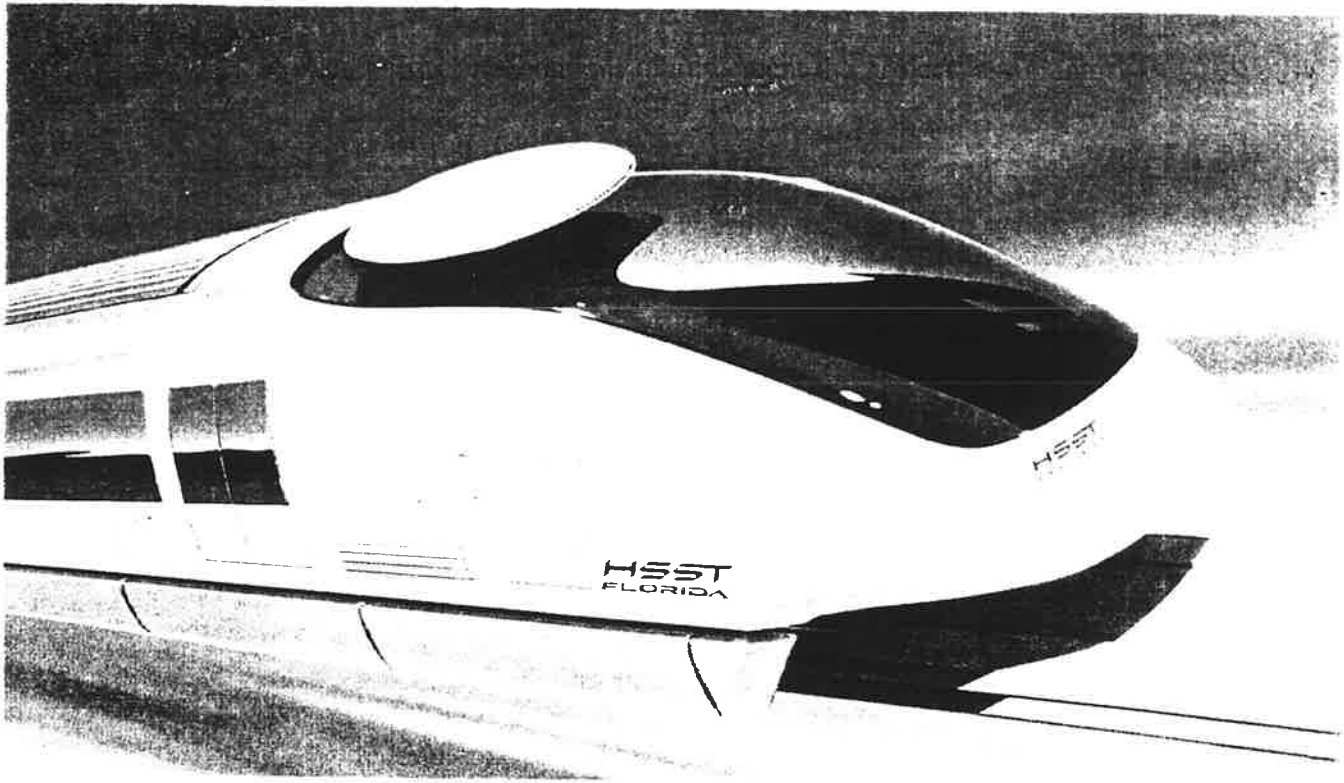




United States Department of Transportation
Volpe National Transportation System Center

VNTSC Case Study:

**“Non-Technical Impediments to Maglev Development:
A Lessons Learned Study of the Florida Maglev Demonstration Project”**

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Table of Contents

I. Introduction	1
II. Involved Federal, State, Local and Private Entities	3
A. Federal	3
B. State	3
C. Local	3
D. Private	4
III. Timeline of Maglev Project	5
IV. Narrative History of the Maglev Project in Florida	7
A. Pre-legislation	7
B. 1984 Florida High Speed Rail Transportation Act	7
C. 1988 Magnetic Levitation Demonstration Act	8
D. MTI's efforts to obtain Project certification	9
1. WDW withdraws	10
2. Post-WDW	10
a. western terminus on I-Drive	10
b. GOAA is unhappy	11
E. Other considerations	12
F. The state certifies the Maglev Project	12

G. The Maglev Project receives federal funds	12
H. Adverse developments	13
1. GOAA again	13
2. Transrapid's costs increase and cause delay	13
3. Deerfield Homeowners complain about noise	14
4. HSST technology; the demonstration project slows	14
V. Issues Resulting in Lessons Learned	15
A. Pre-Maglev Act (1985-1988)	15
1. Project mission	15
a. mission and participants	15
b. revised mission	16
2. Alternatives analysis and route selection	16
a. terminals	16
b. route criteria	17
3. Economic analysis	18
a. original intent of self-funding	18
b. WDW's philosophy	18
4. Federal, state and local regulation of magnetic levitation technology	19
a. federal railroad regulation	19
1) FRA jurisdiction?	19
2) rule-making?	19
3) labor costs	20

b. state regulation; environmental	20
c. local regulation; building and planning codes	20
d. regulatory preemption by FHSRTA?	21
e. establishment of certification under to the Maglev Act	21
B. Maglev Project to Loss of WDW Station Location (1988-1989)	22
1. Maglev project certification issues	22
a. in general	22
b. environmental issues	22
1) wetlands	22
2) noise	22
c. safety	23
d. rail competition issues	23
2. Station location issues; condemnation power	23
a. MTI is powerless to condemn station sites; WDW withdraws	23
1) OIA's use of its "veto"	24
2) WDW's use of its "veto"	24
b. resulting issues	25
1) no public funds	25
2) "private" vs. "public" status	26
C. Amendment through Project Certification (1989-1990)	27
1. In general	27
2. High speed rail; parallel tracks and different goals	28
a. conflicting objectives; FHSRTA and Maglev Act	28

b. OIA dissents	28
c. MTI coordinates with ABB	29
3. OIA station site negotiations	29
a. sources of animosity	29
1) parallel track	29
2) lost revenues	29
b. station location at OIA	30
1) MTI's position; through-ticketing	30
2) OIA's position; reliability	31
3) DOT intervenes	32
4. Negotiations with local government and state agencies	33
a. safety	33
b. financial capability	33
c. community impact	34
d. specific environmental impact	34
e. station design; public access	34
5. Conditions of certification	34
a. specific conditions	35
b. rejected condition; Expressway Authority's request for "mitigation"	37
D. Certification through Final Financing Commitment (1990-1992)	38
1. In general	38

2. Private parties' negotiations to implement the project; assigning risks	39
a. cost overrun risks	40
b. technology risks	40
c. ridership shortfall and operating risks	41
3. ISTEA funds	42
a. the effect of federal entry into the process	42
b. fund dispersal	42
1) reimbursement procedures	43
2) National Environmental Protection Act (NEPA)	43
3) federal contracting guidelines	43
4) match credit	44
5) repayment and assurances against project failure	44
VI. Conclusions and Recommendations	45
A. Conclusions	45
B. Recommendations	48
1. One-stop permitting	48
2. Power to condemn station sites	49
3. Environmental impact balancing test	49
4. Public agencies govern condemnation, permitting and corridor coordination	49
5. Public resource strategy	50
6. Alternative technologies	50
7. Attracting private sector support	50

I. Introduction

Since 1985, private and public interests have been developing the Florida Magnetic Levitation Demonstration Project in Orlando. The 14.5 mile, for-profit, demonstration of maglev technology will connect the Orlando International Airport with the International Drive tourist area, which includes Walt Disney World, Sea World and other attractions and hotels serving the burgeoning tourism market in central Florida.

The project is likely to become the world's first commercial demonstration of high speed magnetic levitation transportation technology; in 1991, Florida's Governor and Cabinet issued a certificate to Maglev Transit, Inc. to exclusively construct and operate such a project. The cornerstone of planning and development for the project is legislation adopted by the Florida legislature in 1988 which provides, in part, for a novel one-stop environmental, land use and technology assessment. The Act codified a strategy to overcome hurdles identified in the project team's assessment of anticipated governmental barriers; all affected entities are bound to present jurisdictional concerns during a single certification process before a single forum.

One critical development in project planning has been consensus building to bring together diverse modal constituencies with the project. The OIA and local transit authorities and business interests, for instance, have joined with the project in a collaborative planning process to create an intermodal demonstration at the maglev terminal. By way of contrast, during this same period, a competing proposal to construct a statewide network of high speed trains in Florida failed. Recent proposals by the Florida Department of Transportation note the success of the Maglev project and express a desire to render Florida's future high speed rail effort more like that of the Maglev project's.

ISTEA proposes a Maglev Prototype Development Program to construct a demonstration project of at least 19 miles. After successful testing and technical evaluation is completed, the prototype is to be converted to commercial operation. ISTEA imposes an ambitious timeframe to complete the project. In addition, Congress had asked USDOT to prepare a feasibility study for both high speed rail and Maglev technology. Impediments similar to those both anticipated and unanticipated by the Maglev project team would undoubtedly surface to contravene such a timeframe. Such impediments relate to issues involving impacts on competing transit modes, public agencies and businesses, zoning and land use restrictions, corridor and right-of-way acquisition, noise, wetlands and electromagnetic fields. Those implementing the federal program hope to expedite deployment by incorporating means to overcome such impediments.

Those implementing the ISTEA program may expedite planning by adopting a consensus building process similar to the one that evolved at the Orlando project. As noted, despite initial intense opposition from a variety of groups, this process led to unanimous support for the project by all state, local and private interests groups, including the state environmental and land use regulatory agencies, affected local government and OIA.

The objective of this paper is to study lessons learned, to date, from the Orlando experience. Particular attention will be given to the economics of competing modes in the private and public section. That objective will entail identifying the groups who raised issues or opposed the project, an examination of the issues raised, the context in which they were raised and the means by which the Orlando project achieved consensus and overcame or failed to overcome the impediments.

II. Involved Federal, State, Local and Private Entities

The roles of the following federal, state, local and private entities in the implementation of the Maglev project will be discussed:

A. Federal

1. Federal Aviation Administration (FAA)
2. Federal Highway Administration (FHWA)
3. Federal Railroad Administration (FRA)

B. State

1. Florida Department of Transportation (DOT)
2. Florida High Speed Rail Transportation Commission (FHSRTC)
3. Florida Department of Natural Resources (DNR)

C. Local

1. Central Florida Commuter Rail Authority
2. City of Orlando
3. East Central Florida Regional Planning Council (ECFRPC)
4. Economic Development Council of Mid-Florida (EDC)
5. Greater Orlando Aviation Authority (GOAA)
6. Orlando International Airport (OIA)
7. Kissimmee/St. Cloud Convention and Visitors Bureau
8. Meadow Woods Elementary School
9. Metropolitan Planning Organization (MPO)
10. Orange County
11. Orange County Public Schools
12. Orange County Public Utilities
13. Orlando Orange County Expressway Authority (OOCEA)
14. Orlando Orange County Convention & Visitors Bureau (OOCVB)
15. Osceola County
16. Port Canaveral Port Authority
17. Tri-County Transit (Lynx)

D. Private

1. Efficient Transportation for the Community (ETC)
2. Florida Power Corporation (FPC)
3. Japanese National Railways (JNR)
4. Japanese Railways Technical Services (JARTS)
5. Maglev Transit, Inc. (MTI)
6. Orlando Utilities Corporation (OUC)
7. Sea World/Anheuser Busch
8. Transrapid International (TRI)
9. United Arts of Central Florida
10. Universal Studios
11. Walt Disney World Company (WDW)

III. Timeline of Maglev Project

June 1986	JNR-JARTS team dispatched to Florida
June 1987	Conceptual agreements with Disney MTI purchases ROW and ROW options Preparation of legislation
June 1988	Magnetic Levitation Demonstration Act passes Florida Legislature MTI disengages with JNR MTI signs up Transrapid FHSRTC issues Request for Applications (RFA)
March 1989	MTI submits Application in response to RFA ETC is formed
June 1989	Commission Certification Selection (CCS) Hearing Primary issues for ETC become "public access" & ROW for I-Drive light rail Other issues include: Revenue loss (OIA) Revenue loss (OOCEA) Wetland issues (DNR) EMF issues (DNR) Safety issues (DOT, FRA, GOAA) Reliability issues (GOAA, DOT) Negative economic impact on non-Disney properties (ETC)
October 1989	Disney withdraws EPCOT site
March 1990	MTI submits amended Application
April 1990	MTI submits DRI on Hemispheres Site
June 1990	FHSRTC disbanded
July 1990	CCS Hearing Primary issues: Wetland issues Safety issues EMF issues Loss of toll road revenue Loss of rental car and concession revenue I-Drive transit system

October 1990	Administrative Hearing Primary issues: Technology viability Project financial viability Wetland issues Safety issues OIA revenue loss Toll road revenue loss
November 1990	Begin Work on Implementation Planning Study with technology and financial institutions
June 1991	MTI receives Certification
July 1991	MTI submits Implementation Planning Study (IPS) document
August 1991	Conditional Station Site Approvals
November 1991	ISTEA enacted; Project Receives \$97.5 million
December 1991	Conditional Final Agreements with Station Sites
January 1992	MTI works out Wetland Mitigation Issues
March 1992	Extension of OIA and County Agreements
December 1992	Cost projections exceed project revenues
March 1993	Extension Requested

IV. Narrative History of the Maglev Project in Florida

A. Pre-legislation

Motivated by a burgeoning demand for new transportation infrastructure brought on by Florida's rapid population growth and impressed with the high speed rail technology he had observed in Japan in 1982, then Governor Bob Graham worked to establish a High Speed Rail Transportation Committee (Committee). High speed rail was perceived as an attractive alternative to providing new highway and airport capacity because while those require the clear acquisition of land, high speed rail can be collocated with existing highway and utility rights-of-way. The Governor's Committee was charged with investigating the feasibility of building such a system in Florida and to prepare appropriate legislative recommendations. Because Florida's tax base does not include income tax and the gap between necessary infrastructure and revenue sources was growing quickly, the Committee favored a system predicated solely on private funding.

In response, several companies, including the Japanese National Railway (JNR), Tres Grande Vitesse (TGV), and Bombardier, conducted studies of the feasibility of such a system in Florida. Both TGV and Bombardier found a privately funded system to be financially feasible if cross-subsidized with ancillary real estate development.

B. 1984 Florida High Speed Rail Transportation Act

The Committee recommended legislation which resulted in the Florida High Speed Rail Act (FHSRA), sections 341.3201-341.386, Florida Statutes, and the creation of the Florida High Speed Rail Commission in 1984. The expressed legislative intent was "that the state pursue the development of a high-speed rail line to solve transportation problems and eliminate their negative impacts on the citizens of this state", Section 341.321(1)(d), Florida Statutes. The Commission was authorized to request and review proposals and, if appropriate, issue an exclusive franchise to an applicant authorizing the construction and operation of a high speed rail project. The successful applicant was provided four important incentives; the power of eminent domain through the Florida Department of Transportation (DOT), use of certain public rights-of-way, tax-exempt financing secured by system revenues and the ability to capture increased real estate development values near stations and along the corridor. The last incentive codified the legislature's agreement that if rail access increases real estate values at station sites the rail should be entitled to capture part of that value. The statute provided another incentive that was logically thought to encourage real estate developers to affiliate themselves with the rail development; the accelerated permitting, or certification, process provided to the rail line included approval for station related developments, or ancillary facilities, as well. It was anticipated that, as incidental beneficiaries of such a centralized review process, real estate developers would gladly affiliate themselves with the rail system to be spared exposure to the ponderous and, typically, redundant local review process contemplated by a Development of Regional Impacts review.

Initially, the Japanese National Railways (JNR) considered applying for a high speed rail franchise that would incorporate maglev technology, but because of the level of its technology at the time and the high cost of construction, it declined. JNR did find, however, that the 19-mile corridor between the Orlando International Airport (OIA) and Walt Disney World (WDW) provided an opportunity for a commercial demonstration of maglev technology for two reasons. First, the segment was short enough to keep guideway costs low, and second, in addition to the growing number of transportation riders, there would be attraction riders, to generate revenue. Moreover, proximity to WDW was expected not only to enhance visibility of the demonstration, but to temper perception of Japanese control of American maglev development.

With a preliminary expression of interest from WDW, and financial backing by Japanese investment interests known as the Forum for Urban Development (Forum), Florida Environmental Resources, Inc., (FER), a company created by Forum to support the demonstration, began acquiring land and rights-of-way for it. FER also began discussions with the Greater Orlando Aviation Authority (GOAA) and WDW for terminal sites. Because of the magnitude of the demonstration project, however, the potentially most daunting task of the enterprise would be obtaining permission to construct and operate the demonstration line; it was to pass through wetlands and waterways and close by residential subdivisions. Permitting, therefore, would involve uncoordinated review and approval from a myriad of state and local agencies whose jurisdictional concerns could require excessive and replicated proffers and take years to resolve.

C. 1988 Magnetic Levitation Demonstration Project Act

To address its permitting concerns, the Maglev project team successfully lobbied for a bill that would provide a one-stop certification provision for the demonstration project similar to that found in the 1984 FHSRA; all concerned agencies would be bound to present their evaluations of an applicant's proposal during the certification process. Accordingly, in 1988, the Magnetic Levitation Demonstration Project Act (Maglev Act) was enacted, Sections 341.401-341.422, Florida Statutes. The expressed legislative purpose of the Act is not only to augment the 1984 Act but "to encourage and facilitate the implementation of a magnetic levitation demonstration project in the state", Section 341.402, Florida Statutes.

The Act provided for a seven-member Commission (Commission) appointed by the Governor to solicit and review demonstration project applications and to make recommendations regarding certification. Certification would constitute the sole requirement by the state or any state agency to locate, construct, operate and maintain the project for the life of the project. The certification process establishes turn-around periods for advancing to successive stages of review rendering the duration of the process predictable.

The Maglev Act differed from the FHSRA in several significant, and ultimately, profound, ways. While the Maglev Act similarly allowed for the use of eminent domain to acquire rights-of-way, it did not authorize use of tax-exempt bonds, establishment of a special assessment district or inclusionary permitting of real estate development. In short, the Maglev Act failed to offer financing options deemed necessary to attract high speed rail. Moreover, firms interested in high speed rail franchises were concerned the demonstration project might work to preempt their anticipated market in the Orlando area and, if successful, might provide the foundation for a longer line between Orlando and Tampa which would compete with their contemplated Miami to Orlando to Tampa route. As a result of their efforts, the Maglev Act also specified that a maglev demonstration project had to be located in a single county, section 341.403(12), Florida Statutes. The Act also failed to extend the use of the power of condemnation to allow for the acquisition of station sites, in addition to rights-of-way. Finally, as did the FHSTA, the Maglev Act required applicants to pay a \$500,000 application fee to cover state administrative costs and prohibited the use of any public funds in the implementation of the act, sections 341.405(2) and 341.404(2), Florida Statutes. The provisions of this Act would govern the progress of the maglev demonstration project in Florida.

D. MTI's efforts to obtain project certification

Pursuant to the Act, in June 1988, the Commission issued a Request for Applications. In March, 1989, Maglev Transit, Inc. (MTI) submitted the lone application for certification, a 1,500 page document addressing all aspects of the proposed project, including financial, technological and environmental. The proposal was premised on a 19-mile route that would use German-developed Transrapid maglev technology to connect the OIA with WDW's Epcot Center. The trip would take approximately 10 minutes with speeds reaching 300 mph. In essence, MTI sought to construct the world's first privately-funded commercially operated high speed magnetic levitation train system.

In September, 1989, MTI announced the project and opened an office in Orlando. The response was two-fold, one anticipated, the other not. As required by the Maglev Act, and, therefore, anticipated, many governmental agencies began evaluating aspects of the project under their jurisdiction. The Florida Department of Natural Resources (DNR) and the South Florida Water Management District began reviewing the wetland issue. The Florida Department of Environmental Regulation (DER) began reviewing noise and EMF issues. The East Central Florida Regional Planning Council began reviewing transportation issues. The Commission began reviewing safety and technology issues. Local governmental entities began reviewing the competitive effects of the project on their revenues. The Orlando Orange County Expressway Authority (OOCEA) began reviewing the impact of the project on an projected toll road intended to connect OIA with the tourism corridor; it was concerned that reduced revenues resulting from Maglev patronage would reduce toll revenue and jeopardize bonds used to fund the road's construction. The OIA, in turn, operated by the Greater Orlando Aviation Authority (GOAA), was concerned about rental car revenue loss, the location of the Maglev station at OIA and the reliability of the Maglev system.

Wholly unanticipated by MTI was the opposition to the project by economic groups located in central Florida and directly dependent on the tourism income generated there. Because MTI had spent its first three years, 1986 to 1989, in Tallahassee in north Florida working on the Maglev legislation, it little suspected that its greatest opposition would ultimately come from a newly formed group of tourism-related businesses located on International Drive, Efficient Transportation for the Community (ETC), whose sole purpose would be to oppose the demonstration project. The businesses, including Sea World, Wet-n-Wild, a prominent I-Drive hotelier, Harcourt/Brace/Jovanovich which owned Sea World at the time, and Universal Studios, all consider WDW their economic arch rival. Any project, therefore, that would deliver tourists directly into the already dreaded WDW "black hole" was perceived by the I-Drive businesses as enhancing WDW's pre-existing and, in their minds, unfair market advantage. ETC would eventually convince some rental car companies and private ground transportation carriers to participate in the group.

1. WDW withdraws

ETC's major strategy in its attempt to sabotage the demonstration project was to render it so unappealing to WDW that WDW would withdraw its agreement to locate the project's western terminus at Epcot. To this end, ETC highlighted a condition of certification that required the Epcot station to provide total "public access" including, but not limited to, rental cars, public buses and taxis. This condition further required WDW to provide a right-of-way for a future light rail system that would connect Epcot at the south with Universal to the north. WDW, accustomed to being able to carefully control and restrict access and activities on its property, sought clarification.

At a meeting to resolve this condition of certification as it applied to WDW, the Commission Chairman informed WDW that the proposed statewide high speed rail project (Orlando-Tampa-Miami) was more of a reality than he had assumed and that that system too would connect with WDW at the Epcot station. In response, WDW asked MTI to move the multi-modal public access station from Epcot to Celebration, WDW's "new town" development located south of the theme parks and resort. MTI declined this less lucrative substitution and, in October, 1989, WDW withdrew from the project.

2. Post-WDW

a) western terminus on I-Drive

Following WDW's withdrawal, MTI was in a quandary; it had alienated the local tourism community, lost WDW's support, spent several millions of dollars on permitting and rights-of-way, and had no western terminus. In March, 1990, MTI submitted an amended application locating the project's western terminus on International Drive which shortened the route from 14 to 13.5 miles. While moving the station off of WDW property insignificantly

changed the mix of riders to include more transportation riders and less attraction riders, the new site was perceived by MTI not only to offer more development opportunity but to result in I-Drive business support.

b) GOAA is unhappy

After relocating the western terminus to I-Drive, and with I-Drive's presumed support, MTI was confident that it could quickly permit and implement the project. GOAA, however, was unhappy. As landing fees have plateaued, airports have increasingly relied on non-airline revenues, particularly rental car, parking and concession revenues, to meet their capital and operating costs. GOAA's largest single source of revenue was from rental cars and many of its bonds were backed with a pledge of rental car revenues. The introduction of the project threatened those revenues. In addition, GOAA staff and officials had been spending significant money and time on the development of a corridor that would connect OIA with Port Canaveral to the east. Included in the corridor plans was a high speed rail service that would connect cruise passengers arriving at OIA with the cruise ship at Port Canaveral. With the possibility of significant revenue reduction due to the project, and the potential of the project to interfere with its rail plans, GOAA sought to protect its interests.

While MTI began responding to environmental, technological and safety issues in relation to its proposal, GOAA focused on issues that were difficult to assess; financial impact (lost revenues) on GOAA, the ability of the demonstration project to succeed financially, and the appropriate location of the OIA station. While MTI had agreed to "replace" lost revenue, it, at the same time, wanted credit for new and additional revenue that would result from the project. During the Commission Certification Selection (CCS) public hearings on the demonstration project, this issue, coming to an impasse, threatened to halt the project. In a last minute compromise GOAA requested, and MTI agreed, that GOAA be allowed to operate the I-Drive terminal and participate in revenues generated by that facility. GOAA, concerned that OIA might be "stuck with a white elephant" should the project fail, demanded better proof of capital cost, ridership and revenue projections, as well as survey methodologies and market assumptions.

Meanwhile, early in the project, MTI had met with GOAA staff who had recommended that the Maglev terminal be located in the proposed southern terminal which would be a mirror image of the 96 gate northern terminal and would house the INS international arriving facility. During the post-application period, however, it became apparent to MTI that the southern terminal was many years away from implementation and that from a marketing and passenger access perspective the Maglev terminal must be located in the OIA northern terminal. GOAA has reserved land adjacent to the northern terminal for a "train station" that would house a state-wide high speed rail train, a train to the east coast, and light rail systems that would run north and south out of OIA.

E. Other Considerations

GOAA was not the only institution pressing MTI. During this period, OOCEA argued that the project would adversely affect its toll road bonds; DNR argued that an additional two miles of length should be added to the system to avoid its negative impact on Boggy Creek Swamp; and ETC was leveraging MTI for financial support for an I-Drive transit system that would connect the I-Drive station in the south with Universal Studios to the north.

MTI addressed the required issues at the hearing. It's additional argument that the project would have far-reaching positive social, transportation, tourism and economic development benefits, although compelling, was not, of course, an enumerated consideration.

F. The state certifies the Maglev project

Following hearing, the Hearing Officer issued a 500-page Findings of Fact and, apparently accommodating many institutional complaints, a draft order with numerous conditions of certification attached. The proposed order would nonetheless allow the project to move forward.

In May, 1991, the Governor and Cabinet began their review of both the Hearing Officer's and DOT's proposed certification order. On June 11, 1991, rejecting many of the Hearing Officers proposed conditions, the demonstration project was certified with 11 general and 32 specific conditions.

G. The Maglev project receives federal funds

On December 19, 1991, the federal "Intermodal Surface Transportation Efficiency Act" (ISTEA) was enacted, Public Law 102-240. The Act provides that, as a national policy, magnetic levitation systems such as Florida's Maglev Project are to be encouraged and fostered, and when demonstrated to be feasible and economical, are to be incorporated into the national transportation network. Line 196 of Section 1106(b) of ISTEA specifically authorized for appropriation of \$97.5 million over a 6-year period for costs relating to land and right-of-way acquisition and guideway construction for the Maglev Project. The Act additionally appropriated for 1992 and 1993, 7.6 and 18.1 million dollars, respectively, for the project.

Because the project had been originally promoted to be privately funded, Orange County, the City of Orlando and GOAA, as well as other governmental entities, expressed concern over the allocation. The appropriation did not diminish or replace any allocation of federal highway or other transportation funds for the state. Nevertheless, many complained that project developers had misrepresented their funding intentions thereby diverting funds from local transportation interests. The concern dissipated as the facts about the funding became known.

H. Adverse developments

1. GOAA again

During this same period, MTI had successfully negotiated with GOAA for a station site at the northern terminal but was having difficulties meeting GOAA staff's technical criteria for locating the station. Matters were exacerbated by the fact that all technical information was gathered by MTI representatives who, in turn, forwarded it to Germany for review and design by Transrapid. GOAA sought to force quick resolution of detailed matters by presenting contracts.

GOAA demanded 10 percent of MTI's gross receipts as a privilege fee for access to OIA, as well as rental and lease fees, concession rights fees and direct financial contribution for the cost of all facilities to be built at OIA. MTI appealed to DOT to intervene as a mediator to facilitate discussion.

2. Transrapid's costs increase and cause delay

Before MTI and GOAA could complete negotiations, Thyssen, Transrapid's primary backer in Germany, announced at a December 1992 meeting in Munich that the costs of many of its component parts increased dramatically and that its schedule for completion had slipped. As a result, project cost projections exceeded project revenues. Negotiations over the terms of a performance guarantee to shift the technology risk to the technology provider made MTI's banks increasingly uncomfortable about the project.

In March, 1993, MTI petitioned for a 6-month extension of its June 12, 1993 deadline to file its financing commitment statement. The Commission granted the extension, the result of a compromise between the demands for proof of financial capability and MTI's argument that until certification was granted, the substantial entities associated with the project were unlikely to invest the time to reach enforceable financing agreements. The financing commitment condition, Special Condition 7, the most fought over of those attached to the certificate, directed that if financing was not obtained within two years the certificate would lapse. Filing for the delay was perceived to seriously undermine the credibility of the project.

An available alternative to the increasingly costly Transrapid technology was the slower but less costly linear induction motor HSST technology (HSST) developed by Krauss Maffai for the Maglev project and later sold to and developed by Japanese Airlines. The slower HSST technology, for several reasons, would soon become even more appealing to MTI.

3. Deerfield Homeowners complain about noise

In July, 1992, MTI had won a modification to move a two mile section in the middle of the route approximately 600 feet northward to avoid elevated flyovers and traffic dispersal systems which had been constructed at the exit of the Southern Connector Expressway and John Young Parkway, approximately the halfway point of the project route. While notices of the intended modification had been published in the Florida Administrative Code and a local newspaper, they had not been published in the Orlando Sentinel, the newspaper with the largest area circulation. A new group, composed of the Deerfield Homeowners Association and the Centex Corporation which owns and developed the Deerfield subdivision, intervened complaining of the notice defect and demanding a full hearing on the issue of whether the route modification impinged on their property rights.

At 250 mph, the Transrapid technology produced a peak noise impact of 95 dba at 80 feet from the guideway center. At 130 mph, the HSST maglev technology produced approximately 75 dba at 80 feet. FRA comments to MTI's draft environmental assessment indicated a federal standard of 93 dba maximum would apply to the project.

4. HSST technology; the demonstration project slows

As noted, the banking interests wanted the technology provider to accept the technology and overrun risks associated with the project. Unhappy with Thyssen's refusal to assume these risks and the increasing cost spiral, the banks signaled their preference for a less costly, slower speed project which would employ technology manufacturing firms with which they were acquainted and from whom they expected to receive adequate assurances against the risk of technical failure. In August, 1993, MTI filed a request to abate the certification proceedings to allow it to file a modification to substitute the HSST technology for the Transrapid technology. Because no party opposed the request, on December 30, 1993, MTI filed a modification request to abandon the Transrapid technology for the HSST technology. MTI established a maximum target speed of 150 mph, but anticipated an average peak operating speed of 125 mph. Thyssen objected to MTI's modification request. At this writing, the issue remains unresolved.

Community impacts and noise specifications were other considerations in substituting technology; the substituted technology would result in reduced noise to nearby residential subdivisions. An additional consideration in substituting technology had been that HSST technology could result in less restrictive guideway geometry and offer greater collocation opportunities than had the Transrapid technology. While the HSST technology can operate at 3,000 meter radius curves, the Transrapid technology operates at roughly a 5,000 meter radius curve. This allows MTI to collocate an additional five miles of the project with the Southern Connector and move the route away from residential housing. In August, 1993, MTI, anticipating the impact of the homeowners group on the state proceedings and MTI's pending environmental assessment, agreed with the group to use the slower, less noisy HSST technology.

V. Issues Resulting in Lessons Learned

Financial, political and regulatory issues relating to the Maglev project have been presented in different forums at different times by different entities and regulatory agencies. The most challenging to the project, of course, were those raised during the certification process. Lessons learned by the Maglev project as it seeks to implement the project will be presented in the order that they have presented themselves.

A. Pre-Maglev Act (1985-1988)

In 1985, representatives from JNR were dispatched to Florida to initiate a cooperative venture with WDW to demonstrate the super speed electrodynamic magnetic levitation system being developed by JNR at Myazaki, in Kyushu, Japan. During this period project planning proceeded, by design, in secrecy. After establishing a team in Florida to support this effort, a proposal to deploy the JNR high speed maglev system between the OIA and Epcot was presented to and favorably received by WDW. Attempting to streamline resolution of non-technical issues, the project team conducted studies to identify possible legal and regulatory impediments to the project. Based on its findings in the project definition phase, the project team drafted proposed legislation that would later become the Maglev Act. The team established a program to acquire the project right-of-way of its intended corridor between WDW and OIA. Project engineering and design proceeded parallel to this effort, particularly the corridor alternatives analysis.

Two days before the 1988 Florida legislative session began, the project was publicly announced. A draft bill was introduced which incorporated mechanisms deemed necessary by the project team's studies, including provision for one-stop permitting. After the announcement, as noted, tourist-driven I-Drive businesses quickly formed the opposition group, ETC. Notwithstanding this opposition, in June, 1988, the Florida Legislature unanimously passed the Maglev Act. The principle issues prior to enactment had been:

1. Project mission

a. mission and participants

It was first necessary to define the project's mission and based on that determination to select a project team. The Orlando project began as a marketing effort by the JNR searching for export markets for Maglev technology being tested at Myazaki, Japan. The JNR team study was supported by finance and construction interests associated with JNR. Eventually, local attorneys and consultants provided input and joined the project study team to assist in overtures to WDW.

While the project team's negotiations with WDW were going well, events in Japan would soon cripple JNR's ability to contribute. As part of the Japanese government's effort to reduce JNR's deficit and reliance on government subsidies, the government privatized JNR. By late 1988, after the Florida-based project team had reached conceptual deals with WDW and secured legislation to establish the certification process, JNR, traumatized and in upheaval, with little enthusiasm for foreign adventure, abandoned the project.

b. revised mission

The project, with support from WDW and local political leaders, however, had developed a life of its own, one separate from that requiring JNR engineers. Financial projections showed a viable market if the technology could be constructed within the proposed budget. Because Japanese financial institutions expressed their continued interest in building a project with WDW using maglev technology, the project team began a search for an alternative maglev technology. At the 1988 Hamburg conference on Magnetically Levitated Transportation Systems, the team, electing to substitute the JNR system with the German Transrapid 0-7 technology, entered serious discussions with Transrapid (TRI). The route and nature of the project, as well as the Florida project planning and management team, remained essentially the same. The shift in mission, however, from promoting a specific technology to a project and market-driven effort fundamentally altered the planning process. Decisions affecting the project were now driven by classic economic considerations such as price, market and internal rate of return. This, in turn, imposed a discipline in the planning process that forced previously unentertained trade-offs and economic analysis of issues that were less important as when the project was to be a subsidized to demonstrate the JNR technology.

2. Alternatives analysis and route selection

a. terminals

The route for the Orlando Maglev project was defined by terminal and route selection criteria. The selection of both terminals appeared obvious: WDW and OIA. The project's target market was WDW bound tourists. Tourists at the high end of this market were perceived as the most likely to ride the Maglev system if ticket prices were equal to or less than rental car rates. The premium tourist market for WDW would arrive in Orlando at OIA where it would have to select a mode of transit at the airport; rental car, taxi or shuttle van, because, of course, one's own automobile is not available. By choosing the Maglev system, the arriving air traveler would avoid the traditional difficulty associated with public transit; diverting ridership from personal automobile to public transit.

The project team had considered, and rejected as unprofitable, a route connecting OIA with the Kennedy Space Port and Cape Canaveral area. Approximately 10 million tourists a year fly into OIA to visit WDW and the surrounding attractions while less than a million visit the space center. OIA planners would later pick up this idea.

b. route criteria

The terminals selected, the project team's task was to define a route from OIA into WDW at Epcot. Because uncertainties existed about land condemnation, the project team knew that it would have to acquire the land by private purchase, which suggested a route including land with relatively few landowners. While topography, in the sense of gradings, was not an issue in the flat terrain of surrounding Orlando, wetlands and poor subsurface conditions did become considerations during the route planning process. Because much of the land to the south of OIA was undeveloped and an existing powerline corridor ran in an east-west direction, the project team focused on the east-west alternative. Route selection criteria were:

- 1) alignment geometry
- 2) minimal impact on existing residential communities and business establishments
- 3) collocation with existing rights-of-way and corridors
- 4) potential to link with other transit modes
- 5) avoid infrastructure conflicts
- 6) minimize environmental impacts

The route is depicted in the document attached as Appendix A

The route into WDW was designed to make use of an old drainage canal and power line easement into Epcot; one golf hole would have to be redesigned. Some WDW planners favored a large loop to the south to pick up an access route. The project team rejected this route as impractical. In total, the route measured 17.542 miles of revenue track with a total trackway of 19.63 miles. As the map illustrates, most of the land along the route is either located in large parcels or could be collocated with existing utility corridors.

An alternatives analysis, including route and terminal selection criteria, developed for the Environmental Assessment, recites the process and considerations in greater detail and is attached as Appendix B.

3. Economic analysis

a. original intent of self-funding

Because the project team had expected the now absent JNR to underwrite a portion of the project costs, the initial ridership estimates on probable markets had not been based on sophisticated surveys but, instead, on input from knowledgeable WDW and JNR officials. A significant element of the original planning process had related to capturing value created by station location. The team had intended to cross-subsidize revenue short-falls with proceeds from a hotel and concession at the Epcot terminal. To estimate the number of tourists in the area, the project team had relied on proprietary WDW data and an analysis of available hotel rooms, divided by length of stay, to estimate the number of tourists in the area. The market size was correlated and cross checked with proprietary and public sources and found to be generally accurate. While the probable transit market seemed apparent, it was more difficult for the project planners to estimate the number of people who would ride the Maglev system as an attraction, without regard to its transportation function. Several WDW officials predicted that the attraction volume would surpass the number of patrons who would ride the system for transportation to and from OIA. The team estimated that approximately one-half of the current WDW bound traffic renting automobiles at OIA would use the Maglev system and that a far smaller percentage of the total tourist market would be expected to ride the system, for an initial total ridership estimate of somewhere between 6.5 million to 8.5 million trips in 1994, the projected first year of operation.

The creation of attraction ridership involving OIA raised an interesting issue: How was OIA expected to accommodate the new traffic, arriving and departing, with no purpose related to OIA? While the potential for additional revenue was clearly present, the attraction element of the ridership projections would continue to trouble OIA.

b. WDW's philosophy

WDW suggested that the project be completed without the use of public money. WDW's "no public funds" philosophy, championed by WDW when building WDW, provides, in essence, that when an entity introduces a large powerful tax base and economic engine that drives the area's economy without the use of public funds, it can bargain with local government for certain powers to regulate and govern itself, independent of local government. WDW's goal had been to insure it's ability to create and maintain the sanctity of its 37,000 acre preserve. To this end, WDW argued, it was necessary for it to be deemed a separate governmental unit authorized to collect revenues and be exempt from public traffic. Accordingly, as a pre-condition to bringing WDW to Florida, WDW had obtained the approval of the Florida legislature to create its own special taxing district, the Reedy Creek Improvement District. WDW suggested a similar philosophy to the Maglev project planners which surfaced in the Maglev Act as a prohibition against the receipt of public funds by the project, section 341.404(2), Florida Statutes. For reasons previously discussed, WDW

ultimately withdrew from the project forcing the project team to consider the use of public funds in implementing the project.

4. Federal, state and local regulation of magnetic levitation technology

a. federal railroad regulation

1) FRA jurisdiction?

Among the first issues JNR and Florida project team advisors had to resolve was whether the project was a "railroad" within the meaning of the Railroad Safety Act of 1970. This issue was clarified, somewhat, by the passage of the Rail Safety Improvement Act of 1988 which provides FRA jurisdiction over all Maglev technology by defining railroad to include "all forms of non-highway ground transportation that run on rails on electromagnetic guideways including commuter or other short-haul passenger service in a metropolitan or suburban area" and "high speed ground transportation systems that connect metropolitan areas without regard to whether they use new technologies not associated with traditional railways". While this language and subsequent actions by the FRA have established Maglev as a railroad, the initial view of the Maglev legal consultants was that a Maglev system between the OIA and WDW was not a "railroad" as contemplated by the 1970 act. In fact, OIA argued as late as 1990 that the FRA did not have jurisdiction over the project.

2) rule-making?

The project team had initially been wary of federal railway designation for two reasons. First, it feared that the FRA would create totally new rules for Maglev and the rulemaking process would be cumbersome and slow, thereby delaying the project. The JNR team was aware that many provisions of the current railroad rules would be problematic for Maglev. For instance, the FRA "buff load" requirements for vehicle strength and crashworthiness in head-on or bumping incidents impose a different philosophy of strength and weight in railroad car bodies than the philosophy behind Maglev vehicle design. Maglev development is more akin to that of aircraft in that vehicle weight must be kept low and aerodynamic drag overcome. Consequently, Maglev body structures are light and would not meet FRA requirements for buff loads. The guideway structures for Maglev also tend to be light and tensile, reflecting a more European design approach. The team was concerned that the guideway would have to be redesigned to accommodate American bridge and civil engineering standards, a possibility that would require extensive new testing. Later actions by FRA addressed many of the concerns raised by the project team in 1986. FRA, adopting an innovative approach, drafted a rule of particular applicability for the Orlando project.

3) labor costs

A second category of concerns relating to federal regulation was primarily economic: that federal railroad status might bring with it organized labor and antiquated and expensive railroad labor requirements might be loaded onto the Maglev project, driving labor and operating costs higher. Advisors familiar with United States railroads recommended that railroad status be avoided if accompanied by railroad labor requirements. Much of this input came from WDW officials who had considerable experience operating the monorail system which demonstrated a high degree of availability and reliability while operating outside the realm of traditional railroad regulations of labor and staffing.

b. state regulation; environmental

The project team recognized that environmental permits are necessary to cross wetlands, to allow for noise impacts and for construction. Florida enjoys stringent wetlands impact regulations which provide for extensive mitigation and impose penalties for unauthorized intrusion on wetlands. From the project team's early alternatives analysis and route planning effort, it was clear that the high speed geometry would not allow the project to avoid all of the wetlands, particularly one large body of swamp, the Boggy Creek Swamp, located almost directly south of OIA. The need for numerous regulatory permits unsettled the project team. Wetlands protection in Florida tends to be impact specific; regulators and regulations that protect wetlands consider only the applicant's impact on wetlands. No balancing provision exists to allow the applicant credit for improvements resulting to the macro-environment from the proposed improvement. Calculations on traffic diversion to Maglev, for instance, indicated significant improvements in air quality emission and reduced gasoline consumption. Although these laudable goals of mass transit appealed to regulators in the abstract, no statutory mechanism existed to allow impact offset or consideration of the positive environmental benefits of a project when assessing a specific impact, in this case, to wetlands.

c. local regulation; building and planning codes

The project engineering staff asked whether local building codes applied. It was concerned, for example, that state and local noise and railroad speed and signaling rules would apply. More problematic was the possibility that local comprehensive land use plans could be invoked to stop the project or require an extensive permitting process which would delay the project. The possibility of multiple, politically charged reviews by local government caused the project planning team concern.

d. regulatory preemption by FHSRTA?

Section 341.322(18), Florida Statutes, of the Florida High Speed Rail Transportation Act, precluded any high speed rail system from being constructed except under the Act. This definition was broad enough to include the Maglev demonstration project. The Maglev project team concluded that without a clear exception to the Act, the project would be in jeopardy. The state might require the project to apply for and obtain a statewide franchise as a condition to constructing the demonstration project. The costs of a 400-mile network of Maglev technology far exceeded any reliable estimate of the likely revenues in Florida. The project team felt that until a successful demonstration in revenue service was complete, it could not win financial backing for longer systems and did not want to be obligated to the statewide system until a demonstration succeeded.

e. establishment of certification under the Maglev Act

The project team determined that a "one-stop" regulatory/certification process, giving the certificate-holder condemnation powers and a clear right to operate, would solve the regulatory and right-of-way issues, at least at the state and local level.

The team proposed to the project backers a legislative package providing for a preemptive one-stop certification process. Unlike the traditional permitting process requiring multiple and, typically, overlapping issues in multiple and unrelated forums, the one-stop review and permitting process would focus all state and local regulatory concerns into a single process and establish time frames within which these concerns had to be addressed, resolved or waived. Further, unlike traditional wetland regulations, the proposed legislation would require regulators to balance economic impacts against macro-environmental benefits resulting from the proposed activity. The team hoped that this would require regulators to consider the positive environmental and economic consequences of the project and force agencies to negotiate with the applicant on acceptable compromises rather than taking the unilateral and harsh no impact position.

The proposed condemnation provisions would additionally enable DOT to exercise its power of eminent domain to acquire rights-of-way for a certificate holder. The legislative package was substantially passed in 1988 as the Maglev Act. The complete text of the document is attached as Appendix C. As noted, the Act became the mechanism that would govern the progress of the project.

B. Maglev Act to loss of WDW station location (1988-1989)

1. Maglev Project certification issues

a. in general

With the passage of the Maglev Act the project entered its second major phase. The team was now required, pursuant to the Maglev Act, to prepare an application in sufficient detail to allow the state an adequate review of all relevant land use, environmental, technical and safety concerns. In addition, the application was to establish the project's financial viability free of public funds. At this point the project team had concluded that a Maglev system could succeed if the costs were at or about one-half billion dollars. TRI's cost estimates were within this budget and the project team agreed with the German Transrapid Consortium to restructure the project as a combined German, Japanese and American effort. The application, prepared using the Transrapid technology, was favorably received by state and local regulatory agencies.

In June, 1989, the FHSRT Commission, responding to the application, began a week-long certification selection hearing.

b. environmental issues

1) wetlands

Regulators objected to an intrusion into Boggy Creek Swamp, a large wetland located almost directly south of OIA. They demanded proof that the project's high speed geometry would not allow a route to the side of the swamp. After MTI's production of evidence, regulators agreed that the additional two miles of track and the restrictive turn to the west would lower the project's speed to an unacceptable level and would render the costs unprofitable. Regulators then required the project to purchase 500 acres of wetlands and deed these over for public preservation as "mitigation" for the project's impact. Negotiations concerning the amount and quality of the land to be purchased consumed many hours of consultant time. MTI estimated the costs to satisfy the mitigation demand for the 14-mile project to be approximately 2.5 million dollars.

2) noise

Environmental agencies, particularly local government, were concerned with the level of noise created by the project. A detailed survey of ambient noise levels along the route and extensive calculations of the noise contours at each point along the route were required. A copy of the completed noise assessment prepared for the environmental impact statement is attached as Appendix D and offers insight into the extent of this review. The issue of noise and the effect of NEPA regulations is discussed above in greater detail.

c. safety

Regulators expressed concern about electro-magnetic fields (EMF) generated by the Maglev train. EMF are associated with the operation of Maglev as they are with that of other rail and mass transit systems. As the Maglev project progressed, public and regulatory attention was drawn to certain studies that suggested the need for additional evaluation and research to consider the possibility that EMF pose health risks. Although all devices using or transporting electricity are sources of such fields, most attention has been focused on the obvious sources such as utility powerlines. Because of the public perception that magnets of a system capable of lifting and propelling a train must be very strong, regulators required extensive evaluation of the EMF issue.

In 1990, the FRA commissioned studies of EMF relating to the Transrapid Maglev system as well as comparison studies of EMF generated by conventional transit systems. These studies indicated that EMF produced by the Transrapid system were within the range of those produced by other transit systems. While not dispositive of the issue, the conclusion that EMF generated by the Transrapid system were not significantly different than the level generated by other transportation systems allayed the concerns of many critics. See An Overview of Biological Effects Relevant to EMF Exposures from Mass Transit and Electric Rail Systems FRA/DOT/ORD 93/32 August 1993 and Comparisons of Magnetic and Electric Fields of Conventional and Advanced Electrified Transportation Systems DOT/FRA/ORD 93/07 Final Report August 1993. A copy of the environmental assessment of EMF relating to the Transrapid system is attached as Appendix E .

d. rail competition issue

The project team also worked to preempt interests that it anticipated might be advanced by the private sector. It was able, for example, to reach agreement with the high speed rail interests not to oppose the project in exchange for a covenant that Maglev would not expand its system except in conjunction with the High Speed Rail Franchisee. Each would cooperate in planning intermodal stations and service to OIA and WDW.

2. Station location issues; condemnation power

a. MTI is powerless to condemn station sites; WDW withdraws

Notwithstanding the Commission's positive recommendation, ETC had successfully created a political crisis over the route into WDW which peaked in 1989. OIA, acting as a surrogate for the I-Drive merchants, demanded, with the Governor's representatives' support, that WDW identify and dedicate a corridor for light rail access to Epcot before the project could be certified. The High Speed Rail Chairman advised WDW executives that the statewide high speed rail project, also planned to connect to the Epcot station, stood an 80% chance of

coming to fruition. Wary of such public access, WDW informed MTI that the project could be located at Celebration, a new WDW shopping mall and development complex located six miles south of the theme parks, instead of Epcot. WDW similarly agreed to dedicate a light rail corridor at Celebration instead of Epcot. The location at Celebration, however, unlike that at Epcot, offered no monorail connection to the theme parks and little of the appeal to Maglev of a direct link to Epcot. WDW, reasoning that there would never have been sufficient space at the Epcot station to accommodate the high speed rail station, also announced that it expected to afford the high speed rail franchisee access rights to the same station. WDW wondered aloud why MTI had not informed it that high speed rail was so likely to happen. ETC's strategy had worked. Six weeks before the final administrative hearing was to commence, MTI declined WDW's invitation to move the station to Celebration and WDW withdrew its participation in the project.

While the 1984 FHSRTA had provided condemnation power to acquire both rights-of-way and station site, the 1988 Maglev Act afforded the certificate holder condemnation power only to acquire rights-of-way, section 341.412(1), Florida Statutes. A certificate holder, therefore, could neither condemn a private station site, such as WDW, nor impose a station site on a unwilling public entity, such as OIA. The failure of the Maglev Act to allow MTI to compel either WDW or OIA to provide station sites effectively awarded both WDW and OIA, private and public entities, veto power over the project's route. This omission proved fatal to the OIA - Epcot proposal.

1) OIA's use of its "veto"

OIA used its "veto" in several ways, the first time of which threw the project into much early disarray. First, as an arm of local government, OIA was susceptible to the political influence of Universal Studios, Sea World and other I-Drive interests and routinely acted as a surrogate for those interests when dealing with the project. In its early attempt to sabotage the project, OIA had predicated station location at OIA on the promise of a light rail corridor and public access into WDW. The strategy was successful; WDW withdrew participation. The project, forced to look for an alternative station site, selected an area on I-Drive. Second, the project's inability to impose a station site on OIA allowed OIA to subsequently demand 10 percent of Maglev's gross revenues, in addition to access fees and station costs.

2) WDW's use of its "veto"

A significant element of the project's original financial planning had involved the project's capture of value created by its station located at WDW. The project team had anticipated cross-subsidization of revenue shortfalls from proceeds generated by a hotel and station located at the Epcot terminal. The loss of the WDW station location, coupled with Thyssen's subsequent increased costs, seriously challenged the project's original intent to proceed as a private sector initiative.

b. resulting issues

1) no public funds

The Maglev project had begun as a private enterprise involving Japanese and American technology interests and WDW. WDW and project planners had adopted the position that if they declined to seek public funds to build the project, and the project produced jobs and revenue for the state, the ability of local government or project opponents to impose conditions would be limited. While this argument prevailed, opponents wanted the pledge of no public funds written into the law. A prohibition against the use of public money, with an exception for federal funds, was included, section 341.404(2), Florida Statutes.

Maglev had originally been optimistic about the project's revenues not only because of a significant attraction component to the project, but because of the project's location in Orlando, the center of an affluent tourist market. The project's early disavowal of any public funds soon proved problematic just as it had for the California, Texas and other "private-public" high speed rail efforts. Opponents seized on the disclaimer to force MTI to prove revenue projections and its ability to go forward without public money. Because MTI did not have a firm financing commitment and could not obtain such a commitment in advance of the certificate, project opponents reasoned that MTI must be made to produce statistically valid evidence for its ridership and revenue projections.

Developing investment grade revenue and capital cost projections for any high speed rail system is difficult and for Maglev was more so. Early, ETC had expressed disbelief in the project's ability to support itself from revenue and its suspicion that MTI and WDW were planning to construct additional hotel rooms to cross-subsidize the project. ETC questioned the capital cost and ridership estimates for the Maglev system citing the abysmal record of mass transit in the United States, particularly the recently completed Miami metromover project. At over \$30 million per mile and with less than a third of the projected ridership, the metromover was an embarrassment to Florida. Opponents were doubtful that a 250 mph Maglev system could be built at less cost and challenged a scientific basis that could be used to project anticipated ridership of the level sufficient to retire the debt service.

The search for credible ridership estimates is beyond the scope of this paper. It is unclear, however, how such estimates can be produced since no high speed rail of any form has ever been built in the United States, nor Maglev technology employed. Although the project team conducted several surveys and ridership studies, opponents predictably complained that the surveys and studies suffered flaws in methodology, sample size and stratification.

Although Thyssen had constructed a test facility at Emsland and was confident of its projected costs, opponents also challenged their cost estimates. Events would later prove the opponents concerns relating to costs to be valid. By 1993, Thyssen, responding to increased component prices, would significantly increase its original cost estimates.

The resulting uncertainty about revenues and costs placed the project in peril. MTI ultimately relied on the provisions of the Maglev Act to allow it to submit evidence of financial viability as part of its post-certification submittals. MTI had successfully argued that absent certification, entities backing the project were unlikely to commit the time and effort required to proceed to enforceable financing commitments. MTI maintained that financing commitments, not ridership surveys, are the best evidence of a project's financial viability. If a banking house is willing to assume the financial risks of the project, MTI argued, the public sector should accept that judgment. Special Condition C-7 resulted which allowed MTI two years to present a final financing commitment to the state.

Local government's continued expressed skepticism of the project's ability to raise funds sufficient to implement the project and the project promoter's inability to demonstrate financial capability early in the process hampered planning. When the project promoters pointed to the tourist ridership and the project's appeal as an attraction in itself, public agencies discounted these features as unworthy of public transportation and less pressing than relieving highway congestion for local commuters.

2) "private" vs. "public" status

As noted, the Maglev project was conceived as a self-funding private enterprise. The project team's original decision to seek legislation was made to cloak the project with the quasi-governmental powers necessary to obtain rights-of-way, prevent competition, and establish a clear right to build the project, powers typically afforded public utilities and, historically, railroads. Even with these statutory powers and a legislatively mandated public purpose, the project circumspectly remained a "private" effort.

MTI's private status, however, created confusion, if not enmity, with public and other private entities. As a private enterprise, MTI was motivated by different institutional goals than was the public sector; mainly, the need to make a profit. If the project failed to make economic sense, it would be abandoned. Public entities regarded this motivation as less worthy than the public interests they were chartered to protect.

In the difficult climate of organized opposition from competing economic interests, the project's private status also resulted in several public relations set-backs. Newspaper accounts of the project were carried as front page or local news and, surprisingly, not in the business section. Public opinion polls taken to gauge the project's appeal revealed that only 58% of Orange County residents supported the project, a surprisingly low percentage for a high-tech project that, at the time, did not require public funding.

The transition of the project from a private to a private-public one adversely affected the resolution of institutional issues. The Florida experience suggests that without a pervasive, supportive role by a public agency with both the credibility and institutional power to influence other public entities, a project will likely be subject to numerous regulatory demands. At best, it can expect no more than benign neglect from the powerful agencies and institutional players, such as airports and municipal transportation planners, necessary to the success of such a project. Until the overt intervention of DOT during station site negotiations, the project had progressed slowly. In hindsight, it is clear that the Maglev Act should establish a clear and more proactive role for the public sector in the certification process. A clear definition of the public's interest in the success of the project, manifested by the patronage of a powerful public agency, is essential.

C. Amendment through project certification (1989-1990)

1. In general

November 1989 found the project team looking for a western terminus for the Maglev project. WDW had withdrawn support for the Epcot station and Maglev had declined WDW's offer to relocate the station project at Celebration, WDW's planned "new town" development six miles south of Epcot and the WDW theme parks. With the Epcot station unavailable, the I-Drive group had accomplished its major objective, avoiding non-stop service from the OIA to WDW.

During the controversy over the Epcot station site, ETC had insisted that a station located on I-Drive would be more in the public interest. Moreover, local politicians had promised public land. After losing the Epcot station site, project proponents were left with three not particularly attractive options: moving the station to Celebration, shortening the project to run to International Drive or abandoning the project altogether. After a six month delay, MTI amended its original application to propose a 14-mile project from OIA to a public station on International Drive. To the project proponent's surprise OIA continued to oppose the project. So fierce was OIA's opposition that after all state, local government and private parties stipulated to the project, the airport acted alone to oppose the project and forced a six week administrative hearing during which it contested every facet of the application. To accommodate weaknesses in the project's financing and the difficulties in obtaining financing before the project was certified, the proponents succeeded in convincing officials to accept a final financing commitment as a post-certification condition. Pursuant to Specific Condition 7, the final financing commitment was to be submitted within two years of certification. With this concession, and shortly before the matter was to be submitted to the Governor and his Cabinet, OIA agreed to drop open opposition to the project. On June 12, 1990, Florida's Governor and Cabinet granted the project the certificate to construct, operate and maintain the demonstration project.

2. High speed rail; parallel tracks and different goals

a. conflicting objectives; FHSRTA and Maglev Act

Florida, like most states and the Federal government, has tried to implement high speed rail by means of the private sector. The 1984 Florida Legislature adopted the view urged by many high speed rail enthusiasts that a privately financed effort would provide the state's high speed rail infrastructure if aided by legislation which simplified the permitting process and offered relief from local land use restrictions. The Florida Maglev project found itself in competition and compared with projects for a statewide high speed rail network proposed under the 1984 Florida High Speed Rail Transportation Commission Act. This development foreshadowed national debate between conventional, incremental and Maglev technology. Maglev project planners viewed the high speed rail process as a naive effort that must inevitably fail. The State refused the statewide project public money. Rail experts associated with the Maglev team, including representatives familiar with the economics and operation of the Japanese system, knew no system could be built in Florida without extensive public funding. Maglev's strategy was to neither interfere nor compete with the high speed rail effort, but to wait for the project to collapse under its own weight. The public, less informed, was swayed by politicians and other statewide project promoters who told it that Florida would soon enjoy a statewide rail system akin to the French TGV without the use of public funds. Florida's 1984 high speed rail legislation relied, in part, on consultant studies commissioned in 1982 which indicated that project revenues, if supplemented by revenue from realty development around the stations, would be sufficient to pay for the system.

b. OIA dissents

By the time JNR and WDW had formed their initial project plan, the statewide high speed rail project under the 1984 Act was bogged down in wrangling among potential vendors. Meanwhile, in 1988, the Florida legislature agreed to pass the Florida Magnetic Levitation Demonstration Project Act to create, essentially, a public utility franchise giving the successful applicant a monopoly on the right to construct a Maglev project, provided it was primarily in one county and paid for with private funds. The Act gave little guidance as to how the Maglev project would fit within the supposed network of high speed rail being developed under the 1984 Act. This was of particular concern because Maglev proposed to use a route, OIA to WDW, that was to be served in some way by the statewide system. Both the French TGV group and the Swedish ABB group proposed high speed rail routes that included OIA. Both the French and Swedish high speed rail proposers had support in high places, including that of the OIA director who constantly warned against allowing Maglev to come to OIA. It was his position that the statewide high speed rail project would not come to OIA if Maglev was already there. The OIA director was openly critical of Maglev because he viewed statewide high speed rail as more important than the Maglev demonstration to OIA's future. He also viewed the Maglev project's tourist orientation as less worthy than that of intercity transportation.

c. MTI coordinates with ABB

Eventually, MTI fashioned an agreement with the Swedish ABB backers to coordinate service and not compete. This agreement called for a shared station at International Drive and, if the ABB system served OIA, ABB agreed not to sell fares or service to the tourist area from OIA. Plans were made, in concept, to use Maglev to upgrade the incremental rail service under the ABB proposal. MTI, in turn, agreed not to extend its system except in combination with the high speed rail franchisee. Both groups felt this combined effort enhanced ABB's proposal under the high speed rail act and allowed the two projects to coexist. The agreement, however, dismayed the OIA director who resented the ability of private groups to reach, by private agreement, so significant a decision on the future of Florida's infrastructure.

3. OIA station site negotiations

a. sources of OIA's animosity

1) parallel track

To the surprise of the Maglev project team, OIA had become an adversary, not an ally, of the project. OIA's unexpected position can be explained by several factors. First, as shown above, OIA believed that Maglev's presence would adversely affect OIA's ability to woo a high speed rail franchisee to OIA since such high speed rail would require tracks parallel to Maglev's preexisting route which undoubtedly would have already usurped the limited revenue stream for this service. Second, OIA was susceptible to the concerns of I-Drive merchants opposed to the project because OIA is itself a political body and an extension of local government. Opponents of the direct OIA -WDW link, ETC, focused their effort on OIA which resulted in a climate of distrust and dislike between OIA and the Maglev project. Some of that distrust had lingered even after the WDW link had been discarded.

2) lost revenues

Arguably, the most pressing concern behind the OIA's displeasure with Maglev was the prospect that Maglev would cost OIA revenues lost from rental car concessions and parking fees. If patrons were whisked swiftly from OIA to WDW, they would have less time to spend in the restaurants and shops in the airport lobby. These restaurant and shops, in turn, pay a percentage of their revenues, typically 10 percent, to the airport authority. Their loss would result in another source of potential revenue reduction. OIA's financial executives estimated OIA would lose approximately 10 to 20 million dollars annually because of Maglev's presence. Because OIA bonds are backed by pledges of these revenues, the financial officers urged OIA to either request that Maglev agree to pay all revenues lost from rental cars and concessions or oppose the project. For these reasons, OIA continued to raise, if not create, issues and attack the Maglev effort throughout the certification process. MTI was ultimately successful in winning certification despite these objections. Several of the issues raised by OIA, however, bear study, particularly if Maglev systems are to integrate into airports. Among the issues raised by OIA are the following:

b. Station location at OIA

In 1990, as the Maglev certification process was coming to an end, OIA was completing its third airside to accommodate an expanded Delta Airlines terminal. Plans called for a fourth airside and a fourth runway. Master plans also called for constructing, at an uncertain date, another terminal, to the south of the present terminal, roughly equal in size to the existing North Terminal. Airport master plans show rail corridors passing through the southern terminal and beside the northern terminal. A map of the Orlando Airport Master Plan is attached as Appendix F.

1) MTI's position; through-ticketing

MTI initially proposed several station sites to OIA, all of which were located in the northern terminal, since no southern terminal existed. One plan called for Maglev to come in over the existing parking garage and build its terminal on top of the existing OIA terminal, at level five. Another plan was to follow the existing plan for rail access to a terminal located on the east of the northern terminal, midway between the Automated Ground Transportation systems which ferry passengers to the airside. This connection would be by escalator. These issues are discussed much more fully in Design of Passenger Facilities for the Orlando Maglev System, USDOT, VNTSC Order No. DTRS57-92-P-80225, Akira Yamashita and Associates, April 1992.

OIA insisted that Maglev construct its terminal on the site reserved for the southern terminal and purchase and provide to OIA an AGT system linking its system to the southern terminal. This proposal was not acceptable to MTI.

The OIA director resisted Maglev access to the North Terminal. He insisted that the cross field taxiway identified on the master plan could not accommodate Maglev because all slots had been reserved for road, high speed rail and light rail access. He argued the taxiway should not be recut because of slope and incline restrictions and insisted that Maglev would have to build a water tight tunnel under the existing tunnel. The location of the Maglev station, if it was in the north, was to be at the outside of several vacant lanes reserved for future high speed and light rail systems and Maglev was asked to bear all costs for constructing the station for itself and these other modes. Project engineers determined that the turns necessary to wind into the north terminal would be too tight for the Transrapid system to negotiate and probably too tight for any form of rail. Nonetheless, OIA planners insisted that the location of other fixed pieces of infrastructure dictated this alignment and changed the plans only slightly after considerable negotiation. Eventually the speed of the system would be lowered considerably while in the airport compound.

Maglev survey and ridership data made it clear that seamless transfer of passengers and baggage was essential if Maglev was to attract sufficient ridership. Focus group data indicated that inserting a mode change and a significant distance between the OIA terminal and the Maglev station would adversely affect project revenues.

Maglev sought "through-ticketing," including the price of the Maglev ticket into the airline ticket and making the point of sale for Maglev the purchase of the airline ticket. Customers paying hundreds of dollars for an airline ticket were perceived to be less sensitive to an additional twenty or thirty dollar charge for transportation to their destination. MTI was less confident that these fares could be achieved if the customer was asked to pay that sum as a separate charge at the airport terminal. The point of sale was important to MTI; if the airline sale decision incorporated the sale of the Maglev and were jointly marketed, Maglev was likely to sell more tickets than if patrons had to seek out and purchase Maglev tickets at OIA. For these reasons, a close relationship with the airlines and integration into the existing airline service was considered critical to Maglev officials.

2) OIA's position; reliability

OIA's objections to these arrangements were many. First, it reasoned that if Maglev, as an untried and new technology, failed and passengers arrived holding Maglev tickets, OIA would have no means of getting these passengers to their destination and OIA would ultimately suffer both public relations and financial setbacks. OIA demanded various forms of assurances that Maglev availability could be met ranging from liquidated damages to a period of operation for several years before revenue service could begin. OIA asked that Maglev acquire and keep at OIA a fleet of buses to transport passengers if the Maglev system went down. Eventually, negotiations progressed involving an agreed trade-off predicated on MTI's right to use through-ticketing on the availability and reliability of its service. If Maglev proved unreliable, as defined at an agreed percentage of down time or failure, then through-ticketing would be stopped until improvements were made.

Although OIA had agreed to conditional through-ticketing, it then questioned whether through-bagging was feasible because obtaining a three letter code to transfer baggage was a difficult, if not impossible, task. OIA raised concerns relating to security, tracing and liability for lost baggage and the resulting imposition of additional sorting and baggage transfer burdens on OIA. OIA alternatively questioned how baggage could be synchronized with passenger flow if, for instance, baggage transfer took 8 minutes and the passenger departed within 5 minutes of arrival. OIA insisted on and then repudiated a desire to operate the I-Drive terminal for Maglev.

3) DOT intervenes

DOT eventually intervened in station site negotiations between MTI and OIA. To provide for the study of the various systems which might have OIA access and agreement on station design, DOT created an "Intermodal Committee". Together with MTI, DOT persuaded FTA to provide \$500,000 for this process. The strong and innovative leadership of DOT, as well as the support of progressive interests in the Orlando and regional transit planning departments, moved the process along. OIA, at several points, insisted that Maglev pay all engineering, attorney and staff time to conduct the negotiations and declined to continue until its request was addressed. Maglev, for its part, was often preoccupied with the details of the financing arrangement and lacked the resources or a firm grasp of its financial constraints to allow it to enter into binding business relationships with OIA. To the frustration of both parties, lapses of several months were not uncommon.

OIA's position on compensation for Maglev access varied. In general, OIA insisted on a payment of 10% of the gross receipts from ticket sales as well as rental fees for the station site and concessions. OIA argued that this arrangement mirrored agreements with other vendors on OIA property. Maglev argued that as a state transportation project it was entitled to different treatment than private vendors on the OIA property. OIA countered that airlines are given preferential treatment because they are signatories to airport bond covenants and agree to pay OIA revenue shortfalls.

Maglev's difficulty in establishing itself as a financially viable project early caused OIA not to take the project as seriously and resulted in conflicts in planning. MTI and OIA engineering staffs tended to plan in isolation. Both groups voiced suspicions that the other's plans were, at some level, part of the adversarial struggle in which each principles were engaged. After the creation of the Intermodal Committee, this situation improved, particularly after MTI assigned a local staff engineer to work closely with OIA.

Outside of the larger issues of system concept, specific technical issues arose. Would, for example, the electric or communications transmissions for Maglev interfere with airport avionics. Who had jurisdiction over this issue? The FAA eventually began correspondence with Maglev and OIA in an attempt to resolve the issue. Allocating agreed frequency bands appeared to solve the problem.

Another issue arose over whether property purchased with FAA funds could be used for the Maglev station and whether the funding restrictions on FAA funds precluded the intermodal station and connections being discussed by the Intermodal Committee.

OIA was keenly interested in the fate of the infrastructure from the project if, as it suspected, Maglev failed as a private business and abandoned the project. In the administrative hearing, OIA asked for and won a provision in the Certificate requiring MTI and its financiers to agree that if the project was abandoned, the guideway and rolling stock was to be turned over, debt free, to OIA. This provision troubled the project financiers who were already struggling to define the nature of their collateral.

Finally, OIA argued that the station at Epcot and, later, at I-Drive did not have enough parking space for rental cars. OIA's assessment of the amount of parking, bus lanes and acreage required to house the terminal was twice that arrived at by MTI's architects and transportation planners.

The issues of station control and the regulation of associated activities were never fully resolved. OIA asked for and Maglev agreed to allow the I-Drive Station to be operated by OIA with the revenues and expenses shared between OIA and MTI. After MTI argued that OIA's bonding capacity could be used for the I-Drive Station, OIA alternatively insisted that another local government, perhaps the County, operate the station.

4. Negotiations with local government and state agencies

MTI's strategy in preparing for the certification hearing was to obtain stipulations from all local government and station agencies to resolve by compromise or post certification submittals, the issues raised in their reports. The Maglev Act required each agency to conduct a review of the project and file their comments with the Commission. These comments were then incorporated into the Commission report and forwarded to the Department of Administrative Hearings which was required to hear evidence on the matters. These comments and recommendations would then be forwarded to the Governor and Cabinet for final action. Issues raised by local and state government related to safety, financial capability, community impact, specific environmental impact and station design.

a. safety

The Commission and local government sought assurances of safety testing. In the beginning, it was unclear which entity had safety jurisdiction with ultimate authority to insure that the technology was, in fact, safe. FRA's intervention clarified this issue. Nevertheless, several questions recurred throughout the process. What happens if a large object is placed on the guideway? What happens if the power is cut off? What are the effects of EMF? MTI attempted to resolve these issues through an education process, local hearings and FRA assistance. FRA testified at the hearing regarding the exhaustive safety review process it had undertaken pursuant to a memorandum of agreement with the Commission. Evidence of the extensive safety and reliability assessments in Germany were also helpful. The German testing organization, TUV Rheinland, had conducted safety assessments for years and German safety officials made presentations to local government and at hearings. Joint efforts by FRA, DOT and TUV ultimately satisfied local government of the project's safety.

b. financial capability

Local government also sought evidence of MTI's financial capability, because, it reasoned, the project contemplated use of an important transportation corridor which should

not be tied up indefinitely if the Maglev project was unable to go forward. Local government wanted assurance that financial capability would be demonstrated within a fixed, limited time and that that requirement be included as a condition of certification. MTI and affected interests finally agreed, as a condition of certification, on a two year period within which MTI must produce final financing commitments for the project or surrender the certificate.

c. community impact

The project did bring out neighborhood groups opposed to the project's effect on their community and property values. Local government, as the group most responsive to these constituencies, was concerned about compliance with local noise ordinances and setbacks from homes and schools. To allay concerns, MTI paid all expenses for local officials and concerned citizens to travel to Germany. The purpose was to demonstrate the Transrapid sound levels and impact in person. MTI also produced, with TRI, considerable information concerning noise impacts. Eventually MTI agreed to setbacks from school zones and to lower speed during nighttime operations to lower sound levels. Concerns from the neighborhood groups would be one reason MTI finally selected the slower HSST technology.

d. specific environmental impact

Impact to wetlands was resolved by stipulation which provided for mitigation, or the purchase of land pursuant to statutory formulas. MTI agreed to provide data required of any permittee in a post-certification process, provided that the regulators were limited to improvement measures and could not change the location or right of the project to proceed.

e. station design; public access

With the loss of the Epcot station location, MTI accepted an offer from Orange County to locate its western terminus on county land near I-Drive. As a condition of certification, MTI agreed to give the county approval rights over station design. Both OIA and the City of Orlando requested similar rights to review and approve the station design. Local government expressed concern over who would bear the cost of additional infrastructure to serve the station and whether provisions were made to connect the station to other forms of transit.

5. Conditions of certification

MTI ultimately obtained stipulations from every agency except OIA and the Orlando Orange County Expressway Authority. These stipulations were codified into 32 specific post-certification conditions, as well as 13 general conditions. The conditions addressed all aspects of concerns raised by state and local government. A complete text of the conditions is attached as Appendix G.

a. specific conditions

1. Condition C-1 obligates MTI to provide data to the city and county concerning the testing and approval of the technology by TUEV and FRA. MTI is obligated to provide a final approval of the system by TUEV or another safety consultant acceptable to DOT and FRA.

2. Condition C-2 establishes performance standards which assure continuous operation at a level OIA and others deemed necessary if the project was to function as a true transportation system.

3. Condition C-3 requires construction to commence within 3 years and revenue operation to commence within 6 years.

4. Condition C-4 reflect representations of MTI that the German government will issue a certificate of technical readiness before the project begins construction and that each of the first five trainsets will be tested in Germany before being shipped to Florida.

A safety program, approved by DOT, with FRA comment, is required prior to commencement of construction.

Final design plans, as well as plans for transit stations, are to be submitted to DOT for review. While local government conceded that its building codes will be preempted by all technology aspects of the project, it retains the right to review the non-technical aspects of the station and to determine whether adequate provision for public access and intermodal connections is provided.

A commissioning program is required. MTI was to submit the proposed plan, with the approval of TUEV, for approval by DOT.

An operations and maintenance manual is required to be produced before commencement of construction.

5. Condition C-5 requires the applicant to announce its intent to abandon the project at least a year prior to closeout and provides DOT the right to replace the applicant at anytime upon receiving notice of intent to abandon the project.

6. Condition C-7 requires staged proof of financial feasibility and capability. MTI is required to present a complete, final financing statement within two years.

7. Condition C-8 requires MTI to provide evidence of adequate insurance including protection of the DOT and others.

8. Condition C-9 requires testing and monitoring of EMF.
9. Condition C-10 requires MTI to develop, with GOAA and FAA three stages of final design plans for both stations and to obtain the approval of both city and county.
10. Condition C-11 requires MTI to produce a program for evaluating the success of the demonstration project; one providing for specific quantitative measures and criteria and for how and when such data is to be collected.
11. Condition C-12, inserted OIA, requires that "the transit station at both Orlando International Airport and at the International Drive Grand Terminal shall be operated by GOAA and the revenues and expenses resulting from the operation of such stations shall be shared by MTI and GOAA".
12. Condition C-13 requires MTI to produce evidence of agreements for operation and use of the two transit stations within 90 days of certification and to reach enforceable agreements within 180 days.
13. Condition C-14 requires agreement for co-location with the Expressway Authority and utility companies be produced at the first state of final design plans.
14. Condition C-15 requires verification of compliance with crossing standard for highways, rail and utility lines.
15. Condition C-16 requires evidence of an agreement with a public utility to supply the project with power without causing a loss of electric supply to other local users.
16. Condition C-17 sets out procedures for invoking the eminent domain provisions of the Maglev Act and coordination with DOT.
17. Condition C-18 assures elderly and handicapped access.
18. Condition C-19 requires an approved emergency action plan with local government.
19. Condition C-20 incorporates and requires MTI to comply with local wetlands permitting procedures.
20. Condition C-21 requires a systematic professional archeological and historical survey of the entire route.
21. Condition C-22 requires MTI to purchase the wetlands mitigation as agreed in its stipulations with the agencies.
22. Condition C-23 requires a plan for dealing with hazardous materials.

23. Condition C-24 precludes the use of herbicides to maintain the right-of-way unless specifically authorized by the environmental agencies.

24. Condition C-25 requires approval of a wastewater program.

25. Condition C-26 requires evidence of an environmental monitoring program detailing the effect of the guideway on the Boggy Creek Swamp.

26. Condition C-27 requires compliance with all water management rules.

27. Condition C-28 requires a detailed wildlife and vegetation survey of all listed species approved by the Game and Fresh Water Fish Commission and a habitat management program for any listed species found. The issue of an eagle's nest near the western terminus of the route was on the mind of state regulators.

28. Condition C-29 requires permits for the use of sovereign lands such as wetlands and requires them to be restored to productive habitat if disturbed.

29. Condition C-30 requires noise levels to comply with the Orange County Noise Ordinance.

30. Condition C-31 requires a 150-foot distance from the Meadowwoods Elementary School.

31. Condition C-32 incorporates the agreement between MTI and the High Speed Rail Franchisee that MTI would not seek to extend its project in competition with the High Speed Rail Project.

32. Condition C-33 requires MTI to recognize and give notification that the I-Drive station will also serve the Kissimmee - St. Cloud area and to give that area's visitors' bureau space within the terminal and shuttle service to this area located just below the Orange County line, approximately five miles south of the I-Drive station.

b. rejected condition; Expressway Authority's request for "mitigation"

Not every issue raised by local government or agencies was elevated into a condition. For instance, DOT agreed with MTI that the Expressway Authority's request for mitigation against the loss of traffic tolls should be denied. The Governor and Cabinet agreed.

The Expressway Authority's report to the DOT had sought \$35 million dollars from MTI in "mitigation" for toll revenue that would be diverted from the Southern Connector, a toll road facility under construction between OIA and the tourist area. MTI was unwilling to pay these costs. Both DOT and the Governor rejected the Expressway Authority's request reasoning that it would result in an unfair burden on emerging mass transit and was inconsistent with the intent of the Maglev Act, to encourage and facilitate emerging transit technology.

After the rejection of its request, however, and believing that its pledge of bond revenues required a position opposing Maglev, the Expressway Authority did not work with or coordinate planning for its expressway project with Maglev. The Expressway Authority was constructing a four-lane divided median highway paralleling much of the Maglev project route, the edge of which could have been used as the Maglev guideway corridor. Because of the Expressway Authority's refusal to coordinate its design, many of the curves in the road bed are unsuitable for high speed geometry and several areas where the Maglev system was expected to cross the road are now complicated by elevated flyovers and other traffic dispersal choices. As a result, the project must now either lower its design speed and geometry to use the road right-of-way or acquire a new right-of-way incurring new acquisition costs.

D. Certification through Final Financing Commitment 1990-1992

1. In general

On June 12, 1991, the Governor and Cabinet signed the Certificate providing MTI the right to construct and operate the project. Maglev began the project financing effort in earnest and recommenced right-of-way acquisition efforts. In December, 1991, ISTEA awarded the project 97.5 million dollars as a result of the efforts of Florida Senator Bob Graham, who as Florida's Governor in 1982, had ridden on the Japanese Maglev at Myazaki with the JNR group who began the Florida effort. The federal ISTEA money proved to be a mixed blessing; accompanying the funds was the imposition of new regulations and considerable confusion as to the status of the project, shifting it from a purely private to a quasi-public one. Local officials in Orlando believed Maglev had mislead the public about the project to divert federal dollars from local transit projects. OIA, while publicly supportive, remained privately cool. By 1992, the Florida High Speed Rail project was abandoned when project promoters admitted that billions of dollars in public aid would be necessary to complete the project. At that point, Maglev became the only prospect for rail service to OIA and relations between Maglev and OIA improved greatly.

Immediately following the certification additional studies were conducted relating to ridership and revenue, engineering and estimated costs. This effort became known as the "Implementation Planning Study". The study required TRI to present a final fixed price for the system and performance guarantees to protect the project backers against risks created by the project. In December, 1992, at a meeting in Munich to put together the construction contract and interim financing, TRI announced that its current price estimates had significantly

increased. The estimated costs of some components were far higher than those reported in the implementation planning study the previous year. This development ground implementation efforts, including right-of-way mapping and acquisition, engineering studies and contract negotiations to a halt. Once again the planning team was forced to consider its options in the face of large obstacles. While considering how and to what extent Transrapid costs could be reduced, the team began an analysis of other available technology, including NMI prototypes and the HSST linear induction maglev technology originally developed by Krauss Maffai and now owned by Japan Airlines.

It was the banks' position that, to protect the banks against cost overruns, the technology provider should accept all technology risks for the project. Unsettled by Thyssen's response, the banks indicated a preference for a less costly, lower speed project using technology providers who were willing to give economic assurances against technical failure. The international recession, which settled in over the two years since the certification, complicated the search for capital. In this environment, the support of the Japanese Import Export bank was important to lower the cost of capital. A less costly project, albeit at a lower speed, was determined to be more manageable.

In August, 1993, MTI filed a request to abate the Maglev certification proceedings to allow it to prepare and file a modification requesting the substitution of HSST linear induction maglev technology for Transrapid technology. No party opposed the request and, on December 30, 1993, MTI filed the modification. MTI's intent in substituting technology was to allow Maglev to provide a less costly form of the high speed transit system with which the Japanese backers would be more comfortable. Banking interests insisted that the project could not be financed without a firm fixed price from Thyssen consistent with its original estimates. The modification sought to reduce costs, centralize management and construction into a single organization, to accommodate the concerns of the banking interests.

Thyssen objected to the modification request. At this writing, the issue has not been resolved.

2. Private parties' negotiations to implement the project; assigning risks

Negotiations between the private parties to finance and construct the Maglev project had a profound effect on this public-private venture. As was true at other stages of the project, the interests and goals of the private sector differed from those of the public sector. In general, the project's economics, particularly allocating risk, was the primary issue for the private players. If the project either lost money or was likely to lose money, the private sector was not interested. The public sector was concerned with risk, but more in the sense of safety and not having the project abandoned to the embarrassment of state and federal officials who supported the project.

In the early stages of the project, risk concerns focused on uncertainties associated with the regulatory process: Could the project be built? Could right-of-way be acquired? Could construction be delayed by long review processes? Many of these risks were either minimized or eliminated entirely by the enactment of the certification provisions of the Maglev Act. At the implementation stage of the project, the private sector began focusing on assigning various risks.

a. cost overrun risks

The record of innovative technology, from space to high speed rail, has been characterized by a tendency to overpromise the capabilities of the technology and to underestimate the costs. These tendencies were well known to the banking professionals who were to decide whether to finance the project. The bankers and financiers deemed a fixed-price essential to limit the risk of cost overruns.

Unlike the public sector, in the private sector, if costs exceed estimates, banks are forced to choose between lending additional money or foreclosing on an asset of little value or one which would require considerable effort to rehabilitate. Accordingly, banks want to reduce uncertainty about a project price and the assurance of a party with adequate resources to assume the risk of cost overruns. In this case, the banks wanted assurances from the technology provider that it would bear the risk of cost overruns. Delay in completing construction was also equated with cost overruns because each day revenue operation was delayed resulted in an increase in the project price. Assurances of an enforceable construction schedule, therefore, were sought by the banking and project team.

b. technology risks

The banks and project promoters also deemed a performance guaranty placing the technology risk on the technology provider essential. Neither the bankers nor MTI possessed the expertise to evaluate and accept the risk that the Transrapid technology would perform adequately or as advertised. The technology had been demonstrated only on a test track. A limited guarantee was not acceptable. The bankers and MTI not only wanted liquidated damages to cover their risk if the Maglev system did not operate at the level specified in the Certificate, they wanted definite resources to cover that pledge.

Conversely, the technology providers were concerned that the revenue loss risks from a technology failure were much larger and disproportionate to the return they could expect from constructing the system. They were concerned that their resources would be depleted by cost overruns, particularly those relating to construction activities in Florida where they had little experience. Geotechnical conditions and systems necessary to accommodate the high horizontal load generated by the Maglev system were of great concern. Subsurface conditions along the route are poor, consisting predominantly of sand and wetland bogs. Various estimates of the nature and extent of subsurface support structures were made and inevitably, the German consultants' figures were far higher than those of the MTI consultants and the American construction and engineering firms associated with the project.

To allay some of these fears, a compromise was reached whereby MTI and its contractors would incur the risk relating to the construction of the subsurface support structures and frame support pillars while the technology provider would be responsible for all activity above the concrete support structure. Even this compromise, however, was insufficient to bring the price within that predicted by the IPS.

Estimating construction timeframes in Florida proved difficult. The extreme restrictions on wetlands activities imposed by the certificate were problematic. Transporting heavy steel beams to and erecting them at the site on a strict schedule would be difficult. The optimism of the certification process gave way to both the realities of enforceable deadlines and the vagaries of constructing a huge project in a foreign country. Some felt the German group applied unrealistic contingencies to cover the fixed price guarantee. The relatively short distance of the project, 14 miles, imposed additional difficulties. The tool-up costs and the number of vehicles necessary to fabricate the guideway does not drop significantly when building a short, instead of a long, system; consideration was given, therefore, to acquiring rights-of-way to extend the Maglev to Tampa, a distance of 80 additional miles. Amortizing the start-up and tool-up costs over a longer distance would have reduced the costs of the demonstration project. TRI reported that it was difficult to interest German suppliers in providing quotes for a short system and a speculative venture. The costs given the Transrapid team reflected these difficulties. It is also arguable that some suppliers on the Transrapid team were interested in marketing conventional rail technology in Florida and the United States and were less willing to cut costs or take risk for the Orlando Maglev venture. Cultural differences between the Japanese banking groups and German technology groups resulted in additional difficulties. The potential for international intrigue and the inevitable nationalistic suspicions of each group cannot be overlooked. Both sides suspected the other of scheming to take over the project.

c. ridership shortfall and operating risks

The operating risk for the project was considered adequately addressed by Amtrak's involvement. Amtrak felt that its personnel and staff could be trained to operate the Maglev system.

MTI and its financial backers expected to bear the risks associated with any ridership shortfall, losses resulting if fewer riders show up than are necessary to support the project's costs.

Those who bear risks charge a premium for accepting that risk. The technology provider, Amtrak and MTI, increased their costs and charges, therefore, to allow them to bear the risk of shortfall.

After the decision by MTI to seek new technology, both sides would argue that the other had conspired to take the certificate. The recriminations are beyond the scope of this paper. It is worthwhile, however, to catalogue the issues relating to risk among the parties. Minimizing or shifting risk was the predominant aspect of the private negotiations. If the public sector were to assume portions of the risk, for instance, through ridership shortfall guarantees or by constructing, at its own cost, the guideway infrastructure, private participation might be easier to obtain. In general the private sector is innovative and well suited to strategies to increase ridership and marketing, to introduce innovative technological design and hold down construction and operation costs. The private sector, however, is reluctant to incur economic risk. The more uncertainty relating to costs and revenue projections can be reduced, the better suited the project becomes for private sector participation.

3. ISTEA funds

a. The effect of federal entry into the process

Section 1007 (b) 196 of the Intermodal Surface Transportation Efficiency Act of 1991 awarded 97.5 million dollars to the "Orlando Maglev Project" to purchase "land, right of way and guideway". The funds were awarded over a six-year period beginning in 1992. The receipt of the federal ISTEA funds was greeted with excitement by the MTI project team because it felt that at last the public would share the costs as well as the benefits of the project. The public sector reaction, however, was less positive. Local government and the Orlando newspaper felt MTI had deliberately misrepresented their intention to privately finance the project and had successfully diverted to the project funding which should have gone to relieve local mass transit. The DOT held a series of meetings with local officials to acquaint them with the facts and defuse the anger directed at Maglev.

b. fund dispersal

A major issue resulting from MTI's receipt of federal funds was how the Federal Highway Administration (FHWA) from whom the funds were to be dispersed, would administer the funds to MTI. Because the FHWA typically worked with DOT in association with federally assisted highway projects and the FRA has safety jurisdiction over MTI, MTI and DOT prepared, subject to FHWA and FRA approval, a formal Memorandum of Understanding (MOU) relating to fund dispersal. Provisions of the MOU were modeled on the fund disbursement procedures adopted by DOT and FHWA and would govern disbursement of the federal funds to MTI. While the idea of adapting the customary procedures between DOT and FHWA for the fund dispersal seemed logical, the presence of MTI, a private entity, did not completely square with the usual DOT - FHWA process. The MOU addressed these issues. The complete text of the MOU is Attached as Appendix H.

1) reimbursement procedures

DOT would typically spend approved amounts, submit invoices and proof of payment and be reimbursed by FHWA. The MOU contemplates that MTI obtain approval of its right-of-way and guideway costs and, after spending these sums, provide evidence of that cost to DOT who would, in turn, submit it to FHWA for reimbursement. MTI and DOT agreed to use this model.

2) National Environmental Protection Act (NEPA)

Prior to its receipt of federal funds, it had been unclear whether the project would be subject to review under the National Environmental Protection Act (NEPA). While some questioned how FRA would complete its rule of particular applicability, no federal funds had originally been invested in the project. MTI had not considered completing a NEPA environmental assessment to be a priority. After the receipt of ISTEA funds, the MOU provided that MTI was to complete an NEPA environmental assessment. In the interests of time, MTI agreed to fund the assessment, in part, to enable it to select its own contractors and, in part, because state and federal officials were concerned that the ISTEA funds not go for soft costs. Orlando's Mayor and others had expressed concern that MTI's internal operating costs and other soft costs would be federally funded before the project's financial feasibility had been demonstrated and asked that DOT limit MTI's use of ISTEA funds to hard costs. MTI having already completed an environmental assessment pursuant to state regulatory requirements, did not enjoy the prospect of redoing the assessment for federal review. MTI, nonetheless, conducted new studies at a cost of several hundred thousand dollars, to accommodate the NEPA requirement. Issues settled in the state process were revisited in the federal forum and allowed at least one neighborhood group to intervene and gain leverage to extract concessions from the project.

3) federal contracting guidelines

The MOU required MTI to follow federal guidelines and procedures for selecting contractors and acquiring land. These procedures differed significantly from the way the project team had planned right-of-way and guideway acquisition. Initially, MTI had acquired parcels along the route by private purchase. MTI was forced to begin, at its own expense, a costly right-of-way mapping and appraisal process which contemplated a right-of-way acquisition program run pursuant to FHWA procedures, undoubtedly by a federally qualified right-of-way acquisition consultant. MTI's conservative estimate was that such requirements would result in a 25 to 30% increase in right-of-way costs.

While MTI, DOT and FHWA agreed that the technology specific components of the project could be single sourced, those aspects of the project which were not technology specific would, arguably, be subject to competitive bidding. While the idea of competitive bidding is typically appealing, however, in the context of performance, fixed-price and completion guarantees, this provision becomes troubling. If the low bidder failed to perform on time or its work was unacceptable, the technology provider would be excused from its obligations under the guarantees. MTI did not want to add new parties whose failure to perform could only be addressed through litigation and performance bonds. The simplicity of relying totally on the technology provider appealed to MTI.

4) match credit

Twenty percent of the federal funds were to be matched by private or state funds. The ability, however, of DOT to match funds was questionable. This concern was later addressed by section 64 of the Florida Intermodal Surface Transportation Act, which created section 341.501, Florida Statutes, to authorize DOT to enter into joint project agreements for the demonstration of high-technology transportation systems such as magnetic levitation technology. MTI anticipated that funds MTI had already expended for land and planning, design and engineering costs could be used in calculating match credit in the same way DOT costs were typically calculated.

5) repayment and assurances against project failure

The State was also concerned that it be held harmless if the project failed. It sought an agreement providing that if the project failed, MTI would repay all federal funds. The state also insisted that no federal funds be spent until after the financing commitment was complete or at least until MTI posted several millions of dollars as evidence of financial capability.

VI. Conclusions and Recommendations

A. Conclusions

Since 1985, private and public interests have been developing the Orlando Maglev project. In 1991, Florida's Governor and Cabinet issued a certificate to MTI allowing it to construct and operate a 14.5-mile, for profit, demonstration of maglev technology between OIA and the I-Drive tourist area surrounded by WDW, Sea World and other attractions and hotels serving the burgeoning tourism market in central Florida. The project eventually won a \$97.5 million federal appropriation pursuant to ISTEA. Construction was scheduled to begin in 1994. The project today, however, has evolved from the project as originally contemplated. At present, developers are considering a change in Maglev technology to lower maximum speed from 250 mph to 150 mph to control capital and operating costs. The story of how and why those modifications were made provides lessons to be learned from MTI's current intent to implement the technology. Future maglev efforts may profit from the Orlando project's successes and mistakes.

One-stop and Balancing Provisions in a Model Act

Unlike traditional permitting processes involving multiple and unrelated forums addressing a myriad of overlapping concerns, the one-stop permitting and review process established by the Florida Magnetic Levitation Demonstration Project Act effectively focused all regulatory concerns and disputes into a single process and established timeframes within which resulting issues had to be either resolved or waived. Most importantly, the Act provided for an environmental impact balancing test whereby agencies were required to balance the impact of the project against its economic consequences. The presence of the balancing criteria forced agencies to negotiate, particularly in areas where they traditionally adopted the "no impact" position.

Right-of-Way and Station Acquisition

While the provisions of the Maglev Act afforded the certificate holder the power to condemn a right-of-way, they did not afford it the ability to condemn a station site. This proved fatal to several early project proposals. First, once the Maglev project between OIA and WDW was announced, an issue immediately arose as to the project's economic impact on hotels and attractions outside the WDW complex. Hoping to sabotage the project, opponents applied pressure at all levels of the governmental and regulatory process. While project promoter's thought Maglev Act provisions would address these partially pretextual concerns, the Act did not afford the certificate holder the ability to either condemn a station site located on private property, such as WDW, or to impose a station site on an unwilling public entity, such as OIA. The absence of such provision effectively afforded OIA and WDW station site veto power. OIA, therefore, could precondition OIA location on public access to WDW, and WDW, wary of such access, could offer the project an alternative, less lucrative WDW location.

Neighborhood and Land Use Issues

Neighborhood groups opposed to the project's perceived impact on their community and property values focused on issues relating to noise, nearness to homes and safety. These groups ultimately won concessions resulting in reduced noise levels and which forced the project to incorporate tighter geometry to avoid nearing residential neighborhoods and public schools. Finally, a consensus building process and compromise allowed MTI to secure rights-of-way. It is clear that neighborhood concerns will affect cost and route selection in future projects.

Private vs. Public

The Orlando project began as a private sector initiative involving Japanese and American technology groups and WDW. The decision to seek protective legislation was intended to cloak the enterprise with quasi-governmental powers necessary to obtain rights-of-way, and prevent competition. Even with these powers and a legislatively mandated public purpose, the project remained "private". In a climate of organized opposition from competing economic interests, the project's private status, combined with its profit motive and business operating style, also caused public relations setbacks. Public opinion polls indicated project approval of 58% in Orange County, a surprisingly low percentage for a high-tech revenue producing project requiring, as yet, no public funding. Future efforts should decide whether these issues should be resolved first by a public agency with operating and business aspects left to the private sector.

The Florida project's transition from private to public-private status also adversely affected the resolution of regulatory issues. The Florida experience suggests that without a pervasive, supportive role by a public sector agency with both credibility and institutional power to affect other public entities, such as DOT, a project will likely be inundated with regulatory demands. At best, it can expect no more than benign neglect from powerful agencies and institutional players, such as airports and municipal transportation planners. Until DOT's overt intervention, the Orlando project progressed slowly. Ideally, the Maglev Act should have established a clearer and more proactive role for the public sector, particularly in the permitting process and negotiations with other public agencies. A clear definition of the public's interest in the project's success, manifested by the patronage of a powerful agency, is essential.

MTI's status as a "private" entity created confusion and enmity with public and other private institutions. As a private institution, MTI is motivated by institutional goals different than those of the public sector; mainly, however, to make a profit. From MTI's perspective, if the project failed to make economic sense, it would dissolve; other considerations were secondary. Public entities regarded this motivation as less worthy than the public interests they were chartered to protect.

Economic Impacts; Public and Private

To the project's surprise, economic impacts, not environmental or technical issues, consumed its agenda and drove debate. Private hoteliers and theme parks which compete with WDW for tourist revenue quickly organized a lobbying and political action group to stop the project. Resolving the project's economic impacts became critical to the project's success. While these issues are unique to Orlando, future projects will doubtlessly be subject to intermediate demands and opposition from groups whose economic interests are adversely affected by the project.

Some public entities will be unwilling to work with the project during the planning stage because of the project's potential to reduce public revenues. For instance, a four-lane divided median highway parallels much of the project's route. The edge of this corridor could have been used as the Maglev guideway corridor but the Expressway Authority refused to coordinate its design with the project. As a result, many of the resulting curves are unsuitable for high speed geometry and several crossings are complicated by elevated flyovers and other traffic dispersal choices. Accordingly, the Maglev project must now either lower speeds to collocate or acquire new rights-of-way incurring additional land acquisition costs. The initial adversary posture of the Expressway Authority was epitomized by its intervention in the Maglev certification process to demand Maglev pay \$35 million in mitigation of revenues the Authority anticipated losing because Maglev patrons would forego driving a rental car on toll roads. The GOAA would additionally demand 10 percent of Maglev's gross revenues, in addition to access fees and station costs, in part, to offset revenues losses resulting from reduced car rentals at OIA thereby denying OIA its usual commission. A lengthy negotiations process was necessary to resolve these demands.

Establishing Financial Credibility in a Private Transit Project

An issue endemic to the project, as a private venture, was the skepticism of local and other agencies that it could raise the half-billion or more dollars necessary to implement the project and the view, based on the dismal history of mass transit in the United States, that the project could never pay for itself. When project promoters pointed to the high tourist ridership and the project's appeal as an attraction in itself, public agencies discounted these features as unworthy of public transportation considerations and less pressing than relieving local highway congestion. The inability of the project to clearly demonstrate financial capability early in the process hampered the planning effort. For example, because the project had failed to demonstrate financial capability, when OIA adopted an extreme position on Maglev access fees, MTI found it difficult to obtain intervention in these negotiations by the OIA board or other entities who might have been able to help the project if they had perceived it to be more likely to succeed and worthy of political capital investment.

Maglev Markets

Ultimately, MTI, to accommodate noise level complaints, reduce capital costs and compete with "incremental" technology being considered for larger projects in Florida, was forced to consider slower speed maglev systems. The Florida experience raised the issue; where is the market for Maglev technology; are there viable near term applications in airport access or shorter routes which could benefit from new developments in maglev technology to reduce costs rendering the technology competitive with incremental technology?

In Florida, the presence of the incremental option required the certificate holder to consider whether adopting a super speed system in the demonstration project would eliminate it from consideration for longer projects where public money would be involved. In Florida, Maglev received greater community acceptance from neighborhood groups who preferred Maglev to the prospect of a high speed at grade rail system near their homes and property; Maglev offered lower noise levels at the 150 mph range, and its elevated guideway was deemed safer than at grade conventional rail. If the Florida project models future efforts, it raises the issue of whether the market for Maglev technology is solely at the very high speed applications.

B. Recommendations

Based on the Florida experience, this paper would make the following seven recommendations. While the incorporation of these recommendations may facilitate implementation, it is inevitable that each participant in a novel and colossal venture such as Maglev will confront its own unanticipated impediments. This awareness coupled with an early reasoned mission may expedite successive enterprises.

1. One-stop permitting

A preemptive one-stop time-limited permitting and review process is essential to accelerate implementation. While the provision allows affected interests an opportunity to be heard, it affords the applicant a single forum thereby preventing the replicating or overlapping of issues by multiple and unrelated parties. Ideally, this review could be further coordinated with the Environmental Impact Statement and other federal reviews. A strong lead agency should be selected to shepherd the project through the process and to enhance its perception as a "public" purpose.

2. Power to condemn station sites

The entity developing the project must be afforded the power of eminent domain enabling it to acquire not only the project route, but access and connection to station sites located on both public and private land. Resolution of economic issues associated with station sites, both public and private, is central to the success of future efforts. While local constituencies should have access to and be part of the process, they should not be allowed to "politically engineer" a route in a manner detrimental to a project's central mission or economic viability. Without this condemnation power, station sites and local entities will be afforded, in effect, veto power over a project's route and enable them to make demands that will skew the process unfairly in their favor.

3. Environmental impact balancing test

A balancing test must be provided which allows the reviewing forum, when resolving a project's environmental, land use and community impact, to weigh that impact against the benefits the project affords. Environmental issues tend to be constituency driven and impact specific. In the instant case, for example, until the statutorily mandated balancing test, the project's impact on the wetlands could not be balanced against improvements in air quality and reduction in particulate emissions which likely result with the introduction of Maglev or high speed rail. Consideration of the public's need to create infrastructure and its legitimate interest in safer and more efficient transportation systems should be mandated. Impact specific environmental concerns should be balanced against the macro-environmental benefits of the project.

4. Public agencies govern condemnation, permitting and corridor coordination

Following a review of private sector needs, and limitations such as high speed geometry, corridor alignment and station site preferences, public agencies, rather than either private entities, or private entities with the power of eminent domain, should have jurisdiction over rights-of-way, station sites and permitting and the responsibility for acquiring them. Agencies planning linear transportation and utility projects should coordinate their routes with entities introducing rail or Maglev lines. When possible, multiple "utility" corridors, suitable to a variety of linear projects, should be planned.

5. Public resource strategy

Before seeking private sector involvement in project financing or technology deployment, a project should determine the public resources available to it and conduct a neutral feasibility assessment. The private sector should participate in the assessment but not in a bidding process which may lead private groups to over promise technology and underestimate price. The project must adopt a clear mission statement, which may include serving various constituencies such as commuter rail interests or airport access, rather than simply assuming that Maglev can only offer a faster form of high speed rail. The presence of constituencies other than urban business travelers may increase the project's access to public funds. To the extent competition exists between sites, local and state entities should provide economic incentives which should be included as part of the site selection criteria.

6. Alternative technologies

Instead of trying to force a single technology into a variety of applications, alternative technologies should be developed to suit a variety of such applications. The federal government should encourage development of a variety of Maglev systems and resist the urge to champion a single prototype thereby limiting private sector innovation. Research should continue, ideally, at a full-scale government test site, on superspeed systems. Slower speed, near term, airport access and commuter applications of Maglev technology still not only offer advantages over conventional rail technology in noise and acceleration rates, but their elevated guideways are less expensive than those for conventional trains. The potential to quickly advance American technology through joint ventures with foreign firms should not be overlooked. United States technology development should stress flexibility so as not to exclude itself from incremental applications and markets.

7. Attracting private sector support

Where private sector support is to be solicited, consideration must be given to the strengths and weaknesses of the private sector. While the private sector is an innovator in technology development and project marketing, it is risk adverse to cost overruns, technology risks and revenue shortfalls resulting from less than predicted ridership. To the extent the public sector can minimize risk through revenue shortfall guarantees, for example, or by shouldering significant capital or infrastructure costs, private sector participation becomes more likely.