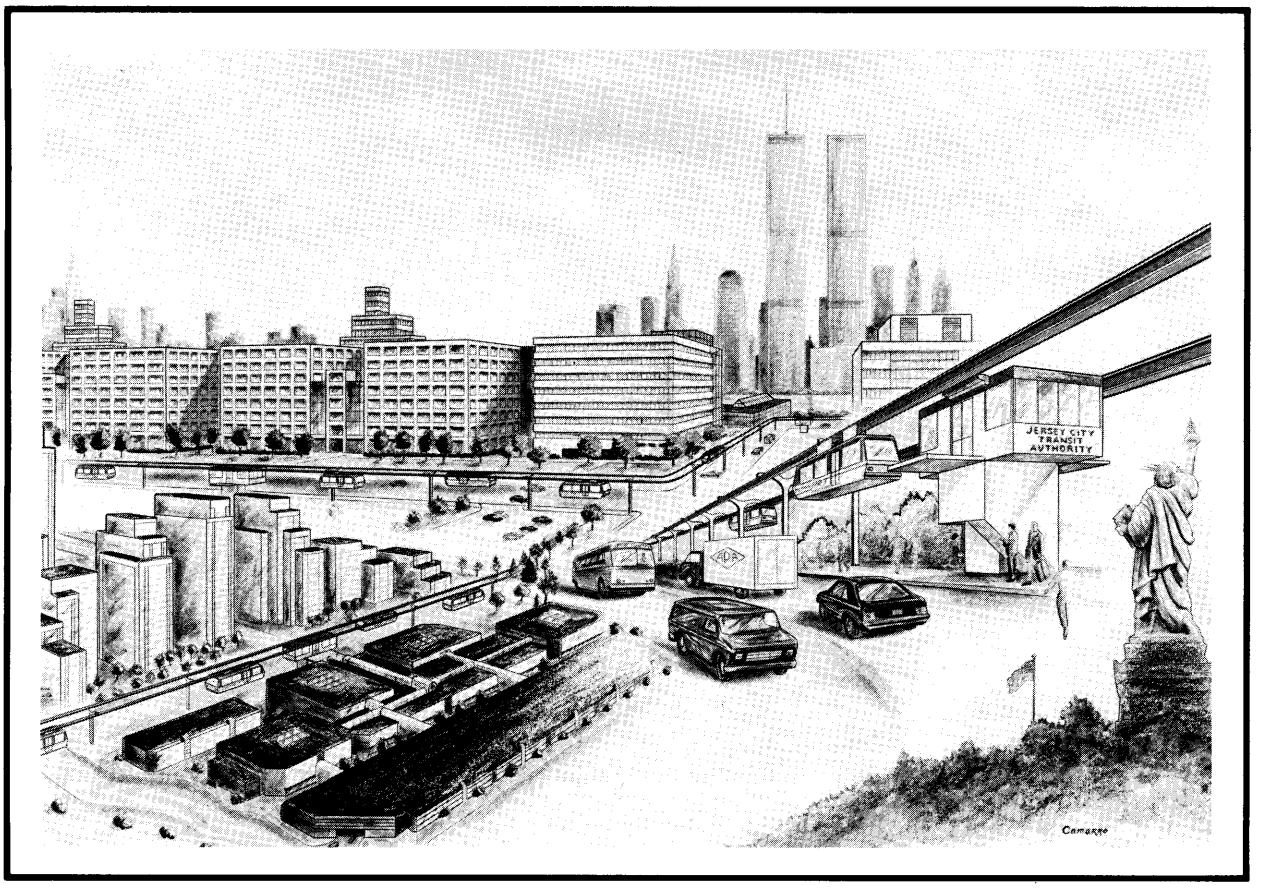
TITAN PRT SYSTEMS



TITAN PRT "JETRAIL" AS PROPOSED
FOR THE HUDSON RIVER WATERFRONT

118 Mill Road, Park Ridge, New Jersey 07656 (201) 930-0300
1020 Chicago Road, Chicago Heights, Illinois 60411 (312) 756-7090

TITAN PRT SYSTEMS

TITAN/PRT Systems "Jetrail" is a scheduled/demand responsive fully automated monorail system that is designed to link suburbs with cities, busy activity centers and airline terminals with their remote parking lots. The System will transport them rapidly, reliably and efficiently. Jetrail has been fully tested and approved by the U.S. Department of Transportation. The TITAN/PRT System offers several distinct advantages:

- Lower capital investment and operating cost for a high-speed fully automated installation.
- Negotiates right curves of 15 feet.
- The system can be re-routed or expanded into a network system without any difficulty.
- Aesthetic, weatherproof structure and vehicles.
- Switching capability for flexibility in routing.
- No interference with ground traffic.
- Accommodates to site conditions without excessive environmental intrusion.
- System capacity can be doubled by adding vehicles, or increasing speed, with minor modifications to the control system.
- Solid-state computer controls constantly monitor and regulate the system and vehicle performance.
- Quiet, pollution-free, patented linear induction propulsion.
- Built-in passenger safety and security.

The TITAN/PRT System is a design engineer's dream but not a financier's nightmare. Its reasonable cost and outstanding service features result in effective solutions to transportation problems in a broad range of applications.

118 Mill Road, Park Ridge, New Jersey 07656 (201) 930-0300
1020 Chicago Road, Chicago Heights, Illinois 60411 (312) 756-7090

Universal Mobility Inc. Bank of Holladay Plaza, 2040 East 4800 South Street
Salt Lake City, Utah 84117 (801) 278-4421

UMI UNIMOBIL AUTOMATED GUIDEWAY TRANSIT SYSTEM
AT THE 1984 LOUISIANA WORLD EXPOSITION,
NEW ORLEANS, LOUISIANA

Universal Mobility Inc. Bank of Holladay Plaza, 2040 East 4800 South Street
Salt Lake City, Utah 84117 (801) 278-4421

UNIVERSAL MOBILITY, INC.
UNIMOBIL SYSTEMS

Universal Mobility, Inc. (UMI) specializes in the design, manufacture and installation of Automated Guideway Transit (AGT) systems. UMI has been in the people mover business since 1956, and has engineered and installed monorail systems, marketed under our registered trade name of Unimobil Systems, since 1967.

To date, UMI has installed nine automated Unimobil Systems throughout the United States.

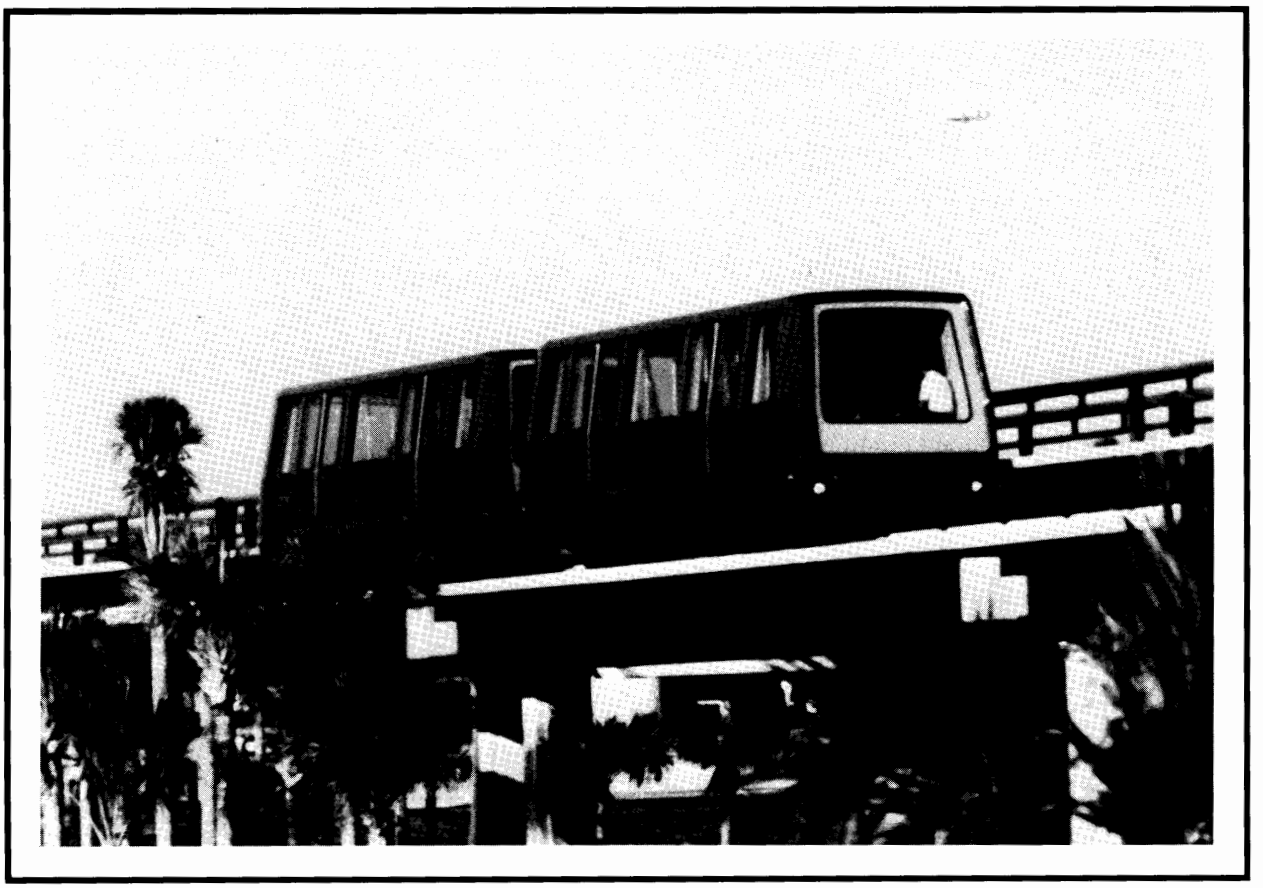
OPERATIONAL	PRESENT SITES	NUMBER OF VEHICLES	LENGTH OF GUIDEWAY
1969	California Exposition Sacramento, CA	Four 8-car trains	1.5 miles
1969	Hershey Park Hershey, Pennsylvania	Three 6-car trains	0.9 miles
1971	Magic Mountain Los Angeles, CA	Six 8-car trains	0.8 miles
1973	Carowinds Charlotte, N.C.	Four 8-car trains	2.0 miles
1974	Kings Island Cincinnati, Ohio	Seven 9-car trains	2.0 miles
1975	Kings Dominion Richmond, VA	Six 9-car trains	2.0 miles
1979	Minnesota Zoological Gardens Apple Valley, MN	Three 6-car trains	1.4 miles
1982	Metrozoo Miami, Florida	Three 10-car trains	1.9 miles
1984	1984 Louisiana World Exposition New Orleans, LA	Six 10-car trains	1.4 miles

All UMI systems provided to date are uni-directional loop configurations with on-line stations; however, UMI's technology lends itself to shuttle and other modes as well. Our trains are driven by electrically powered bogies, generally one per car. System control is maintained by a computer on-board each train which allows for either automatic or manual operation. Optionally, full automation controls may be supplied by utilizing a central control facility.

Westinghouse
Electric Corporation

Transportation Division

1501 Lebanon Church Road
Pittsburgh Pennsylvania 15236-1419



WESTINGHOUSE AUTOMATED TRANSIT SYSTEM
AT THE ORLANDO AIRPORT,
ORLANDO, FLORIDA

Westinghouse Electric Corporation **Transportation Division**

1501 Lebanon Church Road
Pittsburgh Pennsylvania 15236-1419

The Westinghouse Electric Corporation is one of the largest and most diversified companies in the world today with over 100,000 people around the world who make and sell more than 8,000 basic products. Westinghouse is organized into three primary operating units: the Energy and Advanced Technology Group (of which the Transportation Division is a part), the Industries and International Group, and the Commercial Group.

The application history of Westinghouse Automated Transit Systems is extensive and uniquely successful. Backed by nearly 100 years' experience in the design and supply of propulsion and automatic train control equipment, Westinghouse developed its original Automated Transit System technology in the mid-1960's. The system utilizes rubber-tired, electric-powered, automatically-controlled vehicles operating over a dedicated guideway.

Westinghouse Automated Transit System installations have been completed on-schedule at airports in Tampa, Florida; Seattle-Tacoma, Washington; Miami, Florida; Atlanta, Georgia; Orlando, Florida; and Gatwick, London, England, as well as at Busch Gardens in Williamsburg, Virginia. These projects, in addition to those underway for the McCarran International Airport in Las Vegas, Nevada, the Miami Downtown People Mover, and a second system at Gatwick Airport in London, have met all contractual requirements to date and stand as proven testimony to Westinghouse's capabilities and unique expertise in transit applications.

Westinghouse Automated Transit Systems have carried over 450 million passengers safely and efficiently with all system availability levels consistently exceeding 99.0 percent. This demonstrated technical leadership is unapproached by any other manufacturer.

NOTES