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**GROUND ACCESS ASSESSMENT
OF
NORTH AMERICAN AIRPORT LOCATIONS**

**Lawrence F. Cunningham
James H. Gerlach
With assistance from:
Mary P. Hirsch
Holly M. Hodges
University of Colorado at Denver
Campus Box 165
P.O. Box 173364
Denver, Colorado 80217-3364**

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EXECUTIVE SUMMARY

Ground Access Assessment of North American Airport Locations

INTRODUCTION

Purpose of the Study

Airport ground access is perhaps one of the most significant multi-modal planning challenges facing major metropolitan areas. The most impressive and sophisticated airport in the world is nothing if the consumer or employee cannot reach the airport through a variety of transportation choices such as automobiles, vans, buses, rail, taxis, etc. Having access to the airport translates into an enormous economic impact. Ease of use, efficiencies of services, and minimal pollution output are concerns for the consumer, the employee, and the region.

The primary purpose of this research is to investigate ground access projects at other airports to identify how multi-modal transportation planning is applied to varied transportation systems. The objective is to learn from the experiences of other states and countries which are planning and operating multi-modal ground access systems and provide overall recommendations on ground access which have possible applications for Colorado.

RECOMMENDATIONS

Implementation of the following recommendations will serve to enhance the overall effectiveness of ground access at locations in the United States, particularly locations contemplating improvements in ground access. Recommendations are presented for the critical ground access issues explored in this study, including marketing, funding, inter-agency cooperation, and decision processes.

MARKETING RECOMMENDATIONS

Overview

The data collected nationally on modal split show that public transportation alternatives to airport ground access do not capture large market shares in the United States and Canada. Interestingly, this study shows that access plans are often implemented without the benefit of sufficient knowledge of the markets they serve. In situations where public transportation has gained ridership shares above the national average, two key factors have usually been assessed: (1) origin and destination and (2) customer needs. Assessing these factors provides

an empirical basis for transportation alternatives to the auto that are convenient, comfortable, safe, and reliable.

The primary marketing objective should be to create an airport access system at North American airport locations which is fully responsive to the needs of the area's airport access market. This objective is of critical importance, since utilization of the ground access system will depend upon responsiveness to the market. Every consideration of the market, properly implemented, will be another step toward a more effective access system which enjoys higher ridership and better overall public approval.

Three general strategies for achieving this objective are recommended.

1. Officials must develop programs which analyze and aid planners in fully understanding the airport access market.
2. Responsible agencies should make the access system responsive to the market as it is understood to exist.
3. Officials must keep the target markets informed about efforts made to provide a responsive ground access system.

With these strategies in mind, the following recommendations are made:

Recommendation #1: Recognize that the dominant mode of transportation to the airport will continue to be rubber tire.

- ◆ Airport access data from around the country clearly show the importance of automobile access to the airport. On average, 65-70%, of all air travelers access the airport by single-occupancy vehicle (private, rental) nationally. However, this figure can rise to 75-80% if taxis are considered in the single occupancy vehicle category as well. Multi-occupancy rubber tire access shares tend to be at these levels or higher.
- ◆ Rail transit to the airport is a potentially important priority in the development of ground access facilities. However, there are obstacles to be considered.
 - Difficulty attracting sufficient ridership to justify significant capital cost
 - Significant operating deficits
 - Questionable panaceas to air quality and congestion problems

- ◆ Typical rail transit market shares are 2% to 6% in North America. These low market shares are due to both uncontrollable and controllable factors.
 - Uncontrollable factors include, non-existent or poor system integration with rail and/or rubber tire transit system, low population densities, multiple origins and destinations, level of congestion in transit modes, and price elasticities of various market segments
 - Controllable factors include, inherent service limitations in such areas as reliability, safety, features, cost of service, conflicts with commuter needs, service philosophy and parking fees.

- ◆ Perhaps the strongest arguments that can be made for airport rail links revolve around mobility, employment opportunities, economic development, and an opportunity to guide and develop transportation corridors better.
 - Transit alternatives such as rail seem to offer better mobility to precisely those who need it and there is evidence that they use it.
 - Transit operations offer employment opportunities as well as access for lower socio-economic classes to share the employment generated by airports.
 - Transit agencies seem to feel that the development of a rail link almost automatically increases the value of real estate and economic activity around both rail stops and the terminal.
 - Rail links specifically have the opportunity to determine the nature, location and type of growth in underdeveloped corridors through the locations, numbers and nature of stations.

- ◆ For all alternatives to prove more attractive, incentives or disincentives are required to cause a shift from single occupancy vehicles to multi-occupancy vehicles.

Rubber tire access will continue to be the main mode of access to airports in North America. The challenge is to offer public and private transportation alternatives to the auto that match or exceed the convenience and safety that the private automobile provides.

Recommendation #2: Remove barriers and create incentives to companies offering commercial multi-occupancy vehicle service at North American locations should be reviewed. Changes in State and local statutes and regulations should be investigated, where appropriate, to encourage better utilization of existing highway capacity through greater use of multi-occupancy vehicles.

- ◆ The key issue is whether it is possible to avoid additional transportation investment or increase transportation efficiency by removing institutional barriers. Increased use of highways by both air travelers and commuters will result in more congestion affecting ground access barriers are addressed and unless incentives are given for greater use of multi-occupancy vehicles
- ◆ Agencies involved in this review should include the transportation staff of the Public Utility Commissions, ground transportation personnel, officials of the State Departments of Transportation, Metropolitan and Regional Transportation Districts, local Metropolitan Planning Organizations, and commercial vehicle operators.
- ◆ Transportation agencies and organizations should address the balance between marginally profitable public service and potentially profitable private service.

Recommendation #3: There is a need to effectively coordinate courtesy shuttles/hotel van service at many North American airports.

- ◆ Privately-owned shuttle services may be a major impact on ground transportation access at North American Airports. For example, market shares for most cities vary between 3% and 7% for air travelers using these types of services— a higher percentage than those who use rail/transit links. At some airport locations the impact is substantial, not only in terms of market share, but also in terms of highway capacity.
- ◆ A coordinating agency or mechanism is needed to bring together representatives from the State Departments of Transportation, the Public Utilities Commissions, the Regional and Metropolitan Transportation districts, the local Metropolitan Planning Organizations, Airport Authorities, transit operators, and hotel operators to review, coordinate, and enhance existing plans for privately-owned hotel/courtesy van services in the area. Plans for incentives, access fees, license/operating fees, and allowable schedules should be reviewed and enhanced by the task force.

- ◆ The purpose of the coordinating agency is to review and coordinate the plans for privately-owned hotel/courtesy van services in the area including plans for incentives, access fees, license/operating fees, and allowable schedules.

Recommendation #4: Airport locations need to collect data which clearly identifies market segments and to assess users' travel behavior characteristics and service requirements.

- ◆ The additional data will identify market segments, travel behavior characteristics, and demographic and psychographic profiles.
- ◆ It is more meaningful to identify major market segments and travel needs than origins and destinations. Market segments may include business air travelers, airport employees (primary, secondary and tertiary personnel), recreational visitors, occasional travelers, and meeters/greeters as well as emerging market segments.
- ◆ Identify ground access service requirements such as door-to-door service, baggage handling, headways, physical condition of the vehicle, and driver assistance.
- ◆ Potential information sources include surveys of ground access users and a vehicle identification system.
- ◆ Establish user requirements: schedules, headways, baggage handling capabilities, the number of transfers riders are willing to tolerate, and the fare riders are willing to pay for this service.
- ◆ Initiate experiments to collect data through electronic means to get better quality data at lower cost.

Recommendation #5: Based on the results of the study of market segments and travel behavior, assess the feasibility of developing public transportation alternatives which appear generally to have worked in other cities and are responsive to the service requirements of travelers.

- ◆ A network of express bus services.
(It is important to distinguish between the type of limited express service in Denver as compared to the more extensively researched and developed service of Boston.)

- ◆ Door-to-door van service (super-shuttle)
(This service was recently introduced in Denver.)
- ◆ Remote terminals ("park-and-rides" that provide long-term parking) that also accommodate the needs of meeters and greeters.
- ◆ Inter-modal Connection Centers

Recommendation #6: Develop a demonstration project which provides seamless public transportation service between a remote Metropolitan and Regional Transportation Districts' terminal and airports.

- ◆ Develop and implement a cooperative seamless public transportation service to the airport as a demonstration project.
- ◆ Operate from a small remote terminal in the metropolitan areas.
- ◆ The service should include door-to-remote-terminal service, remote check-in of passengers and baggage, and quick and efficient service to the airport.
- ◆ This premium service could be provided at a commensurate price.
- ◆ The demonstration service would be assessed in terms of ridership, pricing, service quality, and external factors, such as air quality.

Recommendation #7: Recognize the need for a marketing strategy for ground access providers that is holistic in nature. Develop, market, and promote existing and new public sector ground access services which are responsive to customer needs. Investigate the feasibility of public-private partnerships that promote private sector ground access services.

- ◆ Both public and private providers benefit from a carefully developed macro-marketing strategy based on a thorough knowledge of available markets.
- ◆ A marketing campaign to entice the people to try the public systems is necessary to build a customer base and follow-up advertising is needed to maintain loyal passengers.

- ◆ Riders' familiarity with the ground access system promotes use. Familiarity is attained through:
 - Proper and attractive signage
 - Information kiosks can direct travelers to ground access alternatives and other businesses.
 - Consistent and unique use of vehicle color and type which assist the public in identifying the service.
- ◆ There is also a need to investigate public-private partnerships which link the information of the public sector with the talents of the private sector providers, such as direct dial phone lines which provide ground access information for both public and private services.

Recommendation #8: Develop a focal point, or designated agency, to develop and maintain a continuous service quality program that measures how well the transportation system satisfies customer needs and identifies ways in which the service can be improved.

- ◆ Service quality data provides:
 - Important feedback regarding user satisfaction
 - Ability to pinpoint weaknesses in the service and the information needed to improve service
- ◆ Service quality data can be collected using user satisfaction surveys and quality of service measurements.
- ◆ Equal effort should be spent understanding why the service is not used by certain market segments in addition to those who do. This information is needed to understand what measures are necessary to increase ridership.
- ◆ One entity should be given responsibility for the service quality program.

Conclusion:

Meeting the objective of providing a fully-responsive ground access system requires a market-driven approach to developing and promoting rubber-tire transportation alternatives to the automobile. North American Airports typically serve a large region which contains different market segments for transportation services. Developing transportation alternatives that come close to matching the convenience and safety of the automobile is a goal that is within reach and is shared by municipalities and the general public. Given the information municipalities have on local opportunities, lessons learned by cross-airport ground access analysis, and the results of market analyses, transportation services can be explored which have the potential to be mode of choice for airport access for a significant share of air travelers, airport employees, and employees working near the airport.

FUNDING RECOMMENDATIONS

Overview:

The share of funds provided by the federal government for airport access initiatives is steadily decreasing. Taking action to fill the void created by dwindling federal resources will be critical to the success of ground access initiatives.

The cost of developing the transportation infrastructure is high. Initial funding is needed from the region. Once developed, however, the opportunity exists to partially recover the cost of developing the transportation infrastructure from those that benefit from it.

Two key strategies for achieving the system's funding objective are recommended:

1. Officials must continue to stress an airport's importance as an economic engine for the surrounding area, positioning the airport (and ground access) as critical state transportation issues.
2. Responsible agencies, including the State Departments of Transportation, must take care to ensure that airport access initiatives are linked to the area's overall transportation infrastructure.

The potential conflict between commuters and airport travelers is a powerful force to be reckoned with, but can be mitigated by blending airport access into the overall corridor approach to transportation planning in the region. When an initiative enjoys popularity among commuters, the likelihood of significant political support for the program is high; this is

crucial to the program's viability, and will be the key to assuring implementation of appropriate ground access systems.

From the perspective of these key strategies come several recommendations:

Recommendation #9 Use existing state and regional resources to support the development of a regional transportation infrastructure which includes provisions for airport ground access.

- ◆ An in-depth economic impact study should be conducted to measure the financial impact airports have on regional economies and to tie the airport to the state's overall growth strategy.

Recommendation #10: Pursue federal, state, or regionally funded demonstration projects which deal with airport ground access.

- ◆ Although federal funding opportunities are decreasing, there may be opportunities for new and innovative projects. For example, San Francisco is pursuing federally funding for an SLRT demonstration project. Pittsburgh received FAP funds for an airport toll road. Las Vegas received funding from CMAQ for an airport access park-and-ride program.
- ◆ Despite limited funding opportunities at the Federal level, ground access is an area which offers unique opportunity for experimentation at the state and regional level.

Recommendation #11: "Bank" land for future airport ground access projects.

- ◆ "Land banking" has been an important peripheral funding aid in several U.S. cities.
- ◆ Acquiring land at current prices will represent a significant savings when future systems are built.
- ◆ On occasion, rights-of-way can be acquired inexpensively from utility companies, land developers, and railways that have abandoned old lines.

- ◆ Both this recommendation and #10 provide opportunities for public-private partnerships such as was seen in St. Louis where private lands were transferred to the public sector to serve as the local match to federal funds.

Recommendation #12: Initiate a dialogue with airport authorities and other transportation organizations regarding the use of passenger facility charges for airport ground access initiatives.

- ◆ At some airports, this may be a limited source of funding in the short term since many airports will very likely need to use passenger facility charges (PFCs) to support the airport. However, in the long term this may prove to be a viable source of ground access funds.
- ◆ Boston and New York envision utilizing PFC revenues for development off-airport grounds transportation links to the airport. PFC revenues can be used to support airport ground access improvement projects that affect air quality.

Recommendation #13: Explore the possibility of incorporating zoning fees as a funding source for ground access.

- ◆ Since private sector developers benefit from the airport facility and public infrastructure investment near it, zoning fees can be used as a means for partially recouping development costs.

INTER-AGENCY COOPERATION RECOMMENDATIONS

Overview:

In order to effectively implement ground access solutions, various organizations must work cooperatively together. Since the variety of agencies involved in airport access projects have diverse (often conflicting) agendas and missions, this can be difficult. However, nothing is more important to the creation of effective ground access systems than an adequate level of inter-agency cooperation. Cooperation is needed between municipalities and transportation agencies.

Achieving this objective would require different strategies in different cities, since the structure of metropolitan cities varies greatly.

Many if not most successful systems were championed by a leader or lead-agency with a clear mission to make the airport accessible. The lead agency should be a coalition of important agencies and organizations.

Recommendation #14: Use a Transportation Policy Committee housed in a metropolitan planning organization or other agency as a mechanism for creating a coherent and clear vision of the future transit system for the region, including appropriate airport ground access.

- ◆ This committee, while embodying diverse modal solutions, has yet to enlist the support of all organizations in multi-modal approaches to the ground access issue.
- ◆ The Transportation Policy Committee should define and develop a vision of airport ground access.
- ◆ Transportation Policy Committee when reviewing ground access issues should consist of members from the aforementioned transportation agencies, the airport authority, the Mayor's office, and the Governor's office.

Conclusion:

There is no way to force effective inter-agency cooperation. However, failing to consider this aspect of the ground access problem can cause serious delays and even failure in the implementation process. A strong lead agency with a clear and unified vision of the final project result will go far toward mitigating this possibility.

DECISION PROCESS RECOMMENDATIONS

Overview:

The process by which ground access decisions are made can make or break the delivery of an effective system. In order to create a system which is both intelligent and politically viable, planners must consider a wide variety of variables; careful and appropriate consideration of all variables can help facilitate the ensuing exchanges which comprise the decision process.

The recommended overall process strategy involves using both quantitative and qualitative methods to take all salient variables into full account. Contrary to what may be intuitive, most access programs are designed based primarily on qualitative data rather than quantitative analysis. However, blending both sources, where possible, is prudent.

Considering this basic strategy, the following recommendations are made:

Recommendation #15: Enhance the quantitative and qualitative capabilities of local and regional multi-modal transportation planning models.

- ◆ Quantitative modeling techniques such as traditional urban transportation models require modification to recognize airport facilities as specific trip generators.
- ◆ Qualitative techniques lend important credibility to efforts which seek to understand public perceptions and attitudes about transportation decision alternatives.
- ◆ The key to making progress in multi-modal planning requires modification of existing quantitative techniques to recognize new economic realities as well as the hard to quantify needs of a 21st Century public.

Recommendation #16: Existing processes and committees responsible for developing transportation multi-modal models should focus on ground access; if existing processes fail, other bodies may be constituted to oversee model development.

- ◆ The openness and fairness of the process guarantees that all transportation alternatives are evaluated consistently, and without bias.
- ◆ The process should utilize both quantitative and qualitative models to provide broad coverage of socio-economic factors.
- ◆ The committee should have broad representation matching that of the Policy Advisory Committee.

Recommendation #17: At a designated focal agency or organization in each metropolitan area, a detailed and comprehensive description of ground access

system operations, results of multi-modal modeling, and market survey findings should be maintained.

- ◆ Multimodal modeling and data analysis will be used to evaluate many alternative proposals on many different dimensions, including air quality, cost, public demand and need, land use, congestion, and travel time. The evaluation of each proposal will need to be matched against the evaluation of competing proposals to see if all local and regional goals are satisfied.
- ◆ The magnitude of this task requires computer support to organize, document, and communicate results of in-depth analyses.
- ◆ An Executive Information System enables decision makers to review decisions, public demands and needs, and the overall performance of the ground access system. A demonstration prototype of this system was developed by the Project Team at the University of Colorado at Denver for the Department under a separate contract.

Recommendation #18: Enhance public involvement in the decision process.

- ◆ A variety of tools have been used for this purpose in cities where ground access initiatives were successful. Among these tools are environmental impact scoping meetings, public relations campaigns, and traveler focus groups.
- ◆ Public meetings alone are *not* public involvement.
- ◆ One successful combination of public involvement techniques utilized in Colorado featured wide-ranging telephone surveys with the results more fully explained by focus groups. This and other techniques are described in a report entitled, "Developing a Customer Focus in the Statewide Transportation Planning Process: Phase III Recommendations," developed by the University of Colorado at Denver.

Conclusion:

Collecting and incorporating data which supports a variety of stakeholder needs and concerns is an important step toward ensuring the smoothest decision-making process possible. Management of the data collection process and data analysis must be done cooperatively and with full participation of important transportation and municipal agencies. As long as separate agencies and stakeholders continue to build their own models, arguments over conflicting data

and analyses will continue. These recommendations are aimed at creating a shared database of credible information.

FOR FURTHER INFORMATION

For more information about the airport sites evaluated, the cross-cutting issues, and more depth in the recommendations, please refer to the full report, available from Lawrence F. Cunningham, University of Colorado at Denver (phone (303) 556-5822, fax (303) 556-5899).

This report is presented in four chapters. The first chapter gives background on the ground access problem and lays out the issues for Denver International Airport's ground access planning. Identification of these issues was the first task in this project. After much investigation, the most important issues were found to be:

- **Methods and protocols for cooperation between regional agencies involved in airport ground access**
- **Application and effectiveness of multi-modal planning and decision models to ground access improvement projects**
- **Approaches to funding ground access improvements**
- **Effectiveness of alternative modes of transportation and conditions which lead to high ridership**

Chapter two presents the lessons learned at each airport location. Literature reviews, telephone interviews, and on-site focus groups provided the information included in this chapter.

The third chapter of this paper analyzes and summarizes key ground access lessons across the various locations studied. The analyses identify conditions that lead to successful or unsuccessful transportation planning for the development of multi-modal ground access solutions.

The fourth and final chapter takes the knowledge gained at each airport site and the issues analyses from chapter three to provide recommendations to decision-makers on the airport ground access issues of pertinence in improving ground access.

GROUND ACCESS ASSESSMENT OF NORTH AMERICAN AIRPORT LOCATIONS

CHAPTER ONE: INTRODUCTION / ANALYSIS OF ISSUES

INTRODUCTION

Purpose of the Study

Airport ground access at the new Denver International Airport (DIA) is perhaps one of the most significant multi-modal planning challenges facing the State of Colorado today. DIA represents a four-billion dollar investment which requires a multi-modal ground transportation system to service it. The most impressive and sophisticated airport in the world is worth nothing if the customer or employee cannot reach the airport through a variety of transportation choices such as automobiles, vans, buses, rail, taxis, etc. Having access to the airport translates to an enormous economic impact on the State and the region. Ease of use, efficiencies of services, and minimal pollution output are concerns for the customer, the employee, and the region.

At the present time, the Colorado Department of Transportation (CDOT) as well as city and county officials at Denver lack detailed knowledge of comparable national and international airport ground access systems which would lead to an understanding of multi-modal planning for airport ground access at DIA. DIA provides an opportunity to study national and international solutions to ground access. Further, it offers the opportunity to assess comprehensive transportation planning and managerial tools as they relate to current and future decision-making in the area of ground access.

The primary purpose of this research is to investigate ground access projects at other airports to identify how multi-modal transportation planning is applied to varied transportation systems. The objective is to learn from the experiences of other states and countries which are planning and operating multi-modal ground access systems to apply these lessons to Colorado and DIA.

Several local agencies and institutes are concerned about ground access to DIA. The DIA Access Task Force, formed at the direction of Bill Vidal, then Regional Director of Region Six at the Colorado Department of Transportation (CDOT), has been charged with forming recommendations for ground access to the new airport. One subcommittee of the Task Force, the Modal Alternatives Subgroup, is specifically charged with investigating alternative transportation choices for reaching the DIA. Other stakeholders in the ground access for DIA include the City and County of Denver, the Colorado Department of Transportation, the Denver Regional Council of Governments, and the city and county governments of the Denver Metro Area. In addition, other agencies involved with the building, implementation and management of DIA are concerned about planning ground access.

Scope of the Study

This report is presented in four chapters. The first chapter gives background on the ground access problem and lays out the issues for Denver International Airport's ground access planning. Chapter two presents the lessons learned at each airport location. Literature reviews, telephone interviews, and on-site focus groups provided the information included in this chapter. The researchers interviewed (in a focus group setting) airport directors, airport ground transportation managers, local transit authorities (usually bus systems) as well as Metropolitan Planning Organization (MPO) representatives. Written summaries about each airport site contain information about the city, the airport(s), ground access plans, the planning process, and funding options.

The third chapter of this paper analyzes and summarizes key ground access lessons across the various locations studied. The analyses identify conditions that lead to successful or unsuccessful transportation planning for the development of multi-modal ground access solutions. The fourth and final chapter takes the knowledge gained at each airport site and the issues analyses from chapter three to provide recommendations to decision-makers on the airport ground access issues identified for Denver's new airport.

Background

Airport ground access has been an important focus for urban transportation planners for many years. Early on, air travel was recognized as a significant factor of economic growth; officials sought to facilitate the rapid growth in air travel which began in the late 1950s and early 1960s. As a result, airport access became integral to metropolitan transportation plans.

Three decades ago, airport access was as simple as creating systems by which people and goods could be moved to the airport. Highways were the primary tools employed by access planners, since they provided the most simple solution to what was then a simple problem. However, the problem has become much more complex. Today, planners must contend with a host of ancillary factors which contribute to the complexity of airport access planning. A key example is air quality: 32 of 35 major airports are now located in metropolitan areas which have failed to meet EPA air quality standards because of ozone and/or carbon monoxide.¹ Air quality is just one of a long list of problems which have contributed to the new texture of access planning; others include land use, noise pollution, congestion, wildlife and wetland preservation, and a host of general and site-specific concerns.

Despite these new factors, the private automobile remains the chief mode of access for the large majority of airport visitors. Since rubber-tire access systems typically grew alongside the high growth in airport travel in the last three decades, this is hardly surprising. However, the current dominance of the private auto mode presents airport access planners with a significant challenge in light of the new complexities of metropolitan transportation planning.

The complexity of airport access is addressed by important public policies created in the last few years. Both the Inter-Modal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Clean Air Act Amendments of 1990 (CAAA) have the reduction of the growth in congestion and vehicle miles traveled (VMT) in cities as major objectives. Achievement of these objectives will require significant changes in airport access systems throughout the United States.

¹ Lacombe, Annalynn. "Ground Access to Airports: The Prospects for Intermodalism." John A. Volpe National Transportation Center, August, 1994.

These developments lead inexorably to the conclusion that planners must adopt a new focus on airport travel market characteristics. In order to entice travelers from the private automobile, planners must study what motivates mode choices, incorporating the needs of travelers into metropolitan airport access plans.

Ground access research was conducted by federal agencies as early as 1977, when the Senate Appropriations Committee directed the Federal Aviation Administration (FAA) to conduct a comprehensive study of ground access to airports. The FAA investigated a sample of 16 airports with perceived access problems. As a result of the study, the FAA concluded that 13 of the 16 airports had inadequate ground access capacity that resulted in excessive delays. According to the FAA study, a number of airport authorities felt that ground access is a problem that could limit airport growth. At the same time, the study pointed out that airport authorities generally lack direct responsibility for planning, building, and operating highway and transit systems beyond airport boundaries.²

A March 1991 study by the FAA and the Federal Highway Administration (FHWA) found that most major airports in the United States are well served by the highway system, being situated within ten miles of an interstate highway. However, the study stopped short of drawing conclusions about the quality of airport access. Such key factors as congestion and travel time, and the impact of these factors on airport growth, had not been studied. "We know that certain major airports are very difficult to get into and out of, especially during rush hours, but we don't know how pervasive the problem is nationwide."³

Since quality is generally market-driven, defining "quality" airport access is essentially a marketing issue. Central to the issue is the gap between actual access service and the market's perception of service. For example, an important study found that, theoretically, 70 percent of trips to Logan International Airport in Boston during peak times can be made in 45 minutes or

² United States Department of Transportation, Federal Aviation Administration. "Airport Ground Access." October, 1978. This report was discussed in Lacombe, Annalynn: "Ground Access to Airports: The Prospects for Intermodalism." John A. Volpe National Transportation Center, August, 1994.

³ United States Department of Transportation, Federal Aviation Administration and Federal Highway Administration. "Highway Access to Airports: An Analysis of the Problem and Recommendations for Change." March, 1991. This report is also discussed in Lacombe.

less. However, when travelers perceive that the trip should take less, or (more importantly) that the travel time is unpredictable, it seems safe to conclude that the market sees access to Logan as problematic.⁴ It follows that assessments of airport access service quality must take such market perceptions and characteristics into full account.

Who designs "quality" airport access? As mentioned earlier, airport authorities generally do not have responsibility beyond the airport grounds. In the CAAA and ISTEA legislation, Metropolitan Planning Organizations (MPOs) have been directed to conduct comprehensive transportation planning and to determine if transportation plans meet the purpose of reducing emissions. MPOs are also required to take an inter-modal approach to transportation planning, specifically considering access to airports, ports, and Inter-Modal facilities. These plans must be made in coordination with airport sponsors, port operators, rail freight operators, and other transportation providers.⁵ Historically, MPOs have not included airport projects unless they were part of a larger highway or transit program. Only recently have MPOs given priority to airport ground access issues.

Ultimately, most airports in the United State are built for rubber-tire (as opposed to rail) access. Airport travelers add to vehicle miles traveled (VMT) and air pollution. A renewed sense of market needs — people's needs — and developing a high quality service process will be needed to effect the change from reliance on the private automobile.

ANALYSIS OF DIA GROUND ACCESS ISSUES

The first phase of this study focused on DIA ground access issues. To this end, the research team implemented the following methods:

- Reviewed local, regional and state agency reports and news articles related to ground access at DIA

⁴ Anis, Zale. "Airport Accessibility Index: Summary Description for the 1993 NPIAS." John A. Volpe National Transportation Center, June, 1993. Also, see Lacombe.

⁵ Clean Air Act Amendments of 1990, Inter-Modal Surface Transportation Efficiency Act of 1991, and the Code of Federal Regulations, Volume 23 CFR 450.

- Attended scheduled meetings of the DIA Access Task Force and the Modal Alternatives subgroup
- Examined working papers and reports of the DIA Access Task Force and the Modal Alternatives subgroup
- Interviewed members of the DIA Access Task Force and the Modal Alternative subgroup
- Interviewed transportation officials and non-transportation constituencies who are stakeholders in DIA

The DIA Access Task Force served as a primary point of contact for identifying the appropriate representatives to be interviewed and for gathering information on DIA. The interviews covered various staff within CDOT, the Denver Regional Council of Governments (DRCOG), DIA office, Denver government, counties of the Denver Metro Area, and other agencies currently involved in managing DIA. (See appendix A for a list of those interviewed in the first phase of this study.)

The work with the DIA Access Task Force, Modal Alternatives Subgroup, and other officials resulted in a comprehensive list of DIA access issues. Upon completing this list, a focus group comprised of members of the DIA Access Task Force was held to reflect on the issues identified by this investigation and to informally rank them by order of importance. General categories of the issues rated as most important are as follows:

- Methods and protocols for cooperation between regional agencies involved in airport ground access
- Application and effectiveness of multi-modal planning and decision models to ground access improvement projects
- Approaches to funding ground access improvements

- Effectiveness of alternative modes of transportation and conditions which lead to high ridership

Major Issues Identified

The major issues identified through this process are catalogued below.

◆ **Ongoing Coordination**

Ground access issues at DIA will continue over the next several years. There is a need for ongoing coordination to address these issues.

- **Mechanisms:**

What is the best mechanism to coordinate ground access planning? Is the DIA Access Task Force an appropriate coordinating mechanism? What alternatives should be considered and/or implemented? What approach to establishing ground access makes sense for DIA: political, use of task forces, use of a highly visible leader or driving force, etc.? How does one assess which approach is more effective? What approaches have other airports used? What worked for them, and why?

- **Establishing Priorities:**

DIA ground access and methods of ground access do not have a higher priority in the metropolitan transportation planning process than other projects. Is this appropriate? How have other airports dealt with such problems?

Is there a need for the DIA Task Force to revisit and prioritize recommendations and issues? The Task Force expressed a concern that the current list of recommendations should be pared down to a more realistic, manageable size. How should the recommendations be sorted into "front row" vs. "back row" issues?

- **Regional Emphasis:**

Initially, it was perceived that the airport and all ancillary services were Denver's problem, and so there was regional support but little state buy-in. Because DIA will serve the entire Rocky Mountain region, a broad perspective is needed, and Denver is looking for regional support. This may create new issues not yet considered. Has this "city vs. regional" conflict occurred in other airports/other states? What issues arose, and which issues were dealt with successfully and unsuccessfully?

- **Public involvement:**

How can public input be effectively included in ground access planning? What structure and process are needed to effectively involve the public and interest groups in addressing ground access issues? What mechanisms are used in other cities to involve the public? For example, how can the public be sufficiently educated regarding the issues in order for individuals to provide reasonable, useful information in responding to a survey?

- **Consensus Building:**

How should conflicts be resolved among participating entities? How have other airports brought together different planning groups to work cohesively? What did and did not work for them? How can consensus be reached around airport access being a high priority?

- ◆ **Information for Decision-making**

- **Information Collection:**

There are a variety of current studies with potential impacts to ground access planning for the DIA (e.g., Denver Union Terminal Inter-Modal Feasibility Study, Inter-Modal Freight Facility Feasibility Study, Northwest Commuter Rail Feasibility Study, Air Train Feasibility Study, Southwest Corridor Alternatives Analysis, Major Transportation Corridor Along I-70, Commuter Rail to Northern communities and to Colorado Springs/El Paso County). DRCOG compiles the relevant studies for input to ground access planning activities. Considerable information on ground access to DIA is available.

- **Origin/destination study:**

There is a need for an origin/destination study regarding travel to and from DIA. Who should be responsible for the O/D study? Is funding available and what is the appropriate timing for completing such a study? What survey methods should be used? What type of data should be collected? Are travel behavior and life style data as important as basic origination/destination data?

- **Incorporating Other National and International Experience:**

What experiences have other metro areas had which could help in planning and implementing ground access solutions at the DIA? The Denver area should benefit from other national and international experiences. What studies/experiences are relevant? How can these be best determined and used in this area?

When incorporating information from other national/international experiences, attention must be paid to how ground access was developed. For example, was the transit service built primarily to serve the airport, or was the airport built near existing transit service which was then altered to accommodate the new airport?

- ◆ **Multi-modal Planning**

- **Comprehensive Planning Process:**

Planning should focus on the integration of different transit modes, not on the technology of the modes. Options regarding congestion pricing, travel demand management and modal tradeoff need to be effectively evaluated. Are there effective criteria for evaluating modal tradeoff?

- **Air Quality and other Socioeconomic Factors:**

Air quality issues are a major regional concern. Are current transportation models sufficiently accurate to assess the differences among ground access alternatives from an air quality perspective? Will residents of the metro area change their travel habits if needed as air quality deteriorates? What

implementable ground access alternatives are best from an air quality perspective?

- **Performance Measures:**

What measures should be used to judge the success of DIA ground access?

Indicators could include: traffic congestion measures, ridership (compare actual to projected), and public reaction to ground access service immediately after the airport opening. How did other airports measure success?

- **Decision Model Effectiveness:**

There are concerns regarding the effectiveness of current multi-modal planning. Are our current models effective in evaluating modal tradeoffs, particularly with respect to major facility development such as the DIA? Are there other models which should be used? Can air quality implications be effectively assessed in these models? Other socioeconomic variables?

Do current models look at situations like Denver where a diverse infrastructure (trolley, light rail, Coors rail line, etc.) is already in place? How will these modes mesh? Did other airports have this situation? What issues were and were not addressed? What will be the impact on ridership of successfully "networking" various public transit modes?

- **Nature of Decision Process:**

Effectiveness of models is not the only issue; what issues could and could not be resolved by these models for various airports? When looking at other airports, the assessment of decisions themselves is not as important as the decision making process.

- **Implementation of Multi-modal Projects**

A related issue questions the effectiveness of the current institutional structure in Denver for implementing multi-modal solutions to ground access issues at DIA and elsewhere in the region. Is there an effective multi-modal implementation process given the specific modal orientations of key players?

◆ **Elements of the Regional Transportation Network**

● **Location of Airport:**

Public perception regarding the new airport may still be "you can't get there from here." How have other airports (such as Atlanta-Hartsfield and Washington-Dulles) which built facilities outside main travel corridors changed this perception? How did they develop secondary airport access (other than private automobile)?

● **Highway:**

What should the highway network look like in and around the DIA and what types of highway facilities should be included? Specifically, what improved access is needed for 104th Avenue, 120th Avenue, Tower Road, I-76 and E-470? Should High Occupancy Vehicle (HOV) facilities be developed? What Intelligent Vehicle Highway System (IVHS) applications are appropriate? DRCOG has identified I-70 as a major corridor requiring improvements and has initiated a major investment study.

● **Transit:**

What types of transit should serve the DIA? What types and levels of bus service should there be? Should outlying park-and-ride lots be developed? Can light rail or commuter rail be effective? During the interviews many comments were made that RTD may not have included all constituents in planning for bus service to DIA. What types of mass transit did other airports utilize? How were they developed? How well did they work? Did they start with a small system and expand, or start big and pare back as needed?

How many other airports have enacted rail solutions? How can ongoing rail projects be judged as "good investments" vs. "bad"? How do the transit professionals at ongoing airport rail projects feel about their systems? What issues could not be resolved?

- **Private Carriers:**

There is concern that some ground access options to and from the DIA may require regulatory changes from the PUC. What new ground access alternatives should be considered? What process is needed to assure that these options are fully considered? How can needed regulatory changes be made in a timely manner?

- **Intra-Regional Air Service:**

Should air taxi service be developed to and from the DIA? Will heliports be needed, and if so, who will develop them and where should they be located? More airlines are flying directly to mountain towns, and passengers are finding cheaper connections through Western Slope airports, thereby decreasing the need for regional flights originating in Denver. How will this competition impact the need for regional air service? Recently, DRCOG completed a study on air taxi service between downtown and DIA.

- ◆ **Financial**

- **Funding Sources:**

Funding is a major consideration in terms of developing solutions to ground access issues at the DIA. Can sufficient federal funding be acquired to implement effective ground access? If not, what other resources need to be developed, how can they be developed and in what time frame? Are there examples of other airports that have created "self-supporting" transit systems? Are there airports that have diverted traditional highway dollars, tolls or parking money to pay for alternative modes and/or a transit system?

What other funding sources have been tapped by airports to develop transportation? How do restrictions placed on funds generated on airport property effect funding options? Are there opportunities to "refinance" State dollars with Federal funds?

- **Funds-Driven Planning:**

Due to the delayed opening at DIA, Denver will be much more geared towards generating revenue than towards doing the "right" thing in order to provide excellent customer service. How can this be overcome? How have other airports "sold" doing the right thing over just generating revenue?

The City and County of Denver has to buy-in to whatever revenue generator a transit system may come up with; it will be difficult to institute higher parking fees or other toll mechanisms because Denver may not want to risk alienating drivers. An access fee may be more palatable.

- **Economic Development Adjacent to the DIA:**

There is the need to strategically invest in transit by proactive planning -- get out ahead of development to shape development before it occurs. There is a concern that land use development and transportation planning in and around the DIA be mutually supportive. Is there an effective process in place to make this happen? If not, what process and procedures should be developed? How can private investment be best supported in developing ground access to the DIA? How can private sector benefits be tapped to finance, plan, and enhance the airport and its ground access?

- ◆ **User Issues**

- **Baggage handling:**

There are concerns among users regarding how well mass transit can accommodate passengers with baggage. Are remote terminals/remote baggage check-in feasible concepts? Will it someday be possible to check-in luggage through the destination airport to the passenger's hotel? Are cities working with the airlines and FAA to provide such a convenient service? Has this been done in the USA or Europe?

- **Ground access costs:**

There are concerns among users regarding the cost of driving to and parking at the DIA, the cost of riding RTD alternatives, and the cost of private sector ground shuttles/taxis and air taxis.

- **Convenience:**
 - Travel time Travel time is a concern of users, for both auto use and use of alternative modes.
 - Access to alternative modes There are concerns regarding the extent to which alternative travel modes will be available to users from various parts of the Denver region and beyond.
 - Access to terminal from alternative modes Once at the terminal complex, will drop-off points for alternative modes be close enough to ticket counters and baggage check areas to support the choice of the alternative modes?
 - Reliability Reliability of ground transportation, especially in bad weather, will be a key issue to user acceptance. How can passenger perceptions be changed in order that public transit is viewed as efficient, reliable and secure?
 - Service to DIA employees Employees are one of the largest user groups of ground transportation at DIA. Will ground access be set up to serve them efficiently? Will public transit service run often enough and to enough locations that will minimize waiting and encourage employee ridership?
 - Ground access vehicles Will vehicles used for ground access be user-friendly? Will they work well, be reliable, and be relatively comfortable for passengers carrying multiple bags? Will they also serve the disabled in an equally effective way?
 - Hotel-to-airport service How will customers of hotels near Stapleton reach DIA? Should the hotels create their own Quebec Street shuttle? Should each hotel run its own van? If a rail station is put in at Stapleton, and a hotel association shuttle services the area to help customers reach the connection, is this an effective, efficient solution?

How have other airports helped make off-site hotel-to-airport service connections?

Summary and Conclusions

Based upon the DIA ground access issues that have surfaced, it is clear that city and transportation planners would benefit from other national and international experiences. Given that ground access to DIA is relatively undeveloped, there is strong interest in how other cities planned regional airport access. Planning involves evaluating transportation alternatives, coordinating participating agencies, and securing funding and public support. Pursuing these concepts, research at the airports selected for ground access analysis focused on the following issues:

- Conditions that lead to the development of transportation alternatives to single occupancy vehicles
- Mechanisms for garnering public involvement and awareness
- Alternative sources of funding for airport ground access projects
- Organizational structures conducive to cooperative decision-making
- Decision support systems and managerial tools for multi-modal planning

CHAPTER TWO: AIRPORT CASE STUDY ANALYSIS

Using the prioritized list of ground access issues relevant to Denver International Airport (DIA) as a guide, the next step was to search for domestic and international airport sites providing experiences and lessons relevant to the situation at DIA. The research team completed a preliminary investigation of over thirty airport sites. Out of this list, fourteen were chosen for in-depth analysis.

These fourteen sites were chosen because they met one or more of the following criteria:

- (1) Existing or planned rail transit links between the airport or areas immediately adjacent to the airport and the metropolitan area.
- (2) Extensive private and public development of multi-occupancy rubber tire ground access service.
- (3) Local Agencies that have conducted extensive examination of the issues identified in (1) and (2).
- (4) A well developed metropolitan planning process which involved examination of ground access issues.

The cities and airports chosen for analysis were: Atlanta, Hartsfield International; Baltimore, Baltimore Washington International; Boston, Logan International; Chicago, O'Hare International and Midway Airport; Cleveland, Hopkins International; Miami, Miami International; New York, Kennedy International, LaGuardia International, and Newark International; Philadelphia, Philadelphia International; Portland, Portland International; St. Louis, Lambert International; San Francisco/Oakland, San Francisco International and Oakland International; Seattle, Sea-Tac International; Toronto, Pearson International; and Washington, D.C., Dulles International and Washington National.

The airport sites were evaluated using the following techniques:

- Literature reviews of environmental impact statements, airport information documents, air passenger surveys, newspaper and magazine articles, etc.
- Phone interviews with airport and regional transportation officials
- Focus groups conducted at each airport site

At each of the focus group sites, the research team interviewed airport directors, airport ground transportation managers, local transit authorities (usually bus systems) as well as Metropolitan Planning Organization (MPO) representatives to gain detailed information on the aforementioned ground access issues. Officials and expert participants were encouraged to provide their opinions as well as factual information.

The airport sites chosen have either implemented ground access improvements within the last twenty years, or are currently planning to implement a major airport ground access improvement project. These projects involve improvements in rail, highway, and bus access. Each city has unique plans to deal with the ground access problem.

Executive summaries of the findings from each location are presented here, in alphabetical order by city. These executive summaries are intended to give a brief overview of the city and the airport(s), as well as the interesting problems the city has dealt with discussing, planning, and implementing solutions. The last part of the chapter is each location's case study (detail summary of findings), presented in alphabetical order by city. In these summaries, the ground access problems and solutions are explored in more depth.

Taken together, these case studies provide broad coverage of the key issues concerning DIA.

EXECUTIVE SUMMARIES

Atlanta, Georgia

William B. Hartsfield International Airport

The Atlanta metropolitan area incorporates seven different counties. Population is predicted to be 3.2 million by the year 2000. Growth over the last ten years has occurred primarily to the north of the central business district towards the counties of Cobb and Gwinnett.

Consequently, Atlanta has become a city of many downtowns oriented around the automobile and suburban concentrations of office buildings and shopping malls. Local planners see no end to the outward momentum for the foreseeable future.

Hartsfield is the fourth busiest airport in the world in terms of total passengers, and in the top ten airports in terms of cargo handled. Located just ten miles southwest of the central business district, Hartsfield employs 38,000 people and contributes an estimated \$7 billion annually to Atlanta's economy.

Ground access to Hartsfield is dominated by the private automobile. A contributing factor to this dominance is the regional highway system which is usually described as excellent.

However, the airport is also accessible via a heavy rail network operated by the Metropolitan Atlanta Rapid Transit Authority (MARTA). Ridership to the airport averages 5,000 passengers per day. Of these 5,000 passengers, 57% are air travelers and 25% are airport employees. Atlanta's experience with ground access to Hartsfield may suggest elements which should be considered when developing ground access to DIA:

- ◆ **Highway and Parking Conditions Affect Alternative Modes** - In contrast to many other major U.S. cities, Atlanta's highway network is generally capable of handling traffic flows into Hartsfield. In addition, parking rates at the airport are extremely reasonable. As a result, air travelers have very little motivation to switch from private automobiles to alternative modes.

- ◆ **Funding for Transit Linked to Region's Growth** - Funded by a 1% sales tax, the MARTA system was linked to regional growth. As the population grew, sales tax

revenues increased and funds for constructing MARTA also increased. Thus, as the area's need for transit evolved so did the system.

- ◆ **Origins and Destinations of Market Defines Ridership - MARTA has limited attraction to Georgia residents outside the I-285 beltway. Those outside the beltway are a significant portion of air travelers for the Atlanta region. Consequently, the MARTA line to the airport is mainly patronized by white, male businessmen from outside Georgia who have a central Atlanta location as their destination.**

- ◆ **Customer Service Enhanced by Layout of System - Ridership surveys revealed MARTA air travelers rated convenience and time savings ahead of cost savings as critical factors for choosing to use the transit system. Time savings are facilitated by the system being very compact. No line extends farther than 15 miles from the central, downtown station which keeps travel times under 25 minutes. Convenience is facilitated by the location of the MARTA station inside the terminal, near the baggage claim area.**

- ◆ **Kiosks Will Assist with Mode Choice - As a component of the computerized transportation management system being implemented in the Atlanta region, kiosks at the airport will relay highway conditions in "real-time" to air travelers at Hartsfield. Information about travel times and alternative routes will assist travelers in their mode choice. Conceivably, if an air traveler is confronted with information which suggests a taxi to downtown will take 25-30 minutes while MARTA is 15 minutes, they may try MARTA.**

- ◆ **Land Banking - The entire MARTA system was laid out in the original referendum process. As a result, significant cost savings were realized years later from the preservation of right-of-ways.**

Baltimore, Maryland

Baltimore-Washington International Airport

Baltimore is one of the more densely-populated cities in the U.S., with 9,200 people per square mile. The city's population declined slightly between 1980 and 1990; however, the Baltimore-Washington metropolitan statistical area (MSA) — the nation's fourth largest — grew more than 16% during the same period (to 6.73 million persons).

Baltimore-Washington International Airport (BWI) is located squarely in the Baltimore-Washington corridor south of the city. The corridor, centered around I-95, is heavily congested. Once a rural area, the corridor is now populated by some residential and many commercial/industrial developments. In addition, travel between Baltimore and the nation's capital has become extremely popular, blurring the boundary between metro-Baltimore and metro-Washington to the extent that the two cities are often considered together. Over the years, other thoroughfares have been added to the corridor in an effort to abate the effects of congestion on I-95, and to serve other points within the corridor. The airport is generally seen as a major focal point of corridor traffic.

Passenger traffic at BWI has more than doubled since 1982. In 1992, BWI enplanements totaled 4.4 million, representing a slight decrease since 1987's figure of 4.52 million. Annual enplanements at BWI are expected to reach 7.7 million by 2005, an increase of more than a third from current estimated levels. This rapid growth is predicted to result from an increasing share for BWI of the Baltimore/Washington air travel market, as well as a general increase in air traffic.

Almost nine out of every ten locally-originating trips to BWI are by private auto, rental car, or taxi, leaving only a small portion for transit.

- ◆ **Investment in Light Rail -** The Baltimore region enjoys good transit rail service. Regional planners have contrived to extend this system to include BWI, an extension which is scheduled for completion in 1995.

- ◆ Unique Funding Structure - Baltimore's transportation initiatives are funded through use of a centralized Transportation Trust Fund (TTF), in which funds are pooled from a variety of sources and reallocated to transportation projects based on need and feasibility.

- ◆ Centralized Government Structure - Transportation planning is largely centered within the Maryland Department of Transportation (MDOT), with its Mass Transit Administration (MTA) facilitating a smooth decision process by helping coordinate with other salient groups and agencies.

Boston, Massachusetts

Logan International Airport

Logan International is less than three miles across Boston Harbor from the heart of downtown Boston. In 1993, Logan handled approximately 24 million passengers. Several studies have suggested air traffic will outpace capacity by the year 2000. Consequently, major improvements are planned for Logan under the "Airport 2000" plan. Included are renovation of the existing terminals, construction of a new terminal, implementation of a compressed natural gas (CNG) fueling station, construction of a parking garage, activation of an automatic vehicle inventory system (AVI), and construction of an airport people-mover. Significantly, four of these projects address ground access and vehicle emissions.

In conjunction with the Clean Air Act in the mid-80's, MASSPORT officials devised a "continuum" which rated various modes of transportation by their environmental impact. Accordingly, official policy is to encourage air passengers to change to ground access modes with less impact. Actions towards this goal include: (1) airport information booths make information for private van/bus services readily available, (2) MASSPORT planners assisted with the implementation of a water shuttle to downtown, and (3) MASSPORT developed and operates the Logan Express — a dedicated bus service from three outlying communities. Discussions with MASSPORT officials revealed the following key factors contributed to the implementation of the Logan Express:

- ◆ All private bus carriers, providing service to the airport, stop in downtown Boston and multiple destinations in outlying suburbs of Boston. A potential market for nonstop service was recognized.
- ◆ Air traveler surveys revealed four different types of travelers based on origin and trip purpose and their preferred transportation modes. Thus, characteristics of target customers for a dedicated bus service were further refined.
- ◆ Origin/destination data identified communities generating a "critical mass" of air travelers with similar characteristics. Consequent revenue projections demonstrated the financial feasibility of a dedicated bus service to those communities.
- ◆ Focus groups with air travelers provided insights into key service features. As a result, MASSPORT has been scrupulous about parking lot security, cleanliness of buses, and timeliness of service on the Logan Express — financially penalizing the contracting operators for late trips or missed trips.

Experiences in Boston with providing alternative ground access modes to Logan International Airport have been examined, and the following lessons have been extracted for application to future ground access developments at North American locations:

- ◆ **Environmental Imperative** - Boston is concerned about air quality issues, and automobile traffic to Logan is a contributor to the area's problems. MASSPORT officials have recognized the value of cooperating with private carriers to increase the use of shared-vehicle modes.
- ◆ **Express Bus Service** - After examining the routes of the "Blue Line" subway and private bus services, MASSPORT discovered substantial air passenger markets in outlying suburbs which were not being served by these modes. Thus, the Logan Express was developed to fit those customers' transit requirements. These requirements were unlikely to be met by a private carrier operating without the benefit of subsidies from other revenue streams.

- ◆ **Modal Limitations - MASSPORT officials postulate that the market share for alternative modes does have a maximum — limited by the widely varied origins and travel purposes of air passengers. As an example, they refer to the limitations of the Blue Line, which does not have luggage facilities, making it suitable only for the traveler with a briefcase or carry-on bag. Consequently, the challenge is to find a cluster of air travelers with similar characteristics and to build or adapt a transit mode to serve that specific market.**

- ◆ **Qualitative versus Quantitative Techniques - Quantitative models provided general indicators for the design of a transit service at the broad vision stage. MASSPORT planners thought behavioral analysis, including tradeoff decisions of air travelers, was more useful on a local level when working in the final planning stages.**

Chicago, Illinois

O'Hare International and Midway Airport

The current population of Chicago is 2,783,276 in an area of 228 square miles which equates to a density of 12,209 per square mile. However, 2,992,903 people are employed in Chicago and much of the workforce commutes from outlying areas such as Aurora, Geneva, Elgin, Waukegan and Joliet.

Like other major U.S. cities, the six county Chicago area is confronting severe of traffic congestion and it is increasing each year. By 2010, population is expected to increase 15%, employment by 22%, and households by almost 30%.

O'Hare International Airport - Located 18 miles from the central business district, O'Hare is, and wants to remain, the world's busiest airport. In 1992, O'Hare handled 64 million passengers, moved 1.2 million tons of freight, directly employed 48,600 people, and contributed an estimated \$13.5 billion to the region's economy.

Ground access at O'Hare is dominated by private automobiles. One of the major problems associated with access is the fact that there is only one road for some 100,000 vehicles per day. O'Hare is also accessible by public bus and rail.

Midway Airport - Located 10 miles southwest of downtown Chicago, Midway Airport has evolved into a medium hub commercial airport; 16 airlines fly out of Midway. In 1993, these airlines served 6.8 million passengers — a 46% increase over the 4.6 million passengers served in 1992. Midway also handles the majority of Chicago's general aviation and corporate air traffic.

Highway access to Midway is via the Dan Ryan Expressway to 55th Street or the Stevenson Expressway to South Cicero Avenue. In addition, PACE operates six bus routes which provide service to Midway Airport and interconnect with CTA rail at the Midway CTA station. The routes have a combined daily ridership of 4,275 and have shown significant growth between the final quarter of 1992 and the final quarter of 1993. This growth has been largely attributed to the connection with the CTA Midway line which opened in 1993 and provides a continuous link to the Loop in downtown Chicago.

Several aspects of the development of ground access at O'Hare and Midway are particularly salient.

- ◆ Perception of Public Transit - The relatively high ability of many air travelers to afford taxis/limos service to O'Hare, and their general perception of public transit as intended for the general population but not for them, may present a psychological barrier to the marketing of the CTA connection from O'Hare to the Chicago Loop. Marketing efforts to business people should focus on convenience and time savings rather than cost savings.
- ◆ Awareness of Transit Options - Many out-of-town travelers to the downtown Chicago area are simply unaware of the rapid transit option. Airport signage, airport maps, and airport personnel are keys to improved communication efforts.

- ◆ **Employee Usage** - The CTA rail line to O'Hare is used by approximately 18% of airport/airport-related employees. The relatively high cost of employee parking (\$50/month) and congestion on the single access road may be influencing factors. Another factor which may encourage O'Hare employees to use the CTA is the extensive network of connecting bus routes and commuter rail lines.
- ◆ **Preservation of Right-of-Ways** - The foresight of transportation planners and public officials in the 1960's preserved a median along a developing transit corridor for future transportation projects. As a result, the cost for extending the Blue Line to O'Hare was profoundly reduced.
- ◆ **Establishment of an Inter-modal Hub** - CTA's Orange Line to Midway not only provides service to the airport from downtown, it also serves as a travel hub for connecting PACE bus routes which has successfully enabled commuters to use the line to get downtown.

Cleveland, Ohio

Cleveland Hopkins International Airport

The metropolitan Cleveland area encompasses 515 square miles which includes 67 cities with a population of 1.6 million. The city of Cleveland is located on the south shore of Lake Erie at the mouth of the Cuyahoga river. Population in the city is 505,616 in an area of 79 square miles. Since 869,106 people are employed in the city, daily commuter traffic is a significant factor on the regional roadway system.

Cleveland International (CLE) is located approximately 10 miles southwest of the downtown area. In 1993, Cleveland International served approximately 5 million enplaning passengers. Of those 5 million passengers, 70% had local origins or destinations.

Transportation officials assert that rubber-tire access to CLE is generally excellent as it is served by two state routes and several other major collector roadways. The airport is also

served by rapid transit - having the distinction of being the first airport in the United States to have a rail facility inside the terminal.

In terms of future operations, Cleveland is a mature airport which is expected to reach its maximum air side capacity in approximately 1998. Initiated in 1990, a new Airport Master Plan incorporates some airside renovations to increase capacity. In addition, the master plan addresses internal roadway issues. A reconfiguration of existing entrance and exits plus the construction of more parking is expected to alleviate the primary ground access issue - namely congestion on airport property. In addition to the groundside renovations, several other components of Cleveland's ground access are particularly important:

Private Operators of Off-Airport Parking

In addition to the 5,000 airport owned parking spaces, private operators of off-airport parking facilities operate another 5,000 spaces and provide complimentary shuttle service to the terminals, which is known as remote check-in. These private sector operators alleviate internal congestion on airport property.

◆ Deterioration of Rapid Transit Infrastructure

Although Cleveland implemented rail access to the airport in 1965, this infrastructure investment was allowed to deteriorate. Consequently, the Regional Transit Authority is now faced with major capital costs for renovations. During the renovation period, rail service stops at 10 p.m. Transportation officials believe this is a contributing factor to rail's modal share decline from 6% in 1989 to current shares of 1% to 2%.

Miami, Florida

Miami International Airport

Growth is expected to be strong in the extreme western part of Dade County and to the south of the central business district (CBD), with the area west of the Florida Turnpike extension expected to experience the most impact. The airport is located just west of the core of Miami's central business district. Consequently, as local traffic congestion increases, ground access to Miami International Airport is expected to deteriorate.

In 1993, Miami International Airport (MIA) serviced 28.7 million passengers, an increase of 2.2 million over 1992's figures. International travelers totaled 12.4 million in 1993, or roughly 43 % of the airport's total patronage. Airport officials project the total 1994 passenger count to approach 30 million. Anticipation of this growth has spurred a \$2.5 billion airport expansion and modernization effort which is currently underway.

The airport ground access situation in Miami offers several key lessons which may be applicable to North American airport locations:

- ◆ Airport as an Asset - Airport access is given a high priority among transportation planning issues. City officials and private business groups see the airport as a vital link to important elements of Miami's economy, including tourism and international trade.
- ◆ Transit Service for Specific Markets - Miami's cruise market offers a large, definable "niche" for which proactive transportation plans can be developed — providing a service to a valuable sector of the tourism industry and simultaneously relieving congestion on local roads.
- ◆ Government Coalition Building - Miami's metro/county government structure has facilitated a high degree of consensus among stakeholder organizations. Products of this cohesive structure include prioritization of airport projects, a perception of the airport as an economic focal point for the region, and empowerment of transportation experts in the transportation planning process.
- ◆ Tiered Decision-Making Process - Transportation officials have developed a process which allows them to conserve analysis resources. Within a specific matrix, transit options are given a series of ratings based on how well they meet certain pre-determined goals. The first ratings (Tier I) are based on transportation experts' knowledge of the region. Tier I is designed to weed out any "weak" projects immediately. Tier II is an intermediate analysis which further reduces the number of options under consideration. Tier III rates the best options after in-depth modeling and analysis have been completed.

- ◆ Systematic Implementation - Transportation development is proposed for six different corridors which have already been identified and evaluated as congested with airport and non-airport traffic. Existing corridors have been prioritized rather than creating a new system which must be "sold" to customers who may resist deviation from their routine travel paths.
- ◆ Land Banking - One practice which has aided Miami planners is "land banking." Over the years, Miami has acquired easements and land accesses which have been held in reserve for future transportation needs, a practice which has assisted planners dealing with current and future regional transportation needs.

New York City, New York *

John F. Kennedy International, LaGuardia International, Newark International

The New York metropolitan area is served by three principal airports — LaGuardia International to the northeast of Manhattan, John F. Kennedy International to the southeast, and Newark International, in New Jersey, to the southwest. Similar to other major U.S. cities, the airports and ancillary services represent a critical economic sector. The Port Authority of New York and New Jersey, which operates all three airports, estimates that combined volume at the three facilities will rise to approximately 95 million passengers by the end of the century.

In contrast to many cities, New York's ground transit system, in terms of roadways, has reached a state of maximum capacity. Beyond roadway re-configurations and technological improvements in maintenance and flow systems, there is almost no capacity for additional roads. Increasingly concerned about the economic losses associated with poor accessibility to LaGuardia and JFK, officials have sought ways to improve public transit links to the two airports.

The proposal for the Airport Access Program (AAP) was devised in the early and mid 1990's and was perceived as a solution for maintaining JFK and LaGuardia as viable economic assets. As conceived, the AAP is a dedicated airport transit system linking JFK, LaGuardia and

Manhattan. While the geographic and market characteristics are unique, the process for executing the Airport Access Project points to issues which may have implications for the immediate and future development of transit at North American locations:*

*The AAP proposal has recently been abandoned and others are currently underway.

- ◆ **Air Passenger Market** - Market research utilizing origin/destination studies identified a significant customer base for travel to and from downtown Manhattan. Furthermore, the majority of these air travelers are business people from out-of-town. These visitors are concerned with safety, cleanliness and reliable access times. Thus, an airport-only system using state-of-the-art technology meets air travelers' expectations by separating them from the daily commuter system and conveniently fits the available funding mechanism.
- ◆ **Separate Funding** - Even with the extreme congestion experienced in the New York metropolitan area which was affecting the economic viability of the airports, planning officials were having difficulty "selling" the idea of improving access to the airport via public transit. The general public was more concerned with improving commuter routes. Support for the Airport Access Program required a funding source (Passenger Facility Charges) separate and distinct from other transportation funds.
- ◆ **Agency Cooperation** - Multi-agency cooperation and political consensus are essential for planning and implementation when the proposed system crosses jurisdictional boundaries. Cooperation can facilitate shared or donated right-of-ways which can significantly reduce implementation costs. A key routing problem for the AAP was resolved by the City of New York's willingness to consider using the Queensboro Bridge to cross the East river.
- ◆ **Role of Transportation Planners** - A steering committee comprised of transportation experts directed substantial research and analysis towards the proposed Airport Access Project, constructed a viable plan, and then assisted public officials with presentations to the general public.

- ◆ **Community Outreach** - Significant resources spent on community outreach were used to "pre-sell" the system to potential customers, answer questions from opposition, and gather feedback for system improvements prior to implementation.
- ◆ **Remote Landside Operations** - Planning officials envision the AAP providing remote baggage handling and check-in. Air travelers would check their bags at the access terminal and the bags would go directly to the various airlines. Specific AAP stations might also include a collector/distributor terminal for air cargo shipments generated by Manhattan business firms. Separating the airport transit system from the commuter system makes these options more workable.

Similar to ground access problems at JFK and LaGuardia, the present on-airport road system at Newark handles approximately 22 million passengers a year — close to its capacity of 25 million. With ground transportation becoming strained, the Port Authority in partnership with the New Jersey Transit Corporation, is currently investigating the possibility of extending a proposed light rail line to the airport. The resulting system would integrate commuter rail and the airport people-mover system. Completed in 1993, the Newark-Elizabeth Rail Link Options Study is a preliminary investigation of the transit alternatives along this corridor. Again, there is information from the study in Newark which is applicable to North American locations:

- ◆ **Economic Development** - Transportation infrastructure is recognized as a key factor in facilitating economic development in the Newark-Elizabeth corridor. As a hub in the transportation infrastructure, and as an employment generator, Newark is one of the most important economic assets in the region. Linking the airport to the transit system improves the airport's competitive position as a gateway to the New York/New Jersey region.
- ◆ **Recycle Existing Facilities** - Transportation planners have devised a plan for the Newark-Elizabeth Rail Link which connects to the existing subway system. Track will be upgraded and subway cars will be replaced by LRT vehicles — with ensuing cost savings.
- ◆ **Inter-agency Cooperation** - Mutually beneficial objectives provided the impetus for the New Jersey Transit Corporation and the Port Authority of New York and New Jersey to

cooperate. As a result, multiple funding sources can be tapped — passenger facility charges, transportation taxes, and ISTEA monies.

Philadelphia, Pennsylvania

Philadelphia International Airport

Within a 100-mile radius of Philadelphia lies 13% of the U.S. population and buying power, and 11% of the country's retail sales; within 300 miles lies a fifth of the U.S. population, and fully a quarter of the nation's disposable income.

Philadelphia is the nation's fifth-largest city. Its development in the 1980s was characterized by decentralization: while the metropolitan area grew 4.3% between 1980 and 1990, the population of the City of Philadelphia declined by more than 100,000 (a decrease of more than 6%). Still, the city remains one of the nation's most densely-populated, with more than 11,000 residents per square mile within the city limits.

Philadelphia International Airport (PHL) is situated seven miles from the city's central business district (CBD), but travel time to the airport ranges to more than an hour from most areas served by PHL. Only 18% of PHL's locally-originating passengers originate in the CBD; the majority of the airport's customers travel to PHL from suburban areas. The airport rests in the center of a heavily industrialized district, and growth is limited due to the scarcity of available land.

In the early 1980s, Philadelphia International Airport averaged approximately 16 million annual passengers. This number dropped significantly as a result of three key developments in the 1980s: a strike by air traffic controllers, fuel scarcity, and airline deregulation. Since the decrease, patronage has climbed back to the 16 million level annually. PHL's patronage is divided fairly evenly between business travel and pleasure travel.

As is typical of U.S. airports, private car is the dominant mode of access to Philadelphia International Airport. Transit, including train and public bus, accounts for a mere 3% of local origination trips to the airport.

- ◆ **Excellent Highway Access** - The region generally enjoys good highway access, and this impacts airport travel. Since many local airport travelers commute to PHL from the Philadelphia suburbs, highway access is important.
- ◆ **Tourism** - Officials and planners are adopting a new focus on serving the city's visitors, including patrons of Philadelphia's new convention center.
- ◆ **Regional Rail System** - The Southeastern Pennsylvania Transportation Authority (SEPTA) operates an extensive light-rail system throughout the region, including PHL. Since the excellent highway system serves the city's suburbs well, the majority of SEPTA ridership is limited to trips to and from the Central Business District.
- ◆ **Problems with Transit System** - There are many instances of problems with the transit system in Philadelphia. For example, potential ridership has been diverted from transit because of the development of an excellent highway system. There is a lack of coordination between the airport authority and SEPTA which is demonstrated in the difficulty of using the system and the lack of facilities in the system for air travelers. The airport rail problem is complicated by the primary objective of the SEPTA line from downtown to the airport: commuter traffic.

Portland, Oregon

Portland International Airport

Portland is a city which has yet to experience the problems of growth and congestion which have created ground access difficulties in larger cities; however, planners are already considering how the region will react to these eventualities.

The city is not heavily congested, and has experienced only moderate growth in the recent past. It is, however, a major metropolitan area which ranks in the top 25 in the United States.

Transit to the airport is not well utilized, with less than one percent of passengers arriving by transit. Currently, a light rail system is being developed to serve the north-south Interstate 5

corridor through the city, and plans are on the boards for inclusion of a light rail extension which will penetrate the airport terminal. This development is expected to coincide with significant growth in employment in the airport vicinity, and planners predict that fully eight percent of passengers will use transit (including the new light rail line) in the foreseeable future. Other plans to address airport access include expanding bus service and consideration of a door-to-door van service.

Portland's MPO, Metro, has the nation's only elected governing council. Most new access initiatives originate within the Metro organization, and are analyzed by advisory committees on public policy and technical merit before returning to the Metro council for implementation.

Two factors are most salient in distinguishing Portland's airport access situation:

Interagency Cooperation. Because resources have been fully adequate to meet the needs of a variety of stakeholders, Portland transportation agencies work well together without a particularly cohesive metropolitan structure.

- ◆ Anticipation of Growth. Portland planners are focusing on alternative transit modes for the future, leaving aside development of new highways. They fully expect this to result in increased congestion, but they accept this as a welcome disincentive to private auto transportation and as an incentive for alternative mode use.

St. Louis, Missouri

Lambert International Airport

St. Louis has focused on reducing its dependence on manufacturing and increasing its services sector. To maintain its position as one of the top ten economic markets in the U.S., Lambert International Airport is located 15 miles from the central business district, employs approximately 15,000 people and currently handles 21 million passengers per year. In addition to the direct employment generated by airport operations, public officials recognize the economic spinoff generated by the airport and its role in attracting new businesses to the St. Louis area.

To maintain Lambert's viability, a reconfiguration of the parallel runway structure is being considered. The addition of a third runway and increased separation between the runways would

enable Lambert to operate in all weather conditions and allow for simultaneous landings/takeoffs. Without the new runway configuration, it is doubtful whether Lambert can handle the 39 million passengers it expects by the year 2025.

In addition to air side improvements, Lambert is also linked to an important ground access investment. In June 1994, the St. Louis light rail system, MetroLink, opened its extension to the airport. As traffic congestion worsens, transportation planners expect MetroLink to carry an increasing number of air travelers and airport employees. Already, there is evidence to suggest MetroLink is a valuable addition to ground access at the airport:

- ◆ Given the option and tax incentives to locate anywhere in St. Louis county, TWA announced its intention to locate its world headquarters near the MetroLink corridor in order to give its employees easy access to the airport.
- ◆ Now accessible by MetroLink, airport hotels have been added to the stock of rooms for convention attendees — dramatically increasing the potential for hosting larger groups or multiple groups in St. Louis.
- ◆ Air travelers with layovers in St. Louis, assured of a reliable mode of transportation to downtown and back, may perceive an opportunity to sightsee — thereby contributing to the St. Louis economy.

The development of MetroLink was accomplished through the combined efforts of the public and private sector. Certain aspects of MetroLink's progress are interesting within the context of future transportation for North American airport locations:

- ◆ **Link Economic Centers to Attract Business** - Improved transit is viewed as one of the keys to maintaining future economic prosperity. By linking key economic centers with communities, city leaders improved employers' accessibility to additional employees, expedited local consumers' passage to recreation and shopping areas, connected out-of-town visitors to business and convention destinations, and reduced pollution and traffic congestion. Each of these factors enhances the overall quality-of-living of St. Louis and makes the region attractive to businesses considering relocation there.

- ◆ Coalition of Local and Federal leaders - While certain local factions were opposed to MetroLink, the local leaders who supported the project were able to forge a partnership with senators and representatives from both Missouri and Illinois. This coalition, with additional private sector backing, secured federal funding. Unable to mount a protest based on funding, the opposition faded or was largely ignored.
- ◆ Innovative Funding - The \$64 million local share of the \$351 million capital cost was provided by the county of St. Louis donating right-of-ways and existing infrastructure. In addition, the station at Lambert International was designed into renovation plans and funded by the airport.
- ◆ Total System Concept - Transportation planners, elected officials and key business leaders envisioned a regional light rail system. Based on the success of the first route, supporters proposed a timetable for funding and constructing the rest of the MetroLink system. This proposal was taken to the voters as a comprehensive package which enabled citizens to discern how they could personally benefit from it.
- ◆ Attract "Non-Traditional" Customers - A combination of routing, aesthetics, comfort and convenience have appealed to customers not normally served by public transit. Three-fourths of MetroLink riders are new riders — not transit patrons who have just switched modes.

San Francisco/Oakland, California

San Francisco International Airport, Oakland International Airport*

The Bay Area is comprised of nine counties which stretch from Sonoma County in the north to Santa Clara County in the south. This region incorporates several major population centers, including the cities of San Francisco, Oakland and San Jose. The population of this area is approximately 6 million people in an area of approximately 7,000 square miles. The economy of the area is extremely diverse with major sectors in computer technology, financial services, and tourism.

San Francisco International Airport (SFO) is the major commercial airport for the Bay Area and northern California. SFO is ranked as the fifth busiest airport in the United States in terms of total

passengers. In 1993, 32 million passengers passed through the airport including a significant amount of international traffic between the United States and the Pacific Rim. In addition, San Francisco is a major cargo airport, handling exports and imports valued at approximately \$31 billion in 1992.

Oakland International Airport, which is operated by the Port of Oakland, is the second largest passenger and cargo airport serving the San Francisco-Oakland-San Jose triangle. In 1993, Oakland Airport served over 7 million air travelers and handled approximately 870 million pounds of air freight — making it the 10th busiest air cargo facility in the country. Consequently, the airport makes a significant contribution to the regional economy and is considered an integral and essential aspect of the East Bay economy.

*The BART/SFO issue may have been substantially changed since the author's draft report of 5/31/95.

Both SFO and Oakland airports have completed updated master plans since 1990 which identify air side and groundside improvements needed to meet the projected increases in air travel and shipping. Groundside improvements have focused on both internal circulation patterns and maintaining regional access. In particular, improving regional access via the Bay Area Rapid Transit (BART) system has been determined the most viable option — given the high cost of land acquisition and environmental constraints which make further highway expansions difficult. Although both connector projects come under the jurisdiction of the Bay Area Rapid Transit Authority, different issues have affected the planning process and funding strategy for the two BART airport extensions:

- ◆ **Political Process Determines Outcome** - At SFO, the primary point of controversy has been the alignment of the proposed BART connection, i.e., whether the system should penetrate airport property and actually terminate underneath the new international terminal complex or terminate across from the airport on the west side of Highway 101 with a "people-mover" connection to the terminals. The terminal location will impact ridership. If BART ends under the terminal complex, there is still a long walk to reach the most concourses. If the station is located outside, a rotating bus service can shuttle travelers to the multiple terminals. The first alternative is the one chosen by decision makers.

The resolution of these issues clearly demonstrates the power of the political process to determine the final outcome regardless of the empirical evidence from transportation models which supported the terminus on the west side of Highway 101 as being just as effective in capturing market share and notably less expensive.

- ◆ **Model Development is Advanced** - Transportation planners in the Bay Area use a logit model for predicting transit ridership. This model considers various mode options including auto, but, rail, airporter, taxi, and limo and uses such key variables as passenger type (resident vs. non-resident, business vs. non-business, gender), travel convenience (travel time, walking distance, delay time, schedule mismatch time, luggage handling, security, and cost), and demographics (departure location and household size). The model was calibrated on an extensive data set that was collected for each of the 22 geographic areas serviced by BART. From this model and based on a transit service, the relevant ridership may be predicted.

- ◆ **Funding Requires Regional Cooperation** - Several studies over the last twenty years addressed the need to improve access to SFO. However, the political imperative never materialized to move a proposal beyond the preliminary analysis stage. Finally, in 1988, a regional effort was mounted to coordinate several future transit improvements. Subsequently, a coalition of county officials and transit directors was able to forge a regional agreement which included Caltrain improvements, BART to the airport, and several BART extensions throughout the Bay Area. Thus, using a regional approach, many funding sources became accessible.

- ◆ **Determination of Design Criteria** - At Oakland Airport, BART currently operates a shared-van shuttle from the BART Coliseum station to the airport which has captured approximately 4% of the air traveler market. Consequently, officials and planners determined fundamental criteria of direct BART service to the Oakland airport should be that it exceeds the speed, capacity, frequency and reliability of the existing shuttle service in order to achieve modal share gains. This criteria impacted proposed headway schedules, vehicle capacities, and alignment options.

- ◆ **Capability to Capitalize on Funding Opportunity** - Having identified the need for a transit mode to Oakland Airport which would avoid roadway congestion and conducted preliminary

planning efforts despite a discouraging funding forecast, BART officials were well-positioned to take advantage of a fortuitous funding opportunity. As a result, when the Federal Transit Administration (FTA) offered grants to study the application of Suspended Light Rail Technology (SLRT), the agency was able provide the necessary documentation to successfully apply for the study grant. Consequently, having submitted a feasibility report to the FTA, the agency officials await notification that Oakland has been selected as the site for an SLRT demonstration project. Such a designation would provide funding for the entire connector project from design through construction and testing.

Seattle, Washington*

Sea-Tac International Airport

Growth in the Seattle area is predominantly along the north-south corridor which is geographically bounded by the Pacific Ocean to the west and the Cascade Mountains to the east. In general, Washington is a rapidly-growing state; experts predict the state's population, which doubled from 1970 to 1990, will double again between 1990 and 2020. In particular, this rapid growth has been largely concentrated in the urban areas of the state — specifically the Seattle, Bellevue, Tacoma triangle.

Along with the growth, traffic congestion has given rise to what some experts call the state's "transportation crisis." This situation is described as a crisis because state and local leaders recognize that the transportation infrastructure is vital to the state's economy which is highly dependent upon trade. Thus, congested highways, railroad bottlenecks, and an overcrowded airport drive up the cost of delivering products to distant markets.

In 1993, Sea-Tac passenger traffic totaled 18.8 million, and Sea-Tac moved 381,541 metric tons of air cargo. Experts estimate that 70% of Sea-Tac's passengers originate locally, using ground access modes; the remaining 30% arrive by connecting flights at Sea-Tac. Private auto is the dominant mode of ground access to Sea-Tac International Airport. A 1994 air passenger survey found that approximately 70% of the locally-originating trips to Sea-Tac were by private car. This percentage has remained unchange since 1988, although the total number of air passengers has increased dramatically. As a result, regional ground access routes to the airport have become increasingly

congested. Consequently, public officials, local officials, local business people, and transportation planners are discussing alternatives to solve transportation issues. A synopsis of the main issues is as follows:

- ◆ Development of a Second Airport — Much discussion has been devoted to a proposal for a second airport which would relieve the capacity pressures on Sea-Tac. However, several sites which were considered suitable in terms of available acreage, buffer zones, and future rail accessibility have been opposed due to their location outside existing north-south travel corridors and major population centers. Opponents surmised the proposed sites would be unable to divert enough air traffic from Sea-Tac to be successful.

*The Seattle ground access picture is undergoing continual reevaluation; and hence, readers are urged to conduct their own primary research for information subsequent to 5/31/95.

- ◆ Development of Rail Access — Because of the geographic configuration of the airport atop a plateau, conventional rail service was originally not considered feasible. However, with the advent of new technologies, several rail options are being evaluated. Currently, the most viable proposal is to include rail access to the airport as part of a regional commuter rail system being developed by the Regional Transportation Authority (RTA). The RTA's proposal was submitted to voters in the spring of 1995 and was defeated. Another proposal recently advanced by a group of local business leaders explores the possibility of a rapid transit system with service to the airport.
- ◆ Increased Involvement of the Private Sector in Funding — Like other U.S. cities, state and local agencies in Seattle face funding shortfalls for major infrastructure projects. However, government officials in Washington have pioneered a mechanism for public-private partnerships which enables a private company to build a specific project using public rights-of-way and private money. The project is then "leased back" to the appropriate government agency.

Toronto, Ontario

Lester B. Pearson International Airport

The province of Ontario lies directly north of Ohio and east of Michigan, bordered by Lake Huron, Lake Erie, and Lake Ontario. The capital city of Ontario is Toronto. The total population of the Greater Toronto Area (GTA) is approximately 3.5 million and expected to grow to 6 million by 2021. The greater Toronto area is comprised of the city of Toronto plus the municipalities of Halton, York, Durham, and Peel.

The Lester B. Pearson International Airport (LBPIA) has become one of the most important air hubs in Canada handling 33% of the nation's scheduled flights, 50% of Canada's international traffic, and 40% of Canada's air cargo. The North-American Free Trade Agreement has further emphasized the need for Canada to maintain and enhance Toronto as a world class airport facility with superior access to and from it.

LBPIA is the second largest economic generator in the Greater Toronto Area, following the downtown district. The airport generates 13,750 direct and 41,250 indirect jobs throughout the province which provide \$750 million in personal income. Additionally, \$3.8 billion in revenue is collected by air industry businesses. A Toronto Board of Trade survey of over 300 of the largest privately owned firms in Toronto indicated that over 60% of the firms used the airport daily and a further 30% used the airport at least once per week.

Recently, the Ontario Ministry of Transportation sponsored a project to study the long-term transportation needs of the area surrounding the airport, and how those needs could be linked to the regional transportation network. The study resulted in the following recommendations and planning initiatives:

◆ **Express Bus Service is Preferred Alternative**

Given the proximity of the Greater Ontario commuter rail line to Pearson International Airport, many municipal officials and planners held the preconception that extending rail service to the airport would be a relatively simple addition to the existing transportation network — thereby linking the airport to downtown Toronto and the subway system.

However, upon completion of a regional study, the proposed rail spur was rejected due to its

exorbitant cost, interference with commuter service and low ridership projections. Instead, a regional "corridor" solution evolved which incorporated the use of extensive express bus service in HOV lanes which could be incorporated into the existing highway system. Then, if future growth warranted, the HOV lanes could be converted to some form of rapid transit over a thirty year period.

◆ **Staged Implementation Process**

Using current economic indicators and growth patterns, consultants on the long-term study were able to project future travel demand for the airport and the surrounding area.

Subsequently, the Transportation Advisory Group suggested a staged implementation process which would enable the populous to envision the plan for the entire transportation system, yet allow planners to make adjustments to the plan if growth patterns change.

◆ **Provincial Funding Control Increases Agency Cooperation**

All major infrastructure projects in Canada are funded by a 75%-25% match formula. Since provincial oversight agencies must approve 75% of the funding, local municipalities are generally willing to incorporate the agencies' suggestions. Consequently, when the Province of Ontario sponsored the formation of the Greater Toronto Area Coordinating Council (GTCC), local officials were quick to "jump on board" and cooperation on regional planning initiatives increased.

Washington, D.C.

Dulles International Airport, Washington National Airport

The Washington/Baltimore region is served by three airports: Dulles International Airport, located approximately 26 miles west of the Washington D.C. central business district (CBD) in Virginia; Washington National Airport, located in close proximity to downtown Washington; and Baltimore/Washington International Airport, located in Baltimore. Two of these three airports (Dulles and National) are under the jurisdiction of the Metropolitan Washington Airport Authority.

Dulles is the region's full-service domestic and international air travel hub. Air passenger traffic to Dulles International has grown rapidly in recent years. In regard to ground access, the Dulles

access highway is one of the most interesting features of the Washington airport system. Currently, the airport access highway corridor is the center of a debate over improving commuter access to Washington D.C. versus preserving ground access to Dulles.

The Washington metropolitan area is also served by Washington National Airport. National is the city's "short-haul" air travel facility. Business travelers (staying in the area two nights or less) comprise 62% of National's business. Surveys indicate, of the three regional airports, National is generally preferred by travelers who are not local residents. Metrorail, the area's rail transit system, currently takes passengers to within 1500 feet of the main terminal and accounts for almost one-tenth of total ground arrivals at National. When construction is completed on a Metrorail station connected to the renovated north terminal by 110 feet of moving walkways, ridership on Metrorail is expected to rebound and then surpass its previous modal share of 15%.

Metrorail Links Washington D.C. to National - National has a higher percentage of passengers using transit for airport access than any other airport in the U.S. Transportation experts attribute this success to the ability of the system to link a major air traveler market to its origin/destination. Use of metrorail is further facilitated by the proximity of the airport to downtown which keeps travel times short.

- ◆ **Airport Authority Operating and Improving Ground Access Services - In 1989, the Metropolitan Washington Airport Authority reclaimed operational control of the Washington Flyer. Now, having brought the Washington Flyer back from the brink of financial insolvency, the Airport Authority is taking aggressive marketing measures to determine customer needs and develop the system into a significant component of ground access to both airports — especially Dulles. One proposed innovation is door-to-door van service for air travelers.**

- ◆ **Federal Involvement Expedited Access at Dulles - During the airport planning process, access to Dulles' remote location was a key issue. When proposals to re-route planned state and federal highways near the new airport proved unworkable, airport officials opted to include construction of a dedicated access highway as part of the airport development project. Right-of-way for the entire 17-mile highway was secured with the assistance of FAA transportation experts and funded with FAA monies as part of the development program.**

- ◆ Access Drove Dulles' Growth - When Dulles opened in 1962, it was in a remote location accessed by secondary roads. Thus, airport officials cited poor access as a contributing factor to sluggish growth at the Dulles airport. From 1962 to 1983, annual enplanements hovered around 1 million passengers. But, once the highway link to Washington D.C. was completed, the growth of the airport and the surrounding region boomed. From 1982 to 1987, annual enplanements increased from one million to over five million.

- ◆ Preservation of Ground Access to Dulles - Currently, planners are struggling to accommodate other constituencies within the airport corridor without eroding the system's ability to serve air travelers efficiently. However, proposed rail alternatives to serve commuter needs in the airport transportation corridor have been deferred. Instead, studies suggest enhanced bus services should be used to take advantage of the access highway asset without requiring an inordinate amount of resources or reducing the efficiency of the corridor for airport access.

CHAPTER TWO, PART 2

CASE STUDIES OF AIRPORTS

William B. Hartsfield International Airport Atlanta, Georgia

General Description of Metropolitan Area

The Atlanta metropolitan area incorporates seven different counties. Population is predicted to be 3.2 million by the year 2000. Growth over the last ten years has occurred primarily to the north of the central business district towards the counties of Cobb and Gwinnett.⁶ Consequently, Atlanta has become a city of many downtowns oriented around the automobile and suburban concentrations of office buildings and shopping malls. Local planners see no end to the outward momentum for the foreseeable future. However, the central downtown core has been revitalized to some degree and remains a highly desirable/high profile business location.

The city of Atlanta's current population is 394,017 in an area of 131 square miles which equates to a density of 3,008 per square mile. However, 1,444,109 people are employed in the Atlanta metropolitan area — resulting in heavy daily commute traffic.⁷

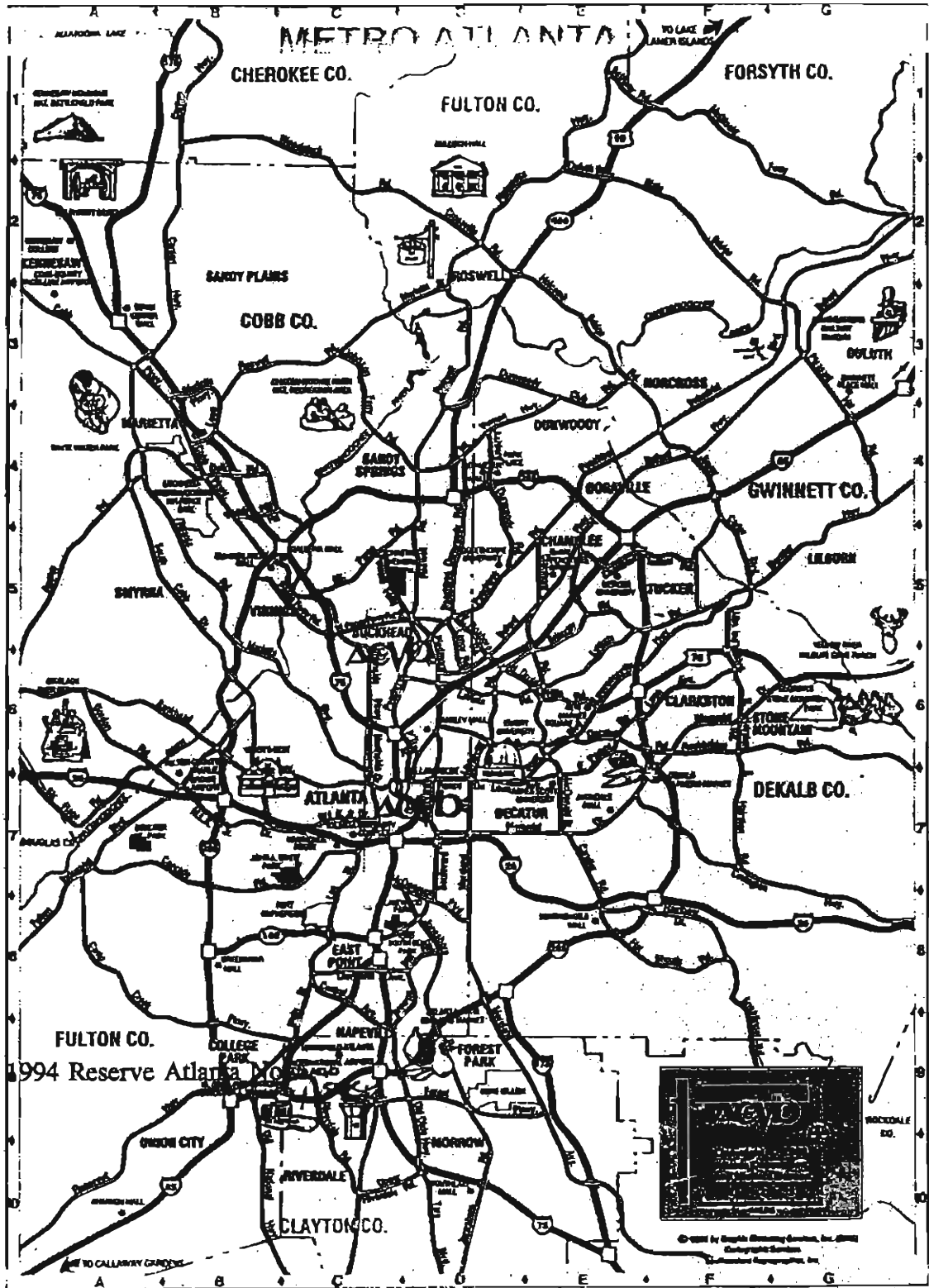
Hartsfield International Airport

Hartsfield is the fourth busiest airport in the world in terms of total passengers, and in the top ten airports in terms of cargo handled. Located just ten miles southwest of the central business district, (See Map 1) Hartsfield employs 38,000 people and contributes an estimated \$7 billion annually to Atlanta's economy.⁸

⁶ "Grow Now, Worry Later," Planning, April 1989, p.20-26.

⁷ World Almanac 1993

⁸ Transportation Report, Atlanta Chamber of Commerce, May 1989.



Winter 1994 Reserve Atlanta No.

Hartsfield boasts a passenger terminal complex designed to comfortably accommodate 55 million passengers a year. Both Hartsfield and DIA were designed on the separated landside/air side concept that originated in Tampa.⁹

In April 1994, a new runway, an international concourse (24 gates), and cargo a facility (400,000 sq. ft.) were scheduled to open. The new facilities are expected to enable Hartsfield to increase flight operations to 907,000 per year. By the year 2000, Hartsfield expects to be handling 63 million passengers each year.¹⁰

Ground Access

Transportation planners for the Atlanta region regard highway access to Hartsfield as excellent. Unlike other U.S. cities, roadway capacity is sufficient to handle projected traffic flows into the next decade; and, the physical condition of the area's highways is generally good.¹¹ Consequently, the private automobile is expected to remain the predominant mode of transportation to Hartsfield. Interstates 85 and 285 offer direct access to the airport via eight driving lanes for quick drop-off, pick-up and curbside baggage check (See Map 2).

Normally, there is ample parking in the four lots adjoining the terminals (18,000 parking spaces). However, as Hartsfield's origin/destination characteristics have changed, the airport is starting to experience parking problems. When Hartsfield first opened, approximately 75% of air travelers were arriving from connecting flights and only 25% had origins in the Atlanta region. Now the mix is approximately 60% from connecting flights and 40% arriving at Hartsfield by various ground access modes, predominately private automobiles. Consequently, airport officials are investigating park-n-ride options.¹²

⁹ "The Denver Airport, Managing a Megaproject," Civil Engineering, May 1993.

¹⁰ "Hartsfield, Big, Getting Bigger," Air Transport World, September 1992.

¹¹ Focus Group, Atlanta, GA: July 1994.

¹² Focus Group, Atlanta, GA: July 1994.

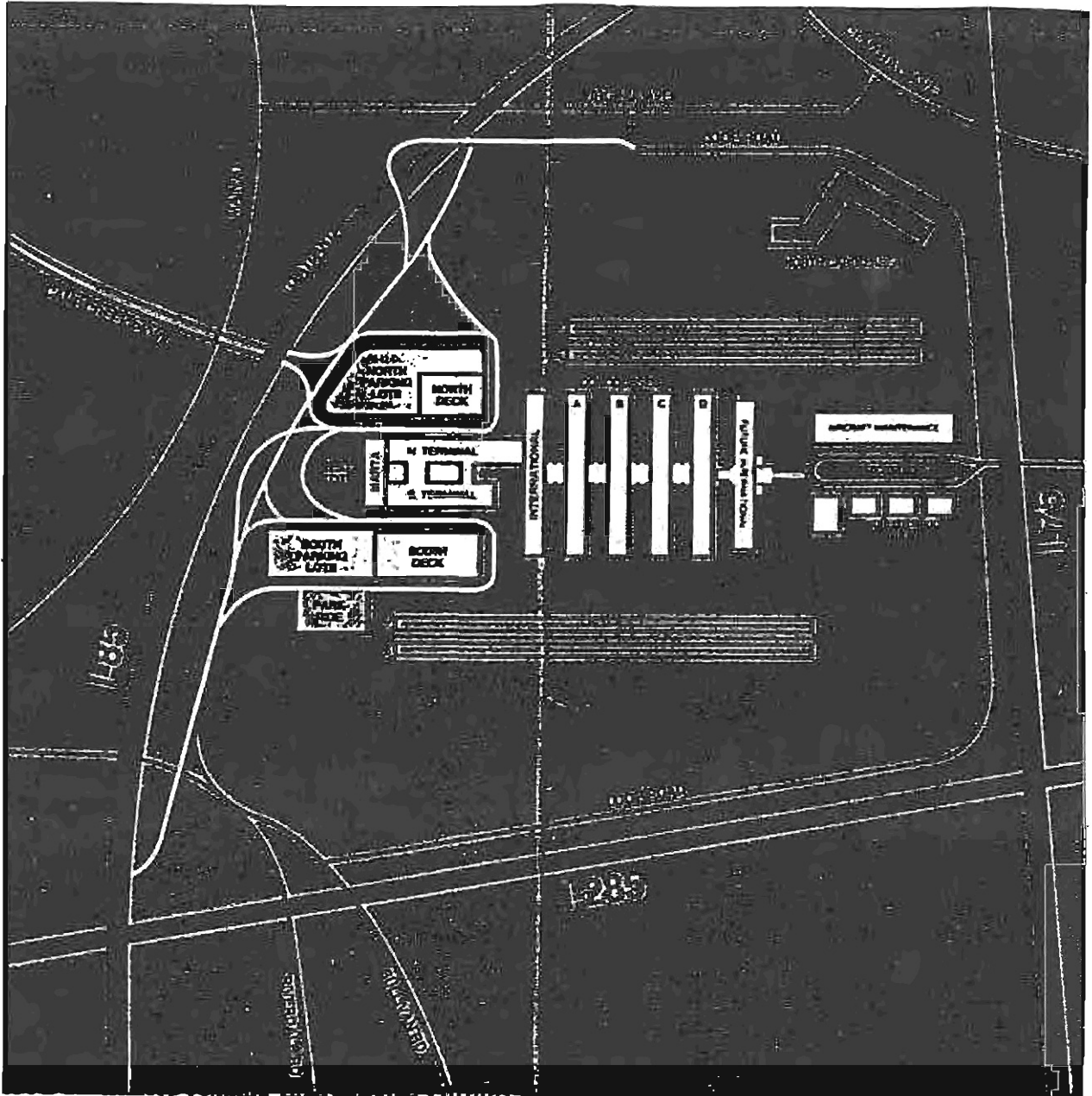
Taxi and shared-limo services are readily available. Taxis are licensed by the City and metered. Shared-limo services run daily at regular intervals to downtown, midtown, and outlying Atlanta metro areas, stopping at all major hotels. Free shuttles service all airport hotels.

Public bus service is almost non-existent. The Metropolitan Atlanta Rapid Transit Authority (MARTA) operates one bus route to the airport park-n-ride lot located at Aviation Boulevard and I-75. An airport shuttle service runs from the parking lot to the terminal every 10-15 minutes. Otherwise, there is no bus service directly to the terminal except by private charter. Private charter buses represent an extremely small percentage of the ground access modes to Hartsfield.

In addition to rubber-tire modes, Hartsfield International is also accessible via the MARTA heavy rail. An in-depth description of this rail is provided in the next section of this report. A summary of ground access to Hartsfield is presented in Table 1, followed by a break-down of modal shares in Table 2.

Table 1: Ground Access

Distance to CBD	10 miles
Travel time to CBD by auto, taxi, or shared van	25 minutes during Peak 15-20 minutes Off-Peak
Cost of taxi to CBD	\$18-\$20
Cost of shared-limo to CBD	\$8
Travel time to CBD by MARTA	15 minutes
Cost of MARTA rail to CBD	\$1.25
Parking at Airport	Hourly \$1/hr. Daily \$12/day Economy \$4/day



1992 Hartsfield Atlanta International Airport Information

Table 2: Modal Shares for Originating Passengers¹³

Private Automobile	59.9%
Rental Car	14.7%
Courtesy/Shared Van/Limo	12.8%
Taxi	7.4%
MARTA rail/bus	5.2%

Airport Access by Rail

MARTA (Metropolitan Atlanta Rapid Transit Authority) is metro Atlanta's public transit system. It currently extends from the CBD only as far out as the I-285 beltway. (See Map 3) MARTA service from the airport to downtown operates every eight minutes. The airport MARTA station is located at the west end of the terminal complex, near other ground transportation services. MARTA is very convenient to most of Atlanta's major downtown employment centers. For example, a MARTA station is within walking distance of Peachtree Center and the Georgia World Congress.

Funding the MARTA Rail System

Created by an act of the Georgia General Assembly in 1965, MARTA's jurisdiction covers five counties: Gwinnett, Cobb, Fulton, DeKalb, and Clayton. Initially, MARTA operated solely as a bus system — taking over the routes and merging the systems of Fulton and DeKalb counties.¹⁴

In a 1971 referendum, voters in only two of the counties - Fulton and DeKalb - approved a 1% sales tax to support MARTA operations and finance construction of a 53-mile rail system complementary to the existing bus system. At the time the referendum was passed, the entire 53-mile rail system was mapped out, including the south line with its connection to the

13 Data from January 1988 Passenger Survey, Hartsfield International Airport, reported in the Ground Transportation Improvement Study Draft Report (Part 1), August 1994, page 6, table 1.

¹⁴ Transportation Report, Atlanta Chamber of Commerce, May 1989.

airport.¹⁵ Thus, there was no specific funding process related to the completion of the MARTA line to Hartsfield International Airport.

MARTA rail commenced operations to the airport in June of 1988. The MARTA station at the airport was incorporated into the blueprints for the new terminal in 1981-82. Consequently, all costs of the station were absorbed by the airport when the terminal was built. The MARTA extension line was relatively inexpensive since the right-of-way protected under the original referendum was already in place and existing track was salvageable. Only a small portion of track actually needed to be constructed.¹⁶

The entire MARTA system has been built gradually as sales tax revenues increased and funds became available. Between 1989 and 1996 several segments of the original planned system are scheduled for completion. One of these segments, a section of track scheduled for completion in 1996, will connect to the I-285 beltway to the north. This line is expected to increase the use of MARTA as an access mode to the airport, as a significant portion of air travelers originate from northern suburbs of Atlanta. To serve this market, MARTA officials are assessing air traveler's requirements for park-n-ride facilities at a "test" site on the east line.¹⁷

Models and Decision Tools Employed

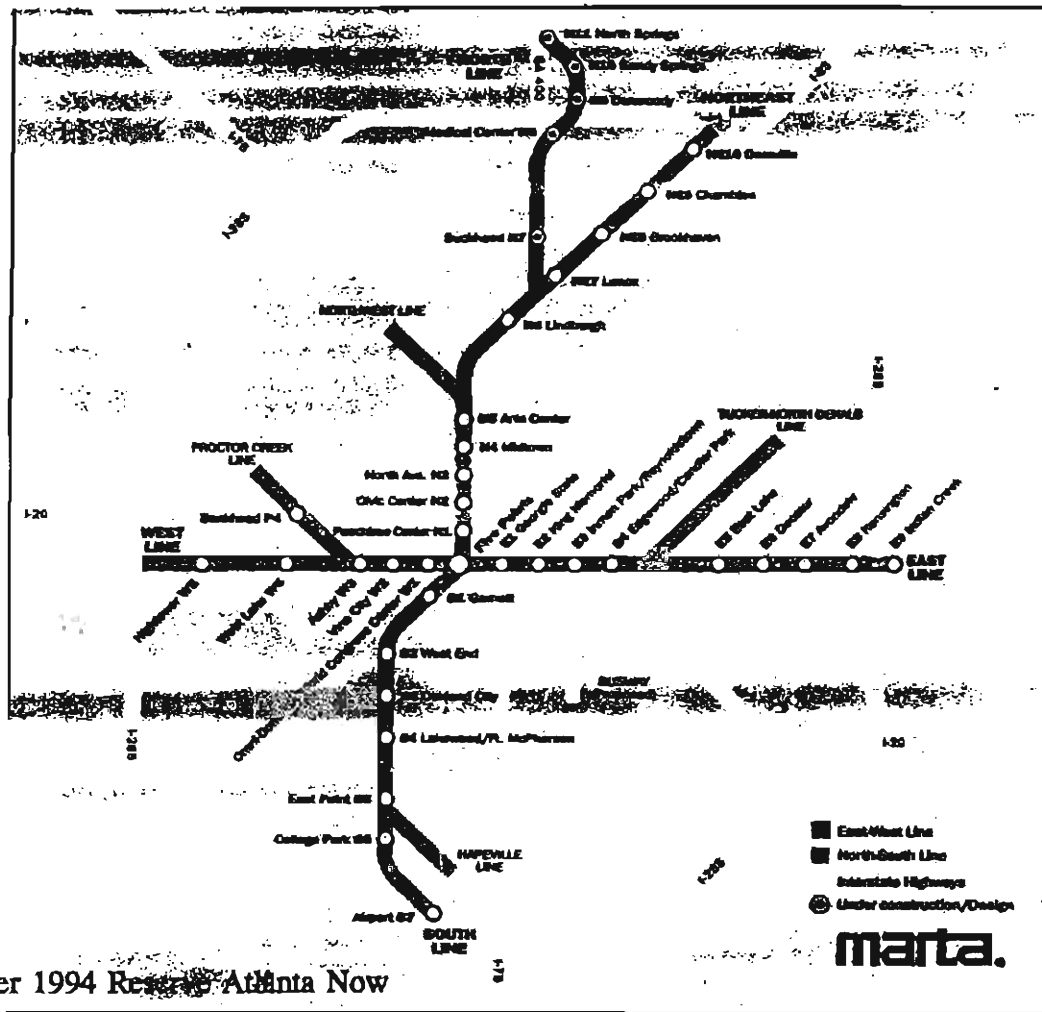
Since the Environmental Impact Statement (EIS) for the MARTA system was undertaken in the 1970's, a "standard" alternatives analysis was employed. Although mode split projections were developed during the EIS process, transportation officials believe the overriding factor for approval of the system was political support.¹⁸

¹⁵ 2/16/94 Interview with Bob Radicks, FHWA - Atlanta.

¹⁶ 2/16/94 Interview Gerald Pacauchi, Director of Transportation Planning, MARTA.

¹⁷ Focus Group, Atlanta, GA: July 1994.

¹⁸ 2/16/94 Phone Interview with Bob Radicks, FHWA, Atlanta.



Winter 1994 Reserve Atlanta Now

Officials indicated the business and political leadership of Atlanta has a tradition of creating a vision for the Atlanta region and pursuing that vision regardless of whether quantitative transportation data completely support it. It is this political motivation which led to the infrastructure components required to move Atlanta from a major southern city, to the predominant city in the southeast, to a national economic force, and finally, with the Olympics, to an international contender.¹⁹

In the future, Atlanta area transportation officials expect to remain in their role of providing technical advice to support the political process. However, under ISTEA, technical support staff will have to account for additional factors and provide information regarding modal tradeoff. Since existing modeling techniques have proven inadequate, the Atlanta Regional Commission (ARC) is currently undertaking a major revision of their models in order to incorporate additional variables and iterative inputs.²⁰ In addition, the Atlanta Regional Commission is evolving into a key player for the coordination of regional Inter-modal planning under the influence of the ISTEA legislation.

Ridership on Airport Rail

In May 1988, prior to the opening of the MARTA airport station, a consulting company was hired to determine interest among target groups, identify key factors to address in promotions, and obtain a potential user profile. The survey results were broken down by target group:

- The results for Airline Passengers showed that prospects for the new MARTA service consisted of 60% residents of Georgia and 40% visitors to Georgia. Over three fourths of the sample were business travelers, slightly more than 50% were 25-44 years old and 60% of the respondents were men. The greatest percentage of airline passengers (36%) using MARTA would come from Fulton County.
- For Air Passengers, convenience was perceived as the most important service variable. Avoiding traffic was the top-ranked advantage. Handling luggage was the disadvantage mentioned most.

¹⁹ Focus Group, Atlanta, GA: July 1994.

²⁰ Focus Group, Atlanta, GA: July 1994.

- The 1988 results for Airport Employees found that 42% of concession workers would "very likely" use MARTA. The primary reason for using MARTA rail to work was convenience. About half of the employees mentioned concerns with leaving their car at a MARTA lot. Inconvenient rail/bus connections and the time required to complete a one-way trip were also cited as reasons for not using MARTA rail.²¹

In 1990, after MARTA rail to the airport had been in operation for about a year and a half, MARTA's average weekday ridership to the Airport station was 9,200 passengers.²² A follow-up study was done to obtain a demographic profile of the airport rider, examine riders' motivations for using MARTA rail, and evaluate the perceived quality of MARTA service.

- Survey results for the MARTA Airport Rail Passenger Profile study showed the majority (57%) of airport rail passengers are air travelers. Of those air travelers, 60% are making business related trips and 63% of all air travelers reside in cities outside of Georgia. These travelers are predominantly white males and they generally seek destinations downtown or in the north Atlanta area such as Buckhead, Lenox and Perimeter.
- Airport employees were the second most frequent users of the rail service (22%). This group of riders consisted primarily of residents from Fulton and DeKalb counties. Over 75% of the employee rail passengers are black, and males account for the largest segment of this group.²³

The 1990 Airport Rail Passenger Study concluded the airport rail service provides a convenient transportation alternative to and from Hartsfield for visitors from other cities with business in metropolitan Atlanta, and residents of DeKalb and Fulton counties. These findings were somewhat different from the projections of the 1988 study which indicated the largest number of air travelers using MARTA would be residents in the Atlanta area.

²¹ Airport Rail Passenger Study, MARTA Division of Planning and Policy, July 1990.

²² Airport Ground-Side Access Study: A Brief Overview of Seven Cities with Rail Access from Downtown to the Airport, UMTA Office of Planning, April 1991.

²³ Airport Rail Passenger Study, MARTA Division of Planning and Policy, July 1990.

MARTA officials conclude the relatively limited use of the MARTA system by residents of Georgia results from a majority of the air travelers residing outside the MARTA service area in Gwinnett and Cobb counties.²⁴

Future Transportation Projects

The Georgia Department of Transportation (GADOT) is embarking on an ambitious plan to install what officials are calling the nation's first fully integrated, computerized transportation management system. The project is unusual in scope as it attempts to link five counties and six independent cities. Combining smart technology such as video cameras, traffic sensors, sign boards, and software, the system will enable traffic managers to send and receive information through a networked system in near-real time.²⁵

While the proposal for the system originated with the City of Atlanta in 1986, funding was not secured until Atlanta bid for the Olympics. In 1991, the successful Olympic bid focused attention on Atlanta. The GADOT took the city's plan, made some updates, added regional/statewide focus, and took it to Congressman John Lewis who was able to get a funding designation of \$58 million as part of the ISTEA legislation. Local funds of \$12 million followed.²⁶

A component of the system will link the airport to highway information. The vision is a two-way kiosk system which will enable air travelers stepping off the plane at Hartsfield to access highway congestion, travel times, and suggested travel routes — from kiosks located throughout the airport. In return, transportation planners hope to link into several major airlines' computers in order to provide flight information to kiosks located at visitor impact locations such as Olympic venue sites, the GA World Congress, Peachtree Center and Georgia Welcome Centers.

²⁴ Focus Group, Atlanta, GA: July 1994.

²⁵ "Atlanta to Install First Smart Highway System," Engineering News Record, April 26, 1993.

²⁶ 3/28/94 Interview with Randy Bundy, City of Atlanta Traffic Planning.

Baltimore-Washington International Airport Baltimore, Maryland

General Description of the Metropolitan Area

Baltimore's 1990 census population was 736,014, ranking it as the nation's 13th largest city. It is also one of the most densely-populated cities in the U.S., with 9,200 people per square mile. The city's population declined slightly between 1980 and 1990; however, the Baltimore-Washington metropolitan statistical area (MSA) - the nation's fourth largest - grew more than 16% during the same period (to 6.73 million persons).²⁷

The Washington/Baltimore region is served by three airports: Dulles International Airport, located approximately 26 miles west of Washington, D.C. in Virginia; Washington National Airport, located in close proximity to downtown Washington; and Baltimore-Washington International Airport (BWI), located 10 miles south of Baltimore's central business district (CBD) (see Map 1). Because of the close proximity of the three airports, transportation planners often consider them jointly as a "system" serving the Baltimore-Washington corridor. This study focuses on BWI, giving separate consideration to its particular issues and elements.

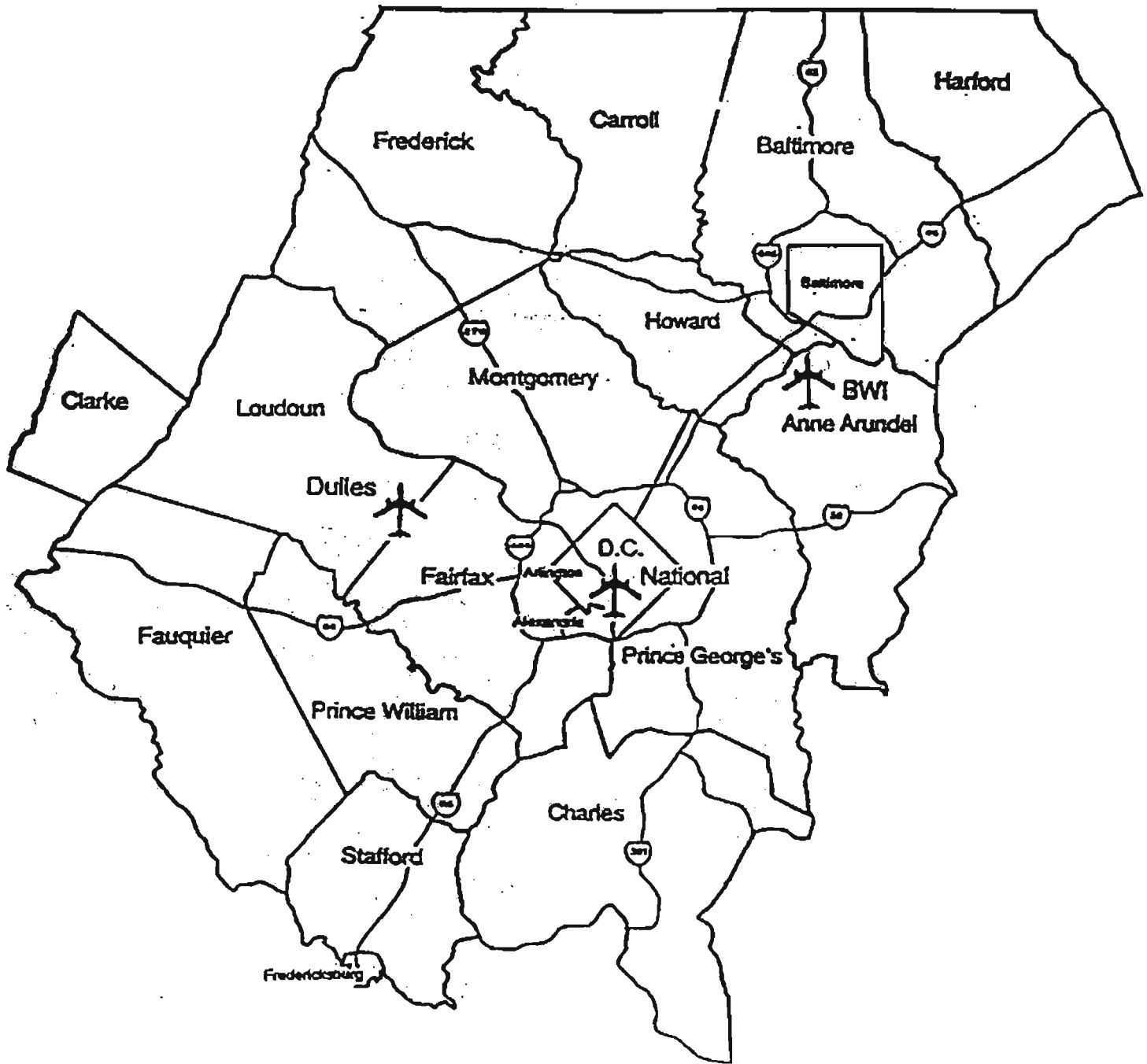
Baltimore-Washington International Airport (BWI)

Passenger traffic at BWI has more than doubled since 1982. In 1992, BWI enplanements totaled 4.4 million; representing a slight decrease since 1987's figure of 4.52 million. BWI's traffic currently represents approximately one-fourth of the total airport traffic in the Baltimore-Washington corridor.²⁸ Annual enplanements at BWI are expected to reach 7.7 million by 2005, an increase of more than a third from current estimated levels. This rapid

²⁷ World Almanac, 1994.

²⁸ Metropolitan Washington Council of Governments, et. al. 1992 Washington-Baltimore Regional Air Passenger Survey (Volume I: Principal Findings), Table 1.

The Washington-Baltimore Region



growth is predicted to result from an increasing share for BWI of the Baltimore/Washington air travel market, as well as a general increase in air traffic.²⁹

BWI is accessed by a variety of roads and highways, including three interstate highways (I-95, I-97, and I-695), four state highways (Maryland 162, 170, 295, and the new Maryland 100), and Andover Road. In 1990, a four-mile extension connecting BWI to I-95 (named I-195) was completed, creating convenient travel for passengers and BWI employees to the airport by circumventing all traffic signals. In addition, light and heavy rail networks pass in close proximity to the airport grounds. Passengers can travel by the Central Light Rail Line (CLRL) to a point (Ferndale Station) approximately three miles from the airport, transferring to a public feeder bus to complete the trip.

Perhaps the most salient feature of the Baltimore airport access situation is the region's current investment in light rail access to BWI. Officials have approved a 2.4-mile extension from the CLRL line to the airport terminal at a cost of \$29.9 million (approximately 6.6% of the \$450 million total cost of the CLRL). After its completion, the new airport extension is expected to serve 2,800 passengers per day (more than one million per year) by 2005; of these, 1,650 daily passengers (602,250 per year) will be bound directly to or from BWI. This would give BWI a light-rail modal share of nearly eight per cent, one of the highest rail-access shares among U.S. airports.³⁰

Modal Shares

Currently, nine out of every ten local-origination trips to BWI are by private auto, rental car, or taxi, leaving only a small portion for transit.

Table 1 details the share of locally-originating trips to BWI for each of several modes of access. Since Baltimore's existing light rail line was not completed until 1993,³¹ the impact of

²⁹ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, Pg. 1-2.

³⁰ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

³¹ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of

the new rail system is not reflected in Table 1. The data is the result of passenger surveys conducted in 1982, 1987, and 1992. Initial ridership figures for the first year of operation of the existing light rail system are not yet available.

Table 1³²
BWI Modal Split

MODE OF ACCESS	1982	1987	1992
Private car	75%	65%	64%
Rental car	11%	17%	17%
Taxi	6%	10%	7%
Rail Service	0%	0%	1%
Airport Bus/Limo	5%	5%	7%
Hotel/Motel Courtesy Bus	1%	2%	4%
Other	1%	1%	1%
TOTAL	100%	100%	100%

Note: Totals may not add, due to rounding.

Airport Ground Access - Overview

The Baltimore-Washington corridor, centered around I-95, is heavily congested. Once a rural area, the corridor is now populated by some residential and many commercial/ industrial developments. For example, Westinghouse operates a major facility in the corridor, very near BWI.³³ In addition, travel between Baltimore and the nation's capital has become extremely popular, blurring the boundary between metro-Baltimore and metro-Washington to the extent

the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, p. 1-1.

³² Metropolitan Washington Council of Governments, et. al. 1992 Washington-Baltimore Regional Air Passenger Survey (Volume I: Principal Findings), May 1994 Draft, page 22.

³³ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

that the two cities are often considered together.³⁴ Over the years, other thoroughfares have been added to the corridor in an effort to abate the effects of congestion on I-95, and to serve other points within the corridor. BWI is located south of the city, squarely in the corridor on the Baltimore end (See Map 2). Though some experts argue that the corridor would be heavily congested without the additional traffic attributed to BWI, the airport is generally seen as a major focal point of corridor traffic.³⁵

The heavy congestion in the Baltimore-Washington corridor is a primary motivator for improvement of transit access to BWI. Planners are interested in providing transit alternatives for BWI access in an effort to reduce congestion on nearby highways and in airport parking lots. For example, light rail stations serving the airport will be built without automobile parking, with all passengers arriving on foot or by public bus. Planners do not expect the resulting bus traffic to make a measurable impact on local roadway traffic.³⁶

Historically, travel within the booming corridor has followed a north-south pattern almost exclusively, while east-west travel has been difficult.³⁷ To improve east-west access within the corridor, officials have approved new construction for Maryland Route 100, which will result in a four-lane east-west highway running south of BWI. Improvements to this highway are in the final design stages.³⁸

³⁴ World Almanac, 1994.

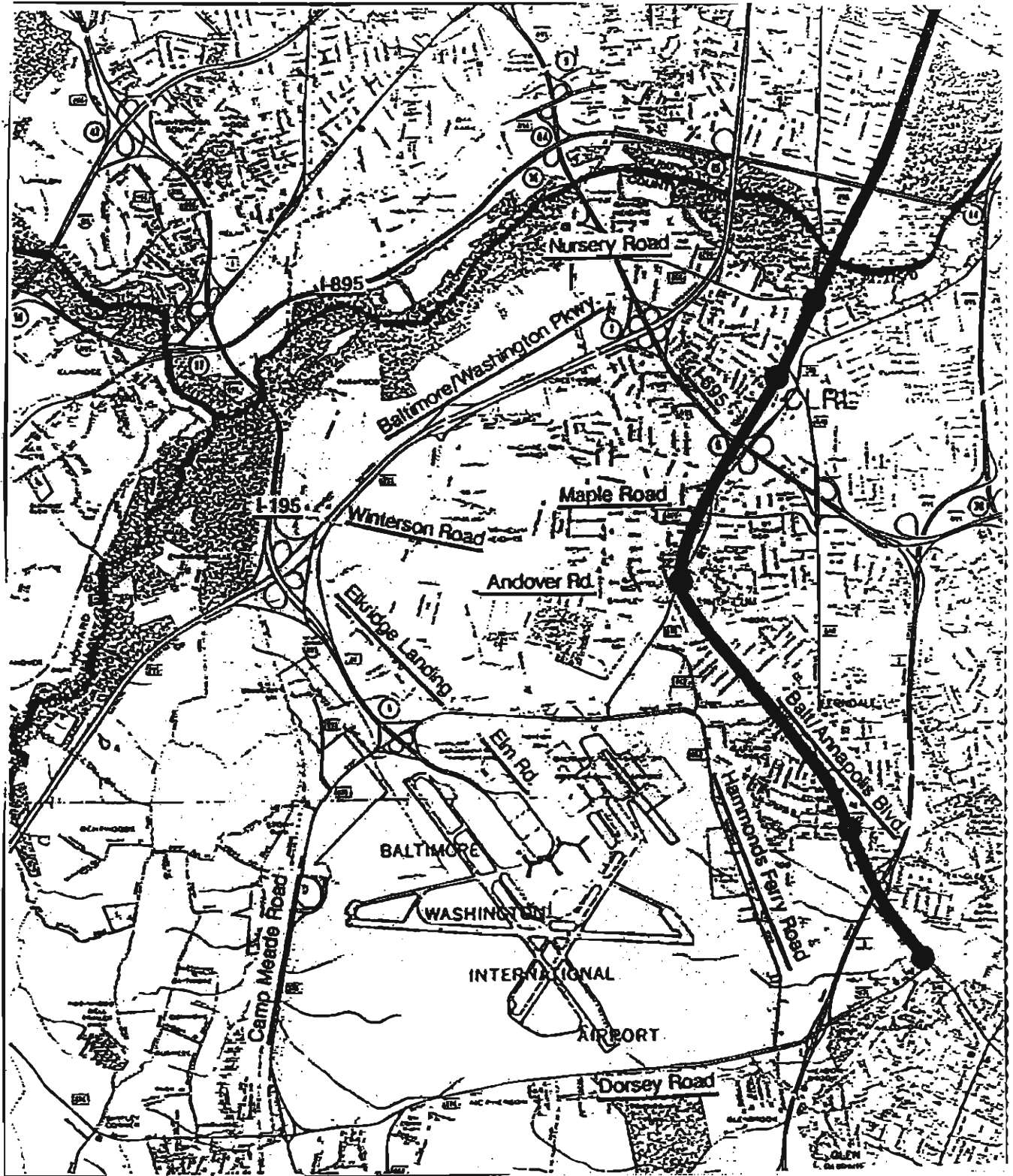
³⁵ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

³⁶ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, P. S-8.

³⁷ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

³⁸ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, P. 1-3.

Map 2



Four elements of the BWI access situation merit study:

- Decision processes and models used to create transportation plans
- Funding systems relevant to transportation and airport access
- The proposed rail extension to serve BWI
- How BWI fits into the macro-market which includes Washington, D.C.

Each of these will be examined in detail.

Decision Processes and Models

Baltimore planners work within a government structure which helps facilitate inter-agency cooperation, which is a major aid to transportation planning. Transportation planning, while impacted by a variety of government agencies, is generally centralized with the Maryland Department of Transportation (MDOT). Within MDOT, the state's Mass Transit Administration (MTA) handles programs of particular relevance to airport access.

MTA officials acknowledge the need for cooperation among jurisdictions, particularly the state's 23 counties and the city of Baltimore. However, the state includes only a few minor jurisdictions (such as townships) which might interfere with the transportation planning process. Once consensus is reached among counties (and, particularly, among the "Big Seven" counties around the Baltimore-Washington corridor), that consensus significantly influences statewide transportation planning. Because the state enjoys a strong executive form of government, consensus on key issues is often relatively easy to achieve. MTA officials see airport access as a priority, and it enjoys favorable status in the planning process.³⁹

Planning generally proceeds in a general-to-specific fashion. Baltimore planners begin by creating system-wide macro plans, from which come plans for specific projects which support the master plan. These projects are then planned in greater detail, and the process ends with the funding of selected projects. Many projects currently underway or under consideration originated as elements of a master plan for BWI formulated in 1987.⁴⁰

³⁹ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

⁴⁰ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

To support decisions (such as the decision to proceed with construction of the 22-mile, \$450 million Central Light Rail System), local officials pursue program selection and implementation by means of a process which examines alternatives in light of several quantitative and qualitative models. This process has resulted in the decision to build the BWI light rail extension.⁴¹

Quantitative models have included a variety of measures designed to assess the proposal's likely effectiveness. These include system ridership forecasts and impacts, new (marginal) daily ridership, airport trips served, and income-levels of likely riders. Officials also used quantitative models to assess service impacts, including travel time savings, impacts on service reliability, and impacts on peak-time transit. Finally, quantitative models were used to assess financial feasibility and cost-effectiveness.⁴²

Officials also used a variety of qualitative models to assess the impact of the new BWI light rail spur. These included maintenance needs, transportation impacts, parking impacts, and effects upon neighborhood/community characters, visual/aesthetic qualities, noise/vibration, ecosystems, water resources, historic resources, safety/security, and other environmental elements.⁴³

Three alternatives were examined in the decision process. These included a "no-build" alternative (maintaining the current system and resources already committed), a Transportation System Management (TSM) alternative (aimed at augmenting the effectiveness of the existing system by adding low-cost elements), and the locally-preferred alternative of adding the BWI

⁴¹ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement.

⁴² U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, pp. S-13, S-14.

⁴³ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, pp. S-6 - S-12.

extension to the CLRL line. Each alternative was evaluated against the variety of quantitative and qualitative models, and were submitted to public scrutiny in a series of meetings with constituents, businesses, and community groups.⁴⁴

Evaluation of Alternatives

Alternatives were evaluated using five basic criteria:

- Attainment of local goals and objectives
- Calculations of cost-effectiveness indices (efficiency)
- Equity considerations
- Financial feasibility
- A trade off analysis to be used for decision making

Six local goals/objectives were established, including optimization of public investment, increasing transit usage, minimization of adverse environmental impacts, enhancement of mobility, encouragement of private investment and orderly growth patterns, and minimization of constraints to implementation.

Efficiency was evaluated on the basis of three primary constructs: ridership, service, and traffic operations.

Each alternative was also examined in terms of equitable distribution of resources. In analyzing these equity issues, evaluators focused on three primary issues: the extent to which transit improvements served particular segments of the population (particularly those which are transit-dependent), even distribution of costs across the population, and the incidence of any significant environmental impacts.

A quantitative cost-effectiveness model examined alternatives in terms of effective use of resources (capital and operations/maintenance costs) in garnering new riders. The model

⁴⁴ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, pp. S-4 - S-5. This was also explored in Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

included an attempt at quantifying the value of improved service to new and existing riders, and resulted in a calculation of the cost of new riders gained for each alternative.

Finally, a full financial analysis of the alternatives attempted to determine what "trade-offs" would result from adoption of various courses of action. This analysis incorporated data from the preceding analyses, and ultimately led to the selection of the locally-preferred alternative.⁴⁵ Transportation planning in Baltimore is somewhat unique because of the "multi-modal approach" used in the planning process, as well as the clear line of communication and command between policy makers and planners at MDOT.⁴⁶

Funding

Transportation programs are implemented in Baltimore on the basis of competition for a significant (but limited) pooled funding resource. MDOT gathers revenue from a variety of sources (including bonds, taxes, and fareboxes), and incorporates the money into a centralized Transportation Trust Fund (TTF). This money is not sub-allocated by mode, but is allocated to projects based upon relative merit. The effect is that administrators design projects based upon need, then compete for funding by "selling" their programs to the political apparatus. There is no set formula for awarding funding to projects; each project is reviewed on its own merits in terms of satisfaction of objectives, feasibility, and technical merit.⁴⁷

MTA operates as a "toll authority," collecting substantial revenues from such programs as Maryland's statewide commuter rail system (which includes heavy rail service to points as far away as the West Virginia border). Money can often be reallocated from this fund to support new projects, as was the case with BWI's new international terminal and the light rail project.⁴⁸

⁴⁵ Information for the Evaluation of Alternatives section was taken from U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, Chapter 6.

⁴⁶ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

⁴⁷ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

⁴⁸ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

The TTF is divided into a variety of categories for the purpose of determining reallocation of funds. In most categories, 30% of the TTF funds are returned to transportation needs of local governments, and MDOT retains 70% for its requirements. In some categories, MDOT retains 100% of the existing funds.⁴⁹

This funding system creates a cyclical problem in providing funds for new projects. In some cases, revenues do not keep pace with inflation and increases in operating costs. Once disbursements are made to cover operations and debt service, few funds remain for new projects. For this reason, the TTF needs an infusion of funds roughly every five years in order to support new projects. This cyclical need creates pressure to select projects with discretion, especially in the area of airport access. MDOT officials appreciate the need for adequate access to BWI, but it is incumbent upon planners to make their case strongly when the time comes for requesting new funds for projects. Officials attempt to present the "statewide need" of airport access projects, and endeavor to point out how airport access serves as an "economic engine" to the flow of commerce in Maryland. They are generally successful in gaining support for important projects.⁵⁰

The BWI Light Rail Extension

The BWI extension from the CLRL has been approved, and is expected to be completed in 1995. As a result of applying to the Federal Transit Administration (FTA) for assistance, federal funds are expected to provide 78% of the funds needed to build the BWI extension and provide three rail vehicles for operations. These funds will also cover two other approved extensions from the system. The total cost for the BWI extension and vehicles amounts to \$35.3 million. While the federal share of funding for the extensions is high, the FTA's share of funding for Baltimore's entire rail project amounts to only 17%.⁵¹

⁴⁹ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

⁵⁰ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

⁵¹ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, S-14.

Constituent support for rail proposals is often hard to come by, especially in comparison to public support for proposed highway improvements. However, the CLRL rail system within the Baltimore-Washington corridor serves passenger needs other than those relating to BWI. The corridor area is booming in terms of commercial and industrial development, and commuter traffic is heavy. Because the rail system will primarily serve commuter needs, public support for the proposed augmentation of the system is generally strong.⁵²

Even so, planners acknowledge that transit's share of airport modal access will ultimately be low. This does not diminish the value to the populace of the rail system, which serves more than a transportation need: social, environmental, economic, and land-use functions are also served by the new rail system.⁵³

BWI's Role in the Baltimore-Washington Market

In many ways, planners see BWI as a competitor of the metro-Washington airports (Washington National and Dulles International Airports).⁵⁴ Within the area, airports compete on the basis of accessibility and quality of air service, and BWI made gains on Dulles and Washington National airports (especially in accessibility) between 1982 and 1992.⁵⁵

BWI's share of the total air travel patronage in the region increased from 20% to 26% between 1982 and 1987; that share remained fairly constant, dropping to 25% by 1992. It is interesting to note that BWI's share of connecting passengers is declining, but that its share of the region's locally-originating passengers has risen since 1982. BWI still services a third of the region's connecting passengers.⁵⁶

⁵² Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

⁵³ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

⁵⁴ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

⁵⁵ Metropolitan Washington Council of Governments, et. al. 1992 Washington-Baltimore Regional Air Passenger Survey (Volume I: Principal Findings), P. 11.

⁵⁶ Metropolitan Washington Council of Governments, et. al. 1992 Washington-Baltimore Regional Air Passenger Survey (Volume I: Principal Findings), Figure 2.

Traffic at BWI is projected to increase by 34% by 2005, to 7.7 million annual enplanements.⁵⁷ This projection is based on anticipated growth in air travel, along with a growing market share within the Baltimore-Washington area.

Patronage of BWI declined in recent years when USAir suffered a labor strike and scaled back its Baltimore operation. However, airport officials are making new efforts to generate patronage, as evidenced by the advent of new service (and discount fares) offered by up-and-coming Southwest Airlines at BWI.⁵⁸

⁵⁷ U.S. Department of Transportation (Federal Transit Administration) and Maryland Department of Transportation (Mass Transit Administration): Baltimore-Washington International Airport Extension of the Central Light Rail Line in Anne Arundel County: Final Environmental Impact Statement, P. 1-2.

⁵⁸ Focus Group, Baltimore-Washington International Airport, Baltimore, Maryland, June 1994.

Logan International Airport Boston, Massachusetts

General Description of the Metropolitan Area

Built up around the Massachusetts Bay at the mouth of the Charles river, the Boston metropolitan area covers approximately 78 square miles. The population in the city of Boston is 574,283, resulting in an average population density of 7,362 persons/square mile. The diverse economy includes significant sectors in services, finance, insurance, and durables manufacturing.⁵⁹

Logan International Airport

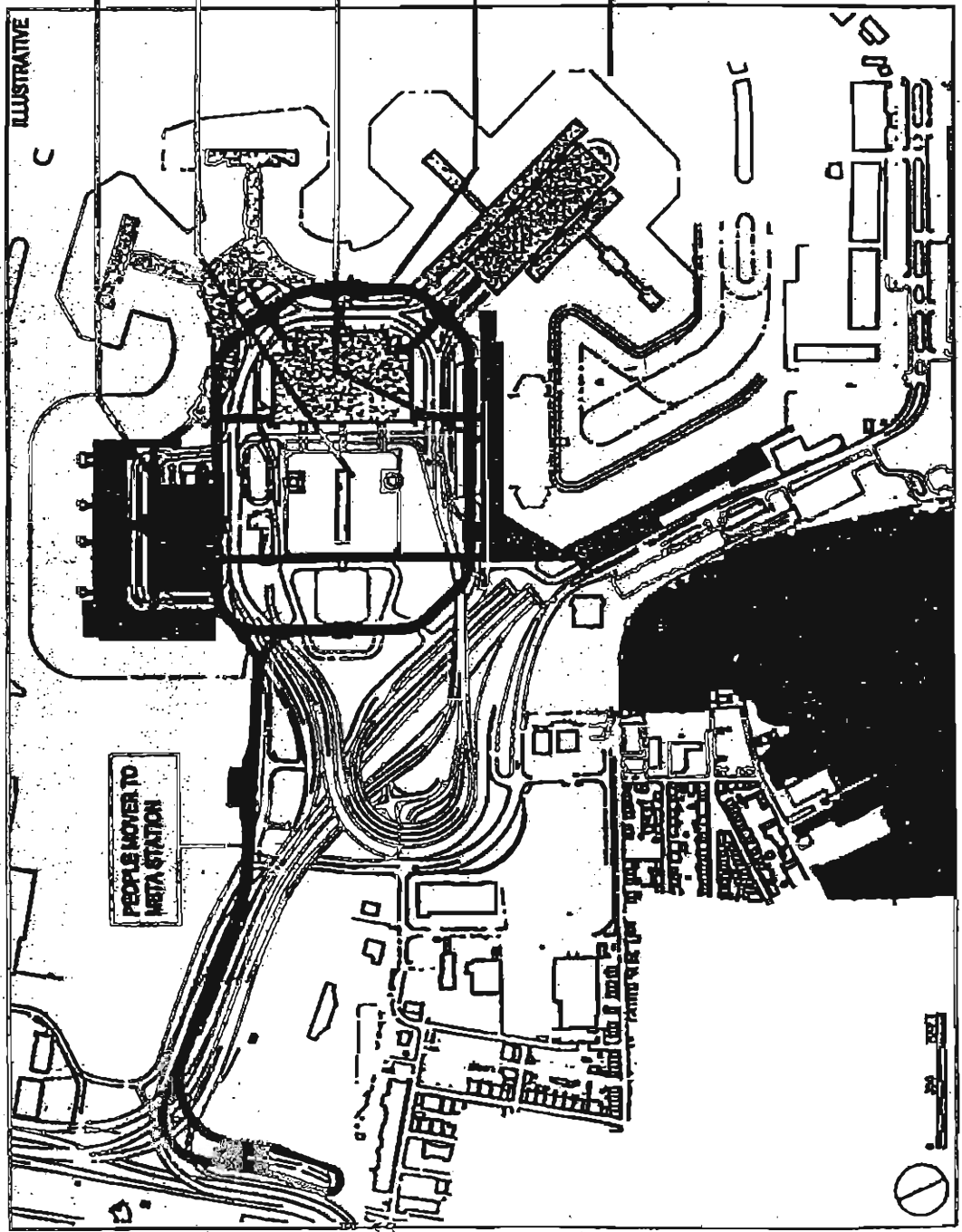
Logan International is less than three miles across Boston Harbor from the heart of downtown Boston. As the major airport in the New England region, Logan serves not only Massachusetts, but also New Hampshire, Vermont, and Maine. The airport is operated by the Massachusetts Port Authority (MASSPORT) which also operates the Port of Boston cargo and passenger terminals. In 1993, Logan handled approximately 24 million passengers. Projected growth at Logan is 5-10% per year.⁶⁰ In order to accommodate this growth, major improvements are planned for Logan under the "Airport 2000" plan. These improvements, in conjunction with revised travel demand forecasts, are expected to postpone the development of an additional airport to supplement Logan. Previous travel demand forecasts had indicated a new airport would be required by the year 2000.

Included in the plans for "Airport 2000" is the renovation of the existing terminals, construction of a new terminal, implementation of a compressed natural gas (CNG) fueling station, construction of a parking garage, activation of an automatic vehicle inventory system (AVI), and the construction of an airport people-mover (See Map 1). Significantly, four of these projects address ground access and vehicle emissions.

⁵⁹ 1993 World Almanac

⁶⁰ Interview with MASSPORT officials, Boston: July 1994.

Priority Modernization Projects



Federal Inspection Services Facility (FIS) / West Concourse

West Garage

Terminal A Replacement

People Mover

Fuel Distribution System

Map 1

Terminal A Replacement

First, airport officials want to convert airport shuttle buses and air side tuggers/carts to CNG. Once CNG vehicles are proven effective in terms of power and operating costs, airport officials hope to convince hotel shuttles and rental car courtesy vans to convert to

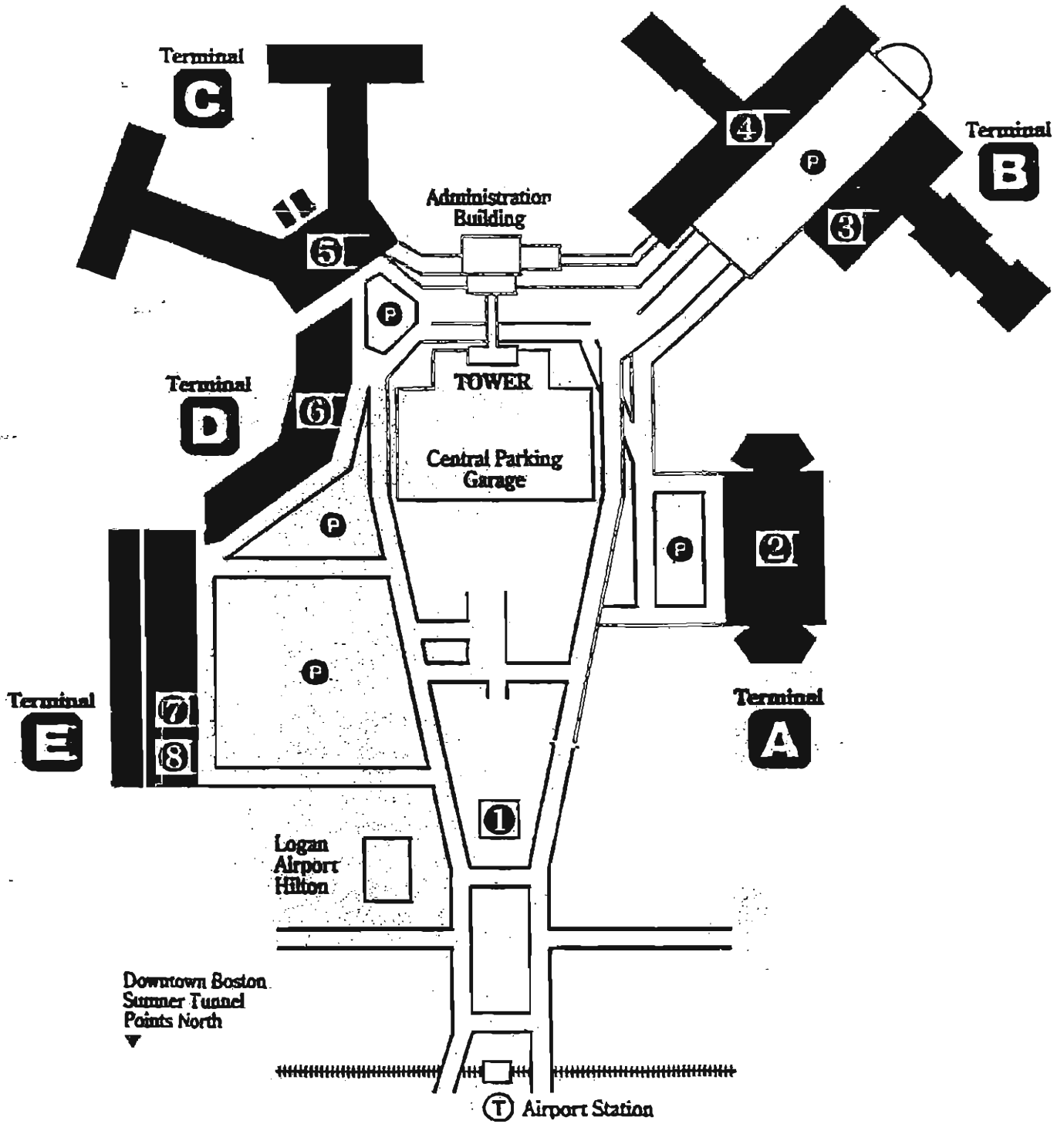
CNG as well. Second, the proposed AVI system will enable the airport to control curbside dwell times and repeated circling of airport terminals by private transport operators. Besides providing a more efficient mechanism for billing private operators for airport access, the AVI should reduce emissions from idling vehicles. Third, an additional parking garage will ease capacity strains during peak times. And, finally, the proposed people-mover would connect the Massachusetts Bay Transit Authority (MBTA) subway directly to the terminals, making the transfer easier and eliminating some of the airport shuttle buses.

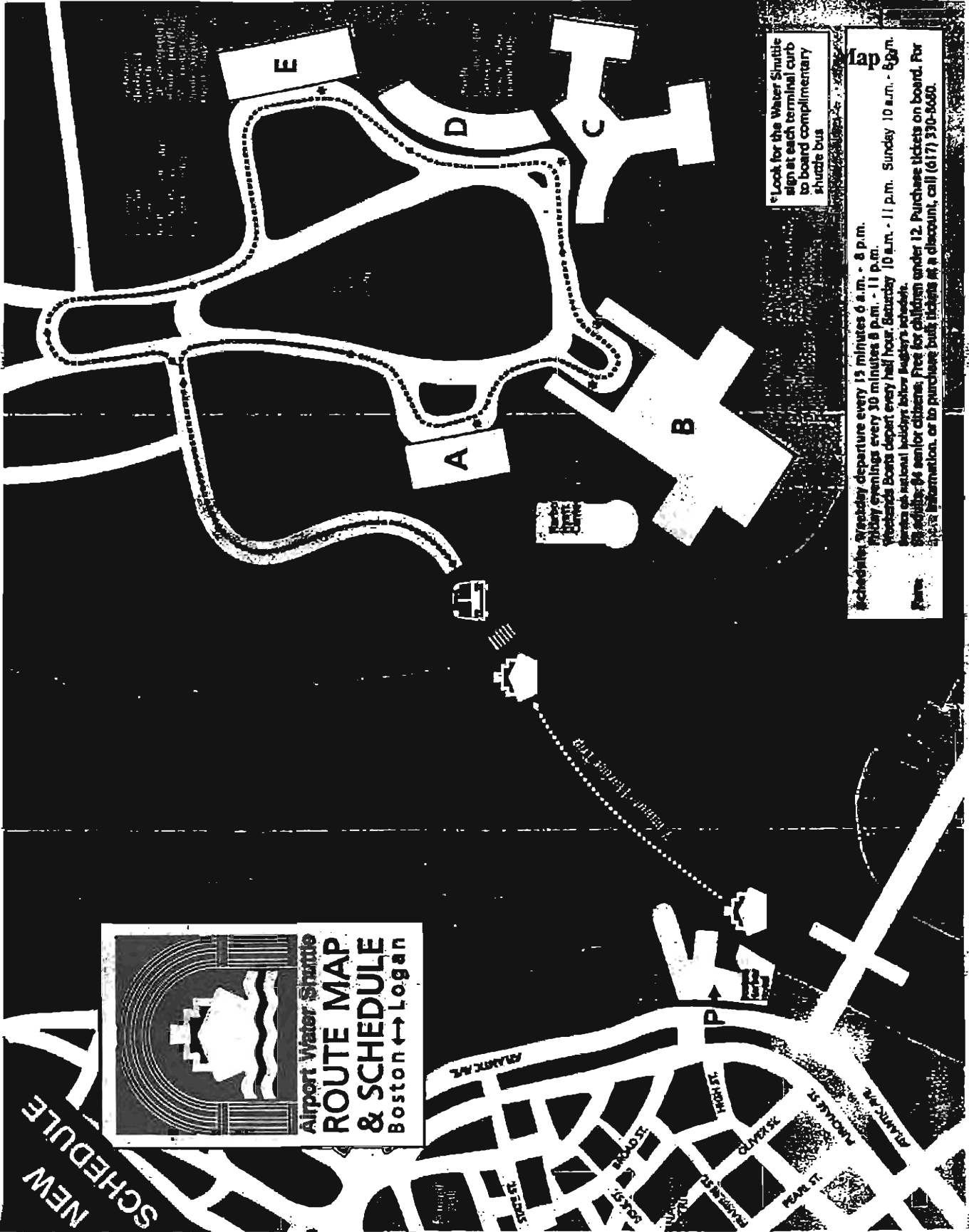
Ground Access at Logan

Boston is known for narrow, winding roads that exacerbate traffic problems. Traffic congestion in the Sumner and Callahan vehicular toll tunnels and their approach roads often make airport access by rubber-tire modes difficult. This results in unreliable travel times ranging from twenty to forty minutes from downtown Boston during peak driving hours.

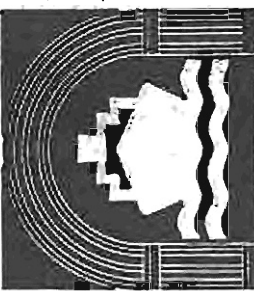
Public modes of ground access include the subway (Blue Line) and a water shuttle from Rowes Wharf, both originating downtown. Blue Line trains, operated by the Massachusetts Bay Transportation Authority (MBTA) stop at the airport station, located about a mile away from the main terminals at Logan. Free shuttle buses operated by MASSPORT take passengers from the station to the terminals. Similarly, a free MASSPORT shuttle bus operates between the harbor and the airport even though the ferry service is contracted to a private operator (See Maps 2 and 3).

The entire Blue Line trip from downtown (including the Blue Line train, transfer, and MASSPORT shuttle) takes about twenty minutes - a little longer than by car or taxi during off-peak times, but free of traffic jams during peak hours. One potential drawback is Boston's subway system is heavily used and the airport is an interim station on the line. Thus, Blue Line trains tend to be crowded at peak commuting times and there are no provisions for





NEW SCHEDULE



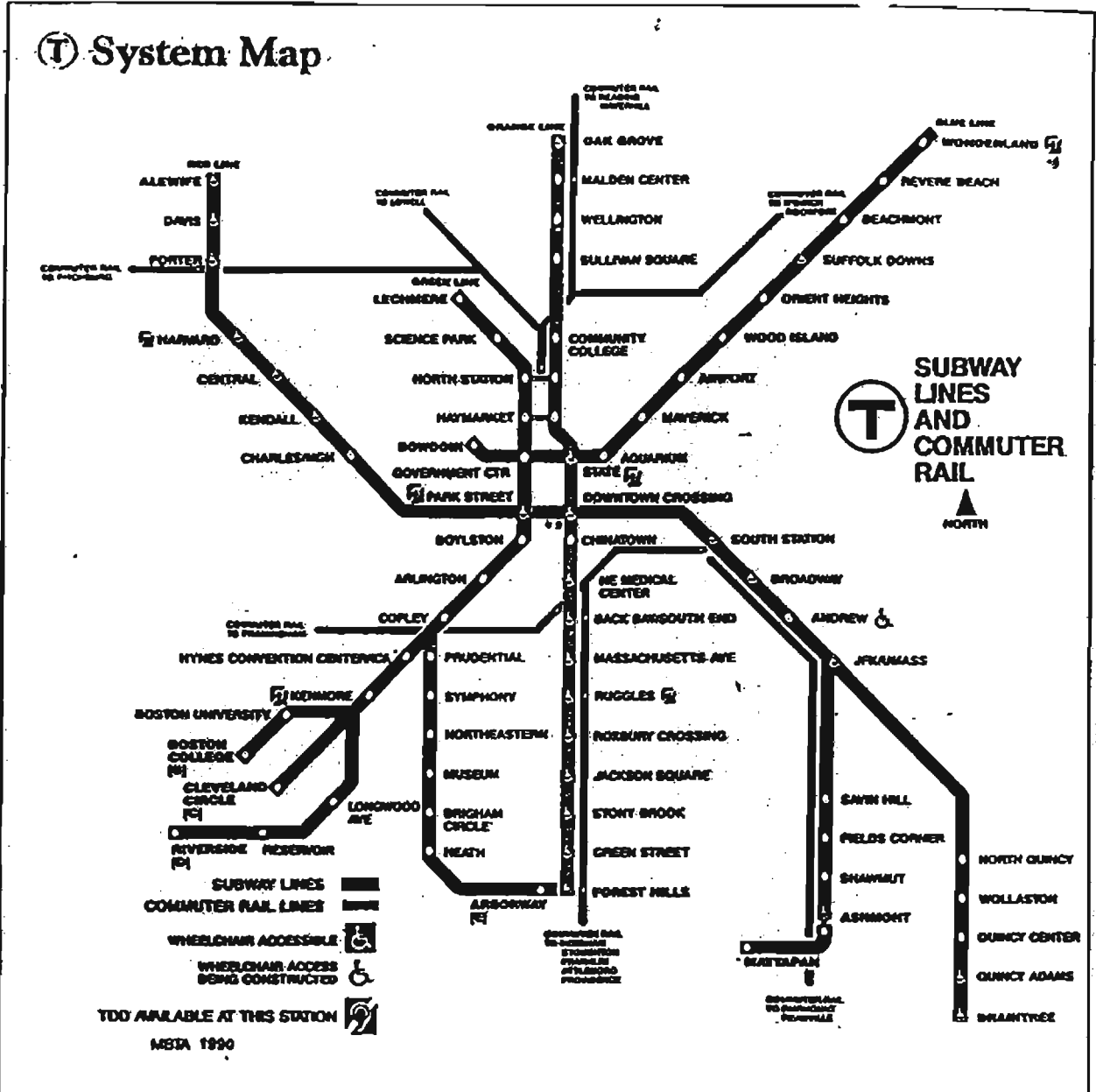
Airport Water Shuttle
ROUTE MAP
& SCHEDULE
 Boston ↔ Logan

Look for the Water Shuttle sign at each terminal curb to board complimentary shuttle bus

Schedule: **Monday** departure every 15 minutes 6 a.m. - 8 p.m. **Tuesday** depart every 30 minutes 8 p.m. - 11 p.m. **Wednesday** depart every 15 minutes 6 a.m. - 8 p.m. **Thursday** depart every 30 minutes 8 p.m. - 11 p.m. **Friday** depart every 15 minutes 6 a.m. - 8 p.m. **Saturday** 10 a.m. - 11 p.m. **Sunday** 10 a.m. - 8 p.m.

Services on national holidays follow major's schedule. For information, or to purchase bus tickets at a discount, call (617) 330-5650.

System Map



baggage. So, the rail system is not conducive to travelers with luggage.⁶¹ A second factor which limits the use of the subway system to the airport is the subway's spoke and hub configuration which requires air travelers from outlying areas to first travel into the CBD — adding time and the inconvenience of an additional transfer between subway stations.⁶² (See Map 4) A summary of ground access at Logan is provided in Table 1.

Table 1: Ground Access System

Distance to downtown	2-3 miles
Travel time to downtown by car	10-15 min. off-peak 20-40 min. peak
Travel time by Blue Line	20 minutes
Travel time by Water Shuttle	7 minutes
Daily Parking	\$13.00 first day, \$11.00 thereafter
Cost of Taxi or Limo to downtown Boston	\$8.00-\$15.00
Cost of Shared Van to downtown Boston	\$7.50
Cost of Airport Water Shuttle	\$8.00
Cost of Blue Line	\$.85

A third type of public transit service to Logan International is express bus service from three of the outlying population centers - Framingham to the west of Boston, Braintree to the south, and Woburn to the north. The Logan Express is operated by MASSPORT and provides service every half hour from 5am to 7pm and every hour from 8pm to 10pm during the weekdays. Two of the advantages of express bus service are reduced parking costs and elimination of parking hassles at Logan — which can be severe during peak times of the year. The costs for parking at the access sites and riding the Logan Express are shown in Table 2.

⁶¹ Manning, Barry, Rail Access to Airport Facilities: Literature Review and Summary of Selected U.S. Facilities, February 1993.

⁶² Interview with MASSPORT officials, Boston, MA: July 1994.

Table 2: Logan Express

	Framingham	Woburn	Braintree
Parking	\$5.00/day	\$3.00/day	\$5.00/day
Fare Mon-Fri	\$8.00 one way	\$5.00 one way	\$7.00 one way
Fare Sat-Sun	\$5.00 one way	\$5.00 one way	\$5.00 one way

In addition to the Logan Express, there are multiple private carriers serving other parts of Massachusetts, Maine, New Hampshire, Vermont and Rhode Island. A summary of the private carriers serving Logan International is provided in Table 3.

Table 3: Private Bus Carrier Service

SERVICE	DESTINATION	FARE
Bonanza Bus	Southern Massachusetts Rhode Island	\$10-\$12
Flight Line	Northern Massachusetts	\$22-\$24
Vermont Transit	Northern Massachusetts	\$12-\$16
Plymouth & Brockton	South Shore and Cape Cod	\$13.75 - \$21.25
Bonanza Bus	South Shore and Cape Cod	\$12-\$15
Peter Pan	Central Massachusetts	\$14-\$19
Marlborough Shuttle	Central Massachusetts	\$18
C&J Trailways	North Shore	\$14
Vermont Transit	Vermont & New Hampshire	\$14-\$48
Concord Trailways	Maine & New Hampshire	\$12-\$33
Flight Line, M&L Transport, C&J Trailways	New Hampshire	\$16-\$26

MASSPORT officials encourage private carrier service to the airport as another alternative available to air travelers which is less harmful to the environment and which reduces private auto congestion on airport roadways. Information about private bus operators is included in Logan ground access handouts and provided by airport personnel at information booths.⁶³

Modal Splits

Table 4: Logan International⁶⁴
Ground Access Modal Splits

MODE	Modal Share
Private Automobile	40.1%
Rental Car	14.0%
Taxicab	18.2%
Private Limousine	8.4%
Hotel Bus/Van	1.9%
Airport Bus	4.2%
Shared Limousine	4.4%
Subway	5.8%
Ferry	1.1%
Other	2.0%
Total	100.1%

⁶³ Interview with MASSPORT officials, Boston, MA: July 1994.

⁶⁴ 1993 Air Passenger Survey, received via fax from MASSPORT

Automobiles are indisputably the dominant mode of access to Logan International with over 80% of all air travelers using private autos, rental cars, private limousines, or taxis. However, public transit has managed to provide an alternative to many of Logan's customers. According to MASSPORT officials⁶⁵, the MBTA subway has acquired 8% of the market, and the Logan Express has captured approximately 2% of the overall air traveler market. Within each of the three individual service areas, Logan Express has 15% to 20% of the air passenger market.

Ridership on Logan Express

Total monthly ridership on the Logan Express is 55 to 60 thousand passengers which allows the service to "basically" cover operating costs. MASSPORT officials hope to increase market share in the three cities plus expand Logan Express services to additional markets.⁶⁶ Increases in market share hinge on several factors. Experience has shown MASSPORT officials that location of access sites and parking security at the sites are important. One access site which shared facilities with commuter rail connections and which was not very visible from the adjoining highway was moved. After moving the site to a separate and more visible location, ridership on the line increased by approximately 30% in four months.⁶⁷ Consequently, MASSPORT may be able to increase market share by analyzing alternative access sites.

A second factor influencing market share is public awareness and acceptance of the Logan Express. In ridership surveys conducted on-board the Logan Express, MASSPORT officials found word-of-mouth to be the form of advertising mentioned most often. Nevertheless, MASSPORT has used a broad spectrum of promotional media to reach potential customers including newspapers, radio, billboards and Cable TV.

Often, promotional efforts are targeted at a particular type of air traveler during time periods when parking facilities are expected to be at capacity such as school term breaks and holidays.

⁶⁵ Interview with MASSPORT officials, Boston, MA: July 1994.

⁶⁶ Interview with MASSPORT officials, Boston, MA: July 1994.

⁶⁷ Interview with MASSPORT officials, Boston, MA: July 1994.

Various types of discounts and incentives have been used to persuade air travelers to try an alternative access mode. These efforts have had varying degrees of success.⁶⁸

Planning Process for Logan Express

While MASSPORT was taking steps to comply with the Clean Air Act in the mid-1980s, concern was expressed over the environmental impacts of the vehicular traffic to Logan International. MASSPORT officials placed all transport modes along a continuum based on environmental impact, with private cars as the worst offenders. Official policy stated every effort would be made to move the public along the continuum — to modes of transport with less impact. As a result of this policy, planning officials authorized studies to determine the extent of the problem and to make recommendations. Recommendations came back suggesting remote bus links and education programs to raise the public's awareness of ground access problems at Logan.⁶⁹

Following up on the recommendations, MASSPORT used a series of air traveler surveys to determine where to implement remote bus service and what types of air travelers could be educated to switch to other transit modes. The surveys revealed the type of transportation used to access Logan depended primarily on two variables: 1. Purpose of the Trip and 2. Origin of the Passenger.

Regarding the purpose of the trip, data showed four types of air travelers: resident/ business; resident/non-business; non-resident/business; and non-resident/non-business. Each of these markets was prone to use a particular type of ground access. Residents traveling for business were most likely to drive and park in long term parking. Residents traveling for non-business were likely to be dropped off by private auto.

Non-residents traveling for business are likely to use rental car facilities or the water shuttle if their destination is downtown Boston. Non-residents traveling for non-business purposes are

⁶⁸ Phone Interview, Evelyn Addante, Ground Access Project Manager, MASSPORT, August 1994.

⁶⁹ Interview with MASSPORT officials, Boston, MA: July 1994.

likely to be met by a private vehicle or rent a car. Consequently, users of the Logan Express were most likely to be residents who were traveling for either business or personal purposes.⁷⁰

Origin data was utilized when MASSPORT was determining service routes. For a dedicated service to be cost effective, a sufficient number of air travelers had to be concentrated in one general geographic area. Upon analyzing origin/destination data, MASSPORT concluded several communities appeared to have potential for a dedicated bus service to the airport.⁷¹

After analyzing air passenger surveys and origin/destination studies, MASSPORT conducted focus groups which provided insight into service features needed for a successful express bus operation. Focus groups showed air travelers required a travel mode which was safe, clean, available immediately, and which would take them to their destination in the same amount of time it would take to drive their car. Consequently, headways were a key issue as were the number of interim stops.

Having successfully implemented Logan Express, MASSPORT continues to conduct periodic passenger surveys to monitor performance and customer satisfaction as well as to solicit suggestions for improvements.

Models/Decision Tools

In regard to implementing alternative ground access modes, MASSPORT planners considered traditional travel demand models to be somewhat useful at the "broad visibility stage." However, when the agency was designing specific routes and access locations for the Logan Express, the models were less useful. Planners attributed the models shortcomings to the difficulty of modeling a service which did not exist. Since forecasting models rely on extrapolations from existing data, and no previous data existed, the models were ineffective.

Comparatively, qualitative studies were more useful in determining routing and access locations for the Logan Express. Techniques such as trade-off matrixes and behavioral

⁷⁰ Interview with MASSPORT officials, Boston, MA: July 1994.

⁷¹ Interview with MASSPORT officials, Boston, MA: July 1994.

analysis were more appropriate for capturing potential customers' decision-making processes. This information was then used to set routes, parking rates, etc.⁷²

Funding for Logan Express

Since MASSPORT operates fairly autonomously, the Logan Express was implemented with very little political discussion. Start-up monies for the purchase of buses were incurred out of MASSPORT's capital improvements budget. Current fare revenues are sufficient to cover the contracting operator's fee. But MASSPORT staff time, leasing fees for parking at access sites, promotional materials, and other related expenses are subsidized by MASSPORT revenues generated by airport and harbor facilities.⁷³

Future Transit Projects

As the total air travel market continues to grow, MASSPORT officials foresee additional opportunities for encouraging air travelers to use transit modes with less impact on the environment. MASSPORT officials predict expansion of the water shuttle service in the near future. Another possibility is a bus linkage to the South Station Inter-modal transportation hub. But, transportation planners are quick to point out that a bus shuttle to the South Station would require mode transfers. Therefore, before initiating such an operation, MASSPORT would want to conduct market research.⁷⁴ A somewhat more remote opportunity is the inclusion of an airport station on a proposed circumferential subway line — enabling air travelers from the suburbs to bypass the trip into the CBD.

⁷² Interview with MASSPORT officials, Boston, MA: July 1994.

⁷³ Phone Interview, Evelyn Addante, Ground Access Project Manager, MASSPORT, August 1994.

⁷⁴ Interview with MASSPORT officials, Boston, MA: July 1994.

O'Hare International Airport Chicago, Illinois

General Description of Metropolitan Area

The current population of Chicago is 2,783,276 in an area of 228 square miles, which equates to a density of 12,209 per square mile. However, 1,473,000 people are employed in Chicago and much of the workforce commutes from outlying areas such as Aurora, Geneva, Elgin, Waukegan and Joliet.⁷⁵

Like other major U.S. cities, the six county Chicago area is confronting severe traffic congestion and it is increasing yearly. By 2010, population is expected to increase 15%, employment by 22%, and households by almost 18%.⁷⁶

O'Hare International Airport

Located 18 miles from the central business district, (See Map 1) O'Hare is, and wants to remain, the world's busiest airport. In 1992, O'Hare handled 64 million passengers, moved 1.2 million tons of freight, directly employed 48,600 people, and contributed an estimated \$13.5 billion to the region's economy.⁷⁷

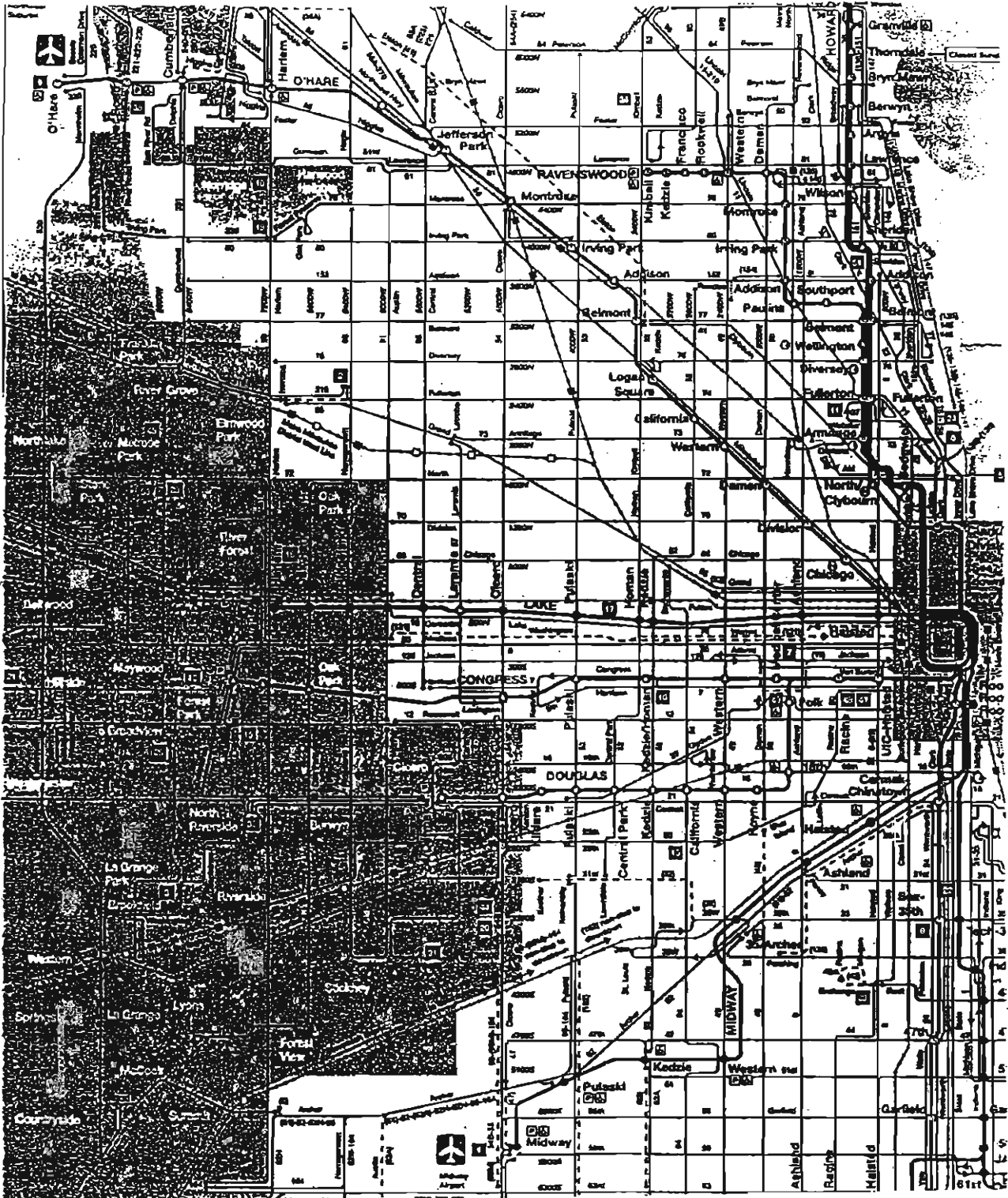
To achieve O'Hare's current success, the City of Chicago established a planning team in 1980 to devise a construction program to meet future aviation needs. The airlines, City of Chicago, State of Illinois, local and federal agencies, and citizens groups designed a ten-year master plan. The first step of the development plan was the Delta Concourse L project in 1982. As of May 1993, the master plan was 94% complete with the opening of the new international terminal and the completion of a state-of-the-art people mover.

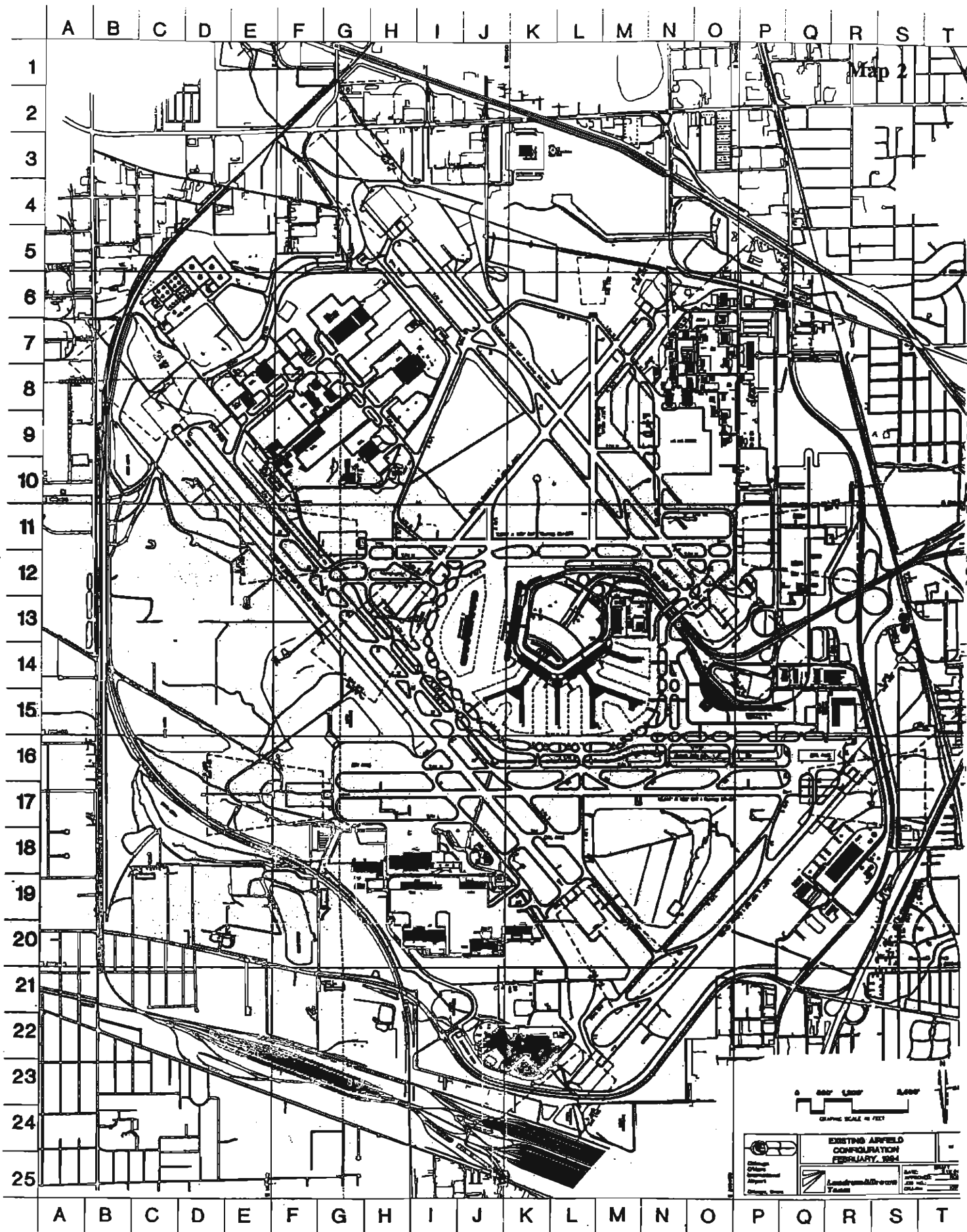
⁷⁵ World Almanac 1993.

⁷⁶ Review of the Transportation Planning Process in the Chicago Metropolitan Area, U.S. DOT, Research and Special Programs Administration, March 1993.

⁷⁷ Chicago's Airports: A Legacy of Livelihoods, City of Chicago Department of Aviation, March 1993.

Map 1





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The people-mover is an automatic transit system (ATS) linking the international terminal with the three domestic terminals and remote parking lots.⁷⁸ (See Map 2) The goals for the ATS were to (1) promote the use of long term parking to reduce airport traffic congestion and pollution, and (2) to make movement between terminals easier. The ATS is a free service and operates 24 hours per day. Travel time from remote parking in lot E to the main terminals is approximately 7.5 minutes via the ATS. Designed with Chicago's winters in mind, stations are located so travelers are not subjected to weather.

Ground Access to O'Hare

Table 1 provides a summary of ground transportation at O'Hare International.

Table 1: Ground Transportation Characteristics

Distance to CBD	18 miles
Travel time to CBD by car	50-60 minutes peak 40-50 minutes off-peak
Daily Parking	Lot D \$29/day Lot ABC \$18/day Lot E \$9/day Lot F \$6/day
Cost of Taxi to CBD	\$25-28
Cost of Shared-ride Taxi to CBD	\$15
Cost of Shared Van to CBD	\$14
Cost of Blue Line rail to CBD	\$1.50

Ground access is dominated by private automobiles. One of the major problems associated with access is the fact that there is only one entrance and exit for some 100,000 vehicles per day.⁷⁹ The I-190 freeway which becomes the airport access road connects with Mannheim

⁷⁸ Chicago Airport Fact Sheet, Chicago Department of Aviation, Office of Public Relations, November 1993.

⁷⁹ "Chicago's Economic Engine," Air Transport World, September 1992.

Road and Bessie Coleman Drive. Other freeways which feed into I-190 are the Northwest Tollway (I-90), the Kennedy Expressway (I-90), and the Tri-State Tollway. Currently, at a cost of \$450 million, the Illinois DOT is rebuilding a 7.5 mile section of John F. Kennedy Expressway that connects Chicago with O'Hare. This renovation is part of an on-going program to modernize Chicago's transit arteries.

Evidence of O'Hares' ground access problems is shown on sections of the westbound airport access road and service ramps to the various feeder interstates which are operating at a level-of-service characterized as at-capacity or over-capacity. As a result, there are severe breakdowns in traffic flows leading to unsafe driving behaviors.⁸⁰ Travel time to O'Hare from the central business district is estimated at 50-60 minutes during peak hours and 40 to 50 minutes during off-peak hours.⁸¹

There is also limited bus service to the airport. PACE (the suburban bus transit provider) operates two routes to O'Hare. Route 220 serves the north suburbs and connects with Metra at Des Plaines. Average weekday ridership on the route is 853 passengers. The other route, 330, operates between O'Hare and the GM McCook Plant and connects to Metra at Bellwood and LaGrange. The 330 route has an average weekday ridership of 1,359.⁸² While direct bus routes to O'Hare are limited, many PACE bus routes in the greater Chicago area connect to the CTA rail system, which then connects to O'Hare. Although available, private/charter bus service is a nominal portion of ground access to O'Hare except during special events such as the World Cup.⁸³

A third mode alternative to O'Hare is rail. Operations on the Chicago Transit Authority (CTA) O'Hare Blue Line commenced in 1984. CTA provides 24-hour, 7-day a week service on its rapid transit system, including the Blue Line from downtown Chicago to O'Hare

80 Working Paper, Terminal Support Work Group Report #3, Chicago Area Transportation Study, 1994.

81 Airport Ground Access Study, UMTA, April 1991.

82 Quarterly Route Review: October - December 1993, PACE Operations Management, February 1994.

83 Interview, Tom Kaiser, Project Coordinator, Landside Operations, O'Hare International, Chicago: July 1994.

Airport. CTA departs from O'Hare every 5 to 10 minutes, days and evenings, and every 30 minutes from 1:00 a.m. to 5:00 a.m.. Travel time from O'Hare to downtown is 35 minutes, with the fare being \$1.50 one way.⁸⁴ The CTA terminal is located directly under Terminal Four, one block from the other terminals, and it is connected by covered moving sidewalks. Typical weekday ridership to and from the O'Hare CTA station is approximately 15,000 passengers. Of this total, 3,500 are air travelers. The remainder are employees of the airport, or airport-related businesses, or businesses in the vicinity. CTA's Blue Line includes three modern Inter-modal terminals between the central business district (CBD) and the airport, at Jefferson Park, Cumberland, and River Road.⁸⁵

Modal Shares

A summary of modal shares to O'Hare is provided in Table 2. In a separate 1990 study by UMTA it was found that although the Blue Line served only 3.7% of the total air passenger market, within CTA's service area it captures 14.7% of the air travelers.⁸⁶

Table 2: Modal Shares for O'Hare Air Passengers⁸⁷

Automobile: Private, Rental, Taxi, Limousine	50.7%
Hotel Bus/Van	7.8%
Bus or Train service	5.3%
Other	12.0%
Total	99.7%

84 CTA Public Information Brochure

85 Fax from Darwin Stuart, Director of Strategic Planning, Chicago Transit Authority (CTA), 3/22/94.

86 O'Hare Airport Ground Travel Survey, CTA, June 1990.

87 Chicago Transit Authority, O'Hare Ground Travel Survey, June 1990, pp 4-5. Average of Arriving and Departing passengers.

Ridership on the Blue Line

In 1988, CTA conducted an air traveler survey at the domestic terminals of the airport. Results from the survey showed the majority (60-65%) of people interviewed for the survey were arriving from or destined to areas outside of the CTA service area. Based on socioeconomic characteristics of the air travelers survey in the O'Hare Travelers Survey, CTA made some conclusions regarding the challenges which exist for increasing the Blue Line's share of ground travel to O'Hare:

1. Only about one third of the overall O'Hare travel market involves origins and destinations within the CTA service area. But, this third still has significant ridership potential of about 16,000 daily (air traveler) trips to and from the central area.
2. Even though business travelers (53% of all O'Hare travelers) represent a harder "sell" (due to expense accounts), they also undertake significantly more travel to and from the Chicago central area. Marketing tactics to businessmen could emphasize convenience and time savings rather than cost savings.
3. Out-of-town travelers represent a majority (around 60%) of travelers, one-third of these travelers are going to the Chicago Loop and other central area destinations. Of these out-of-town travelers, only 50-60% were even aware of the CTA rapid transit option. A variety of promotional and advertising measures could be taken to reach this significant travel market.⁸⁸

In addition, officials observe that the Blue Line does not pass in close proximity to a significant number of hotels, a fact which could impact ridership. They also point out that air travelers without luggage are more frequent Blue Line riders.

The 1988 survey identified several areas where CTA could improve communication with air travelers destined for downtown locations, thereby increasing total ridership. One suggestion was to improve airport signage directing air travelers to the CTA station. At the time, CTA was unable to implement many of the suggested improvements due to strict signage restrictions

88 O'Hare Airport Ground Travel Survey, CTA Strategic Planning Department, June 1990.

on airport property. Recently, the position of the airport authority has been relaxed and some signage improvements have been made which enable air travelers to locate the Blue Line station in Terminal Four more easily.

The CTA did develop a brochure targeted at out-of-town travelers which explained how to use the Blue Line and the CTA system to get to various downtown destinations. This brochure is distributed at the CTA station at O'Hare. No studies have been done to measure the impact of the brochure.⁸⁹

Decision Process for Blue Line

When the Kennedy Expressway was built in the 1960's, a median was preserved for future transit connections to the Loop. This decision was based on the success of transit lines on the northwest side of Chicago. When the first section was built, there was a great deal of controversy over how far it should extend. Eventually the line was built as far as Jefferson Park.⁹⁰ Primarily, the Blue Line was built to serve the needs of the communities located in the transit corridor — separated from the community, the line would not have been cost effective.

In 1976, the Illinois DOT conducted a feasibility study for the extension to the airport. In 1977, the decision was made to approve the extension from Jefferson Park to O'Hare at an estimated cost of \$136 million.⁹¹ However, the actual construction of the line was delayed by political pressures exerted by private transportation operators concerned about potential revenue losses.⁹² The extension did not actually commence operations until 1984.

Models and Decision Tools Employed

Standard travel-demand forecasting models were used to complete the alternatives analysis and an environmental impact statement required by UMTA. At the time, the impact of air

89 4/7/94 Interview, Sarah LaBelle, Director Market Analysis & Research, CTA.

90 Interview, Charlie Petzold, former Chief Engineer, City of Chicago, March 1994.

91 Interview, Jeff Stern, Public Relations, CTA, March 1994.

92 4/7/94 Interview, Sarah LaBelle, Director Market Research & Analysis, CTA.

travelers at the airport station was not viewed as significant. Consequently, it was not factored out separately.⁹³

In 1981, the travel-demand models projected average daily one-way ridership for the O'Hare Airport station would be approximately 12,000. This number included all ridership uses of the station. In 1985, after one year of operation, the actual daily ridership was 11,440. By 1991, the average daily ridership in both directions had increased to 15,000.

Transportation planners noted the models used for the Blue Line analyses are basically the models currently available. These models incorporate a fairly rigid set of assumptions which do not enable planners to address the economic development possibilities from a dynamic Inter-modal system.⁹⁴

Funding

The funding for the extension was 80% UMTA and 20% local. The 20% was divided between the State of Illinois and the City of Chicago. Significantly, the City of Chicago did not have to purchase any private land. In addition to the existing right-of-way along the Kennedy Expressway, the city reconfigured some of the existing highway interchanges. By essentially, "un-doing" part of a cloverleaf, the city was able to create space for CTA stations and park-n-rides.⁹⁵

Other Potential Transit Projects and Issues at O'Hare

Metra, the commuter rail division of the Regional Transit Authority (RTA) sent out a 1994 request for proposals to assist Metra in the analysis of the market potential for an airport station on the commuter rail service to the north scheduled to start operation in 1996. The Wisconsin Central route runs on the eastern edge of the airport and is adjacent to remote parking lot F. Metra has proposed a station at Parking lot F. However, air travelers using the Metra line would have to transfer to a bus shuttle at parking lot F to get to parking lot E since

93 Focus Group, Chicago: July 1994.

94 Focus Group, Chicago: July 1994.

95 Interview, Charlie Petzold, former Chief Engineer, City of Chicago, March 1994.

O'Hare's people mover system terminates at lot E. Upon reaching lot E, air passengers would have to transfer again to the people mover system. For travelers with luggage, these transfers present a major disincentive for using public transportation. One possibility to ameliorate the hassles of transferring is to provide remote check-in at Parking Lot F — allowing travelers to deposit their baggage and proceed to the terminals. To determine the impact of these alternatives, Metra's request for proposals defines two tasks (1) document the characteristics, needs, and attitudes of the O'Hare bound trip maker utilizing existing data, focus groups, and surveys (2) develop tools for estimating demand using the data collected in the first phase.⁹⁶

96 Excerpt from RFP: Wisconsin Central Chicago O'Hare International Airport Market Demand Study, Metra, 1994.

Midway Airport Chicago, Illinois

Located 10 miles southwest of downtown Chicago, Midway Airport has evolved into a medium hub commercial airport; 16 airlines fly out of Midway. In 1993, these airlines served 6.8 million passengers — a 46% increase over the 4.6 million passengers served in 1992.⁹⁷ Midway also handles the majority of Chicago's general aviation and corporate air traffic.

Ground Access to Airport

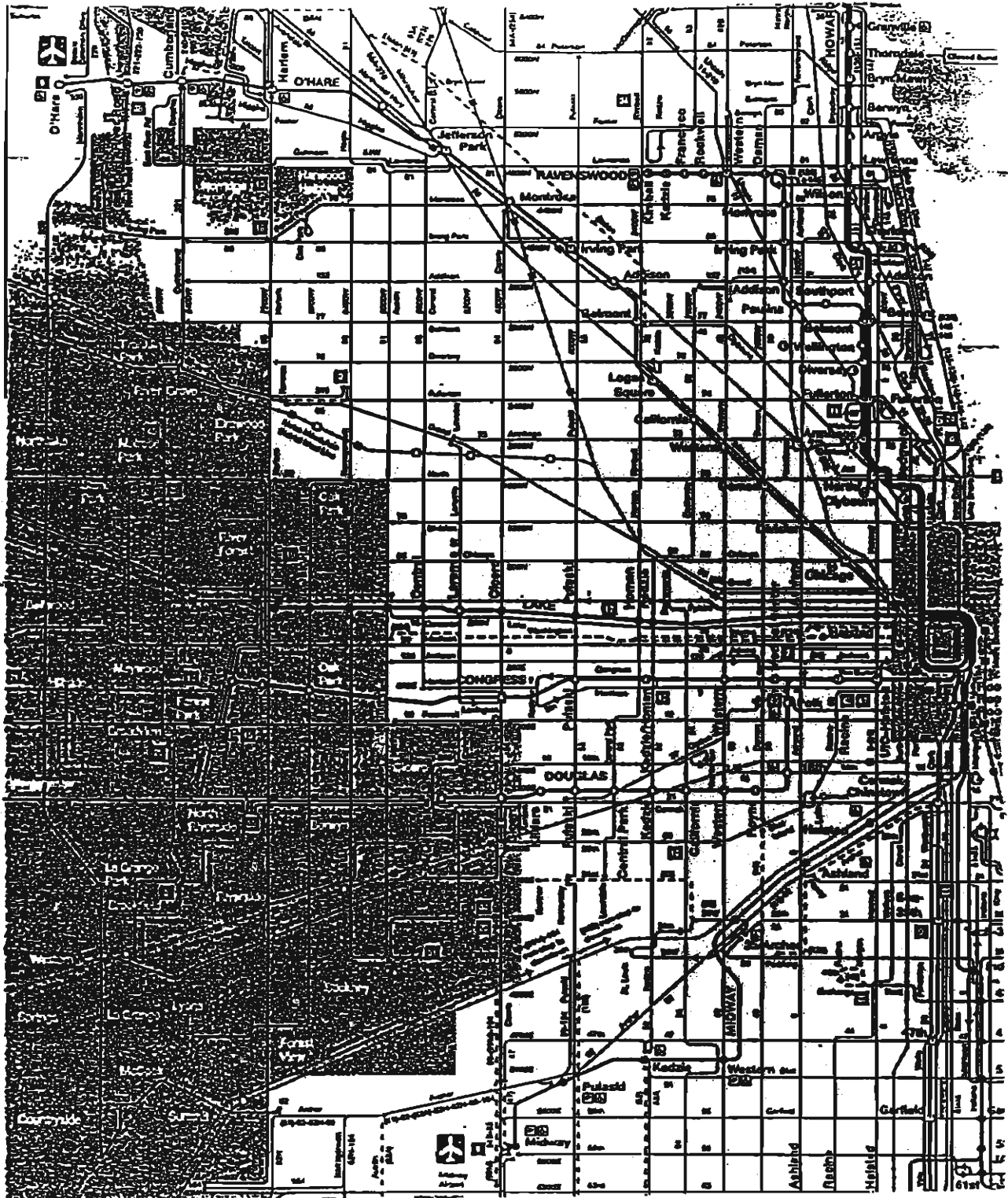
Highway access to Midway is via the Dan Ryan Expressway to 55th street or the Stevenson Expressway to South Cicero Avenue. (See Map 1) The main parking lot is located directly adjacent to the main terminal. This lot is delineated into two separate areas — hourly and daily. The rates for the hourly lot range from \$3.00 to a maximum of \$49.00 per day, while the rates for the daily lot range from \$4.00 to a maximum of \$18 per day.

In addition there is a long term parking lot located about a quarter mile from Midway on 55th Avenue. The City of Chicago, Department of Aviation runs a free shuttle bus from the long term lot every 15 minutes. The rates for long term parking range from \$2.00 to a maximum of \$6.00 per day.

Taxis are located in front of the Main Terminal. A taxi ride from Midway to downtown Chicago takes about 20 minutes and costs \$15 to \$20. A Shared Ride program allows visitors to be charged a flat rate of \$10. The Airport Express shuttle service leaves from in front of the Southwest Airlines ticket counter every 15 minutes. The shuttle to downtown costs \$9.50 one way.

PACE operates six bus routes which provide service to Midway Airport and interconnect with the CTA transit system at the Midway CTA station. The routes have a combined daily ridership of 4,275 and have shown significant growth ranging from 6%-68% between the final quarter of 1992 and the final quarter of 1993. The growth has been largely attributed to the connection with the CTA Midway line which opened in 1993 and provides a

97 Fact Sheet, Chicago Midway Airport, Office of Public Relations, 1994.



combined route to the Loop in downtown Chicago.⁹⁸ Indeed, when the CTA Midway station opened, eight bus routes were eliminated and fourteen other routes were modified.

Airport Access by Rail

CTA's "Orange Line" service to Midway Airport opened in November of 1993 with 9.2 miles of track and eight stations, it provides service to southwest side residents — filling a gap in CTA's rapid transit system. It also incorporates a number of technological innovations which could be adopted on other CTA lines — including single-person employment and an exact fare system that removes cash handling by station agents.⁹⁹

The Midway line station ends at the airport and is connected to the terminal by a covered walkway with a moving sidewalk. Trains run every six minutes during peak hours and every ten minutes during off-peak hours. The trip from Midway airport to the Loop takes about 25 minutes. The fare is \$1.50 with \$.30 transfers to other CTA rail lines or bus routes.

Ridership on Airport Rail

Prior to the opening of the Orange Line, a market survey was conducted to assess southwest Chicago residents' perceptions of the benefit/detriments of the new line, intention to use the line, and current travel behavior and transportation mode preference.¹⁰⁰

The survey found 28% of southwest area residents would be very likely to ride on weekdays. These weekday passengers were equally likely to be male or female, and the majority of riders represented lower socio-economic classes.

During weekdays, 65% of the potential riders on the rapid transit line were likely to have incomes of \$30,000 or over, but the service was also likely to attract other income groups. The age of the majority of weekday passengers was expected to be between 35 to 64 years. Most of the riders who were likely to ride the new line on weekdays were already using various modes of public transportation to get to work.

98 Quarterly Route Review: October - December 1993, PACE Operations Management, February 1994.

⁹⁹ "Takeoff time for CTA's Midway Line," Railway Age, June 1993.

¹⁰⁰ Midway Line: Market Potential Survey, Marketing Strategy & Planning, Inc., Technical Report SP92-06, June 1992.

Over 16.5% of the survey respondents who were not using public transportation on weekdays indicated a likelihood of using the new line on weekends for shopping, dining out or recreation activities — indicating, weekend service could attract new riders.

Although follow-up studies have not yet been completed, PACE and CTA officials agree the Midway station seems to have evolved into a "Inter-modal" transfer point for commuters. Until such studies have been completed, it is difficult to quantify the specific number of air passengers utilizing the CTA Orange Line or a combined PACE bus/CTA rail service as their mode of access to Midway.¹⁰¹ Modal splits for ground access to Midway are unavailable.

Decision Process for Rail Access

As Chicago grew, transportation routes quickly developed along the economically successful, densely populated corridors that radiated from the downtown Loop. However, the southwest corridor did not meet certain criteria for transportation investments as well as other corridors that developed earlier. One factor is that the southwest side has historically been a low density area in terms of population.

While there was a longstanding desire for a southwest corridor line - transit maps going back as far as 30 years often show a shaded line - funding only became available with the 1979 demise of another planned Chicago transportation project, the Crosstown Expressway. Consequently, the southwest corridor planning effort commenced in 1979.

To address the problems and needs of the corridor, three major goals were developed:

1. Improve Transportation Service in the SW Corridor - including improved travel times throughout the Chicago region, improving the comfort and reliability of transit, and improving access to the transit system.
2. Develop a Cost-Effective System which would maximize user cost savings, minimize capital and operating cost, and minimize local subsidies.
3. Promote a Balanced System that Supports the Development of the Region enhancing economic development, utilizing energy efficiently, and minimizing adverse impacts.

101 Focus Group: Chicago, July 1994.

The first phase of the planning effort was completed in 1980. Phase I was designed to cull out infeasible alternatives. For example, alternatives were eliminated due to excessively high costs, severe design problems, or significant displacement of homes and businesses.¹⁰² As a result of the Phase I analysis, several alternatives were recommended for detailed engineering evaluation in Phase II.

Twelve alternatives were considered in Phase II: seven rapid rail, two busway, a rapid rail/busway hybrid, a TSM alternative, and a null alternative. Since the TSM alternative and the null alternative did not substantially improve the quality of Southwest side transit, they were quickly eliminated from further consideration. The next step in the evaluation process was to select the best alternative from each of the modal concepts. At this point, efficiency and affordability became key selection criteria. As a result, four of the rapid rail alternatives were eliminated due to proportionally higher costs. In the last step, the process compared the three final alternatives - one rapid rail, one busway, and one rail/bus hybrid.

In December of 1982, the Mayor of the City of Chicago, on the recommendation of the Interagency Policy Committee, approved the 49th Street-Midway rapid rail alternative. This alternative was selected for its effectiveness (as defined by ridership, development potential, and equity) rather than its efficiency (as defined by cost relationships). The public participation program, conducted in conjunction with the alternatives analysis process, demonstrated strong support for this alternative - given the longer route to Ford City was not financially feasible at the time.

The public involvement program consisted of six parts: a scoping meeting in 1981, three newsletters, two meetings of the Citizens Advisory Committee in 1982, two public information meetings in 1982, five meetings with citizen groups at their request, and a public hearing in

102 Southwest Transit Corridor: Preferred Alternative Report, Bureau of Transportation Planning and Programming, City of Chicago, December 1982.

1982. Each of these forums provided information regarding the alternatives under consideration, addressed concerns, and solicited further public input.¹⁰³

Funding for Rail Access

The City of Chicago used federal interstate transfer funds to finance major transportation improvements in the 1980s. These funds became available when the plan for Chicago's Crosstown Expressway expired. A city-state agreement followed which divided the \$2.2 billion originally earmarked for the Expressway. Subsequently, a program of substitute projects was developed and incorporated into the regional Transportation Improvement Program (TIP).

Accordingly, since the Southwest Transit project was incorporated into the revised TIP, 85% of its funding was provided by federal interstate transfer funds. The remaining 15% was provided through matching local funds secured by utilizing 1979 state legislation which authorized the issuance and sale of bonds for mass transportation purposes.

103 Southwest Transit Corridor: Preferred Alternative Report, Bureau of Transportation Planning and Programming, City of Chicago, December 1982.

Cleveland Hopkins International Airport Cleveland, Ohio

General Description of the Metropolitan Area

The metropolitan Cleveland area encompasses 515 square miles which includes 67 cities with a population of 1.6 million. The city of Cleveland is located on the south shore of Lake Erie at the mouth of the Cuyahoga river. Population in the city is 505,616 in an area of 79 square miles. Since 869,106 people are employed in the city, daily commute traffic is a significant factor on the regional roadway system.¹⁰⁴

Faced with converting from an industrial-based economy to an information-based economy, Cleveland developed the Cleveland Civic Vision 2000 Downtown Plan which focuses on building downtown Cleveland into Ohio's largest commercial and employment center. In this vision of a synergistic commercial, retail, and entertainment core, various transportation modes take an integral role.

Cleveland Hopkins International Airport

Cleveland International (CLE) is located approximately 10 miles southwest of the downtown area. In 1993, Cleveland International served approximately 5 million enplaning passengers. Of those 5 million passengers, 70% had local origins or destinations. (See Map 1.)

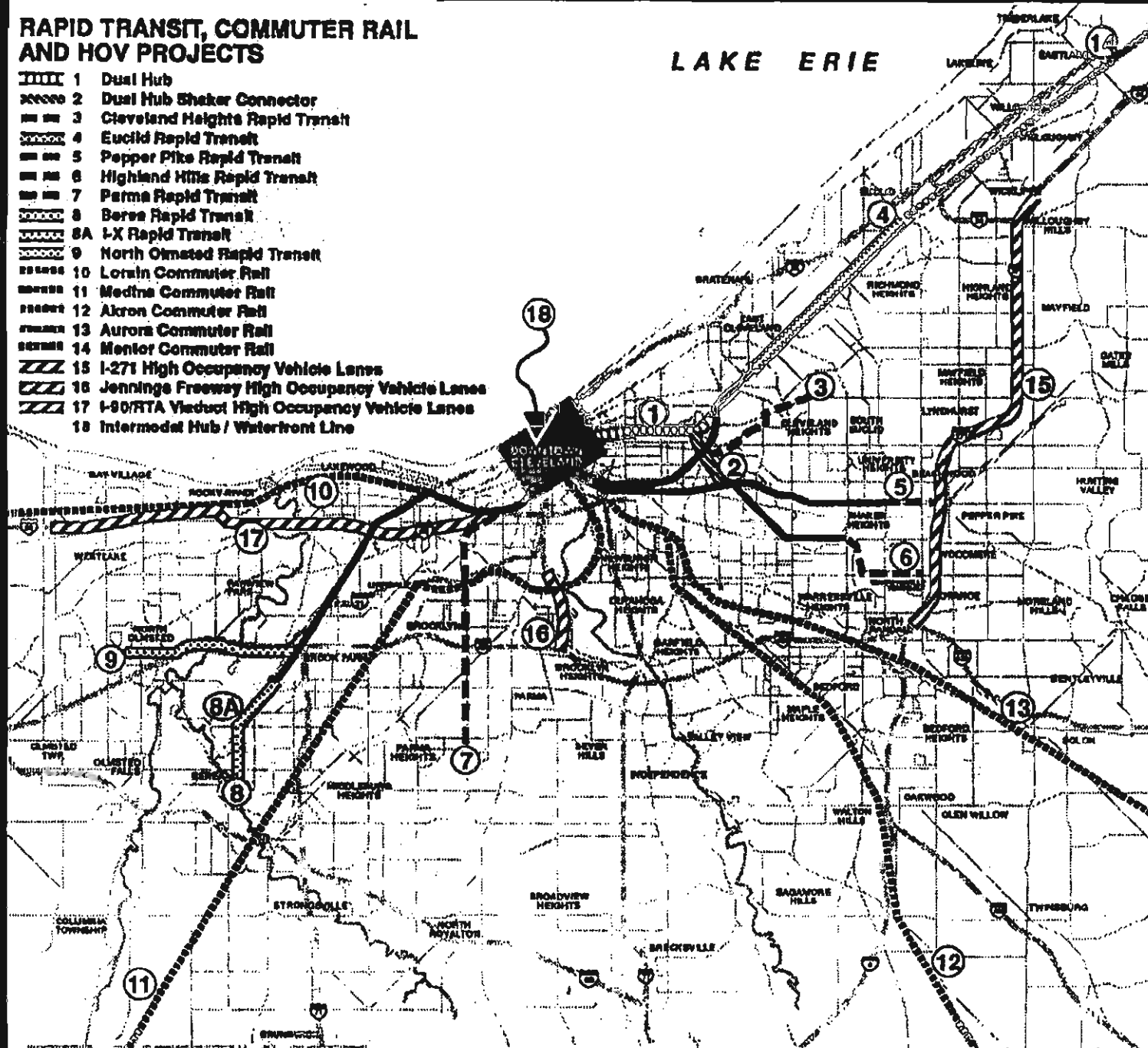
In 1990, in conjunction with urban revitalization plans, the City of Cleveland initiated an analysis of the existing facilities at CLE with the goal of developing an updated Master Plan. Results of the study showed Cleveland International was a mature airport which would reach its maximum airfield capacity in approximately 1998. In response, several alternatives of augmenting capacity in the near-term (0-10 years) and long-term (10-20 years and beyond) were evaluated.

104 World Almanac 1993

RAPID TRANSIT, COMMUTER RAIL AND HOV PROJECTS

- ⊕ 1 Dual Hub
- ⊕ 2 Dual Hub Shaker Connector
- ⊕ 3 Cleveland Heights Rapid Transit
- ⊕ 4 Euclid Rapid Transit
- ⊕ 5 Pepper Pike Rapid Transit
- ⊕ 6 Highland Hills Rapid Transit
- ⊕ 7 Parma Rapid Transit
- ⊕ 8 Berea Rapid Transit
- ⊕ 8A I-X Rapid Transit
- ⊕ 9 North Olmsted Rapid Transit
- ⊕ 10 Lorain Commuter Rail
- ⊕ 11 Medina Commuter Rail
- ⊕ 12 Akron Commuter Rail
- ⊕ 13 Aurora Commuter Rail
- ⊕ 14 Mentor Commuter Rail
- ⊕ 15 I-271 High Occupancy Vehicle Lanes
- ⊕ 16 Jennings Freeway High Occupancy Vehicle Lanes
- ⊕ 17 I-80/RTA Viaduct High Occupancy Vehicle Lanes
- ⊕ 18 Intermodal Hub / Waterfront Line

LAKE ERIE



Consequently, in the near-term, CLE will extend an existing runway capable of handling international service to Europe, convert the primary NE/SW runway to a taxiway, and construct a new NE/SW runway. In the long-term, the Master Plan calls for a new mid-field terminal and runway construction which will allow simultaneous arrivals and departures of large air carriers.

Ground Access

Transportation officials assert that rubber-tire access to CLE is generally excellent as it is served by two state routes and several other major collector roadways. State Route 17 is on the north; State Route 237 is on the east; Kolthoff Drive is on the south; and West Hangar Road is on the west. Regional planning officials noted that residents in a seven-county area are able to access CLE within one-half hour.

In contrast, congestion on the airport's internal roadways is a serious problem. In particular, the roadway configuration of three loading lanes and two moving lanes on the lower level is incapable of handling the volume of passenger vehicles, shuttles, and limos requiring curbside access. Another issue is the relatively limited roadway span between the highway entrance to the airport and the departing passenger zone at the terminals. One official noted that during peak periods, it was not uncommon to have traffic backed-up onto the highway 237 entrance ramps to the airport.¹⁰⁵

The revised Airport Master Plan addresses these internal roadway issues to some extent. The immediate construction of another parking garage and a reconfiguration of existing entrance and exits over the next ten years are the measures being taken which are expected to alleviate congestion on airport property. Airport officials are also intrigued with the industry's notion of remote check-in capabilities at outlying parking lots — linking air passengers to the airport by a people mover or shuttle system. However, no study has been conducted to explore this option.¹⁰⁶

¹⁰⁵ Focus Group, Cleveland, Ohio: September 1994.

¹⁰⁶ Focus Group, Cleveland, Ohio: September 1994.

In addition to the standard taxi, hotel courtesy van, rental car and limousine services found at most major U.S. airports, a significant portion of Cleveland International Airport's ground access is provided by off-airport parking lot shuttles. In fact, of the 10,000 parking spaces generally utilized by airport patrons, 5,000 are owned by the airport and the remaining 5,000 are privately owned. These commercial parking operators provide free shuttles to the airport terminals.

Bus service to CLE is virtually non-existent. There is an RTA stop in the southwest corner of the airport property at Eastland and state route 237. However, this service is mainly used by employees as it does not provide terminal access. On occasion, chartered buses are used to deliver or pick-up large groups and tours, but this is not a regular practice.

A summary of modal shares for Cleveland Hopkins International Airport is provided in Table 1.

Table 1: Ground Access Modal Shares¹⁰⁷

Private Auto	58.5%
Taxicab	6.4%
Rental Car Shuttle	12.9%
Hotel Shuttle	5.7%
Other Shuttle	15.5%
Public Transit	0.0%
Other	0.9%

The Regional Transit Authority estimates that 6% of all passengers used the RTA system at the airport system prior to major renovations is the RTA rail system.

107 Regional Transit Authority, vehicle counts made on 10/3/90, average of arriving and departing vehicles.

Rail Access to CLE

The airport is also served by rapid transit - having the distinction of being the first airport in the United States to have a rail facility inside a terminal facility. Completed in 1965, the Regional Transit Authority's (RTA) "Red Line" connects the airport to Tower station in downtown Cleveland. Thus, CLE is connected to the entire RTA system. Trains generally run between 4:23 a.m. and 1:30 a.m. on a regular schedule.

RTA officials believe the majority of the patrons of the rail system to the airport are airport employees with residences on the east side of Cleveland. However, a comprehensive ridership study is not available which would support this hypothesis or provide any greater insight into the rail patrons reasons for using the system or their satisfaction level with the service.

Currently service levels on the RTA are greatly reduced. Transportation officials remarked much of the RTA system was allowed to deteriorate during the late 1970s and 1980s.¹⁰⁸ Consequently, as of December 1991, rail traffic gets shut down at 9:30 p.m. for renovations on the system. Officials believe this may be a contributing factor to rail's modal share decline from six percent in 1981 to its current share of one to two percent.

In addition to rail line and grade improvements which affect service to the airport, RTA is also rehabilitating the airport station. Completed in early 1994, the airport rail station has been transformed from a "dark, dilapidated facility" into a comfortable waiting area with vaulted ceiling, skylight, bright lighting, and new signage.¹⁰⁹

These renovations are designed to offset the public's negative perceptions regarding rail access to the airport and rail transit in general. A 1988 study conducted by the northeast Ohio area wide Coordinating Agency (NOACA) found that while Cleveland area residents acknowledged the advantages of rail access in terms of cost and relief of roadway congestion, their overriding reason for not using the system was safety.

108 Focus Group, Cleveland, Ohio: September 1994.

109 Regional Transportation Authority 1993 Annual Report

Residents interviewed during the study cited lack of personal safety as the main reason for avoiding the rail system. They felt vulnerable when waiting at stations in isolated locations that were poorly maintained and aesthetically unattractive. Residents were also reluctant to drive and park at stations because the lots are generally located in proximity to some of the lowest income areas in the region.¹¹⁰

Many factors have contributed to rail transit's poor image in the Cleveland area. While the RTA is in the process of upgrading facilities which will address some of the concerns voiced in the 1988 study, there are limited funds available for public relations and advertising programs to promote the renovations and create a more positive image.

110 Comparison of Development on the Airport-Windermere and Shaker Heights Rapid Transit Lines in Cleveland, Ohio, NOACA, May 1988.

**Miami International Airport
Miami, Florida**

General Description of the Metropolitan Area

Miami's population is 358,548 in an area of 34 square miles, making it a very densely populated city (10,546 per square mile). The city's population grew 3.4% between the 1980 and 1990 census reports. There are 841,349 people employed in Miami, further demonstrating that commuter congestion is significant.¹¹¹

A study of the Miami metropolitan area (See Map 1) would be appropriately focused on Dade County. The 1990 census figures placed the county's population at 1,937,094. For the ten-year period ending in 1992, annual growth in Dade County averaged approximately 1.25%. The county's population was estimated at just over 2 million just before the onset of Hurricane Andrew in 1992. Projections of regional growth have been adjusted to account for the effects of the hurricane. County population in 2000 is expected to exceed 2.2 million, and projections for 2010 exceed 2.5 million. Growth is expected to be strong in the extreme western part of Dade County and to the south of the central business district (CBD), with the area west of the Florida Turnpike extension expected to receive the strongest growth.¹¹²

Miami International Airport

In 1993, Miami International Airport (MIA) served 28.7 million passengers, an increase of 2.2 million over 1992's figures. International travelers totaled 12.4 million in 1993, or roughly 43% of the airport's total patronage. Airport officials project the total 1994 passenger count to approach 30 million. Air travel contributes (directly and indirectly) 176,000 jobs to the metropolitan Miami area, and impacts the area's economy by \$12 billion annually.¹¹³

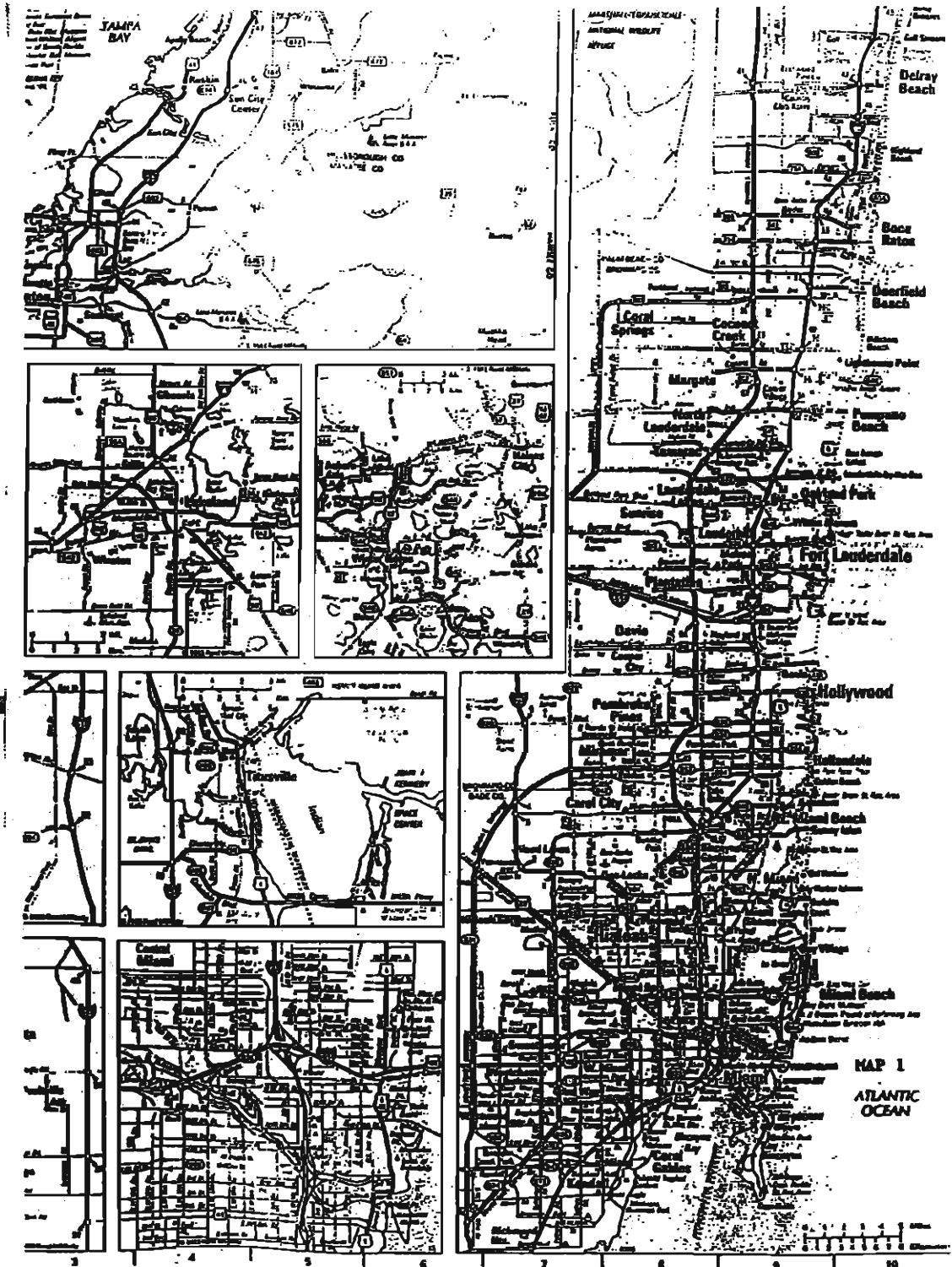
The airport is located just west of (and in close proximity to) the core of Miami's central business district. Miami International Airport services a vast area (with a radius of

¹¹¹ World Almanac, 1993

¹¹² Telephone interview with John Hernandez, Junior Planner, Research Division, Dade County Planning Department, July 1994.

¹¹³ Dade County Aviation Department, Miami International Airport (The Hub of the Americas), 1994.

Map 1



Approximately 100 miles) which includes several other south-Florida cities (including Fort Lauderdale, West Palm Beach, and Boca Raton). The international nature of MIA's passengers, combined with its large service area, makes the airport a regional transportation center. Anticipation of future growth has spurred a \$2.5 billion airport expansion and modernization effort which is currently underway.

The Dade County Aviation Department, which oversees the operation of MIA, is financially self-supporting. Funding for the airport's operations and improvements requires no local tax dollars. Airport revenue from a variety of sources (rental charges, landing fees, usage fees, etc.) fully supports the airport's financial needs.¹¹⁴

Three primary factors influence Miami's airport ground-access operation:

1. MIA's patronage is unique. Airport traffic is divisible into distinct market segments, including tourism (particularly cruise-ship traffic) and international traffic.
2. The cohesive nature of Miami's metropolitan government structure has a significant impact upon multi-modal transportation planning.
3. Regional growth patterns have affected transportation planning, and have caused the emergence of two key projects: development of an east-west corridor and construction of an innovative Inter-modal center.

MIA's Customer Base

Dade County Aviation Department's 1992 air passenger survey revealed several interesting aspects of the airport's patronage:

- Non-business travelers comprise a uniquely high percentage of MIA's traffic: nearly two-thirds (64.5%) of weekday travelers, and 70.8% of weekend travelers.
- A surprisingly low percentage of MIA passengers leave a place of business for their ground trip to the airport (only 6.6% of weekday travelers and 1.1% of weekend

¹¹⁴ Dade County Aviation Department, Miami International Airport (The Hub of the Americas), 1994.

travelers). The overwhelming majority of MIA passengers who arrive by ground transportation departed from "leisure" or residential locations.

- A significant number of MIA passengers are bound for cruise ships at the Miami seaport. More than 12% of the airport's weekday traffic, and more than a quarter (26.8%) of MIA's weekend traffic is comprised of cruise patrons.
- International traffic is a substantial portion of MIA's business. More than a third (37.8%) of MIA passengers arrive by connecting flights; of those, more than half (51.4% weekdays, 58.2% weekends) connected from a city outside the United States. Nearly half of MIA's weekday passengers (45.7%), and 40.6% of the airport's weekend passengers are headed for foreign destinations.
- Not surprisingly, downtown Miami (including the seaport) is the leading single origination site for ground trips to MIA among 21 surveyed locations. What is significant is that about one-fifth of the ground arrivals originated 25 or more miles from the airport (approximately 21% of weekday travelers and 20% of weekend travelers). These originations include Fort Lauderdale, Naples, West Palm Beach, and the Florida Keys.¹¹⁵

These unique aspects of MIA's patronage make a significant contribution to the particular transportation planning needs of the region.

Airport Access Modal Shares

Private cars remain the dominant mode of access to MIA. Experts assess that the traditional American "love affair with the automobile" has not diminished;¹¹⁶ the 1992 survey supports this, showing that 42.8% of weekday travelers and 32.1% of weekend travelers arrived at MIA by private car. Project consultants assert that American travelers, unlike their counterparts in foreign countries, are not "transit oriented," and that transit planning should

¹¹⁵ Figures for this section were taken from Dade County Aviation Department, Air Passenger Survey, 1992.

¹¹⁶ Focus Group, Miami International Airport, Miami, Florida, June 1994.

attempt to co-exist with private-car transportation, not to supplant it.¹¹⁷ Two initiatives, the Miami Inter-modal Center and East-West Corridor projects are intended to help blend private-auto use with public transit imperatives.

Private rental transportation modes share dominance with private car transportation in terms of MIA access. Rental cars (or rental car courtesy vans) bring in more than a quarter (25.5%) of MIA's weekday passengers, and 24% of the airport's weekend traffic. Tour buses, including those provided by cruise line vendors, account for 7.6% of weekday access and nearly a fifth (19.8%) of weekend access; this considerable patronage forms a "captured market," and is a major passenger base for the East-West Corridor project. Taxis also contribute significantly to MIA's ground access, with a 12.2% share of weekday traffic and a 14.3% share of the airport's weekend trips. Public bus and rail account for a mere 1.2% of weekday access, and only 0.4% of weekend access.

Exact modal-split figures from the 1992 survey are summarized in Table 1.

Table 1: Modal Shares¹¹⁸

MODE	WEEKDAY SHARE	WEEKEND SHARE	AVERAGE
Private Car	42.8%	32.1%	37.5%
Rental Car/Courtesy Van	25.5%	24.0%	24.8%
Taxi	12.2%	14.3%	13.3%
Tour Bus	7.6%	19.8%	13.3%
Hotel Courtesy Van	3.7%	4.0%	3.9%
Super Shuttle	3.4%	2.7%	3.1%
Off-Airport Parking Bus	1.7%	2.1%	1.9%
Limousine	1.9%	0.7%	1.3%
Public Bus/Rail	1.2%	0.4%	0.8%

¹¹⁷ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹¹⁸ 1992 Air Passenger Survey, Airport Master Plan Update. July 1992. Originating passengers only.

Proposed transportation projects, such as Miami Inter-modal Center and East-West Corridor include developments experts say will increase public transportation modal shares and shift the burden away from public highways which are congested with airport and non-airport traffic. The Inter-modal Center is expected to increase ridership on the city's main rail networks (Metrorail and Tri-Rail) and serve as a link between several modes of transportation. Additionally, planners hope to extend Florida's proposed statewide High-Speed Rail System to Dade County to assist with transportation needs in the corridor.¹¹⁹

The degree to which ridership can be increased by these projects is still unclear. One official has predicted that public transit's ridership share could reach 11% if current plans are enacted. Planners are still working on specific projected modal share figures, but optimism is high that today's planning efforts will reap big payoffs in terms of increased public ridership in the future.¹²⁰

Miami's "Metropolitan" Governmental Structure

A second unique aspect of the Miami airport access situation is a perceived cohesiveness in the policy-making process created by what experts call Miami's "metropolitan" or "county-based" government structure. In many U.S. cities, difficulties in developing a smooth regional transportation plan (including airport access) originate to a large degree from the challenge of coordinating across jurisdictional and political boundaries. In Washington D.C., for example, regional transportation planners must contend with two states, the District of Columbia, and no fewer than seventeen separate government jurisdictions.¹²¹ The Inter-modal Surface Transportation Efficiency Act (ISTEA) requires that all relevant jurisdictions be included in the planning process for any major transportation project; many cities are challenged in their efforts to comply with the ISTEA. Miami's county-based government has been helpful to planners in coordinating across such jurisdictional lines.¹²²

¹¹⁹ ICF Kaiser Engineers, Miami Inter-modal Center Scoping Document (prepared for Florida Department of Transportation), December 1993, p.2.

¹²⁰ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹²¹ Focus Group, Washington Airports, Washington, D.C., June, 1994.

¹²² Focus Group, Miami International Airport, Miami, Florida, June 1994.

Two imperatives seem to drive progress on metropolitan transportation planning in Miami: a reactive imperative, and a proactive imperative. Reactively, officials seem to be responding to growth and congestion which has forced action regarding redevelopment of the county's transportation systems. Proactively, planners are able to look ahead to the possibilities presented by upgraded transportation systems in capturing new economic development opportunities.¹²³

Currently, Miami's planning efforts are focused on coordination of studies for the region's two critical transportation proposals: the East-West Corridor, and Miami Inter-modal Center (MIC). Planners have conducted parallel studies which take advantage of the similarities between the two projects, avoiding duplication of planning effort.¹²⁴

Miami Inter-modal Center (MIC)¹²⁵

Miami's unique travel patronage demands the need for creative and efficient solutions to Inter-modal transportation problems. The Miami Inter-modal Center is part of the solution. Located between MIA and the core of the CBD, the proposed Miami Inter-modal Center (MIC) is a transportation hub connecting several different modes of regional transportation. (See Map 2) When it is completed, MIC's goal will be to facilitate smooth, "seamless" transfer of passengers and parcels between modes.

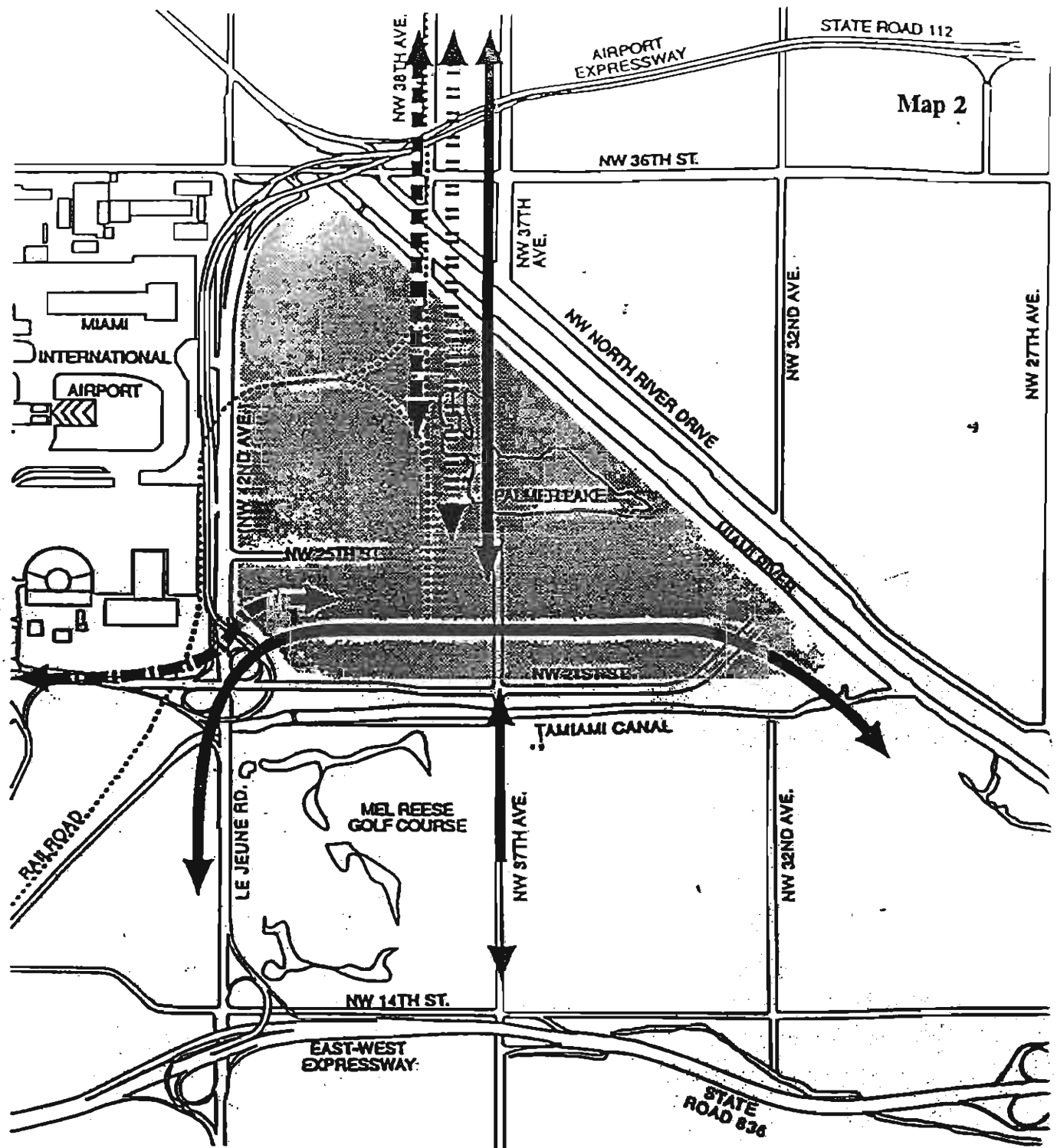
The various modes which will connect at the MIC are:

- Metrorail
- Tri-Rail (commuter rail system)
- Amtrak
- Future Florida High-Speed Rail
- Seaport-Airport Transportation Services
- Metro Bus

¹²³ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹²⁴ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹²⁵ Information for this section was taken from ICF Kaiser Engineers, Miami Inter-modal Center: Scoping Document; prepared for Florida Dept. of Transportation, December, 1993.



Map 2

LEGEND

- Metrorail Access Alternatives
- - -→ Tri-Rail
- · · · → Amtrak & High Speed Rail
- +— Airport Connector

Figure 6
TRANSIT ACCESS TO THE MIAMI
INTERMODAL CENTER



- Regional highways

MIC will also be helpful in coordinating:

- Access to the MIA passenger terminals
- Access to hotel (and other) courtesy vehicles
- Bicycle and pedestrian movements
- Visitor and employee parking
- Various passenger services and amenities
 - Pick-up and drop-off
 - Ticketing
 - Baggage check/claim
 - Waiting areas, concessions.

Interestingly, Miami's Inter-modal center presents an opportunity to shift the burden of many airport landside operations away from the main airport site. When passengers are able to check-in, obtain tickets, check baggage, and access ground transportation at the MIC, congestion at the airport site should significantly diminish. This will provide for smoother, faster airport operations.

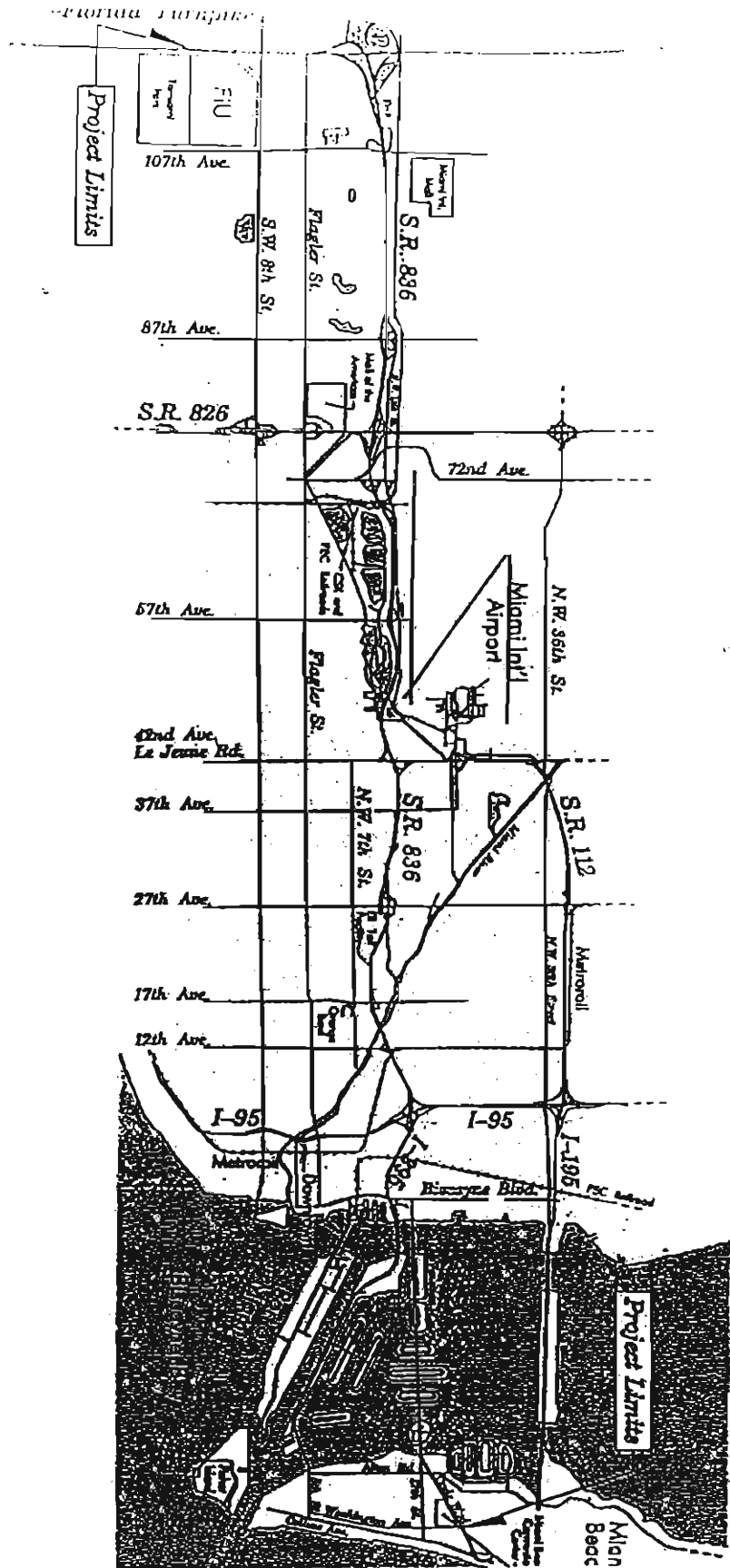
East-West Corridor Development

The Atlantic Ocean forms an obvious geographic barrier to Miami's growth. As the city has developed, the preference for oceanside real estate has created a definite proclivity toward a north-south growth pattern, making north-south transportation systems dominant. Two interstates, a turnpike, and several other major thoroughfares constructed over the past several years are north-south highways. This proclivity has drawn attention away from the transportation requirements of the city's east-west corridors. As a result, east-west traffic congestion, particularly along the primary thoroughfare of S.R. 836 (the East-West Corridor), has become severe.¹²⁶ Because of this, and since future growth is expected to be strongest to the west of the CBD, planners generally concur that "the time has come for the East-West."¹²⁷ (See Map 3)

¹²⁶ Florida Department of Transportation, East-West, Vol. 1., No. 1, Winter 1993; this theme was also developed in the Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹²⁷ Florida Department of Transportation, East-West, Vol. 1., No. 1, Winter 1993.

EAST-WEST MULTIMODAL STUDY
AREA MAP



W.P.I. No. 6714094
State Proj. No. 87200-1539

Experts consider east-west development to be a critical issue in Miami. Planners estimate that 90% of the region's visitors travel through the East-West Corridor.¹²⁸ The corridor is important for local, non-airport traffic as well: by 2010, experts estimate that 1.3 million trips per day will pass through the airport area, and that only 21% of these trips will actually be destined for the airport.¹²⁹ Planners hope development of the East-West Corridor, including completion of the innovative MIC, will serve to alleviate much of the congestion problem along this route.¹³⁰

One aspect of the region is the high number of patrons traveling from the airport to the seaport (primarily cruise patrons). These passengers must travel through the East-West Corridor. Though the significant number of these passengers serves to exacerbate congestion in this critical corridor, planners recognize the uniquely "definable" nature of this market and the opportunity to capture the bulk of it through transit development projects.¹³¹

Planning Process for East-West Corridor

Officials must undergo two distinct processes in the course of creating new transportation policies: a planning process involving work by transportation professionals, and a scoping process aimed at stimulating involvement from public interests. Agencies which have cooperated in the planning and marketing of these projects have included Florida Department of Transportation, Federal Aviation Administration (FAA), Federal Railroad Administration (FRA), the U.S. Maritime Administration, Federal Transit Administration (FTA), Federal Highway Administration (FHWA), the U.S. Coast Guard, Dade County Aviation Department, and local jurisdictions.¹³²

¹²⁸ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹²⁹ ICF Kaiser Engineers, Miami International Airport Scoping Document (prepared for Florida Department of Transportation, December, 1993, p.21.

¹³⁰ Florida Dept. of Transportation, East-West, Vol. 1, No. 1, Winter 1993.

¹³¹ Focus Group, Miami International Airport; Miami, Florida, June 1994.

¹³² ICF Kaiser Engineers, Miami Inter-modal Center Scoping Document (prepared for Florida Department of Transportation), December, 1993, pp. 2-3.

This coalition of agencies has made significant efforts to communicate with the public regarding development of these projects. This effort has included numerous public meetings (1-2 per day at the peak of activity), as well as a formal "scoping" process. This process, which involves tabulation of comments from a variety of public interest groups, showed strong public support for the MIC and East-West Corridor projects. Over the course of three public scoping meetings held in late 1993, officials heard 31 comments in favor of the projects, 12 opposed, and 8 neutral.¹³³ As a result of the scoping process and other public-involvement efforts, experts perceive that public opinion of these key transportation projects is relatively favorable.¹³⁴

Funding

Funding for the projects has come from a variety of sources, and including Federal funds. In order to compete successfully for U.S. dollars, Dade County must develop resources to match Federal financial participation as extensively as possible. For this reason, the metro coalition is exploring a variety of funding options for the East-West Corridor and MIC projects, including tolls, subsidies, and gasoline taxes. Authorities are also exploring the possibility of developing a local "express lane authority" which may be of assistance in providing funds through new tolls. Another source of funding is a transportation fee which is currently added to ticket prices paid by cruise patrons. This fee, which amounts to \$15 per passenger, is earmarked to cover transportation from MIA to the seaport for cruise boarding.¹³⁵ Ad valorem (property) taxes also support public transportation. For additional future funding support, officials are also considering submitting new bond initiatives to voters.¹³⁶ Experts intend that the combination of all funding sources will be adequate to provide for the funding needs of the MIC and East-West Corridor projects.

The MIC and Corridor projects are two of a list of several projects which have been on Miami's drawing boards in recent years. In all, seven major corridors have been identified as

¹³³ ICF Kaiser Engineers, East-West Multi-modal Corridor and Miami Inter-modal Center Projects: Scoping Results Report; prepared for Florida Department of Transportation, April, 1994.

¹³⁴ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹³⁵ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹³⁶ Interview with Jose Mesa, Director, Metropolitan Planning Organization of Miami, June 1994.

needing development: the South Corridor (in need of rail and busway development), the Kendall Corridor (serving a southwestern thoroughfare), the North and Northeast Corridors, the Beach Corridor, the West Corridor, and a combined West-Beach Corridor.¹³⁷

Because resources are scarce, projects must compete; generally, priority is given to projects which are most necessary and/or most feasible. Miami planners have been forced to shelve certain projects which were judged to be less critical or less feasible than the MIC and East-West Corridor projects. For example, work on a transit project in a particular corridor was postponed because bus ridership in the corridor was already high - one criterion used to prioritize projects is how many new riders can be moved out of private automobiles.¹³⁸ Of the remaining projects, priority for completion is assigned in accordance with opportunities (primarily funding) which arise; since the MIC and Corridor projects serve two vital and publicly-supported needs, these projects have emerged as readily fundable, and thus enjoy dominant priority over other regional undertakings.¹³⁹

Decision Processes and Models

In coordinating decision making across agency and jurisdiction boundaries, officials have labored to create as much consensus as possible among various key organizational decision makers. Essential to this consensus-building effort was the development of objective criteria which satisfied the needs of all organizations involved.

In support of the metro government's cohesive decision process, planners and consultants have used a variety of qualitative and quantitative models in analyzing Miami's transportation systems and needs. The project has been centered primarily within two work groups: a policy steering committee, comprised of director-level transportation professionals who help create

¹³⁷ Dade County Metropolitan Planning Organization: Dade County Transit Corridors Transitional Analysis: Corridors Evaluation Report (Executive Summary).

¹³⁸ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹³⁹ Interview with Jose Mesa, Director, Metropolitan Planning Organization of Miami, June 1994.

the over-arching objectives and plans for the project, and a technical steering committee, made up of transportation planners who examine the specific details of the project.¹⁴⁰

The "Miami Model," originally developed to analyze the city's current transportation system, has been updated for use in studying the city's new (and future) needs. The city uses what planners call a Project Development and Environmental study (PD&E). The guidelines for this process are straightforward, and include investigation of a variety of impacts for a given project.

Central to the modeling process has been the "Major Investment Analysis," a label for the formalized procedure used to satisfy the needs of fund-providing Federal agencies. This process includes goals and objectives of the project, as well as "fatal flaw analysis" which helps weed-out weaker projects.

Within this process, a wide array of models have been used. These models include:

- Traffic models
- Air quality assessment models
- Noise impact models
- Financial feasibility models
- Operations models
- Maintenance models
- Models for energy consumption and savings
- Wetland impact models (including WET II Model)
- A variety of other environmental impact models.

These are standard transportation models, fine-tuned to match the characteristics of the region. The models and the data used to drive them are reviewed by the technical steering committee. Consensus on model formulation and data collection is attained before the models are used for analyzing project alternatives.

¹⁴⁰ The information for this section was taken from the Focus Group, Miami International Airport, Miami, Florida, June 1994.

This process of consensus management is a critical aspect of Miami's regional planning effort. By giving high priority to building consensus regarding model formulation and data gathering, an agreement is created between all decision makers to work from the same set of numbers, making the subsequent exchanges inherent in the planning process proceed smoothly.¹⁴¹

Once data were gathered and analyzed using these tools, policy committee officials met to determine a uniform set of assumptions that could be used in comparing projected performance of various project alternatives against stated project goals. These goals included:

- Maximize mobility for area residents and workers
- Improve South Florida regional connections
- Maximize efficiency of the transportation system
- Integrate transportation in the community and encourage improved development patterns
- Preserve and protect the environment.

What resulted was a decision "matrix" which combined data analysis with goal criteria for the purpose of assessing the project's viability. The analysis is divided into three primary tiers. Tier One provides a rough estimate of the alternative on each dimension of the matrix; Tier Two is an intermediate analysis; and Tier Three involves full modeling and evaluation. An example of the "shell" for this matrix is included as an appendix to this report.¹⁴²

¹⁴¹ Focus Group, Miami International Airport, Miami, Florida, June 1994.

¹⁴² Dade County, Florida: East-West Multi-modal Corridor Study: Evaluation Criteria.

New York City, New York Metropolitan Airports
John F. Kennedy International
LaGuardia International
Newark International

General Description of the Metropolitan Area

The New York metropolitan area comprises some 25 counties in New York and New Jersey. The population in this region is 17.95 million with an average density of 990.0 per square kilometer.¹⁴³ The economic focus of the area is centered on Manhattan Island with a large number of people commuting daily into the central business district. Because of this daily influx of commuters, New York has a highly developed public transportation system which includes bus, rail, ferry, and subway. However, the area is characterized by a high degree of traffic congestion. Public officials have become increasingly concerned about the impact of this congestion on the environment and the region's economic prosperity.

The New York metropolitan area is served by three principal airports: LaGuardia International to the Northeast of Manhattan, John F. Kennedy International to the southeast, and Newark International, in New Jersey to the southwest. (See Map 1) Adding to the congestion problem, existing public transportation links to the three major airports are poorly developed. The Port Authority of New York and New Jersey (PA), which owns and operates all three airports, estimates that combined volume at its three facilities will rise to between 95 and 100 million passengers a year by the end of the century. The need to increase the use of public modes of access has prompted the PA to investigate ways to improve the quality and use of public transit links to each of the three facilities.

Newark International

When Newark opened in 1928, it was New York's first major airport and soon became the world's busiest. However, with the advent of LaGuardia and JFK, the number of passengers using Newark declined in the middle of the century. The decline reversed when People Express and Laker Airlines moved to Newark. Later, Continental took over

¹⁴³ World Almanac 1993.



- JFK** • Van Wyck Expressway to Airport Exit
- Belt Parkway East to Exit 19/Van Wyck Expressway
 - Belt Parkway West to Exit 20/JFK Expressway

- LGA** • Grand Central Parkway
- East to:
- Exit 5/Astoria Boulevard, Marine Air Terminal
 - Exit 6/94th Street, alternate Airport Exit
 - Exit 7/Airport Exit
- West to:
- Exit 5/Steinway Street, Marine Air Terminal (right at first light)

- EWR** • NJ Route 1-9 to Airport Exit
- NJ Turnpike (Interstate 95) to Interchange 14 or 13A
 - Interstate 78 to Airport Exit
 - NJ Route 22 to Airport Exit

People Express and set up its eastern hub at Newark. Today, the airport is host to 24 airlines and by the end of the decade Newark's passenger load is estimated at 30 million.¹⁴⁴

Ground access to Newark is solely by rubber-tire modes. In order to connect with the New Jersey subway, the New York subway, Long Island Rail Road (LIRR) trains, or Amtrak trains, travelers must use some type of rubber-tire vehicle and navigate through at least one transfer. Table 1 provides a summary of ground transportation at Newark International.¹⁴⁵ Modal shares are addressed later in this report.

Table 1: Comparison of Transportation Costs from Newark

TRANSPORTATION MODE	MANHATTAN	QUEENS, BRONX, BROOKLYN	NJ SUBURBS
New Jersey Transit Bus	\$7	no service	no service
NJ Transit Bus/subway/train	\$2.50 + train	\$7 + subway \$1.25	\$4 + train
Private Bus	\$7	no service	\$9
Private Bus/subway/train	no service	\$7 + subway \$1.25	no service
Shared Van	\$17	\$19	\$15-\$19
Taxi	\$25-30 + tolls	\$26-\$56	\$10-\$168

Ground Access Improvements at Newark

On the land side, the present on-airport road system at Newark handles approximately 22 million passengers a year — close to its capacity of 25 million. In order to handle the number of passengers using the airport more efficiently, a people mover system is being installed which loops around the airport — connecting the terminal, concourse buildings and parking facilities.¹⁴⁶

¹⁴⁴ "New York Airports Update," Air Transport World, May 1992.

¹⁴⁵ Airport Guide: A Professional Travel Planners Reference, Fall/Winter, 1993/1994.

¹⁴⁶ "New York Airports Update," Air Transport World, May 1992.

With the increasing number of passengers using the Newark airport, ground transportation is becoming strained. In partnership with the New Jersey Transit Corporation, the Port Authority is currently investigating the possibility of extending a proposed light rail line to the airport to relieve congestion on the roadways. The resulting system would integrate commuter rail and the airport people-mover system. The Newark-Elizabeth Rail Link Options Study is a preliminary investigation of the transit alternative along this corridor.

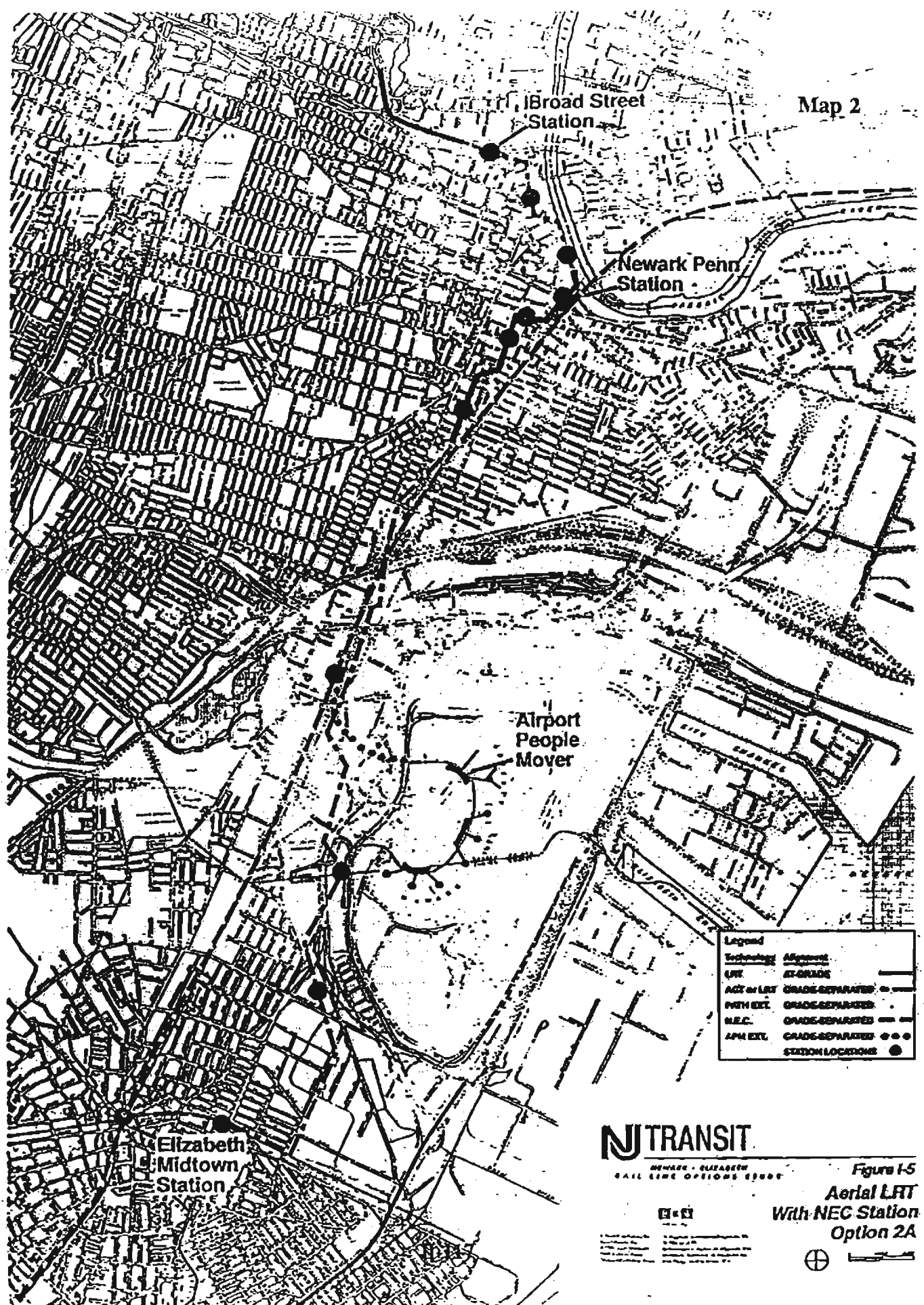
This study looked at six technology/alignment options including a no-build option (required for comparing environmental impacts of build options), a transportation systems management (TSM) option (required by the Federal Transit Administration), and four "build" options. The final recommendation was for a "build" option. When completed, it would carry more riders than any of the other build options — projected daily ridership on the Newark-Elizabeth link was 134,319 by the year 2010 plus 7,690 air passengers. This option includes an 8-mile, 11-station Light Rail Transit (LRT) line linking Newark and Elizabeth, configured as an extension of the Newark City Subway and attached to the airport by a one-mile extension of the airport people-mover.¹⁴⁷ (See Map 2)

The capital cost estimate for the preferred option is \$844,567,000 which included new light rail, station construction, and upgrades to shared subway facilities. A plausible funding scheme considers the New Jersey Transit's 1994-1998 Capital Program (supplemented by ISTEA monies) sufficient to complete substantial portions of the recommended option. The extension of the people-mover system and the airport station would be funded by Passenger Facility Charges (PFCs) collected by the Port Authority of New York and New Jersey.

Having completed the initial study, transportation officials are proceeding with the preparation of Environmental Impact Statements (EIS) and funding procurement. The EIS for the extended people-mover was released in July 1994. Transportation officials expect construction on the people-mover to carry-over until the extension is complete. Progress on the light rail link has been slower. Currently, the preliminary scoping meetings have been completed, and work on the EIS has just begun.

¹⁴⁷ Newark-Elizabeth Rail Link Options Study, New Jersey Transit Corporation, June 1993.

Map 2



NJ TRANSIT
 NEWARK - ELIZABETH
 RAIL LINE OPTIONS STUDY

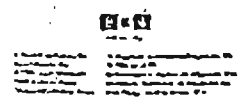


Figure I-5
 Aerial LRT
 With NEC Station
 Option 2A

Significant economic benefits are expected from investing in transit in the Newark-Elizabeth-Airport corridor: increasing the competitiveness of Newark Airport, creating a focus for development at priority sites in Newark and Elizabeth, and creating construction jobs for infrastructure projects.

LaGuardia

LaGuardia was the second major airport built in the New York City area. At the time of its construction in 1939, it was the primary hub for air activity in New York. However, physical constraints at the site have prevented it from being expanded to handle the larger jets in use today. Some relief was gained with the construction of an over-water extension of one runway; but with only two intersecting runways, its air capacity is severely limited.

Ground access to LaGuardia is also focused on rubber-tire modes. However, there is also a water shuttle which operates between the airport and downtown Manhattan. A summary of ground access from LaGuardia is given in Table 2.¹⁴⁸

Table 2: Comparison of Transportation Costs from LaGuardia

TRANSPORTATION MODE	MANHATTAN	QUEENS, BRONX, BROOKLYN	NJ SUBURBS
NY Transit Bus	no service	no service	no service
NY Transit Bus/subway/train	\$1.25 + \$1.25	\$1.25 + \$1.25	no service
Private Bus	\$8.50	\$5-\$7.50	no service
Private Bus/subway/train	\$5 + LIRR	no service	\$8.50 + bus
Shared Van	\$12	prices vary	prices vary
Taxi	\$18 + tolls	\$10-20	prices vary
Water Shuttle	\$20	NA	NA

¹⁴⁸ Airport Guide: A Professional Travel Planners Reference, Fall/Winter, 1993/1994.

Ground Access Improvements

The central terminal building, opened in 1964, was designed to handle 8 million passengers per year. The Port Authority estimates LaGuardia will handle 30 million passengers annually by the end of the decade. To accommodate this increase, a strategy has been put in place to realign and widen the road system at the central terminal building and improve facilities at the east end terminals. With these improvements, passenger traffic has been shifted away from the central terminal.

More recently, a proposal has been advanced for an Airport Access Program (AAP) which would provide a dedicated transit service for air travelers and airport employees. The AAP would link Manhattan with LaGuardia and JFK. The goal of the AAP is to provide service from Manhattan to LaGuardia in fifteen minutes. The Airport Access Project is discussed in-depth later.

John F. Kennedy International Airport

Located 15 miles from Downtown Manhattan, JFK has become the principal Origin/Destination gateway for international travel and handles the most passengers of any of the three airports in the area. In 1990, it handled 30 million air passengers and the Port Authority expects that figure to grow to 40 million by the end of the decade.

Currently, landside access is dominated by rubber-tire modes. Like Newark and LaGuardia, access to public transit is accomplished via bus-to-rail transfers. As a result, public transit's modal share to JFK is minuscule. JFK's ground access is summarized in Table 3.¹⁴⁹

¹⁴⁹ Airport Guide: A Professional Travel Planners Reference, Fall/Winter, 1993/1994.

Table 3: Comparison of Transportation Costs from JFK

TRANSPORTATION MODE	MANHATTAN	QUEENS, BRONX, BROOKLYN	NJ SUBURBS
NY Transit Bus	no service	no service	no service
NY Transit Bus/subway/train	free + \$1.25 \$1.25 + \$1.25	free + \$1.25 \$1.25 + \$1.25	no service
Private Bus	\$11	\$5-\$9.50	\$18.65
Private Bus/subway/train	\$5 + LIRR fare	\$5 + \$1.25	\$11 + bus
Shared Van	\$15	\$23-30	\$29-40\$
Taxi	\$28 + tolls	\$11-40	Prices vary
Helicopter	\$65	NA	NA

Ground Access Improvements

Currently, the Port Authority is spending \$2.7 billion to improve facilities on both the land and air sides of the airport. One of these improvements has been to reconfigure the on-airport road system into quadrants. This will allow vehicles to move directly to the associated terminals and parking lots without having to circle the entire structure. This is intended to relieve congestion and save time for air travelers. The other major improvement to ground access is the JFK Expressway which provides a second entrance to the airport from the east and north. This expressway allows direct access for passengers coming to JFK from Long Island, and siphons traffic away from the often jammed Van Wyck Expressway.¹⁵⁰ (refer to Map 1.)

In addition to rubber tire modes, JFK can also be accessed by rail to some degree. However, rail does not penetrate the airport facility. Passengers using the NYC subway system or the Long Island Rail Road must take a shuttle bus from the nearest station to the airport terminal — a time consuming and inconvenient alternative. Consequently, progress on the proposed

¹⁵⁰ "New York Airports Update," *Air Transport World*, May 1992.

Airport Access Program will also benefit JFK. Under the proposal for the Airport Access Program (AAP) service would be provided from Manhattan to JFK in 35 minutes.

Modal Shares for the New York Airport System

Having described the current ground access systems, the following table compiles information taken from the Port Authority's 1992 Air Passenger Survey and summarizes the current modal splits for Newark, LaGuardia and JFK.

Table 4: Modal Shares

MODE	NEWARK	LAGUARDIA	JFK
Private Car	51.8%	31.5%	43.2%
Taxi	7.5%	32.8%	17.4%
Private Limousine/Car Service	19.1%	19.3%	19.9%
Rental Car	11.5%	5.0%	3.8%
Hotel Van	2.5%	1.1%	3.1%
Private Bus/Shared Van	4.8%	7.1%	8.4%
Shared Limousine/Car Service	1.7%	2.0%	2.8%
Public Transit (bus, bus/rail or ferry)	1.1%	1.1%	1.1%

Ground Access in New York

A summary of ground access characteristics and origin/destination data for the three airports is presented in Table 5. Significantly, over 78% of the air traveler market in New York is arriving or departing from Manhattan — approximately 54,000 trips per day. This is roughly the same as the entire market region for the Dallas/Fort Worth airport and two-thirds as much as the entire O'Hare (Chicago) market region.¹⁵¹ Obviously, the number of air travelers and the compact geographic characteristics of this market represented an opportunity for increased public transit services.

¹⁵¹ Briefing Report: The Port Authority's Proposed Airport Transit System to Connect JFK and LaGuardia with Manhattan, 1993.

Table 5: Ground Access System

	NEWARK	LAGUARDIA	JFK
Distance to Airport from Downtown Manhattan	16 miles	8 miles	15 miles
Travel Time to Manhattan	40 minutes*	20 minutes*	40-60 minutes*
	* All times may double during peak periods		
% of Air Passengers originating in Manhattan	14%	46%	32%
% of O/D Passengers residing in 5 NY counties	23.1%	86.8%	80.5%
Daily Parking	\$22/day	\$18/day	\$24/day

Airport Access Project

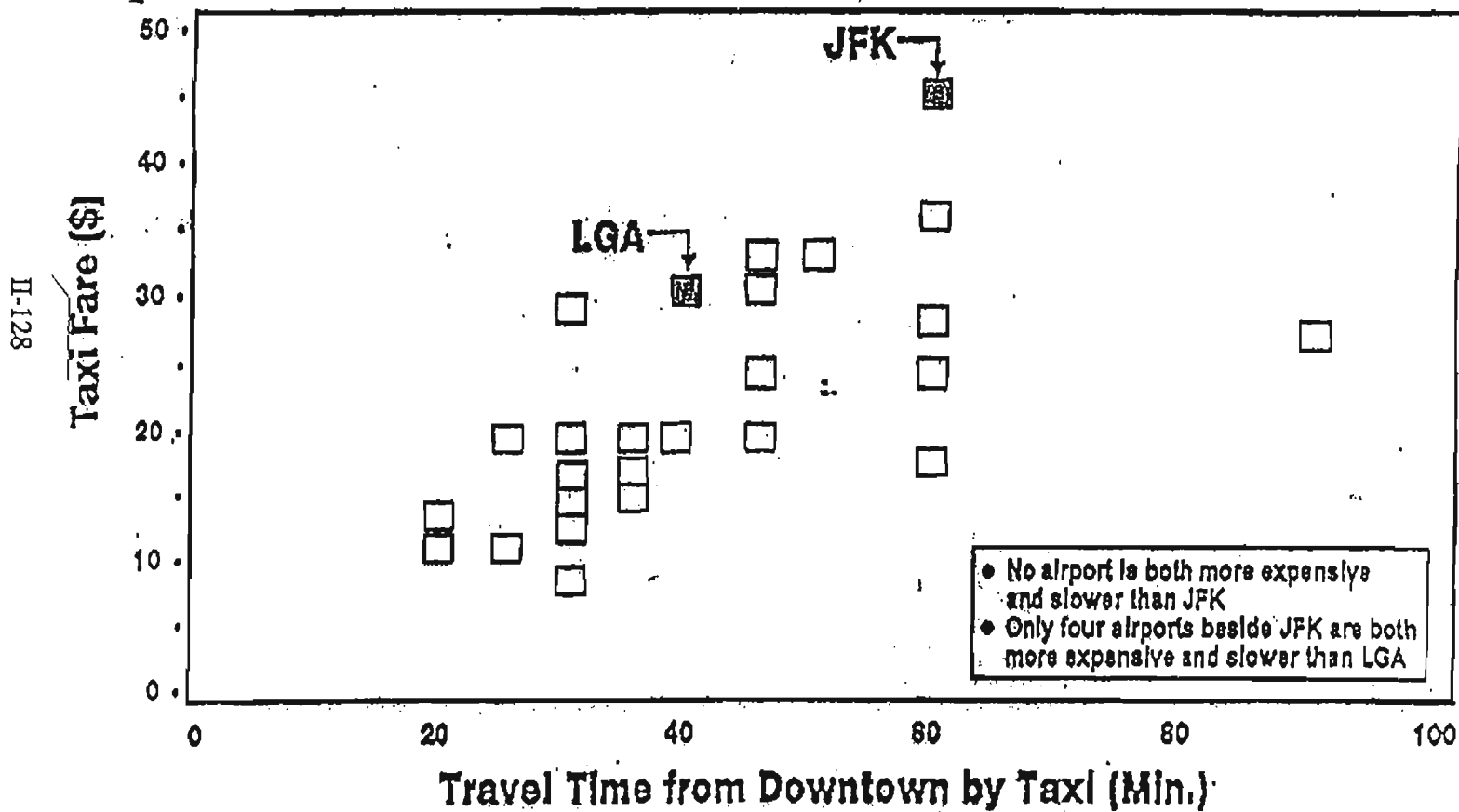
Despite the roadway improvements at LaGuardia and JFK, planners and officials have long realized landside access was continuing to deteriorate. A recent study showed transportation to be more expensive to LaGuardia than to any other major airport in the United States — even though it is closer to the downtown area than most. LaGuardia also received a poor ranking, and only four airports besides JFK were more expensive and more time consuming. (See Attachments 1 and 2)

The end result of access problems is that New York, and particularly Manhattan, is becoming less accessible to other parts of the United States and the world — resulting in economic losses to New York. To illustrate this point, planners point to a survey of businesses leaving the region which showed, "poor access to airports is the second most common reason for leaving."¹⁵²

In response, the Port Authority of New York and New Jersey proposes to implement an elevated Automated Guideway Transit (AGT) system linking JFK and LaGuardia to Manhattan in order to improve airport access. (See Map 3) As the map indicates, the route

¹⁵² Presentation by James Kelly, Assistant Director, Airport Access Program. New York: June 1994.

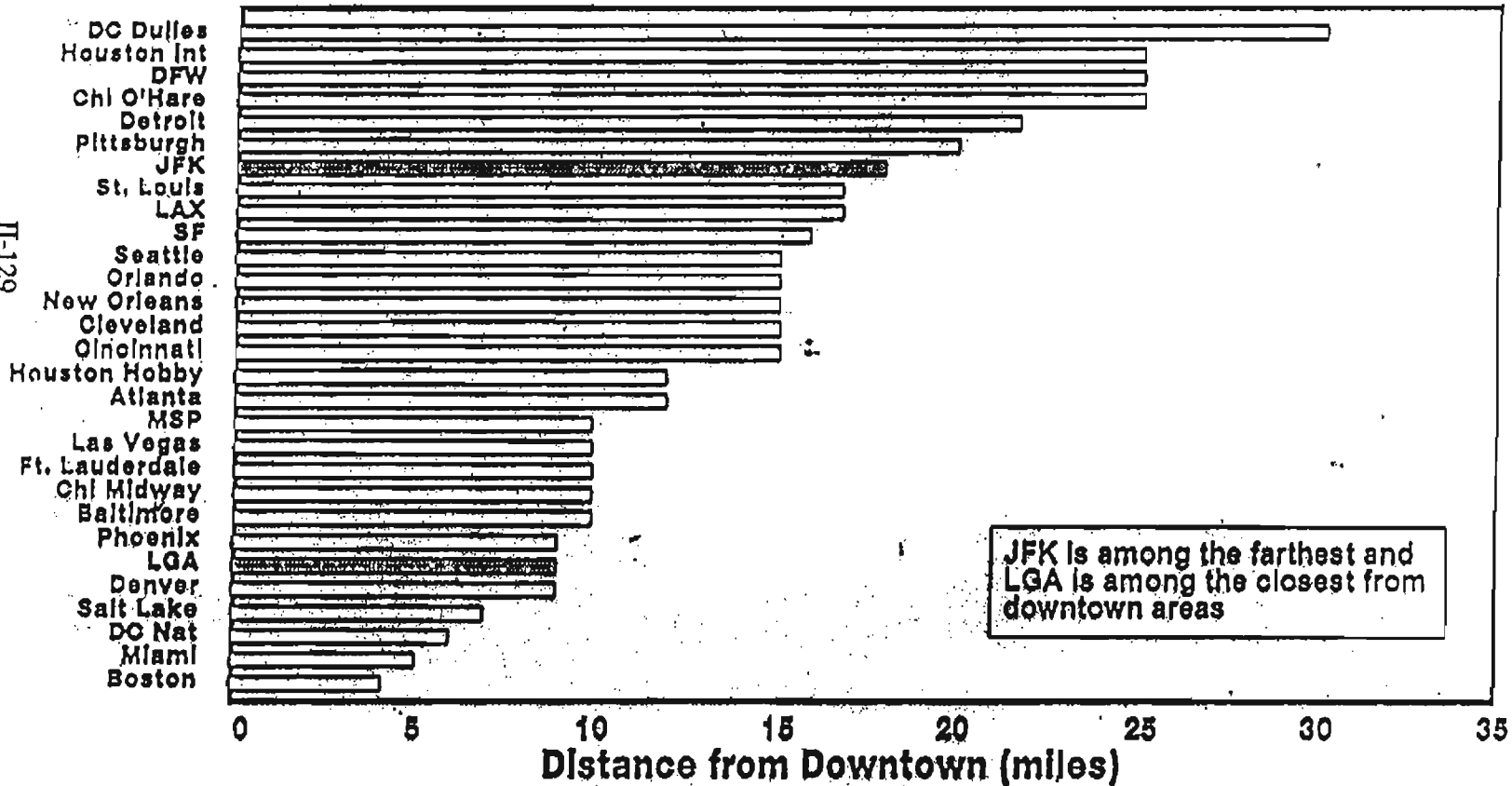
Comparison of Travel Times and Costs



Attachment 1

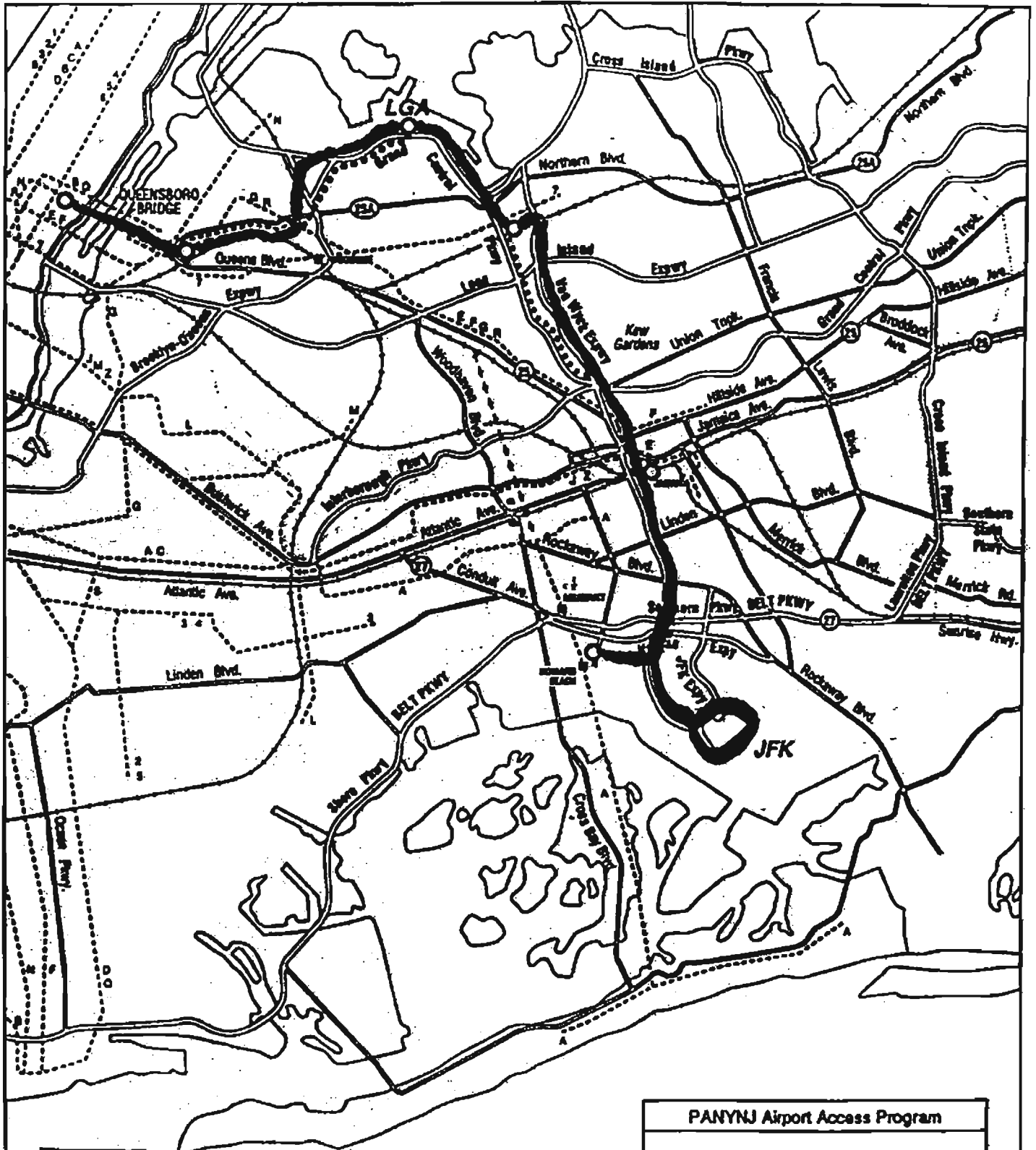
Survey of 29 Airports in "Business Travel Survival Guide"

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Attachment 2

Map 3



■ AUTOMATED GUIDEWAY TRANSIT (AGT)
..... ALTERNATE ALIGNMENT
○ AGT STATION

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PANYNJ Airport Access Program	
Automated Guideway Transit System Alignment	
USDOT-FAA	NYSDOT
LBA/URS Joint Venture	Figure 3-2

begins in the east midtown area of Manhattan. It crosses the Queensboro Bridge to a station in Long Island City where passenger transfers with subway lines will be provided. It then utilizes available space in railroad and highway right-of-ways to reach LaGuardia.

From LaGuardia, the system will use available space within the Grand Central Parkway right-of-way to reach Shea stadium. It will continue south on an elevated structure adjacent to the Van Wyck Expressway to Jamaica. At Jamaica, passengers will be able to transfer to both LIRR and subway trains. Continuing south, the route will be on an elevated structure above the median strip of the Van Wyck Expressway to JFK, where it will stop at each of the terminals.¹⁵³

Previous Transit Efforts

The AAP is not the first proposal of its kind. In the last three decades, improved public transportation to the airports has been the subject of over twenty official planning efforts. Previous proposals generally used public right-of-ways by utilizing New York City Transit Authority or Long Island Railroad lines, reactivating or reconstructing abandoned transit lines, or constructing new dedicated routes within existing right-of-ways. With the exception of the JFK Express ("Train to the Plane"), none were implemented.

The factors which impeded these projects fell primarily into three categories: community opposition, capacity constraints on existing right-of-ways, and lack of ready funding.¹⁵⁴ Community opposition has centered on the disruption caused by construction and the noise impacts on the affected neighborhoods once the system is built. Capacity constraints and the lack of funds are somewhat related. Existing rail and subway lines are fully utilized by commuter trains — there were no available "windows" to operate a dedicated airport service. Additionally, using transportation funds to cater to an elite group of 54,000 air travelers versus the needs of millions of commuters was politically unattractive.

¹⁵³ Briefing Report: The Port Authority's Proposed Airport Transit System to Connect JFK and LaGuardia with Manhattan, Document 9405.2801, undated.

¹⁵⁴ Airport Access Alternatives Retrospective: John F. Kennedy International Airport and LaGuardia Airport, August 1993.

However, the current proposal has three advantages over prior proposals:

1. A viable funding source
2. Strong consensus regarding the economic imperative
3. Multi-agency participation and cooperation

Consequently, transportation officials believe expectations for the successful implementation of the AAP are realistic.¹⁵⁵

Planning Process for Airport Access Project

Having identified the Passenger Facility Charge authorized under FAA legislation as a potential funding source, the planning process for the AAP gained momentum in July of 1992 when the FAA approved the application for planning. A steering committee was formed of transportation officials from local, state and federal agencies. (See Attachment 3) Responsibilities of the steering committee have included setting the project timetable, directing technical feasibility studies, and directing community outreach efforts.¹⁵⁶

After planning approval, simultaneous studies began on the technical feasibility of the system and the potential ridership. Extensive market research was conducted with focus groups of frequent flyers to determine the characteristics necessary to attract them to a transit system. Specifically, air travelers to New York requested a system that is safe, clean, fast, convenient and reliable — at a reasonable cost. Safety, in particular, is important as sixty percent of Manhattan's air travelers are from other parts of the country; their perception of New York's subway is based on media portrayals of danger and filth.¹⁵⁷

In addition to the information gleaned from the focus groups, planning officials made use of origin/destination studies to determine the location of critical markets. From ridership information, it was clear the AAP had to serve Downtown Manhattan — approximately 32%

¹⁵⁵ Presentation by James Kelly, Assistant Director, Airport Access Program. New York: June 1994.

¹⁵⁶ Presentation by James Kelly, Assistant Director, Airport Access Program. New York: June 1994.

¹⁵⁷ Briefing Report: The Port Authority's Proposed Airport Transit System to Connect JFK and LaGuardia with Manhattan, Document 9405.2801, undated.

Steering Committee

✈ Local

- Mayor's Office of Construction
- Mayor's Office of Transportation
- NYCDOT
- NYC Economic Development Corporation
- NYC Department of City Planning
- Manhattan Borough President
- Queens Borough President
- Manhattan City Planning
- Queens City Planning

✈ Federal

- USDOT
- FAA
- FTA
- FHWA

✈ Transportation

- Air Transport Association

✈ State

- Governor's Office
- NYSDOT
- MTA
- LIRR
- NYCTA

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Attachment 3

of JFK's and 46% of LaGuardia's passengers emanate from there.¹⁵⁸ After completing the initial studies, the steering committee agreed to take the next step by beginning environmental and economic impact studies. Concurrently, in consensus with the steering committee, the Port Authority took the lead in coordinating community outreach. A series of more than two hundred meetings were held with community and business organizations to promote the concept of the AAP, to demonstrate the urgency and benefits of improved airport access, to gather feedback, and to garner support.

As of June 1994, the conceptual plan for the AAP had been completed (leaving the technology open) and a draft Environmental Impact Statement (EIS) was circulated. The future of the AAP now depends on completing the EIS and receiving final approval from the FAA to use the Passenger Facility Charge as the funding mechanism.

Funding for AAP

By the end of the 1980's the need for improved access to the airports had become near-critical and discussions recommenced between transportation officials and key staff members in Mayor Koch's administration. However, the discussions hinged on the absence of a workable funding mechanism.¹⁵⁹

Fortunately, other cities were also struggling to implement capital improvements for airports. As a result, legislation was passed by Congress in 1990 which provided for a Passenger Facility Charge (PFC) under the FAA's mission to improve the capacity and competitiveness of the air transport system.¹⁶⁰ This legislation was worded broadly enough to encourage New York's proponents of rail access to pursue funding through passenger facility charges on the grounds that major capacity constraints in New York were not caused by inadequate airport facilities but by insufficient ground access to those facilities.¹⁶¹

¹⁵⁸ The Manhattan Air Passenger Market, December 1992.

¹⁵⁹ Interview with Edward S. Seeley, Deputy Assistant Commissioner, New York: June 1994.

¹⁶⁰ Scoping Process Record for the Environmental Impact Statement, September 30, 1993.

¹⁶¹ Interview with Edward S. Seeley, Deputy Assistant Commissioner, New York: June 1994.

By using passenger facility charges, transportation officials in New York sidestep public accusations that transportation funds should be used to benefit the greatest number of citizens — i.e., commuters. However, this advantage is offset by a potential disadvantage of using PFC monies. Under the legislation, PFC revenues can only be used for projects that benefit airport patrons, which rules out use of the system for local transit purposes, except by airport employees commuting to the airport.

After construction, the AAP must be self-supporting as PFC's can only be utilized for capital construction. This has some elected officials concerned since fees will be generated by only two groups of customers - air travelers and airline/airport employees. Preliminary projections contend the Manhattan customer base of 54,000 passengers per day is sufficient to generate adequate revenues. Port Authority officials project the AAP will capture nearly 20% of the air passenger market on its opening day.¹⁶²

¹⁶² Presentation by James Kelly, Assistant Director, Airport Access Program. New York: June 1994.

Philadelphia International Airport
Philadelphia, Pennsylvania

General Description of Metropolitan Area

Greater Philadelphia is the nation's sixth-largest Metropolitan Statistical Area (MSA). The region includes parts of four states (Pennsylvania, New Jersey, Delaware, and Maryland), and is home to 5.83 million people. The city of Philadelphia is the nation's fifth-largest, with 1.59 million (according to the 1990 U.S. Census).¹⁶³ Within a 100-mile radius of Philadelphia lies 13% of the U.S. population and buying power, and 11% of the country's retail sales; within 300 miles lies a fifth of the U.S. population, and fully a quarter of the nation's disposable income.¹⁶⁴

Philadelphia's development in the 1980s was characterized by decentralization. While the Philadelphia MSA grew 4.3% between 1980 and 1990, the population of the City of Philadelphia declined by more than 100,000 (a decrease of more than 6%). Still, the city remains one of the nation's most densely-populated, with more than 11,000 residents per square mile within the city limits.¹⁶⁵

Philadelphia's primary suburban corridors can be described as follows (See Map 1):

The **Western Corridor** (Chester and Delaware Counties) is centered 20 miles from downtown Philadelphia. The population of the corridor includes a strong representation of upper-middle-class households, and employment is particularly strong within the service industries. Public transportation is rarely used in this corridor, with the exception of the main commuter rail line to downtown's 30th Street Station.

¹⁶³ World Almanac, 1994.

¹⁶⁴ Greater Philadelphia Chamber of Commerce, Get To Know Us, P. 1.

¹⁶⁵ World Almanac, 1994.

Map 1



The **Northeast Corridor** (Montgomery and Bucks Counties) extends to approximately 15 miles outside the city. Middle-class households are prevalent, and employment in manufacturing industries is strong. The public bus and train systems are utilized extensively in this area.

The **Southern and Eastern** parts of Philadelphia (Camden, Gloucester, and Burlington Counties) are largely comprised of industrial parks and manufacturing plants. Use of public transportation is moderate.

Philadelphia International Airport

Philadelphia International Airport (PHL) is a five-terminal airport situated seven miles from the city's central business district (CBD) (See Map 2). Travel time to the airport ranges to more than an hour from most areas served by PHL. The airport rests in the center of a heavily industrialized district, and growth is limited due to the scarcity of available land. Nonetheless, plans are currently underway to add a sixth terminal to PHL.¹⁶⁶

In the early 1980s, Philadelphia International Airport averaged approximately 16 million annual passengers. This number dropped significantly as a result of three key developments in the 1980s: a strike by air traffic controllers, fuel scarcity, and airline deregulation. Though PHL has not achieved the traffic numbers predicted before these developments, patronage has climbed back to the 16 million level annually.¹⁶⁷ As of 1990, the airport supported 8,000 employees, and has been called the "busiest airport in the nation for commuter traffic."¹⁶⁸

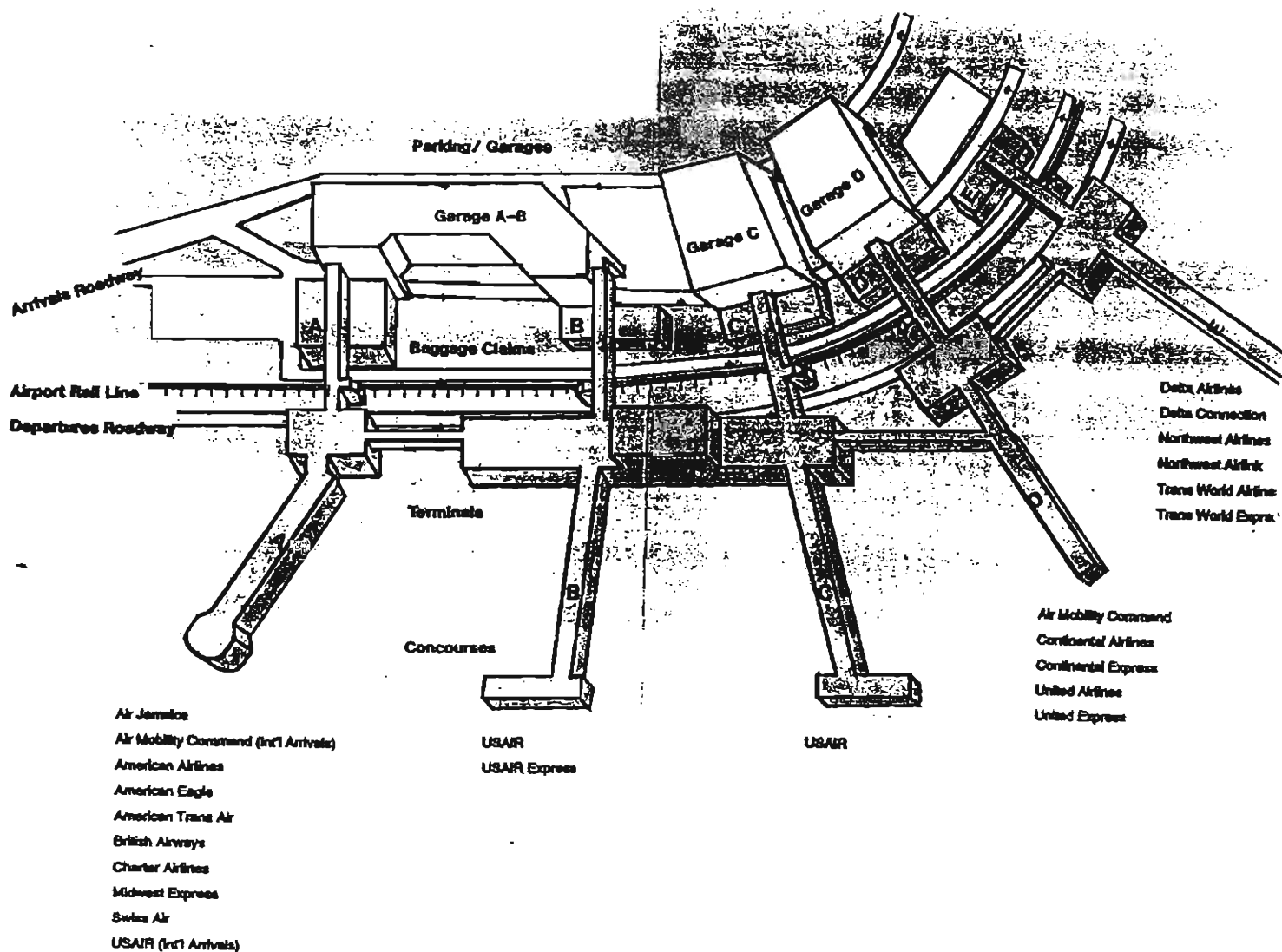
PHL's patronage is divided fairly evenly between business travel, which represents nearly half (49%) of PHL's passenger load, and pleasure travel (43%). More than half of the airport's passengers travel alone (51%), and only 11% travel in parties of four or more. A strong majority (84%) plan their trip in order to arrive an hour or more in advance of their flight.

¹⁶⁶ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁶⁷ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁶⁸ City of Philadelphia Division of Aviation, Airport Ground-Side Study, 1990.

Map 2



Only eight percent of PHL travelers check three or more bags; 28% check two bags; 33% check one bag; and 26% check no baggage.¹⁶⁹

Ground Access to PHL - Overview

Only 18% of PHL's locally-originating (non-connecting) passengers come from the CBD; the majority of the airport's customers travel to PHL from suburban areas of the Philadelphia region, with nearly a third (32%) traveling to the airport from areas northwest of the CBD.¹⁷⁰

Four primary highway routes are used for access to PHL: 35% of those using highway access travel to PHL on I-95 from the north, 32% use I-95 from the south, 20% use the new I-476 "Blue Route" (a new highway serving western suburbs which was completed in 1991), and 13% use the I-76 Schuylkill Expressway.¹⁷¹ A variety of other highways also serve the Philadelphia metropolitan area (see Map One).

Parking is a major source of revenue for most airports, and PHL is no exception. Of those passengers who park their cars, 74% use parking facilities on the airport grounds. Of these, 30% parked in short-term parking areas, 22% in long-term lots, and 15% in economy lots, and 7% in other on grounds parking.¹⁷²

Airport Access Modal Shares

As is typical of U.S. airports, private car is the dominant mode of access to Philadelphia International Airport. Transit, including train and public bus, accounts for a mere 3% of local origination trips to the airport.

Table 1 presents the most recent information available regarding ground access modes to Philadelphia International Airport.

¹⁶⁹ D&Z, Inc., PHL Landside Master Plan (Passenger Survey), December, 1993.

¹⁷⁰ D&Z, Inc., PHL Landside Master Plan (Passenger Survey), December, 1993.

¹⁷¹ D&Z, Inc., PHL Landside Master Plan (Passenger Survey), December, 1993.

¹⁷² D&Z, Inc., PHL Landside Master Plan (Passenger Survey), December, 1993.

Table 1¹⁷³
 Share of Market Among Modes of Access
 Philadelphia International Airport

Mode of Access	Percent
Private Car	49%
Rental Car	18%
Limousine	10%
Taxi	5%
Off-Airport Bus/Limo	4%
Hotel Van	3%
Tour Bus	3%
Train	2%
Public Bus	1%
Other	5%
Total, all modes	100%

Primary Issues Affecting PHL Ground Access

A study of the airport ground transportation situation in Philadelphia points out four issues which merit examination:

- **HIGHWAY SYSTEM:** The region generally enjoys good highway access, and this impacts airport travel (refer to Map One).
- **SEPTA:** The Southeastern Pennsylvania Transportation Authority (SEPTA) operates the region's transit systems, including an extensive light-rail system which includes PHL (see Map Two).

¹⁷³ D&Z, Inc., PHL Landside Master Plan (Passenger Survey), December, 1993.

- **TOURISM:** Officials and planners are adopting a new focus on serving the city's visitors, including patrons of Philadelphia's new convention center.
- **FUNDING and DECISION-MAKING:** The process by which new transportation plans are derived and funded is a key to understanding how Philadelphia's transportation systems evolved.

Each of these issues will be explored in further detail.

Philadelphia's Regional Highway System

The question, "Why do travelers overwhelmingly choose rubber-tire modes of access to PHL over the existing, sophisticated transit systems?" could be simply answered thus: Most of PHL's locally-originating passengers come from the suburbs, and the prevailing public perception is that the highway system serves the suburbs most conveniently.¹⁷⁴

Two new highways completed in the last ten years have served to create an overall high regard for the Philadelphia interstate system. The first was completion of Interstate 95 from the CBD south into Delaware. The second was the "Blue Route," Interstate 476, to serve suburbs to the west of the city.

The regional highway system still has the capacity to serve the bulk of PHL's locally-originating customers makes it difficult to "sell" passengers on transit alternatives. The rail system, which had high usage to the airport when it was first completed, has since been eclipsed by the new highways. Consequently, the air passenger now has options that could be perceived as equal in terms of time and convenience. When this happens, the private car alternative will prevail due to the general proclivity toward the privacy and independence offered by private-car travel.¹⁷⁵ This is not to say that access to PHL is without problems, nor that planners are not interested in increasing the use of transit alternatives.

The primary problem faced by road travelers to PHL is the rigid structure of the road system on the airport grounds. All incoming cars enter the grounds in a counter-clockwise pattern,

¹⁷⁴ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁷⁵ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

and the congestion at parking entrances is significant. Further, if drivers miss their stop on the access loop, they cannot get back to it without driving an additional two miles due to the lack of flexibility for recirculation.¹⁷⁶

Because congestion at the airport is a growing problem, airport officials are hoping to divert traffic to transit alternatives in the future, even if parking revenues are depleted; officials are convinced that the immediate cash benefit of parking revenues begins to diminish as the direct and indirect costs of congestion mount. Officials agree that transit use needs to be increased and they equally agree that this will be difficult to manage.¹⁷⁷

SEPTA and Transit Alternatives

The Transit Division of SEPTA operates 200 routes throughout the region, including buses, trolleys, rail lines, trackless trolleys, and high-speed rail lines. The rail system is one of the most extensive in the nation, and reaches into Delaware and New Jersey. More than a million trips are taken on SEPTA routes on an average weekday for a total of four million miles. During peak periods, 80% of Philadelphia's work trips take place on SEPTA transit routes. Philadelphia is also one of few U.S. cities in which rail service penetrates the airport grounds.¹⁷⁸ Despite these impressive facts, SEPTA buses and trains account for only 3% of locally-originating (non-connecting) trips to PHL.

Local officials are determined to increase transit ridership through a variety of improvements. In particular, signage, reliability, and train frequency are targets for service improvement. In addition, planners are hoping to enhance transit marketing in an effort to increase awareness among target customers, particularly in the suburbs.¹⁷⁹

However, the result of one recent innovative attempt by SEPTA to serve suburban customers is illustrative of the difficulties of such undertakings. Three pharmaceutical companies employing a large number of people opened facilities in a location just beyond the planned

¹⁷⁶ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁷⁷ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁷⁸ Southeastern Pennsylvania Transportation Authority, SEPTA's Philadelphia Street and Transit Map, 1990.

¹⁷⁹ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

terminus of a SEPTA rail line. SEPTA planners' research showed that a mere 198 trips per day would be sufficient to justify extension of the line to serve the area, and the extension was approved and constructed. SEPTA "did everything in a marketing sense that could be done" to attract ridership to the new line, including drawings and give-aways for free monthly rail passes. Despite these efforts, average ridership never exceeded 30 trips per day. The service was eventually discontinued. "We just couldn't get people out of their cars," one SEPTA official said.¹⁸⁰

This case illustrates the overwhelming preference for private-car transportation, even when roads are congested. Officials have come to perceive the market (beyond the core of steady transit users) as fairly inelastic; even such factors as high gasoline prices do not have significant impact upon transit ridership figures.¹⁸¹

Convenience is a primary factor in transit ridership, and officials have focused on baggage handling as a key to improving transit convenience. One measure under consideration is to change the configuration of baggage claim facilities at PHL in order to make the transportation of luggage from the claim area to transit vehicles easier. Another plan — establishment of a remote baggage check facility at the 30th Street Station downtown — was scrapped because existing traffic flow was considered insufficient to justify the additional labor costs that would be required.¹⁸²

Philadelphia is a transit-oriented city, but almost exclusively in terms of work-commuting. Indicative of this is the fact that about 90% of the passengers who use SEPTA's airport lines are not air travelers, but are bound for workplaces in and around the airport. Officials are pleased that this commuter-market is being served, but are still hoping to appeal to the virtually-untapped air traveler market. The airport lines serve 2,600 one-way trips each day, but have capacity to serve at least five times more.¹⁸³

¹⁸⁰ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994. The quotes in this paragraph are from Mr. James McGloughlin, a SEPTA planner present at the focus group meeting.

¹⁸¹ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁸² Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁸³ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

New Focus on Tourism

With the advent of the city's new convention center, Philadelphia officials have adopted a new focus on serving visitors. One idea intended to serve the burgeoning Philadelphia convention market is remote baggage services at the new convention center. A committee chaired by a prominent member of the city council is investigating this possibility, seeking support from a variety of organizations, including airlines. Under the proposal, convention customers would be able to check their bags all the way through to the convention center from their city of origin, eliminating baggage handling hassles. The initiative is seen as a key selling point for the convention center, and for the city.¹⁸⁴

Several barriers to checking bags through to the convention center exist. First, it is unclear whether space can be designated at the convention center for a baggage facility. In addition, the initiative faces a variety of logistical problems, including staffing of the facility and security of (and liability for) baggage. Finally, officials wonder whether customers will make a "leap of faith" in entrusting their baggage to the new system. Despite these barriers, the committee is seeking federal funds for a pilot project to test the concept.¹⁸⁵

While Philadelphia has not had an official agency for the promotion of tourism, the city's mayor recently called tourism "one of the last arrows we have in our economic development quiver." For that reason, the Mayor's Action Council for Visitors was formed to serve a key function in promoting tourism-related initiatives, among which is smooth access to and from PHL.¹⁸⁶

The Action Council is comprised of 30 to 40 members, including business leaders, government officials, and representatives of quasi-governmental organizations. It has been co-chaired by the mayor and the publisher of the city's primary newspaper. Because the Council has been successful in garnering key input to tourism-related plans (and because its efforts have led to successful growth in tourism), the body is rapidly becoming a legitimate

¹⁸⁴ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁸⁵ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁸⁶ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

component of the transportation planning process in Philadelphia. Formal decisions are funneled through this organization.¹⁸⁷ This view of airport access as central to the key economic engine of tourism is critical to the priority of transportation plans in the region.

Funding and Decision-Making Processes

The Mayor's Action Council for Visitors supplies a necessary link between planners and the constituencies they serve; it joins the Delaware Valley Regional Planning Commission (DVRPC), the region's metropolitan planning organization, as part of the overall process which leads to transportation decisions and funding.

Air quality is one of the primary issues among many concerns which help guide the transportation planning process in Philadelphia. New policy is aimed at diverting traffic from congested highways to transit alternatives, but officials are dubious that new legislation has the power to make such initiatives effective.¹⁸⁸ What seems clear is that suburban citizens, who comprise the bulk of PHL's patronage, are unconvinced of the need to divert to transit alternatives at the present time.

Funding

In accordance with longstanding use agreements with the airlines, PHL divides the airport's operation into "cost centers." Of these, one center - the "Outside Terminal Area" (OTA) - represents revenue over which city officials have control. Income from the other cost centers goes into a pool which is then reallocated on the basis of the decisions made by committees representing the interests of the airlines. For this reason, airport officials are most motivated to exploit the revenue-producing opportunities represented by the OTA cost center, of which ground transportation is a part.¹⁸⁹

¹⁸⁷ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁸⁸ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁸⁹ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

However, this revenue is not sufficient to support key activities, such as airport expansion and growth initiatives. For needs of this type, PHL still must rely heavily on the input and consent of the airlines.¹⁹⁰

Summary

PHL is a mature airport, located in a well-developed corridor which is home to a good deal of industrial and commercial business. Ground access to the airport is fairly well-established. For this reason, officials do not feel that ground transportation to Philadelphia International Airport represents a significant difficulty at present. Though congestion continues to increase, officials are upbeat.

In light of the new convention center, the existence of rail transit alternatives already in place, and the improved regional highway system, airport officials feel they have "solved" PHL's surface access problems.¹⁹¹

¹⁹⁰ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

¹⁹¹ Focus Group, Philadelphia International Airport, Philadelphia, Pennsylvania, June 1994.

Portland International Airport Portland, Oregon

General Description of the Metropolitan Area

Though it is not one of the larger cities investigated by this study, metropolitan Portland ranks in the top 25 cities in the United States in terms of population. The metropolitan statistical area had approximately 1.8 million residents at the 1990 census, with a moderate 13.3% growth rate since 1980. Population density in the city is 4,246 persons per square mile. Generally, Portland is not a heavily congested city.¹⁹²

Portland's primary transportation corridors are north-south, as defined by the region's geography (see Map One). The city is located at the confluence of the Columbia and Willamette Rivers, and is home to a 27-mile-frontage freshwater seaport. The main rubber-tire thoroughfares are Interstate 5, which runs north to Seattle and south to Salem, and Interstate 205, which makes a north-south loop to the east of the city and near Portland International Airport. Interstate 84 runs east-west on the Oregon side of the Columbia River, intersects I-205 on the Northeast end of Portland near the airport, and terminates at the junction with I-5 near downtown Portland. A light rail line to serve the I-5 corridor is currently under development.¹⁹³

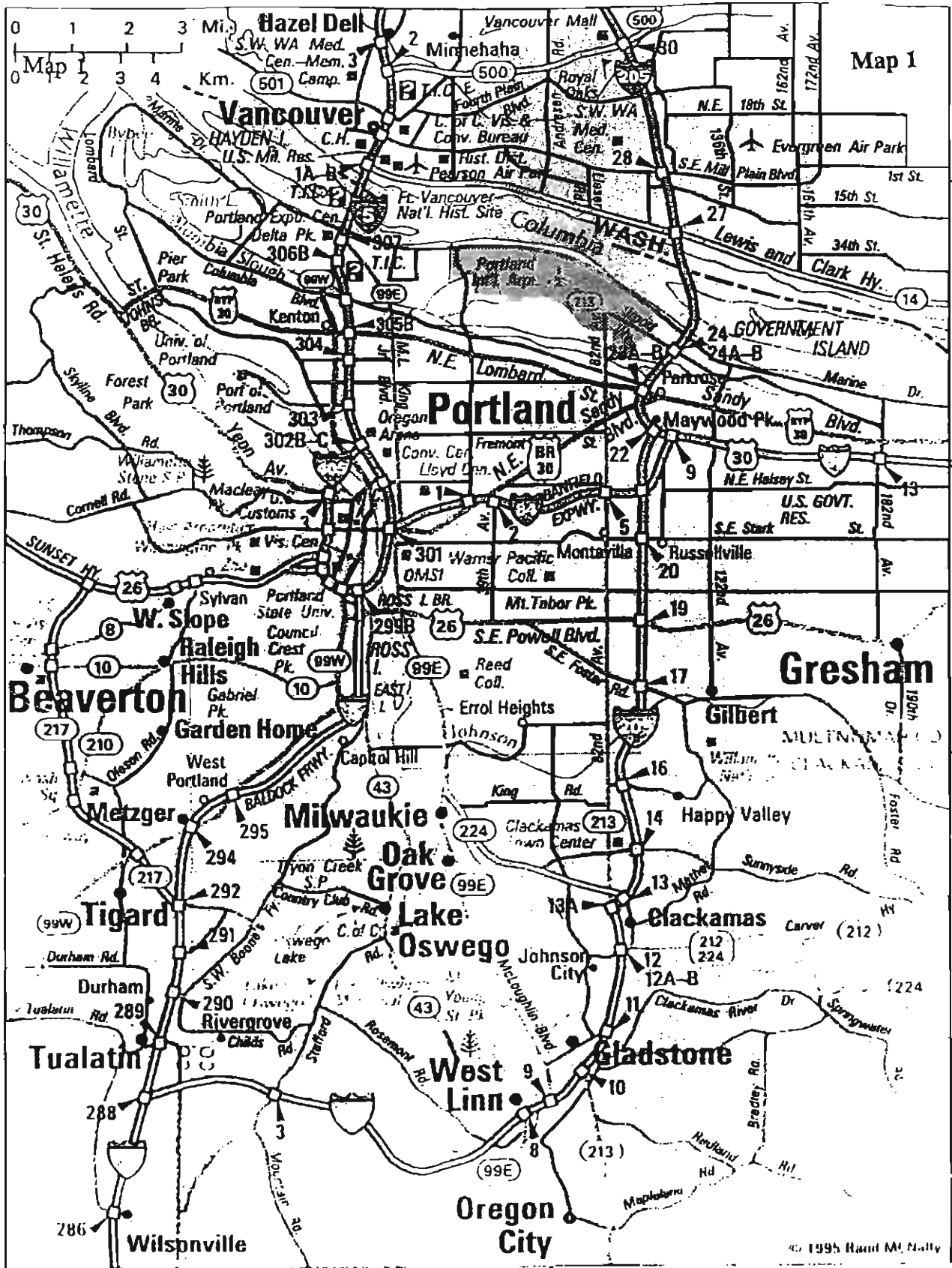
Portland International Airport

Portland International Airport (PDX) is located on the northeast end of the city, adjacent to the Columbia River and near the junction of Interstates 84 and 205. Airport employment is between 4,000 and 5,000, and is expected to grow to the 8,000 to 9,000 range in the next 20 years.¹⁹⁴

192 World Almanac, 1994.

193 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

194 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.



Passenger traffic at PDX was 6.3 million in 1991. This number is expected to increase to 8.2 million by 1997, 10.3 million by 2002, and 16.2 million by 2012. Air cargo is expected to grow from 185,000 tons in 1991 to 462,000 in 2012; total aircraft operations are projected to grow to 376,700 in 2012 from the 1991 level of 264,300.¹⁹⁵ In addition to growth in traffic and employment at the airport, growth is expected as part of the development of a 400-acre business park in the immediate vicinity, which is expected to have employment of roughly 12,000 within 20 years.¹⁹⁶

The airport is operated as a unit of the Port of Portland.

Modal Shares

Table 1¹⁹⁷
Passenger Modal Shares, PDX

Mode	1990 Survey	1993 Survey	Baseline Forecast	Alternate Forecast
Auto; on-site parking	22%	21%	See below	See below
Auto; off-site parking	8%	7%	28%*	25%*
Auto; drop-off	32%	35%	35%	30%
Rental car	21%	23%	23%	21%
Shuttle/Limo	12%	10%	10%	13%
Taxi	5%	3%	3%	3%
Transit/LRT	< 1%	< 1%	1%	8%
Totals	100%	100%	100%	100%

* These figures include both on-airport and off-airport parking.

195 Portland International Airport Master Plan Update (Executive Summary), April, 1993.

196 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

197 Terminal Access Study (Final Report), Portland International Airport; Port of Portland, August, 1994.

This table shows trends in the proportion of passengers traveling to PDX by various modes of transportation. Actual modal shares based on survey data appear in the first two columns; columns three and four show two types of projected shares for the upcoming 20-year planning horizon.

The baseline forecast is based upon maintaining the current range of modal shares through the 20-year planning horizon. The alternate forecast shows how planners expect modal shares to shift with the inclusion of light rail transit (LRT) within this time period.¹⁹⁸

The table illustrates the dominance of private auto as an access mode to PDX. Private auto accounted for 62% of passenger access in 1990, and 63% in 1993.

Ground Access - Overview

Portland planners are operating on a 50-year plan for development and growth known as the Regional 2040 plan. A major goal of this plan is to reduce vehicle miles per capita in the region. Parking management is one tool for reducing vehicle miles; however, planners note that provision of adequate parking may be one service which must be traded off in order to pursue development of other modes. Other modes and plans under consideration include:

- Expanding bus service
- Shuttle or door-to-door van service
- Light rail extension to PDX.¹⁹⁹

Regional officials were recently faced with deciding between two key options regarding regional light rail: serving the I-5 corridor, or serving the I-205 corridor with an airport extension. The selected option was the I-5 corridor, though planners generally feel that I-205 and the airport are high priorities for light rail once the I-5 corridor is built. Generally, experts are confident that the airport will be served by light rail within the next 20 years.²⁰⁰

198 Terminal Access Study (Final Report), Portland International Airport; Port of Portland, August, 1994.

199 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

200 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

Less than one percent of PDX's passengers arrive at the airport by public bus transit. Planners have suggested that poor bus service may be one cause of this low ridership; however, they generally agree that the service is not as poor as the public perceives it to be. Bus routes serve the airport every 15 minutes, with a limited number of express routes. Key areas of the city are not served by convenient bus-to-airport access, however.²⁰¹

As in other cities, a major factor which drives transportation planning decisions in Portland is congestion. Portland has not thus far experienced levels of congestion similar to those of other large cities; as a result, an interesting planning cycle seems to be at work. Since congestion is not heavy, planners have de-emphasized roadways in favor of transit modes for their future planning horizons. They agree that this will have the eventual effect, as the area grows, of contributing to increased congestion. However, this is not thought to be disastrous, since congestion is a major disincentive to rubber-tire private auto transportation. Anything which provides disincentive to driving is, de facto, consistent with the region's long-range transportation plan. With the advent of perceived increased congestion, non-auto modes will gain attractiveness, and (presumably) increased ridership.²⁰²

A graphic example of the effect of increased congestion was provided during the most recent holiday season, when officials conducted an experiment with temporary park-and-ride systems. In response to anticipated holiday-related airport access congestion, planners established two express bus routes to PDX from key park-and-ride locations. These routes provided free service to the airport terminal, and were presented to the public as temporary solutions meant to alleviate holiday congestion. They were successful. In fact, the media responded to the measure by suggesting to readers, viewers, and listeners that the park-and-ride routes would be good holiday access alternatives.²⁰³

201 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

202 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

203 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

Transportation Planning and Government Interaction

One of the unique features of Portland's transportation planning system is the transportation policy structure and process utilized by the region. The MPO in Portland is called Metro, and it is the only MPO in the nation with an elected council. Other key organizations are the Port of Portland and the Tri-County Metropolitan Transportation District of Oregon, known as "Tri-Met." However, of paramount importance to the transportation planning process are two multi-jurisdiction representative boards: the Joint Policy Advisory Committee (JPAC) and the Technical Planning Advisory Committee (TPAC).

Joint Policy Advisory Committee (JPAC). The JPAC is held out as a model transportation policy planning organization. The council has enjoyed a reputation for success for many years. Part of this reputation can be traced back to the 1970s, when the proposed Mount Hood Freeway project was canceled, creating a \$700 million pool for transportation initiatives. JPAC came into existence at roughly the same time, as a tool for examining proposals for spending this pool. From that time until recently, Portland planners have enjoyed a remarkable lack of conflict between organizations and stakeholders in terms of transportation proposals. Nearly all viable proposals could be approved, and the region is just now exhausting the money created by the cancellation of the Mount Hood Freeway. The result is that JPAC, operating for most of its existence with sufficient resources to satisfy all stakeholders, has gained a reputation of success which has aided not only JPAC's endeavors, but governmental interaction in the transportation planning process in general.²⁰⁴

Technical Planning Advisory Committee (TPAC). This board is similar to JPAC, except that it reviews transportation initiatives for technical merit as opposed to issues of public policy. Typically, initiatives originate from a variety of sources, and are generally put into proposal form by Metro. These proposals are then forwarded for review to TPAC. Once approved on technical merit, a proposal is sent to JPAC for policy review. Finally, the proposal - with the approval of both TPAC and JPAC - goes back to the Metro Council for final approval and implementation.²⁰⁵

204 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

205 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

Portland provides a good example of how adequate resources can contribute to effective interagency cooperation on transportation planning. In Miami, conflict is minimized between stakeholders because of the cohesive county-based metropolitan structure; data from Portland suggest that a good pool of resources can serve to accomplish the same thing, metropolitan structure notwithstanding. Transportation officials feel cooperation between jurisdictions has been good while the resources have lasted; they are reticent to say how cooperation will be maintained as the money has been exhausted and competition between initiatives gives rise to new conflict between agencies.

Decision Processes, Criteria, and Modeling

In considering ground access proposals, Portland officials employ a variety of basic decision criteria. As a matter of policy, these criteria are not assigned any sort of weighting methodology. The recent Terminal Access Study conducted by the Port of Portland is a good example of a typical execution of the decision process.²⁰⁶

The Terminal Access Study was conducted in six phases:

- Identification of existing conditions and trends
- Assessment of site constraints
- Analysis of future needs
- Development of functional alternatives
- Integration of functional elements into a Terminal Access Plan
- Preliminary assessment of costs and financing.²⁰⁷

To facilitate the study, planners segmented terminal access into seven basic functional elements. From these elements, planners were able to identify critical issues and develop plans for addressing them. The elements included:

- Commercial roadway (buses, limos, taxis)
- Light rail transit (LRT)
- Parking
- Roadways (including bicycles)

206 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

207 Terminal Access Study (Final Report), Portland International Airport; Port of Portland, August, 1994.

- Terminal curbside area
- Rental car facilities
- Pedestrian facilities.²⁰⁸

In general, modeling is relied upon in the decision process for most transportation plans. Most modeling is done in-house at Metro, where planners test various scenarios regarding the mix of transportation plans with such variables as land use and congestion.²⁰⁹

However, officials acknowledge that airport access is a "weak link" in terms of modeling. Reasons given include a lack of familiarity with the many available airport access modes and the bases for consumer mode choices. The airport is a unique destination which offers a variety of access modes and a different price sensitivity than other destinations. Important decision support information, such as light rail ridership projections, has been calculated based upon indirect data (such as enplanements); however, planners say they are not fully comfortable with the result of the overall modeling process with relation to airport access. Portland officials are currently poised to embark upon a study which they hope will illuminate this problem, and by which they hope to derive a locally-appropriate stand-alone airport access model.²¹⁰

Funding

As in most cities, the issue of funding is a difficult one for Portland planners, although resources from the cancellation of the Mount Hood Freeway have helped to ease this difficulty. Now that the Mount Hood money has been exhausted, and other funding sources (such as federal assistance) are diminished, Portland officials are looking for new, innovative funding alternatives.²¹¹

208 Terminal Access Study (Final Report), Portland International Airport; Port of Portland, August, 1994.

209 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

210 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

211 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

One possibility is an increase in parking fees. Since this would provide a disincentive to private auto access, planners feel such an increase would be consistent with overall regional plans.²¹² At the current time, however, officials in Portland say they are still in the early planning stages on most contemplated initiatives, and have not advanced to final consideration of funding issues.²¹³ However, they also point out two significant advantages which will ease the burden of creating innovative funding solutions:

- Rights-of-way have already been secured, and grades already built, in anticipation of many future needs.
- The light rail system will come within close enough proximity to the airport to facilitate an inexpensive link directly to the PDX terminal.²¹⁴

Conclusion

The unique approach to inter-agency cooperation and foresight in regional planning are the most important points which distinguish the ground access situation in Portland.

Portland agencies achieved a high degree of inter-organizational cooperation, even though the structure of the metropolitan area is somewhat fragmented. This was accomplished because of two important factors: the one-of-a-kind elected governing council of the MPO, and the significant resources made available by the cancellation of the Mount Hood Freeway project in the 1970s.

It is interesting to note that Portland planners are not afraid to make provision in their future plans for aspects of growth which are usually considered unsavory. Intentionally eschewing new highways in an effort to concentrate on non-rubber-tire transit alternatives, planners foresee significant new congestion and embrace it as a new disincentive to private auto travel. Rather than attempting to avoid highway congestion (a goal which has eluded planners in other

212 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

213 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

214 Focus Group, Portland International Airport, Portland, Oregon; January 6, 1995.

cities), Portland planners are working to provide alternatives and solutions before the problem becomes significant.

Lambert International Airport
St. Louis, Missouri

General Description of Metropolitan Area

The city of St. Louis borders Illinois along the Mississippi river. The current population of St. Louis is 396,685 in an area of 61 square miles which equates to a density of 6,503 per square mile.²¹⁵ However, 1,195,276 people are employed in the St. Louis metropolitan area and approximately 30% of the downtown workforce lives in Illinois — commuting across the river.²¹⁶

Since the mid-80's, leaders in St. Louis have continued to revamp the local economy which suffered from job losses in the aerospace and automobile industries. In order to maintain its position as one of the top ten economic markets in the U.S., St. Louis has focused on reducing its dependence on manufacturing and increasing its services sector.

Lambert International Airport

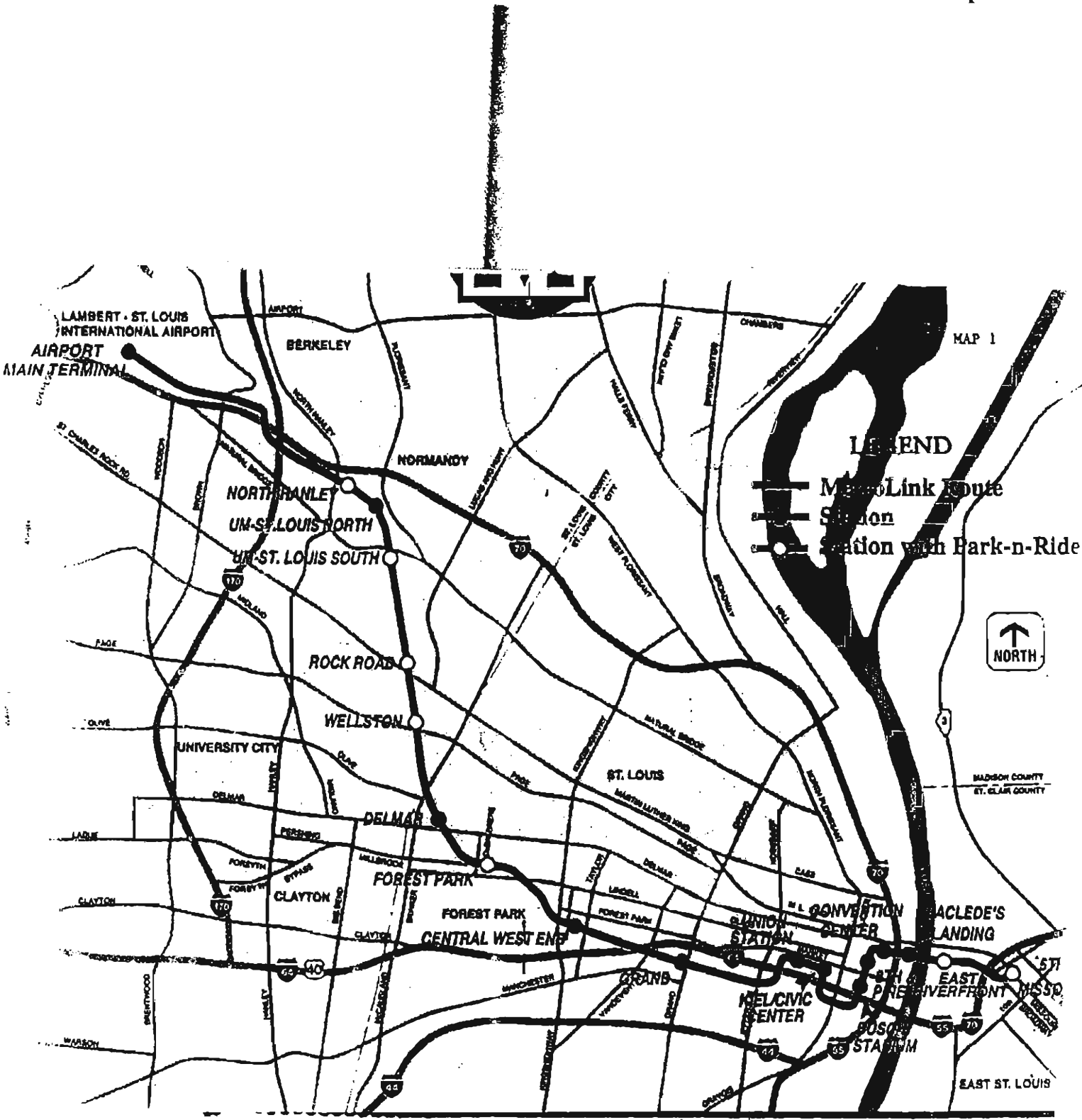
Located 15 miles from the central business district, (See Map 1) Lambert employs approximately 15,000 people and currently handles 21 million passengers per year. In addition to the direct employment generated by airport operations, public officials recognize the economic spin-offs generated by the airport and appreciate its role in attracting new businesses to the St. Louis area. As a result, resources devoted to improving the value of Lambert International as an economic asset are viewed as an investment in the future.

To maintain Lambert's viability, a reconfiguration of the parallel runway structure is underway. The study for the expansion is expected to be completed in early 1995, with final federal approval slated for late 1996 and construction expected to begin in 1997. With the addition of a third runway and increased separation between runways, Lambert will be able to operate in all weather conditions and handle simultaneous landings/takeoffs. Without the new

²¹⁵ World Almanac 1993

²¹⁶ Kramer, Jerome. "Metro Link: Transportation plus," Railway Age, August 1993.

Map 1



runway configuration, it is doubtful whether Lambert can handle the 39 million passengers it expects by the year 2025.²¹⁷

In addition to air side improvements, Lambert is also embarking on ambitious landside refurbishments. Renovations to the east terminal began in the spring of 1994. The addition will add 12 gates - handling 3.5 million passengers - and expand ticketing, baggage claim, and traveler services. The project also includes a 1,250-car parking garage that will also house rental car companies and one additional MetroLink station.²¹⁸

Ground Access to Lambert

Access to the airport is dominated by rubber-tire modes — principally private automobile. However, with the completion of the light rail link to the airport in June 1994, air travelers and airport employees have an alternative mode of transportation. A summary of ground access to Lambert is presented in Table 1.

Table 1: Ground Access System

Distance to downtown	15 miles
Travel time to downtown by car	15 minutes off-peak 20-30 minutes peak
Travel time by Metro Link to downtown	20-25 minutes
Daily Parking	Hourly \$12/day Intermediate \$7/day Long Term \$4/day
Cost of Taxi to downtown	\$20
Cost of Shared Van to downtown	\$8
Cost of MetroLink to downtown	\$1

²¹⁷ Phone Interview with Kathy Leonard, Lambert Public Relations, 3/22/94.

²¹⁸ 1993 Annual Report, Saint Louis International Airport, 1994.

Modal Shares

Since the opening of the MetroLink station, daily boardings have averaged 2,034 customers at the airport station. This number represents approximately 5 percent of MetroLink's total daily boardings. However, there is no data as yet on how MetroLink fits into the overall ground access scheme at Lambert. As the information in Table 2 indicates, the private automobile dominates ground access to Lambert International.

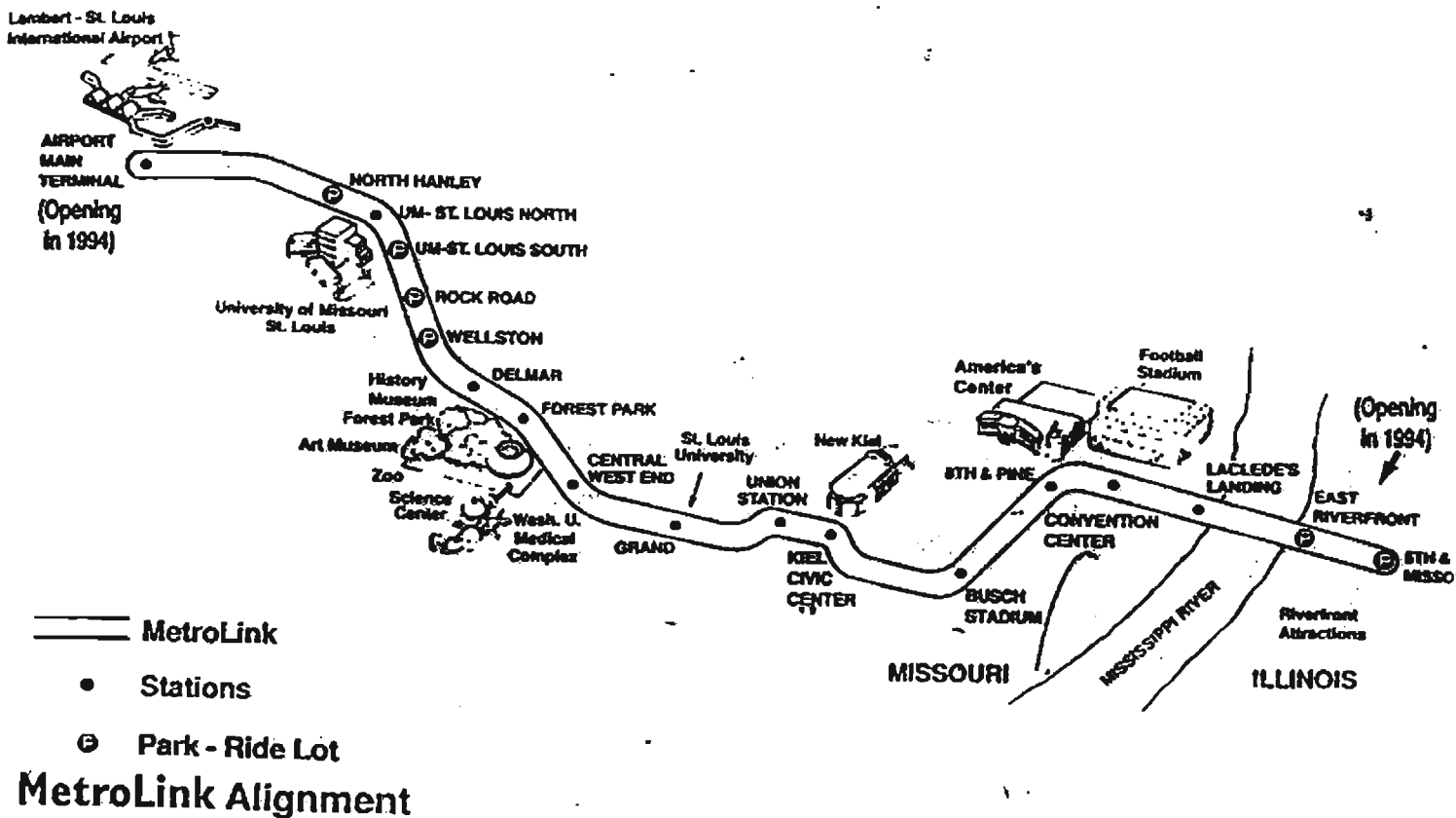
Table 2: Modal Shares²¹⁹

Private Automobile	63.4%
Taxi / Private Limousine	12.1%
Hotel Van	6.1%
Rental Car Shuttle	2.1%
Airport Bus/Shared Limousine	1.7%
Other Shuttle	12.5%
Other	2.1%

Airport Access by MetroLink

MetroLink is an 18 mile light rail service extending from the community of East St. Louis, Illinois to Lambert International Airport located west of St. Louis, Missouri. The system connects major centers of economic activity: Lambert airport, University of Missouri campus, Washington University medical center, Riverfront stadium, Busch stadium, St. Louis convention center, tourist attractions and the central business district. (See Map 2)

²¹⁹ Airport Ground Transportation Study, August 1991. Vehicle counts made by Kennedy Associates and reported by KPMG Peat Marwick. Note that these counts are prior to the operation of MetroLink. Average shares of three terminal sites.



MetroLink opened its first 14 miles and 16 of 19 stations in July 1993.²²⁰ The final four miles of track to the airport were completed in June of 1994, after a problematic crossing of a cemetery was resolved. The MetroLink station is located on top of the "D" concourse — close to baggage claim facilities. MetroLink trains operate from 5:00 a.m. to 1:30 a.m. Monday-Friday, 5:00 a.m. to 1:20 a.m. on Saturday, and 5:20 a.m. to 12:30 a.m. on Sunday. A MetroLink train departs from the airport every seven minutes. The current fare is \$1 with \$.10 for transfers to connecting bus lines.

Projections for MetroLink estimated the system would carry 17,000-19,000 passengers per day by the end of the first year of operation. By the year 2000, the system was projected to carry 35,000 passengers per day. However, ridership has exceeded expectations. Average weekday ridership has fluctuated between 20,000-30,000 since fare service began.²²¹ Bi-State officials point out that attractions such as sporting events and rock concerts significantly increase ridership.²²²

A ridership study conducted in November and December of 1993 (prior to the opening of the airport station) found that MetroLink had "successfully introduced transit to an untapped market — three-fourths of train riders are new to public transportation."²²³ Furthermore, customer characteristics of MetroLink vary significantly from characteristics of bus patrons.

MetroLink riders use transit primarily by choice — because it saves them money on driving or parking, and gives them the opportunity to relax and avoid traffic problems. In contrast, Bi-State bus riders use transit by necessity — 40% come from households which do not own an automobile. Furthermore, although 42% of the riders on MetroLink use it to get to work, 30% use it for shopping, and 15% use it for recreation purposes. From this survey, officials conclude the light rail system is serving the purpose for which it was built — to provide access to economic centers in St. Louis.

²²⁰ "St. Louis MetroLink Opens July 31," LRT News, TRB, December 1993.

²²¹ 2/23/94 Letter from Jerry Blair, Manager of Special Projects, EWGCC.

²²² Focus Group, St. Louis, Mo: July 1994.

²²³ Market Research Survey: Bus & MetroLink Customers, Bi-State Development Agency, March 1994.

In addition, MetroLink riders are 65% White and 70% reported household incomes of \$25,000 or more. In contrast, 74% of bus patrons are African-American and 72% reported household incomes of less than \$25,000.²²⁴ These differences emphasize the ability of an integrated transit system to serve many different customer needs.

Bi-State Development plans to conduct ridership surveys roughly three times per year. Future surveys will discover whether patrons using MetroLink to the airport are consistent with the customer's characteristics discovered to date. Already, Bi-State has had to contract with two off-airport parking companies to accommodate riders who want to park overnight and use MetroLink to the airport. (Parking overnight is not allowed in regular MetroLink park-n-ride lots.) Further evidence of the commitment to serve airport customers is exemplified by the construction of a second MetroLink station at the airport located near the East Terminal — adding convenience for air travelers in terms of time and walking distance.

Planning Process for MetroLink

The MetroLink project was initiated by a combination of individuals with a shared vision for St. Louis' transportation network. Goals for improved transit included (1) increasing accessibility to activity and employment centers (2) stimulating economic expansion and job creation, and (3) improving air quality and energy conservation. Working with these goals in mind, planners in the City of St. Louis transportation department developed the first generation of plans for a public rail system.

However, as the vision expanded to include a link across the Mississippi river, the regional planning organization became involved. After confronting reluctance from the county of St. Louis and the transit authority (Bi-State Development) to get involved in a potentially risky project, the East-West Gateway Coordinating Council (EWGCC) became the primary vehicle for carrying the plan forward through subsequent planning and design stages.²²⁵

²²⁴ Market Research Survey: Bus & MetroLink Customers, Bi-State Development Agency, March 1994.

²²⁵ Focus Group, St. Louis, MO: July 1994.

Presented with a workable plan, and convinced of the future necessity for a transit alternative, the mayor of St. Louis at the time became a proponent of MetroLink — selling the concept to key business leaders. These business leaders funded and formed the core of a citizen's group promoting a light rail strategy. Members of the citizens' group spoke to other civic organizations willing to listen to the plan.²²⁶ Business leaders also played a role in building support in Congress — at times using the resources of their company lobbyists in Washington.

In addition to elected city officials, business leaders, and regional planners, Missouri and Illinois congressmen were a critical element of the MetroLink coalition. Leaders of both parties worked in tandem to garner the support of other members of the U.S. Senate and Congress during funding deliberations to determine whether infrastructure could be used for the local funding share under the FTA matching funds program.

Throughout the planning and funding process, many agencies and organizations continued to oppose the MetroLink project — believing it to be poorly planned and a waste of money. In particular, controversy surrounded the issue of terminating the line in East St. Louis — a low income, economically depressed neighborhood. Naysayers were convinced a park-n-ride lot at the East St. Louis terminus would be vacant as potential users weighed the risks of leaving their autos in a neighborhood ridden with crime.²²⁷

Other agencies reversed their initial position and joined the coalition. Significantly, the transit authority, Bi-State Development, took over construction responsibilities and interjected a strong Inter-modal component by reconfiguring bus routes to connect with MetroLink.²²⁸ The integrated bus system required nine new routes, changes to 25 existing routes, and elimination of thirteen routes made redundant by MetroLink. Overall, 49 bus routes in the region connect with MetroLink stations.

²²⁶ 3/31/94 Interview with Jill Roach, Director of Transportation Planning, City of St. Louis.

²²⁷ Focus Group, St. Louis, MO, July 1994.

²²⁸ Focus Group, St. Louis, MO: July 1994.

The link to the airport became another point of controversy when the routing of MetroLink to the airport had to be altered in response to FAA concerns about future airport expansions. In accordance with airport plans to purchase a nearby cemetery for the airport's renovations, planners agreed to route MetroLink across the cemetery — with the understanding the airport would own the property and would relocate the graves by the time construction commenced on that rail section. However, the airport's final agreement with the FAA did not include purchasing the cemetery area.²²⁹

Under construction and unable to change the final design, Bi-State Development was faced with the costly proposition of having to move the cemetery. Lacking sufficient funds for this purpose, it appeared the last four miles of light rail would be delayed indefinitely. Fortunately, the new director of the airport believed the airport was a critical element in the vision to link economic centers, negotiation resolved the problem²³⁰ and the track to the airport was completed a year later.

Funding Process for MetroLink

MetroLink's funding was unusual in two ways: (1) the \$64 million local share of the \$351 million capital cost was provided by donating right-of-ways and existing infrastructure, rather than cash (2) the station at the airport was designed and funded by the airport — meeting specific FAA requirements incorporated into renovation plans for the airport. Also, innovative approaches were incorporated into the construction to keep costs down such as the use of recycled heavy rail; applying locally produced slag ballast; and renovating a historic bridge rather than building a new one.²³¹

Models/Decision Tools

²²⁹ 3/31/94 Interview with Jill Roach, Director of Transportation Planning, City of St. Louis.

²³⁰ The airport paid for moving the graves and handled all the coordination and public relations involved with the process.

²³¹ "MetroLink: Transportation plus," Railway Age, August 1993.

In order to satisfy Federal Transportation Administration requirements, the East-West Gateway Coordinating Council assessed five different public transit scenarios in the 1987 environmental impact statement:

1. No Action - Maintain the existing bus routes, headways, and fleet in service. Build the previously approved Missouri corridor improvements.
2. Transition Systems Management (TSM) - Make the improvements included in no action option, plus upgrade existing park-n-rides, add more park-n-rides and bus freeway ramps.
3. Busway - Make improvements under TSM scenario plus develop high-speed bus corridors to connect outlying areas to CBD with limited intermediate stops.
4. Light Rail - Route from East St. Louis to Clayton and Lambert International to connect major activity centers in the region. Modify bus routes to connect with LRT.
5. Light Rail/Bus Shuttle - Route from East St. Louis to Lambert International with connecting bus service to Clayton. Modify bus routes to integrate with LRT.

The five alternative scenarios were assessed on 11 different impact measures using standard U.S. Department of Transportation models and measurement procedures.

Modeling was able to quantify the costs and benefits of rubber-tire versus light rail on a large scale. Transportation planners indicated modeling was limited by the restricted inputs which did not account for local conditions such as sporting events and conventions.²³² Models were also relatively ineffective in the actual routing of a light rail system, because different combinations of LRT and buses, as measured by the model, were essentially comparable.²³³ What became more important in determining the final route was pre-existing right-of-ways and neighborhood support.

Although modeling was important in securing federal funding, transportation officials believe the human factor was more important on a local level in securing the support to go ahead with

²³² Focus Group, St. Louis, MO: July 1994.

²³³ St. Louis Metro Link Project: Final Environmental Impact Statement, EWGCC, September 1987.

the project. To paraphrase one official: No set of numbers will change people's minds. Their background and experience with public transit as private citizens and their beliefs either lead them to support it or not.²³⁴

Future Transit Projects

Based on MetroLink's success in attracting riders and winning voter support, elected officials and transportation planners anticipate an expansion of the system into the greater St. Louis County area. (See Map 3) Assisting this effort, the initial citizens group has evolved into a strong organization — championing the cause of future light rail developments. The citizens group is now comprised of approximately 3,000 dues-paying members who speak out regarding the pros and cons of MetroLink. In addition, the organization has become involved in the legal maintenance of donated right-of-ways.²³⁵

These efforts by public officials and concerned citizens have yielded positive support for MetroLink. Voters already approved a half-cent sales tax in November 1993 to extend the system to Scott Air Force Base. A second referendum on August 2, 1994 asked voters to approve funding for construction of the system over the next twenty years. The second referendum passed in both St. Louis County and the City of St. Louis. A quarter-cent sales tax increase will raise about \$37 million per year for MetroLink. This funding will allow Bi-State Development to retire a \$10 million operating loan from the State while beginning construction plans for the expansion.²³⁶

²³⁴ Focus Group, St. Louis, MO: July 1994.

²³⁵ Focus Group, St. Louis, Mo: July 1994.

²³⁶ "Election," St. Louis Post-Dispatch, August 3, 1994, p.9A.

ST. PETERS

ST. CHARLES COUNTY
ST. LOUIS COUNTY

BERKELEY

BRIDGETON

Florissant Valley
Community College

FERGUSON

JENNINGS

Northwest
Plaza

OVERLAND

UNIVERSITY CITY

CLAYTON

Chesterfield
Mall

FRONTENAC

Zoo

KIRKWOOD

WEBSTER GROVES

Meramec
Community
College

VALLEY PARK

Wentzville
Lake Park

CRESTWOOD

FENTON










MEHLVILLE

South County
Shopping Center

EUREKA

ST. LOUIS COUNTY
JEFFERSON COUNTY

KEY

-  Existing M
-  Proposed
-  Proposed
-  Proposed
-  Proposed
-  Proposed
-  Proposed
-  MetroLink
-  Transfer S

II-169

II-169

ST. LOUIS COUNTY

PACIFIC

Wentzville
County Park

270

235
80

MISSOURI
BLVD

Map 3

San Francisco/Oakland, California
Bay Area Airports
San Francisco International Airport
and
Oakland Airport

General Description of the Metropolitan Area

The Bay Area is comprised of nine counties which stretch from Sonoma County in the north to Santa Clara County in the south. This region incorporates several major population centers, including the cities of San Francisco, Oakland and San Jose. (See Map 1) The population of this area is approximately 6 million people in an area of approximately 7,000 square miles. The economy of the area is extremely diverse with major sectors in computer technology, financial services, and tourism.

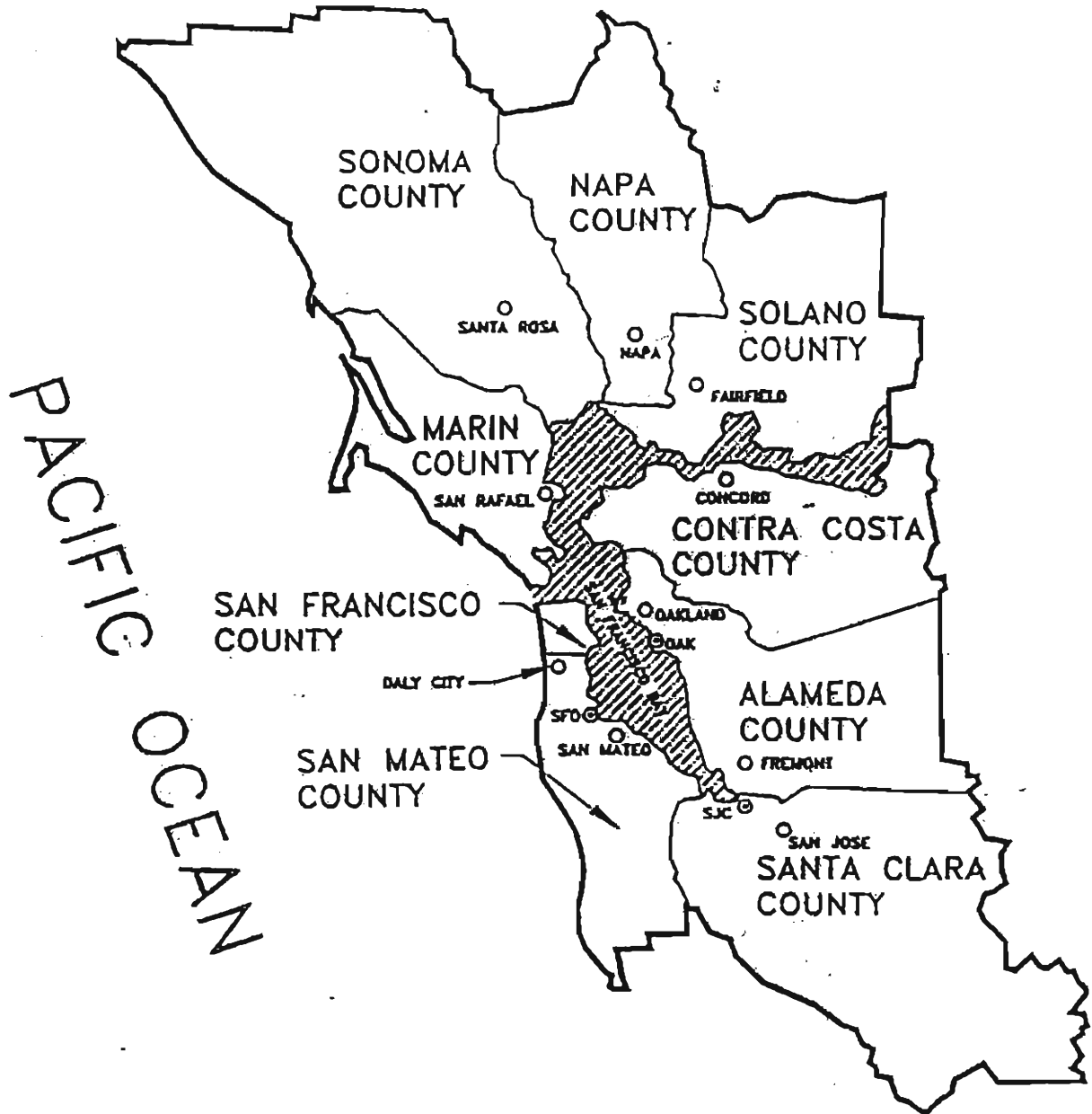
San Francisco International Airport

San Francisco International Airport (SFO) is the major commercial airport for the Bay Area and northern California. Located fourteen miles south of downtown San Francisco in an unincorporated area of San Mateo County, the airport rests on land that was reclaimed from bay tidelands during and shortly after World War II.²³⁷

In terms of its current operations, SFO is ranked as the fifth busiest airport in the United States in terms of total passengers. In 1993, 32 million passengers passed through the airport including a significant amount of international traffic between the United States and the Pacific Rim. In addition, San Francisco is a major cargo airport, handling exports and imports valued at approximately \$31 billion in 1992. Furthermore, SFO employs 30,000 people, contributes \$123.1 million in annual tax revenues to San Mateo county, and has an overall impact of adding more than \$14 billion to the Bay Area economy.²³⁸

²³⁷ Information Package, San Francisco International Airport, March 1994.

²³⁸ Information Package, San Francisco International Airport, March 1994.



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NORTHERN CALIFORNIA
SERVICE AREAS

FIGURE
16

Completed in November 1992, a revised master plan for SFO responds to projections of economic growth in the surrounding Bay Area. The centerpiece of the master plan is a new International Terminal Complex scheduled for completion in the late 1990's. Capable of processing 5,000 passengers per hour through customs, the international terminal complex will also incorporate a ground transportation center. The ground transportation center will include a staging area for rental cars and shuttles as well as providing a transfer point to the proposed airport light rail system which will connect to the other terminals, Caltrain, and long-term parking facilities. (See Map 2) The airport's light rail system is expected to eliminate 50% of commercial vehicle trips from the terminal roads, 5 million rental car trips from the terminal loop, and 2 million employee vehicle trips to the airport annually.²³⁹ Also proposed, is a Bay Area Rapid Transit (BART) station at the international terminal, linking the airport to the regional transit system.²⁴⁰

Ground Access

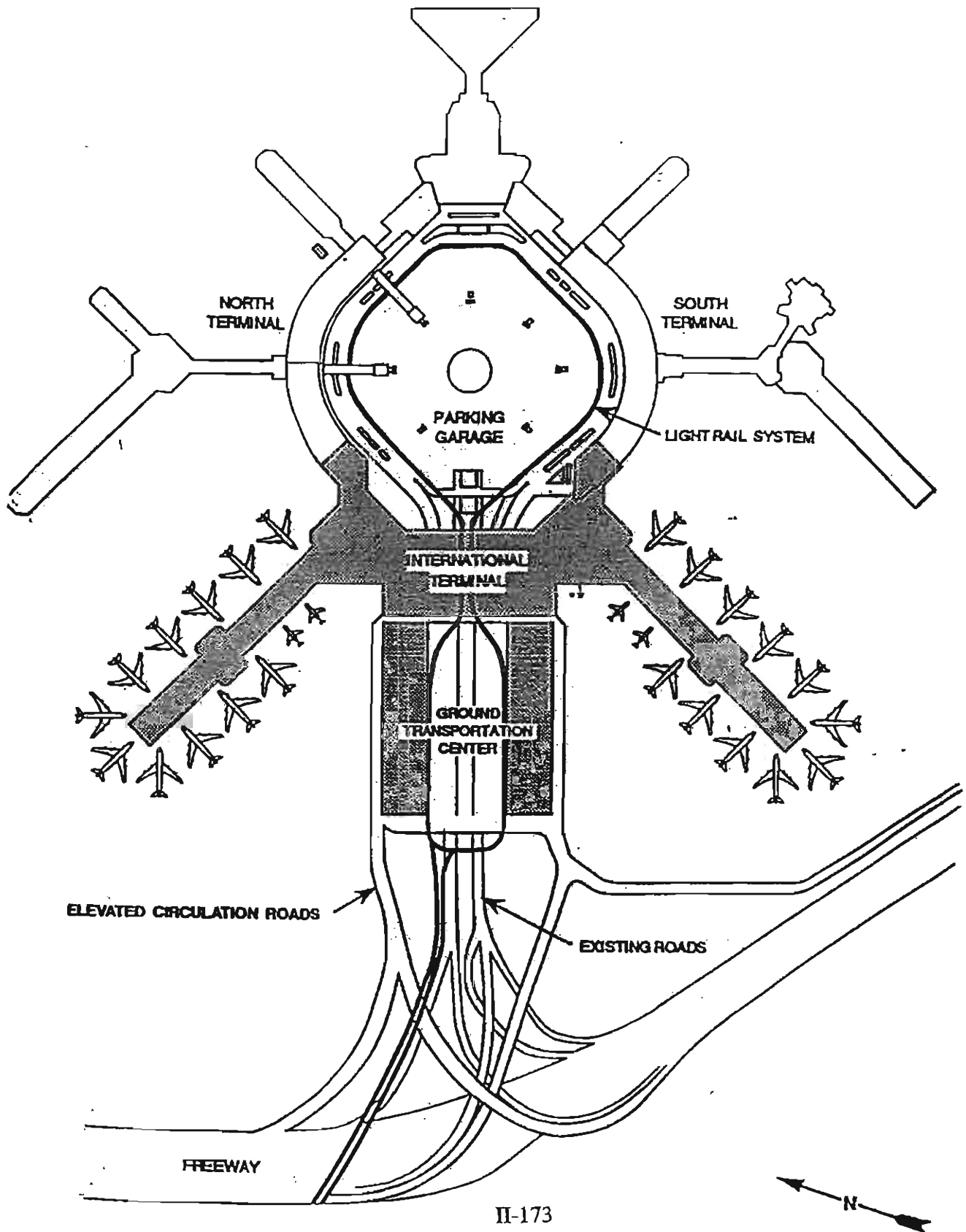
Highway access to SFO is limited by the unique topography of the Bay Area.(See Map 3) Highway 101 is the only major route directly serving the airport. Air travelers must use one of several connecting highways to access 101. Since Highway 101 is the primary north-south route for commuter and commercial traffic, significant congestion is experienced during peak periods — making airport access times unreliable. The use of HOV lanes on 101 with direct access to the airport has been suggested as a possible way to increase capacity in the future.²⁴¹

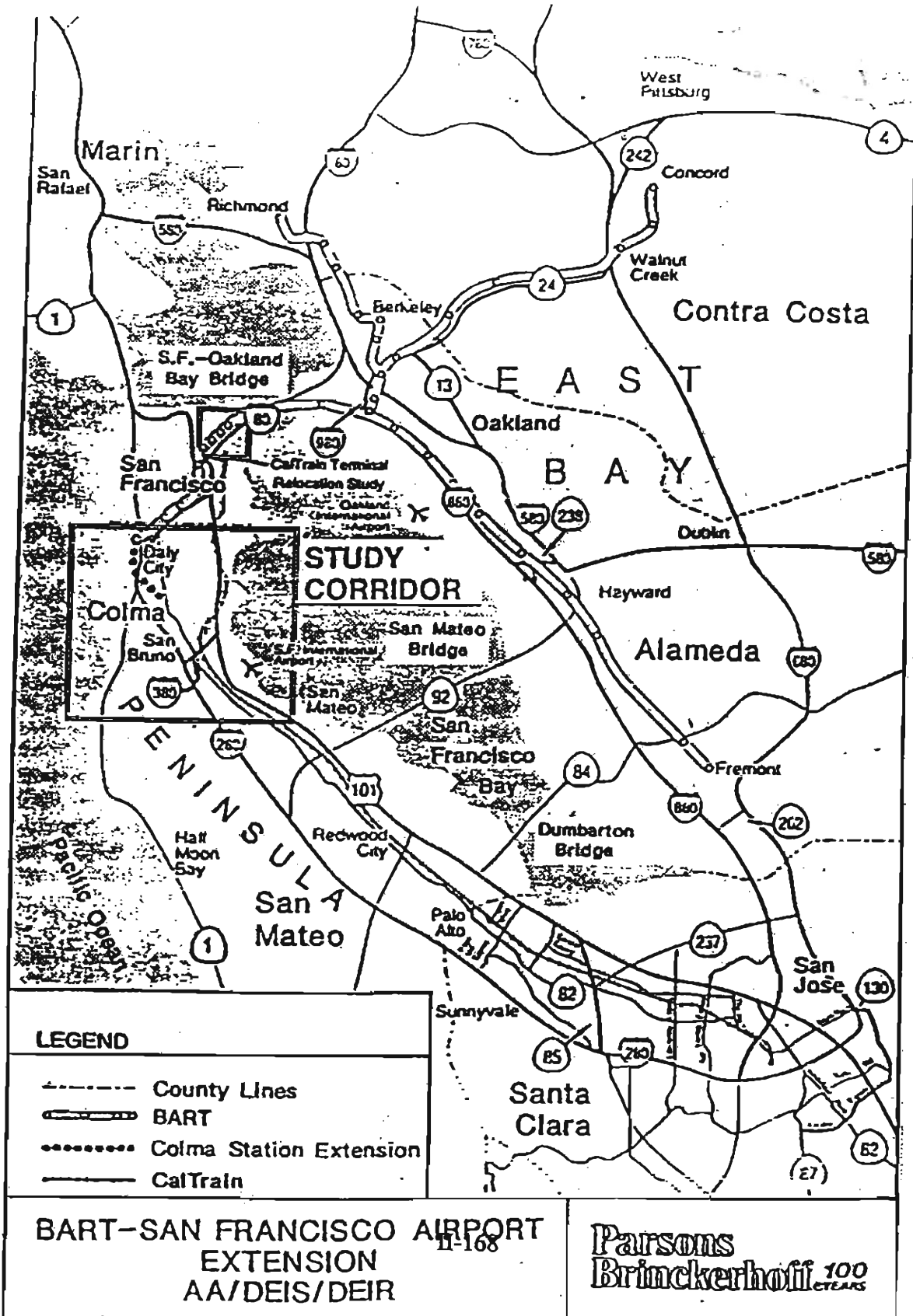
Currently there are no direct connections between SFO and the Bay Area Rapid Transit (BART) system or between SFO and the Caltrain network — even though Caltrain stations in San Bruno and Millbrae are located fairly close to the airport terminal. However, local bus service provides a shuttle connection between many Caltrain stations and the airport. The major drawback to this Inter-modal system is the inconvenience of multiple transfers,

²³⁹ Master Plan Executive Summary, Airports Commission, City and County of San Francisco, November 1993.

²⁴⁰ Information Package, San Francisco International Airport, March 1994.

²⁴¹ California Aviation System Plan: Ground Access Study, California Department of Transportation, August 1991.





LEGEND

- County Lines
- ==== BART
- Colma Station Extension
- CalTrain

**BART-SAN FRANCISCO AIRPORT
EXTENSION
AA/DEIS/DEIR**
II-168

**Parsons
Brinckerhoff** 100
YEARS

particularly for air travelers with luggage. To increase air traveler usage of transit, a BART extension to SFO is under consideration.

In addition to off-airport access constraints, San Francisco International Airport is plagued by internal circulation problems. In particular, the dominance of private vehicles, shared-van service, limos, and taxis as the primary transportation modes to SFO create an ongoing dilemma over curbside access.

A summary of the principle means of ground access to SFO is presented in Table I. Currently the modal share for transit is virtually non-existent; but, the proposed BART extension to the airport is projected to capture approximately 7% of the air traveler market.

Table 1: Ground Access Modal Splits to SFO²⁴²

TRANSPORTATION MODE	MODAL SHARE
Private Automobile	46%
Rental Car	13%
Taxi and Limo	13%
Private Transit	19%
Hotel Courtesy Shuttle	6%
Other	0%
Public Transit	3%

Future Transportation Alternatives

Connecting SFO with the Oakland airport by a rapid transit tunnel under the bay could help maximize the efficiency of both airports and has been discussed at various points. A more realistic approach appears to be a ferry service linking the Ferry Building in downtown San Francisco with SFO, downtown Oakland, and the Oakland airport. One proposed technology

242 California Aviation System Plan: Ground Access Study, California Department of Transportation, August 1991, page 52.

for this ferry service is hovercraft which are capable of cruising speeds of 30 to 36 knots and can hold as many as 200 passengers. This type of shuttle has been widely used and successful throughout eastern Asia.

Another proposal supports the creation of remote terminal sites to further reduce suburban auto traffic to the airport. Remote terminals with baggage check and ticket confirmation capabilities could encourage air travelers to use transit connections to the airport. Formerly, a remote terminal facility in downtown San Francisco connected air travelers to SFO by "Airporter" bus. Bags were tagged at the site and delivered directly to the appropriate airline. In addition, representatives of all major airlines provided ticketing services at the remote terminal. However, this facility was closed in the mid-1970's as demand shifted towards door-to-door services.²⁴³

BART Extension to San Francisco Airport

Traffic on Highway 101 and I-280 near the airport and into San Francisco regularly exceeds existing highway capacities and this congestion is expected to persist unless additional mobility improvements are made. However, opportunities to increase highway capacity are limited by factors such as costly right-of-way requirements, high construction costs, and significant environmental restrictions.²⁴⁴ For these reasons, an improved mass transit system has been identified as the most viable option for addressing long-term travel demands in the corridor between San Francisco and San Jose.

One option which has been considered under various planning efforts is the extension of the BART system to the airport. The current BART network connects the major population centers on the east side of the bay; and in addition, bridges the bay to San Francisco. One alternative for extending BART to the airport would begin at the city of Colma's BART station and progress primarily as a subway until it terminated at a joint BART/CalTrain station on the west side of Highway 101, directly across from the airport terminals. This transfer center would be connected to the airport via an automated guideway transit (AGT) system which would be constructed and operated by the airport. This is the preferred alternative from the

²⁴³ 11/1/94 Phone Interview with Mathew Donalson, SFO Airporter.

²⁴⁴ Bart-San Francisco Airport Extension: Locally Preferred Alternative Report, June 1992.

perspective of the transportation planners involved with the alternatives analysis. A closely related alternative would extend BART under Highway 101 with a station located directly under the airport's international terminal. It is this second "preferred" alternative which has obtained the local elected officials' support.

Decision Process for the BART Extension

According to transportation planners employed by the numerous transportation districts in the bay area, the BART Extension to the airport has evolved over twenty years.²⁴⁵ Previous studies which addressed the need to improve access to SFO included the San Francisco Airport Access Project Report (1972) and the Peninsula Mass Transit Study (1985). However, until 1988, the political imperative never materialized to move the proposal beyond the preliminary planning stage.

Finally, in 1988, a regional effort was mounted to coordinate future transit improvements. Subsequently, a coalition of county officials and transit directors was able to forge an agreement which incorporated CalTrain improvements, BART to the airport, and completion of the BART system in the east bay. Fulfillment of this agreement, the "Regional Rail Extension Program," was based on local sales taxes already designated for transit agencies and federal funding. However, the portion of federal funding was relatively modest, comprising only 30% of the total cost of the projects in the agreement.

In order to commence a formal EIS process, the Federal Transportation Administration (FTA) required a re-evaluation of the cost-effectiveness of several alternatives identified in the 1985 Peninsula Mass Transit study. These alternatives were assessed in the Phase I BART San Francisco Airport Extension/CalTrain Upgrade Pre-Alternative Analysis/DEIS (1990).²⁴⁶ The objective of the Phase I analysis was to define which alternatives should be advanced into the Alternatives Analysis (AA) phase.

As a result of the re-evaluation completed in 1990, five alternatives were carried forward into the Alternative Analysis (AA) phase. The AA process followed the guidelines outlined in the

²⁴⁵ Focus Group, San Francisco, August 1994.

²⁴⁶ BART-San Francisco Airport Extension: Locally Preferred Alternative Report, June 1992.

FTA's Procedures and Technical Methods for Transit Project Planning (1986): identify alternatives; perform a technical analysis of those alternatives; develop a draft environmental impact statement, obtain citizen input through public hearings; advance a preferred alternative based on the prior steps; obtain concurrence among the decision making bodies of the affected jurisdictions or governments.

After completing the technical analysis, EIS, and public hearings, the planning organization (in this case the Metropolitan Transportation Commission) then compared the alternatives on cost-effectiveness as defined by the Federal Transportation Administration, financial feasibility and equity. Upon completing this evaluation, the lead planning body put forth the preferred alternative for consideration by the local governments.

Notably, the preferred alternative put forth by the Metropolitan Transportation Commission (MTC) incorporated several technical design and alignment considerations to mitigate the effects on the surrounding communities — despite the higher costs associated with modifications such as putting the system underground. In particular, the citizens of Colma were concerned about preserving several cemeteries in the proposed BART corridor, and the city of San Bruno did not want the downtown area disturbed.

Upon completing the alternatives analysis, the next step in the planning process to be undertaken was funding approval. At this point, the transportation organizations involved with the project encountered some political resistance. As one official noted, "There is a significant gap between the technical analysis and final decision process." In this case, despite the increased cost-effectiveness of the preferred alternative indicated by the modeling tools, the decision makers' vision of a direct BART link to the airport terminals prevailed.²⁴⁷ As a result, the BART extension directly to the new international terminal complex will increase the cost of the total project by approximately \$200 million dollars.²⁴⁸

²⁴⁷ Focus Group, San Francisco, August 1994.

²⁴⁸ BART-SFO Airport Extension: Funding Options for the Expanded Project, White Paper by Frank J. Wilson, March 1994.

Models/Decision Making Tools

Transportation planners in the Bay area have fairly complete models which have been updated to incorporate air traveler access modes and origin/destination information. Thus, planners are confident in their ability to assess factors such as cost savings and travel time. Like public agents in other states, planners struggle to evaluate and incorporate such qualitative factors as baggage handling and reliability into patronage estimates for the proposed system.

The model for predicting mode choice for airport access is a logit model. The model was primarily used to predict ridership for the BART extension to the airport. Of additional interest was the effect on ridership of placement of the BART connection at the SFO.

The model considers various mode options including auto, bus, rail, airporter, taxi, and limo. The choice model predicts air traveler choice using such key variables as passenger type (resident vs. non-resident, business vs. non-business, gender), travel convenience (travel time, walking distance, delay time, schedule mismatch time, luggage handling, security, and cost), and demographics (departure location and household size). These travel behavior characteristics are matched against service levels provided by alternative transportation modes, including BART and CalTrain. The model was calibrated on an extensive data set that was collected for each of the 22 geographic areas serviced by BART.

The analysis shows that BART stations are more conveniently located for downtown travelers than are CalTrain's. For these passengers, CalTrain's level-of-service would have to dominate BART's if a diversion in ridership is to occur. Also, the analysis shows that the internal BART station for the airport is only slightly more attractive to travelers than the external station. The modelers conclude that walk time with luggage is highly onerous to the air passenger, but the near airport portion is only a minor part of most access trips and does not severely impact the relative attractiveness of this transportation option. Hence, the model predicts that a costly internal BART station will generate only several hundred additional riders over that generated by the more economical external station.

Overall, the model predicts a 7.2 percent local air passenger mode share for BART. This figure is somewhat higher than ridership experienced by other US airports with access characteristics similar to SFO.

However, planners indicated frustration with a dual process in which the federal oversight agencies require extensive analysis and modeling, yet the local decision makers are likely to ignore the empirical evidence.²⁴⁹ Planners also noted that models are "data hungry" and the cost of procuring current data restricts how often the modeling projections can be updated. In this regard, Bay area planners thought the region was fortunate to be able to afford periodic data gathering.

In general, planners noted that while modeling is necessary to secure federal funding, and is a useful tool, it is often the local political process which determines the final outcome of the planning process.

Funding for BART Extension to SFO

BART officials expect this project to be funded under ISTEA. The regulations governing federal and local participation in financing a major transit project, as stated in ISTEA, indicate the federal share will be 75% of the total cost. Thus, the federal portion of the \$1.285 billion project will be approximately \$963.8 million. The remaining \$321.2 million is the responsibility of local jurisdictions.²⁵⁰

In order to fund the local cost of the project, several additional jurisdictions are being called upon to contribute to the project. In addition, the airport is being asked to absorb the majority of the additional cost for the connection directly to the terminal (See Attachment 1).

Oakland International Airport

Oakland International Airport, which is operated by the Port of Oakland, is one of three passenger and cargo airports serving the San Francisco-Oakland-San Jose triangle. In 1993, Oakland Airport served over 7 million air travelers and handled approximately 870 million pounds of air freight — making it the 10th busiest air cargo facility in the country.

²⁴⁹ Focus Group, San Francisco, August 1994.

²⁵⁰ BART-SFO Airport Extension: Funding Options for the Expanded Project, White Paper by Frank J. Wilson.

Consequently, the airport makes a significant contribution to the regional economy and is considered an "integral and essential aspect of the East Bay economy."²⁵¹ The Port of Oakland's annual economic impact study for 1993 showed that aviation operations created 7,200 direct jobs and generated \$2,778 million in business revenues.

Having grown rapidly from serving 2.8 million passengers in 1982 to serving 7 million passengers in 1993, Oakland International is confronting capacity constraints in both its air side and groundside operations. Specifically, the airport needs "more gates, more baggage carousels, more terminal areas, more parking spaces, more air cargo facilities, and greatly improved access (italics added) for the millions of passengers and the thousands of tons of cargo that fuel one of the area's primary assets."²⁵²

In order to address these issues, the Port authorities and airport management developed a long term plan to design, fund, and construct various projects by the year 2002. In regard to terminal facilities, both terminals are scheduled for expansions which will increase passenger waiting areas, add additional concessions and services, and relocate baggage claim areas.

Other landside renovations focus on major airport roadway projects. Several of these projects involve arterial road improvements which require collaboration with Alameda county. As a result, certain improvements will receive tax revenues which have been earmarked for transportation projects by the Alameda County Transportation Authority (ACTA). Other access projects which will be funded entirely from airport revenues include a reconfiguration of the Airport Drive access loop to expand lane capacity and minimize curbside congestion, and construction of a new parking garage and ground transportation center with facilities for rental cars, shuttle services, and baggage claim.²⁵³

²⁵¹ "We're Really Taking Off," brochure provided by Oakland International Airport Public Relations.

²⁵² "We're Really Taking Off," brochure provided by Oakland International Airport Public Relations.

²⁵³ 2002 Airport Development Program: Summary, Port of Oakland, December 1992.

**BART - SAN FRANCISCO AIRPORT EXTENSION
FUNDING SCENARIOS FOR THE LPA AND THE EXPANDED PROJECT**

	LPA	EXPANDED PROJECT	SCENARIO
		OPTION A	OPTION B
Cost	\$ 1087.7	\$ 1285.0	\$ 1285.0
Federal	815.8	963.8	963.8
Local	271.9	321.2	321.2
ALLOCATION OF LOCAL SHARE			
SamTrans	\$ 161.0	\$ 93.4	\$ 146.2
Cemetery	3.0	3.0	
So. S.F.	23.0	23.0	
San Bruno	84.9	8.0	
Millbrae			7.0
San Fran.			4.0
San Mateo County			
State			
SFIA		193.8	164.0
TOTAL LOCAL SHARE	\$ 271.9	\$ 321.2	\$ 321.2

The major air side improvement in the master plan is an extension of the "11/29" runway from 10,000 feet to 12,600 feet in order to accommodate larger, heavier aircraft. Other air side renovations include a widening of the access to the taxiway for the 29 runway and development of a new taxiway for runway 11 to speed up exits of landing aircraft.

Ground Access

I-880, the main north-south access route to the Oakland Airport, currently experiences substantial congestion. During peak periods, many sections of the roadway are at capacity. Specifically, air passengers are likely to experience traffic delays between Fremont and Hayward. (See Map 4)

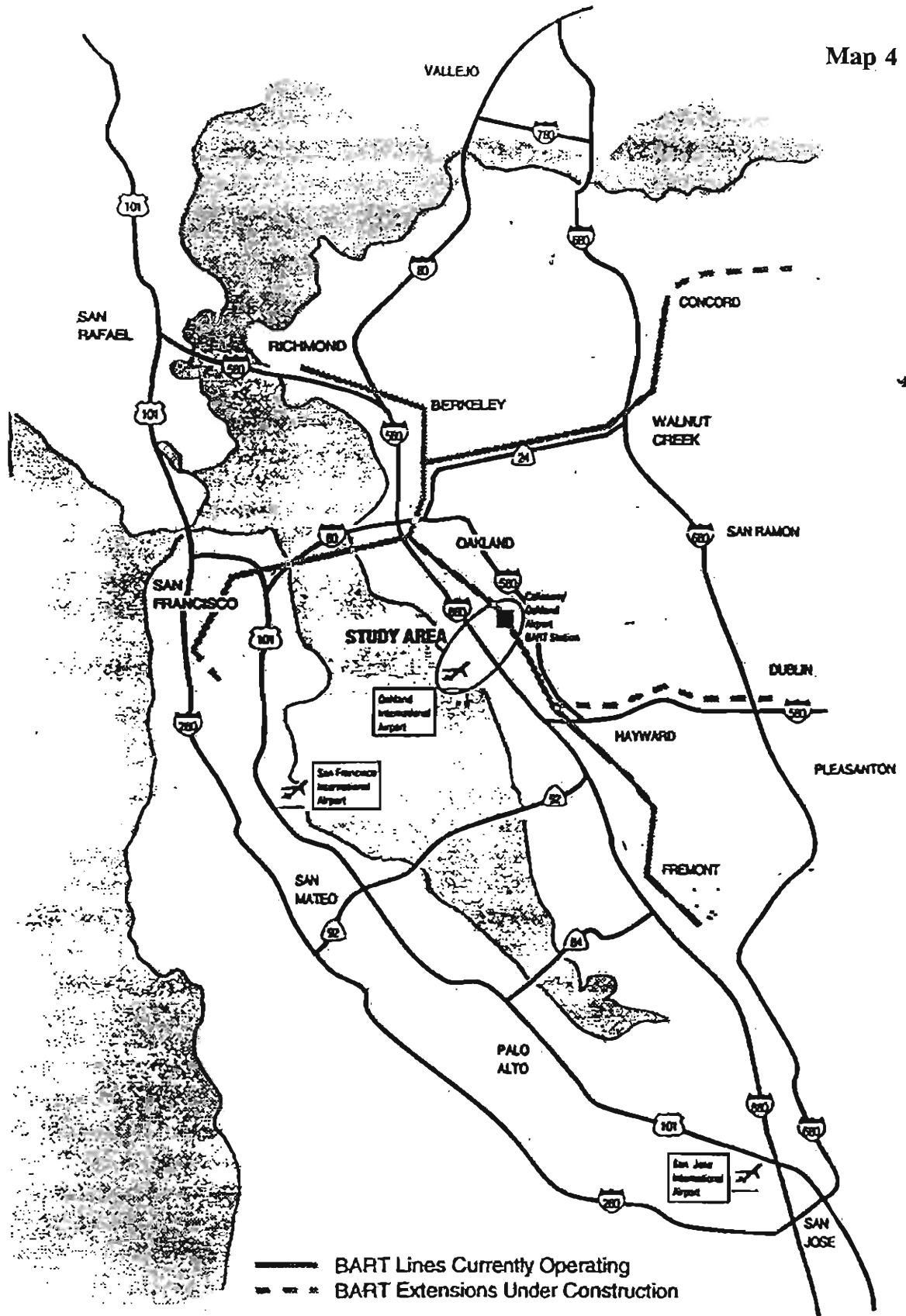
Another north-south highway, I-680, is the only freeway route between the new business centers in central Contra Costa county and the San Ramon Valley and the nearest airport, which is Oakland. Access to the airport via I-680 deteriorates in the vicinity of Walnut Creek where significant commute traffic makes travel times unreliable. This situation is further exacerbated by the Caldecott Tunnel on State Route 24 which creates serious bottle-neck effects.²⁵⁴

I-80 provides east-west access from downtown San Francisco via the Bay Bridge. This freeway is extremely congested during commute hours and effects air passengers traveling across the bay as well as air passengers from northern counties.

Currently, Oakland Airport is only served by rubber-tire modes. Like other U.S. airports, the dominate form of transportation is private automobile or rental car. Other privately operated transportation services include Airporter express buses, limousine and shared-van services, and taxis. Airporter buses are a shared-van service with regularly schedule routes and limited door-to-door service. Other shared-van services operate "on-call" and provide extensive door-to-door service.

²⁵⁴ BART-Oakland Airport: Inter-modal Connector Project Update, prepared for BART and Port of Oakland, December 1993.

Map 4



——— BART Lines Currently Operating
 - - - BART Extensions Under Construction



II-184



Public transportation consists of bus service provided by Alameda County Transit and the Air-BART shuttle service between the airport and the Oakland Coliseum BART station. In the case of Alameda County Transit, the Coliseum BART station serves as a transfer center for lines 45, 46, 49, 58, and 98. However, route 58 is the only bus service to the airport; all other routes require transferring to route 58 in order to complete the trip to the airport. Travel time between the Coliseum station and the airport via bus 58 is approximately fifteen minutes during commute hours.

Similarly, access via the Air-BART shuttle requires a transfer between the BART system and the shuttle service. Service is provided by 16-passenger vans and is contracted out by the Port of Oakland. Since the Air-BART shuttle does not make any intermediate stops between the Coliseum station and the airport, travel time is only 6-8 minutes.

Modal Shares

A summary of access modes is provided in Table 2.

Table 2: Ground Transportation Mode Choice²⁵⁵

TRANSPORTATION MODE	MODAL SHARE
Private Automobile	70.3%
Rental Car	15.0%
Taxi and Limo	5.6%
Private Transit	1.9%
Hotel Courtesy Shuttle	2.5%
Other	0.5%
Public Transit	4.2%

In another study, the BART-Oakland Airport: Inter-modal Connector Project Update,

255 California Aviation System Plan: Ground Access Study, California Department of Transportation, August 1991, page 52.

prepared for BART and Port of Oakland by Wilbur Smith Associates in December 1993 cites the Air-BART service alone accounts for 4.1% of the ground transportation market, and that it is as equally attractive as shared-van services or taxis.

The Metropolitan Transportation Commission (MTC) survey of air passengers found that approximately 86% of the resident air passengers resided in one of the three counties served by BART, while 79% of non-resident air passengers had origins in BART-served counties. Clearly, there is an opportunity to increase the modal share for the Air-BART service. One issue which planners in the Bay Area noted was the crowded conditions of BART vehicles at the Coliseum station during commute periods and special events. Crowded cars and no provisions for baggage are likely to deter air passengers from using the BART system for airport access.²⁵⁶

BART Extension to Oakland International Airport

The need for an improved link between Oakland International Airport and BART's Coliseum station was recognized even before BART became operational. Several studies in the 1970's and early 1980's investigated alignment options and technologies. In 1981, the process went as far as the completion of a draft environmental impact statement. However, some planners surmise that since the Oakland Airport was only serving approximately two million air travelers during this time period, the project lacked a sense of urgency and other regional transportation needs took precedence.²⁵⁷

However, as the airport has become an increasingly important economic generator and as growth has occurred throughout the east bay region, a more reliable link to the airport has become a prominent topic. At this point, BART's board of directors has adopted an "Extensions Phasing Policy" which addresses several projects. Phase I projects, which generally increase commuter services, are currently being built. The Oakland Airport connector is currently included in Phase II of the program.²⁵⁸ In 1992-93, BART and the Port of

²⁵⁶ Focus Group, Oakland, August 1994.

²⁵⁷ Focus Group, Oakland, August 1994.

²⁵⁸ Bart-Oakland Airport: Inter-modal Connector Project, prepared for San Francisco Bay Area Rapid Transit District and Port of Oakland, December 1993.

Oakland funded a study to update the information from previous studies in preparation for final planning efforts. In addition, the updating activities allowed these agencies to successfully apply for a grant from the Federal Transit Administration to examine the feasibility of using suspended light rail technology (SLRT) for the connector.

Decision Process for the BART Connector to Oakland Airport

In the updated report,²⁵⁹ a common vision was articulated by the stakeholders. Namely, the basic service objective of the proposed connector is to increase the absolute number and the proportion of air passengers using transit to access the airport. Consequently, planners determined fundamental criteria of the service should be that it exceed the speed, capacity, frequency and reliability of the existing Air-BART shuttle service.

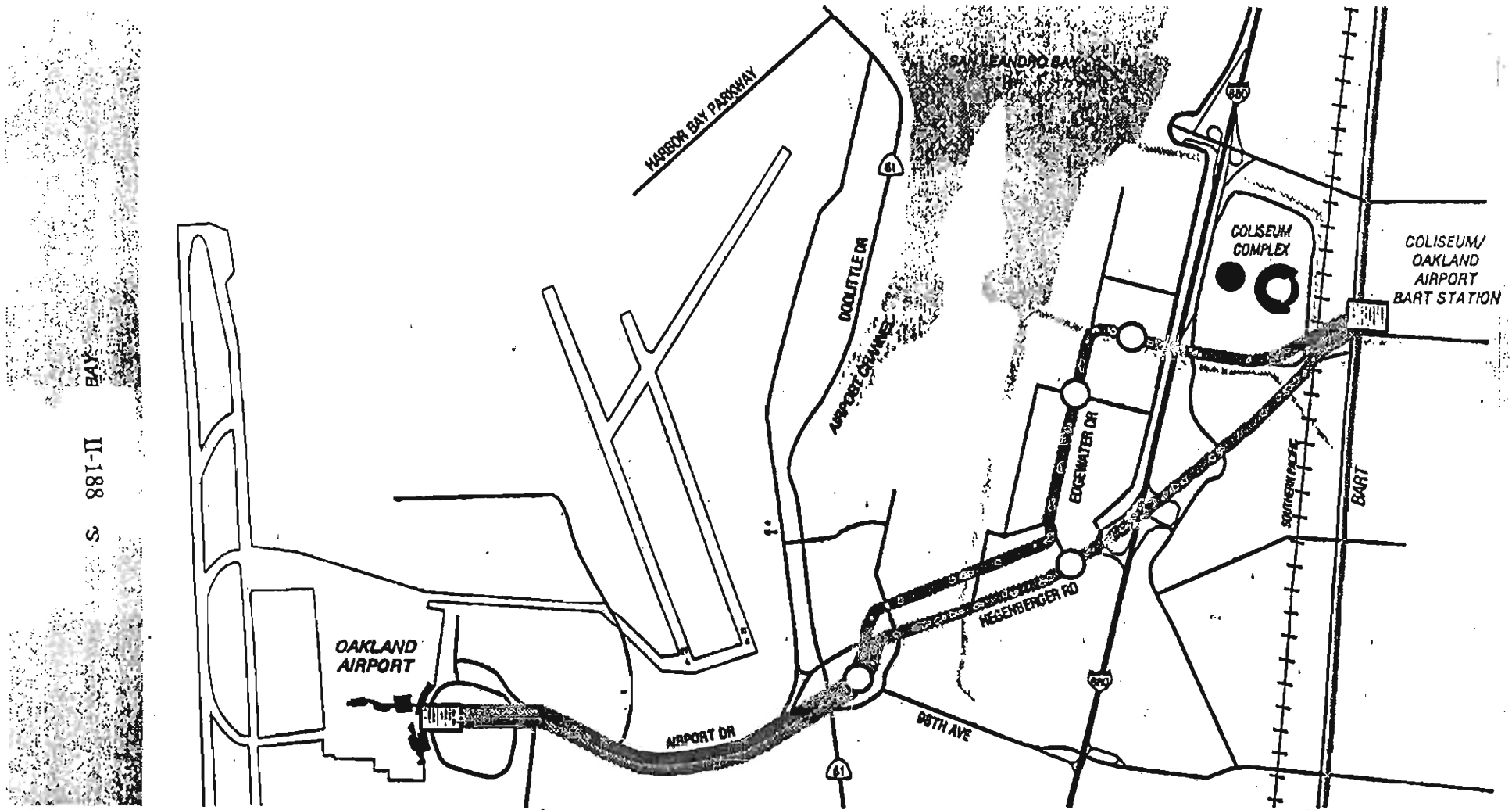
Before analyzing routing options, the consulting firm developing the report further explored these preliminary criteria. A summary of the findings follows:²⁶⁰

- Air travelers are especially sensitive to unpredictable travel times when making their decision regarding which mode to use. Reliability of scheduling, both on the connector and on BART is therefore very important. BART has consistently achieved 94% on-time reliability.
- The journey to the airport is generally the most "time-sensitive" direction of travel. Thus, headways on the connector should be closely spaced to minimize the waiting required by people transferring from BART to the connector. In general, passengers tend to stop referring to transit schedules when the average waiting time drops below three minutes. However, the desirability of minimizing headways must be balanced against the increased costs of higher technology standards, increased number of vehicles, and increased operating costs.
- The connector must be able to carry 700-800 passengers in the peak hour. Vehicles should be sized to meet this demand comfortably at headways of six minutes or less.

²⁵⁹ BART-Oakland Airport Inter-modal Connector Project: Project Update Report, prepared for San Francisco BART and Port of Oakland, December 1993.

²⁶⁰ Bart-Oakland Airport: Inter-modal Connector Project, prepared for San Francisco Bay Area Rapid Transit District and Port of Oakland, December 1993.

BART - OAKLAND AIRPORT INTERMODAL CONNECTOR PROJECT



S. 881-II BAY

OAKLAND AIRPORT

HARBOR BAY PARKWAY

DOOLITTLE DR
AIRPORT CHANNEL

HEGENBERGER RD

89TH AVE

COLISEUM COMPLEX

COLISEUM/OAKLAND AIRPORT BART STATION

BART

 Hegenberger Option

 Edgewater Option

 Stations

 Possible Future Intermediate Stations



WILBUR SMITH ASSOCIATES

Map

Figure ES-1

PROJECT DEFINITION

Having set the minimum criteria for the connector, planning officials proceeded to evaluate two different alignment alternatives (See Map 5) and several station designs for the terminals at either end of the route. To prepare a preliminary trade-off analysis of the two main route options, planners summarized information from previous reports and personal expertise to rate the two options on seven factors using a scale of High, Medium, or Low. (See Attachment 2)

As shown in attachment 2, one of the seven factors concerned environmental impacts. Taking this factor (avoidance of sensitive environmental areas) one step further, planners conducted a more detailed environmental screening using a checklist prescribed by the California Environmental Quality Act (CEQA). By going through this process, the agencies found several "potentially significant project-specific and cumulative effects" that would require further analysis.²⁶¹

Finally, the agency partners calculated capital cost estimates without specifically identifying the technologies to be utilized. To do this, the planners looked at comparable automated guideway transit (AGT) systems around the country, escalated costs to 1993 dollars, hypothesized about staffing levels, and applied the estimates to their generic model.

Funding

Having completed the updated report in December 1993 and formed a partnership to streamline the planning process, agency officials at BART and the Port of Oakland are confronted with two possible funding scenarios. The first scenario assumes the connector project is awarded FTA funding for a demonstration project using SLRT technology. Even though considered a "demonstration" project, this funding would cover virtually 100% of the costs to design and construct the connector. Under this scenario, the connector could be completed within six years from the date of approval. The second scenario assumes the FTA decides not to fund the SLRT project and other funding sources must be pursued. Under this scenario, funding would most likely be secured in from the 75/25 allocation authorized under ISTEA. Like funding for the extension to San Francisco International Airport, local funding

²⁶¹ BART-Oakland Airport Inter-modal Connector Project: Project Update Report, prepared for San Francisco BART and Port of Oakland, December 1993.

for the Oakland connector would most likely come from sales or transit taxes levied by a consortium of counties in the east bay

Table 4-1
ALIGNMENT ASSESSMENT

Factor	Hegenberger Option		Edgewater Option	
	Rating	Comment	Rating	Comment
Directness of Route	H	Straight line between BART and Airport	L	Only deviation is bend to Edgewater and Elmhurst Channel
Compatibility With Adjacent Land Use	M	Visual impact on businesses fronting Hegenberger	M	Visual and noise impact on Elmhurst Channel trail.
Avoids Sensitive Environmental Areas	H	Crosses San Leandro Creek on Hegenberger	M	Crosses San Leandro Creek north of Hegenberger
Avoids Operational Constraints	H	Only two curves	M	Four curves
Right of Way and Relocation Requirements	M	May require right of way to widen street where median is narrow	M	Requires relocation of one business
Opportunities for Intermediate Stations	M	Does not serve Business Park well	H	Serves all potential areas
Opportunity for Maintenance Facility	M	Three potential sites	H	Five potential sites

H = highest benefit/lowest cost
M = medium benefit/medium cost
L = lowest benefit/highest cost

Option appears to be slightly better than the Edgewater Option. It is shorter, which reduces travel time and construction and operating cost. It also has fewer curves which also reduces travel time. Because it stays in the highly developed Hegenberger corridor, it has less impact on sensitive environmental areas. The Edgewater Option is superior in its ability to provide an intermediate station in the center of the business park, but major weaknesses are its length and additional curves.

Sea-Tac International Airport Seattle, Washington

General Description of the Metropolitan Area

The Seattle area is the nation's twelfth largest metropolitan area, with a 1990 census population of nearly 3 million. The central business district (CBD) occupies 84 square miles, and the city's population is 516,259. Seattle's bid to become one of the nation's major seaports began with the opening of the Panama Canal in 1914 which facilitated shipping from Japan and Canada to the United States' eastern seaboard. In addition, the city served as the center of the U.S. aircraft industry during World War II.²⁶²

Growth in the Seattle area is predominantly along the north-south corridor which is geographically bounded by the Pacific Ocean to the West and the Cascade Mountains to the East. (See Map 1) In general, Washington is a rapidly-growing state; experts predict the state's population, which doubled from 1970 to 1990, will double again between 1990 and 2020. In particular, this rapid growth has been largely concentrated in the urban areas of the state — particularly the Seattle, Bellevue, Tacoma triangle. Along with the growth, traffic congestion has given rise to what some experts call the state's "transportation crisis."²⁶³ This situation is described as a crisis because state and local leaders recognize that the transportation infrastructure is vital to the state's economy which is highly dependent upon trade. Thus, congested highways, railroad bottlenecks, and an overflowing airport drive up the cost of delivering products to distant markets.

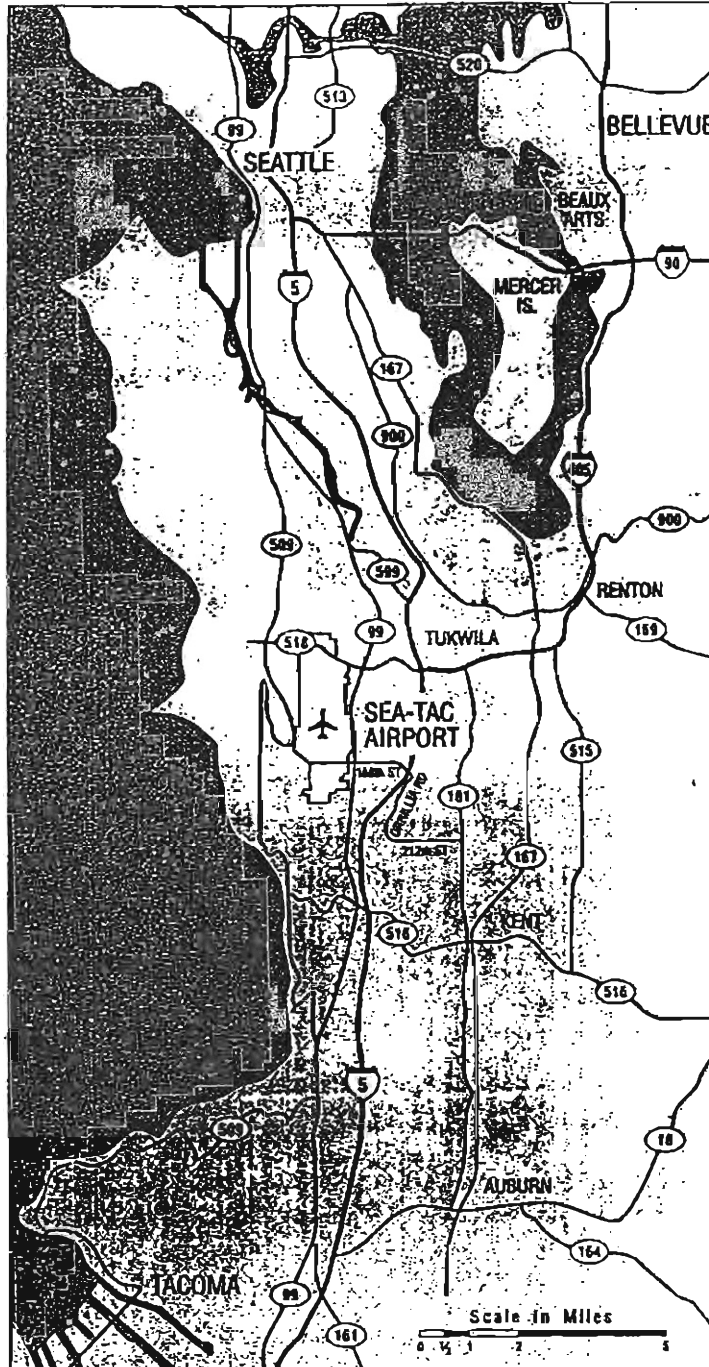
Sea-Tac International Airport

The metropolitan area, which encompasses Seattle, Tacoma, Bellevue, and Bremerton, is served by the Seattle-Tacoma International Airport (Sea-Tac). The airport is located on the

²⁶² World Almanac, 1994.

²⁶³ Davis, Aubrey: "The Transportation Crisis." Seattle Post-Intelligencer, Sunday, September 11, 1994, P. E-1.

Map 1



top of a plateau between Seattle and Tacoma in southwestern King County.²⁶⁴ The airport, which opened for operations in 1947, occupies 2,433 acres, including a 436-acre noise-impact buffer zone. In 1993, Sea-Tac passenger traffic totaled 18.8 million, and Sea-Tac moved 381,541 metric tons of air cargo.²⁶⁵

Sea-Tac is constructed in a north-south configuration, with most of the runways and ancillary buildings located to the north of the main terminal. The main terminal is supplemented by two satellite terminals, with one located just north of the main building and the other just south. These two satellite terminals are connected to the main terminal via an automated underground subway system. Another feature of on-site access is the V-shaped configuration of the main terminal building which provides easy access to the terminal from the primary parking lot. (See Map 2)

Experts estimate that 70% of Sea-Tac's passengers originate locally, using ground access modes; the remaining 30% arrive by connecting flights at Sea-Tac. Additionally, they estimate that 30% of the departing passengers are accompanied by well-wishers, and 40% of arriving passengers are met by greeters, indicating that heavy usage is created by non-passengers using the airport's facilities and ground access).²⁶⁶

Modal Shares

Private auto is the dominant mode of ground access to Sea-Tac International Airport. A 1994 air passenger survey found that approximately 70% of the locally-originating trips to Sea-Tac were by private car. This percentage has remained unchanged since 1988, although the total number of air passengers has increased dramatically. Table 1 shows the shares for various modes of access as discovered in a 1988 study of ground access to Sea-Tac.

²⁶⁴ Focus Group, Puget Sound Regional Council, September 1994.

²⁶⁵ Seattle-Tacoma International Airport Aviation Planning Department, Airport Activity Report, April, 1994.

²⁶⁶ P&D Aviation Team, Sea-Tac University. Handling Traffic-Ground Access Issues, June 22, 1994.

Table 1²⁶⁷

Sea-Tac Passenger Arrival Mode Choice Patterns

Mode of Access	Share
Auto - On-Site Parking	38.5%
Auto - Off-Site Parking	28.2%
Auto - Drop-off, No Parking	12.1%
Auto Share (Subtotal)	78.8%
Subscription Bus/Airporter	6.6%
Auto Rental: On-site	5.2%
Hotel Courtesy Van	3.7%
Taxi	2.6%
Other Shuttle Vans	1.7%
Public Transit	1.4%
TOTAL	100.0%

Ground Access - Overview**Highway System**

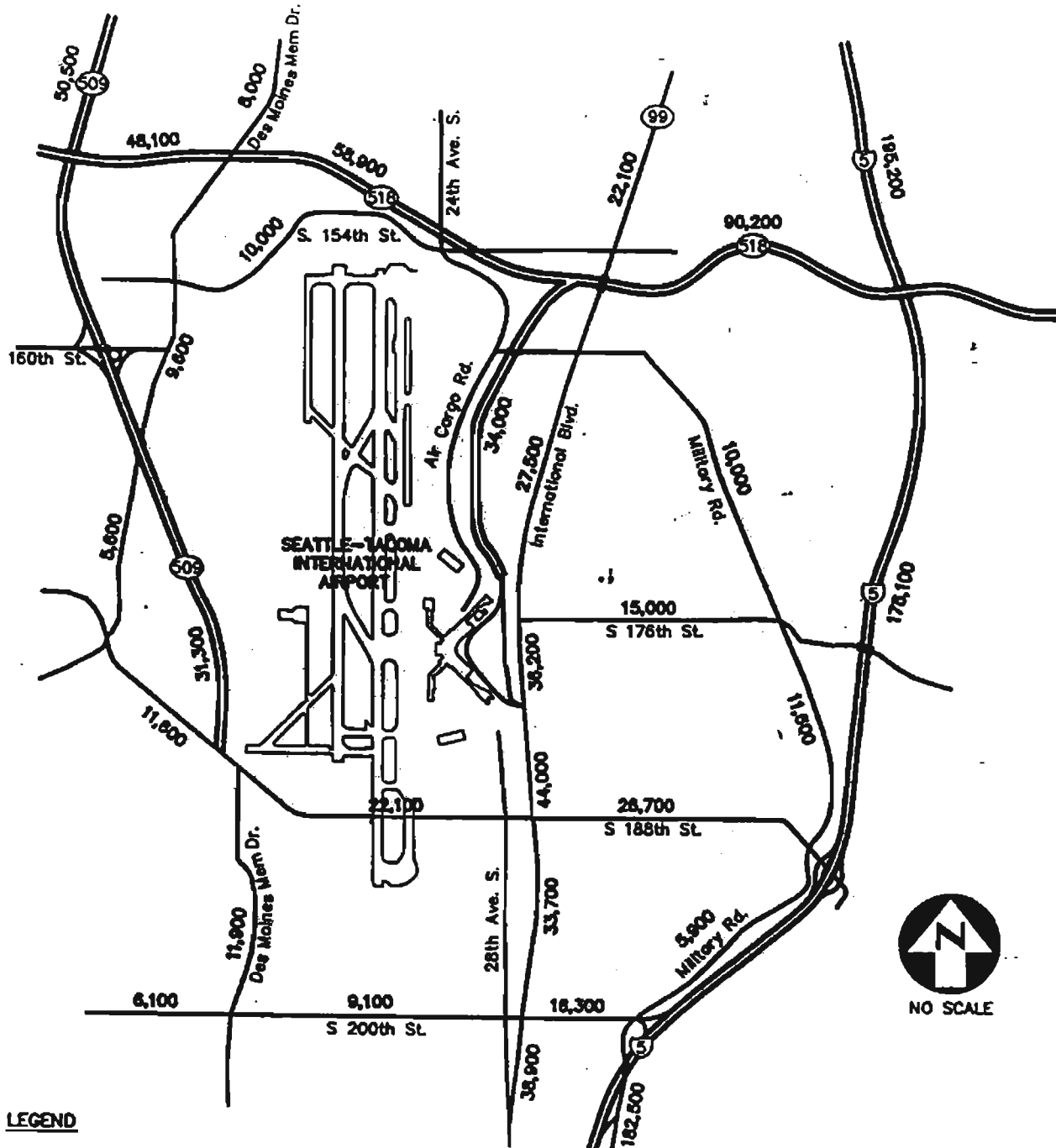
The primary transportation route in the Seattle area is the north-south I-5 corridor on the west side of Lake Washington. This is the main growth corridor in the region, and provides a critical link between the Seattle central business district, Tacoma and the airport. From I-5, air travelers must access an east-west route to complete the trip to Sea-Tac. Here, the travelers' choices are limited, consisting primarily of State Route 518, South 188th Street, and South 200th Street. (See Map 3) In 1990, the final link of I-90 to I-5 was completed, creating an east-west corridor through Bellevue on the east bank of Lake Washington.²⁶⁸ In addition, plans are underway to build a three-mile highway extension from Sea-Tac to I-5. Planners say

²⁶⁷ CH2M Hill, Landside Access Plan (Sea-Tac), 1988.

²⁶⁸ Focus Group, Puget Sound Regional Council, September 1994.



**FIGURE 5-2
EXISTING TRAFFIC VOLUMES**



NO SCALE

LEGEND

10,000 - AVERAGE DAILY TRAFFIC (ADT)

SOURCES: 1. CITY OF SEATAC COMPREHENSIVE TRANSPORTATION PLAN, THE TRANSPOR GROUP, 1991
2. WASHINGTON STATE DOT, JULY 1992 LIMITED COUNTS.



funding is being sought for this project, but give no indication how it will fare when prioritized against other transit initiatives serving the airport.²⁶⁹

Bus Service

The Metro Transit agency was recently reorganized as a result of a consolidation of several public agencies in the area. The authority now includes three counties, and operates four primary bus lines into/out of Sea-Tac. Three of these routes provide service to the Seattle CBD (including express service, local service and "Night Owl" service through the I-5 corridor). The fourth route connects with the Bellevue CBD.²⁷⁰

Rail

Because of the geographic configuration of the airport atop a plateau, conventional rail service was not considered feasible and was never built. However, with the advent of new technology, planners are re-visiting a variety of rail options:

- In 1992, the State of Washington completed a study on the possibility of a high speed rail system which would serve Sea-Tac. The study was inconclusive, and no work is now proceeding on the high speed rail alternative.
- The Regional Transit Authority was created by the state legislature two years ago to explore creation of a regional rail system. One component of this system would be a commuter line on existing rails which would, once modified, serve the airport. Another component would be a regional light rail line serving a vast corridor from Everett to Tacoma, and would also serve the airport. These options are still being studied, and the RTA is due to present an initiative to voters next spring.
- Local business people are exploring creation of a "personal rapid transit" program (PRT) which would consist of golf-cart-sized vehicles running on rails. The future of this proposal is unclear.²⁷¹

²⁶⁹Focus Group, Puget Sound Regional Council, September 1994.

²⁷⁰Focus Group, Puget Sound Regional Council, September 1994.

²⁷¹ Focus Group, Puget Sound Regional Council, September 1994.

Commercial Transportation Services

As the modal split data in Table 1 shows, after private vehicles, commercial services provide a significant portion of the transportation to Sea-Tac. These services include taxis, limousines, shared vans, and courtesy vehicles operated by hotels and nearby parking lots. The Port of Seattle collects three different types of fees from these private operators — permits, a percentage of gross outbound fares, and a fee per trip. In order to streamline the process for collecting trip fees, an automatic vehicle identification system (AVI) was installed in 1992.

Of all the private services operating at Sea-Tac, the largest number of daily commercial operations comes from courtesy vans. Moreover, off-site parking operations generate approximately 30% of all courtesy van activity.²⁷² With approximately 5,000 trips per day made by courtesy vans, this a significant factor contributing to on-site congestion.

Transportation Planning and Government Interaction

The policy decision-making process in Seattle is fairly complex, involving a variety of public entities and constituencies. In general, voters and decision makers are characterized as highly independent, and extremely concerned about the environment.²⁷³ Both of these aspects influence transportation planning.

Most regional transportation planning is facilitated by the Puget Sound Regional Council (PSRC), a metropolitan planning organization (MPO) which encompasses four counties, some thirty townships (including the City of SeaTac, which was incorporated in the airport vicinity in 1990), and other public agencies. At present, planners are pursuing two primary proposals for development: a general development proposal which would include creation of a supplemental airport to relieve some of the passenger burden from Sea-Tac, and a proposal for new transportation alternatives to serve Sea-Tac.²⁷⁴

²⁷² Airport Master Plan Update: Section 5 (Review Draft), 8/12/94.

²⁷³ Focus Group, Puget Sound Regional Council, September 1994.

²⁷⁴ Focus Group, Puget Sound Regional Council, September 1994.

Supplemental Airport

Because of geographic and zoning constraints, no potential site for a supplemental airport in the Puget Sound region has gained much support among planners and officials. Since few potential passengers live in the catchment area of proposed alternative sites, planners doubted a second airport would take much of the burden away from Sea-Tac. Currently, the Regional Council is studying which of several proposed sites is "least flawed."²⁷⁵

Planners suggest that relocation of commuter air traffic to a supplemental site is one of the most promising ideas presented within the multiple-airport scenario. After 1985, commuter traffic jumped to 43% of Sea-Tac operations, and although it has since tapered down to 38%, redirecting this substantial amount of traffic could go far toward the goal of alleviating congestion at the existing airport.²⁷⁶ As a result, in analyzing potential sites for a supplemental airport, planners are studying whether commuter traffic can be successfully moved to a particular site, and whether that site can be reached by rail.²⁷⁷

Improved Transit to Sea-Tac

As previously mentioned, much of the transportation planning in the greater Seattle-Tacoma region is facilitated by the PSRC. Currently, the PSRC has proposed creating a Regional Transportation Authority (RTA) with several goals: reduce dependence on private vehicles, improve air quality, limit urban sprawl, reduce energy consumption, and protect the integrity of neighborhoods.

Although the overall vision is still being developed, the RTA is likely to coalesce around some form of a regional rail or express bus lane system which will connect downtown Seattle to the outlying suburbs and the airport (See Map 4). Work on the proposal is

²⁷⁵ Focus Group, Puget Sound Regional Council, September 1994.

²⁷⁶ Focus Group, Puget Sound Regional Council, September 1994.

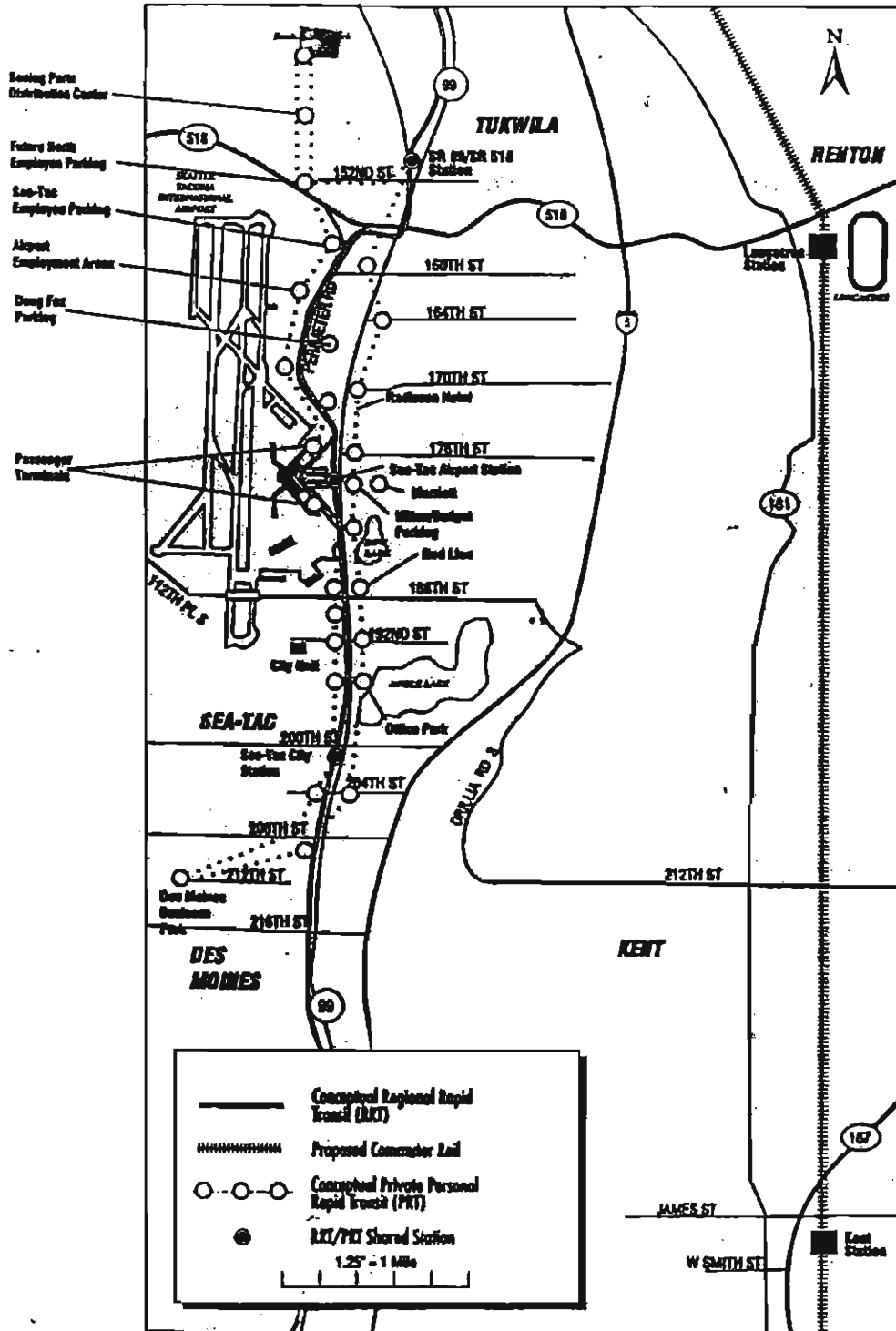
²⁷⁷ Focus Group, Puget Sound Regional Council, September 1994.

AIRPORT MASTER PLAN UPDATE

SEATTLE - TACOMA INTERNATIONAL AIRPORT



**FIGURE 5-5
PROPOSED RAIL SYSTEMS IN THE SEATTLE - TACOMA AREA**



continuing, and regional constituencies are likely to vote on such a proposal as early as Spring, 1995.

Improvements at Sea-Tac

In addition to improved regional access to the airport, the City of Sea-Tac is considering the use of a "people-mover" system to transport air travelers, employees and other users within the Sea-Tac airport area. For this system, the Port of Seattle authority hopes to generate interest in private capitalization (or capitalization through a public/private partnership). This plan is still in the conceptual stage, and securing the interest of private investors (to operate the system for profit) has yet to be attempted. However, the City of Sea-Tac was awarded approximately \$600,000 from the federal government to develop detailed schematics for such a system.²⁷⁸

Decision Processes and Models

Seattle planners use standard models for analyzing transportation initiatives in the region, particularly those models specified by Federal Transit Administration (FTA) regulations concerning transportation investment analysis.²⁷⁹

As a means of structuring analysis of transportation alternatives, Seattle planners use a hierarchical approach. Experts begin with a "system" plan which provides an overall vision of transportation needs in the region (environmental impact studies have already been completed for the region's current system plan). From the system plan come various alternatives to be subjected to separate analysis; for example, planners are currently scrutinizing the first-phase vision for a system-wide rail system.²⁸⁰ Analysts generally examine a given initiative in terms of four key questions:

- What will the alternative cost?
- What area will be served?

²⁷⁸ Airport Master Plan Update: Review Draft, 8/12/94.

²⁷⁹ Focus Group, Puget Sound Regional Council, September 1994.

²⁸⁰ Focus Group, Puget Sound Regional Council, September 1994.

- What ridership will be gained?
- What are the key environmental issues involved?²⁸¹

As part of this analysis, planners use standard quantitative models to assess transportation alternatives, including trip generation, trip distribution, and modal split models. One example of the application (and limitation) of this process is the decision planners face regarding whether the proposed rail system should penetrate Sea-Tac or whether passengers should reach the airport by transferring to another mode (such as bus) from a nearby rail station. However, for such a specific analysis, experts find existing models deficient, failing to account for the full range of possibilities. Planners believe there would be interest in the formulation of new models to support transportation decisions.

One of the best uses of existing models, according to Seattle experts, is in comparing two or more competing alternatives. Analysts are also working on adapting non-transportation models to transportation uses (such as a "hydropower" model used in the Seattle area to assess alternative means of addressing growth), and on new methods for gathering salient data. Rather than predicting performance of various alternatives, however, experts say the models are best used to validate decisions made on the basis of other, more qualitative, criteria.²⁸²

Funding

Transportation initiatives are funded in a fairly straightforward manner in Seattle. Basically, when the RTA presents its rail initiative to voters in early 1995, it is anticipated that funding will be approved at the same time the plan itself is approved. The state has authorized the RTA to seek a sales tax of as much as 0.9%. However, planners have discovered through public involvement meetings that voters will be unlikely to approve the entire amount, and this has provided the motivation to create a proposal which costs as little as possible.²⁸³

²⁸¹ Focus Group, Puget Sound Regional Council, September 1994.

²⁸² The discussion of modeling and decision processes was explored in Focus Group, Sea-Tac International Airport, Puget Sound Regional Council, September 1994.

²⁸³ Focus Group, Puget Sound Regional Council, September 1994.

One new development is the recent creation of a public-private partnership for new projects. Under the partnership, private organizations will build six projects which will then be "leased back" by the public agencies. This year, none of the six selected projects were airport-related.²⁸⁴

Postscript

The RTA Rail Initiative was not passed by the voters in the spring of 1995. As information becomes available on the next step in securing rail services to Sea-Tac, this case study will be updated.

²⁸⁴ Focus Group, Puget Sound Regional Council, September 1994.

Lester B. Pearson International Airport Toronto, Ontario

General Description of the Metropolitan Area

The province of Ontario lies directly north of Ohio and east of Michigan, bordered by Lake Huron, Lake Erie, and Lake Ontario. The total population of the Greater Toronto Area (GTA) is approximately 3.5 million and expected to grow to 6 million by 2021. The greater Toronto area is comprised of the city of Toronto plus the municipalities of Halton, York, Durham, and Peel.

Lester B. Pearson International Airport

The Lester B. Pearson International Airport (LBPIA) has become one of the most important air hubs in Canada handling 33% of the nation's scheduled flights, 50% of Canada's international traffic, and 40% of Canada's air cargo.²⁸⁵ Air passenger travel has grown from 13 million enplaned/deplaned in 1982 to 22 million enplaned/deplaned passengers in 1991. Projections estimate LBPIA will be handling 45 million passenger by the year 2011 and will reach maximum capacity in 2016 at 50 million passengers. To meet the growth, planners in the GTA are looking at a broad range of internal circulation and external access alternatives for Pearson International Airport.

While the North-American Free Trade Agreement has further emphasized the need for Canada to maintain and enhance Toronto as a world class airport facility with superior access to and from it, LBPIA also provides major economic benefits at the regional level. LBPIA is the second largest economic generator in the GTA, following the downtown district. The airport generates 13,750 direct and 41,250 indirect jobs throughout the province which provide \$750 million in personal income. Additionally, \$3.8 billion in revenue is collected by air industry businesses.²⁸⁶

²⁸⁵ Rapid Transit to Pearson International Airport: Social and Economic Need Justification Study, Ontario Ministry of Transportation, November 1992. p.5.

²⁸⁶ Rapid Transit to Pearson International Airport: Social and Economic Need Justification Study, Ontario Ministry of Transportation, November 1992. p.5.

Ground Access

Pearson International Airport is currently served by the full spectrum of private and public transportation modes which are typical of a North American airport. Transportation options include private automobiles, commercial taxi and limo services, Gray Coach bus service from downtown and the subway, GO-Train service to the Airport/Derry station, GO-Bus service, and inter-city bus service by private operators.

Highway access is possible via a network of major freeways and arterial roads. (See Map 1) Highway 409 provides access from areas east of the airport, Highway 427 accommodates travelers from areas north and south of PIA, and Highways 401 and 403 generally serve the northwest and southwest respectively. In 1989, the external road network was more than adequate to meet travel demand.²⁸⁷ Roadway improvements since 1989 have kept pace with increased passenger traffic; thus, current highway conditions to PIA are generally very good and travelers seldom experience time delays. However, planners on the Greater Toronto Area Coordinating Council (GTCC) indicated highway build-out has been maximized and any further capacity increases will have to come from other options such as HOV lanes or transit.²⁸⁸

Given the excellent highway accessibility, the use of private automobiles continues to be the most favored mode of travel to and from the airport for airline passengers. An estimated 72% of leisure travelers and 55% of business travelers rely on private automobiles (including rental cars). In addition, 22% use taxis and limousines — other forms of low occupancy vehicles. The private automobile is also the preferred mode of 93% of persons employed at the airport.²⁸⁹

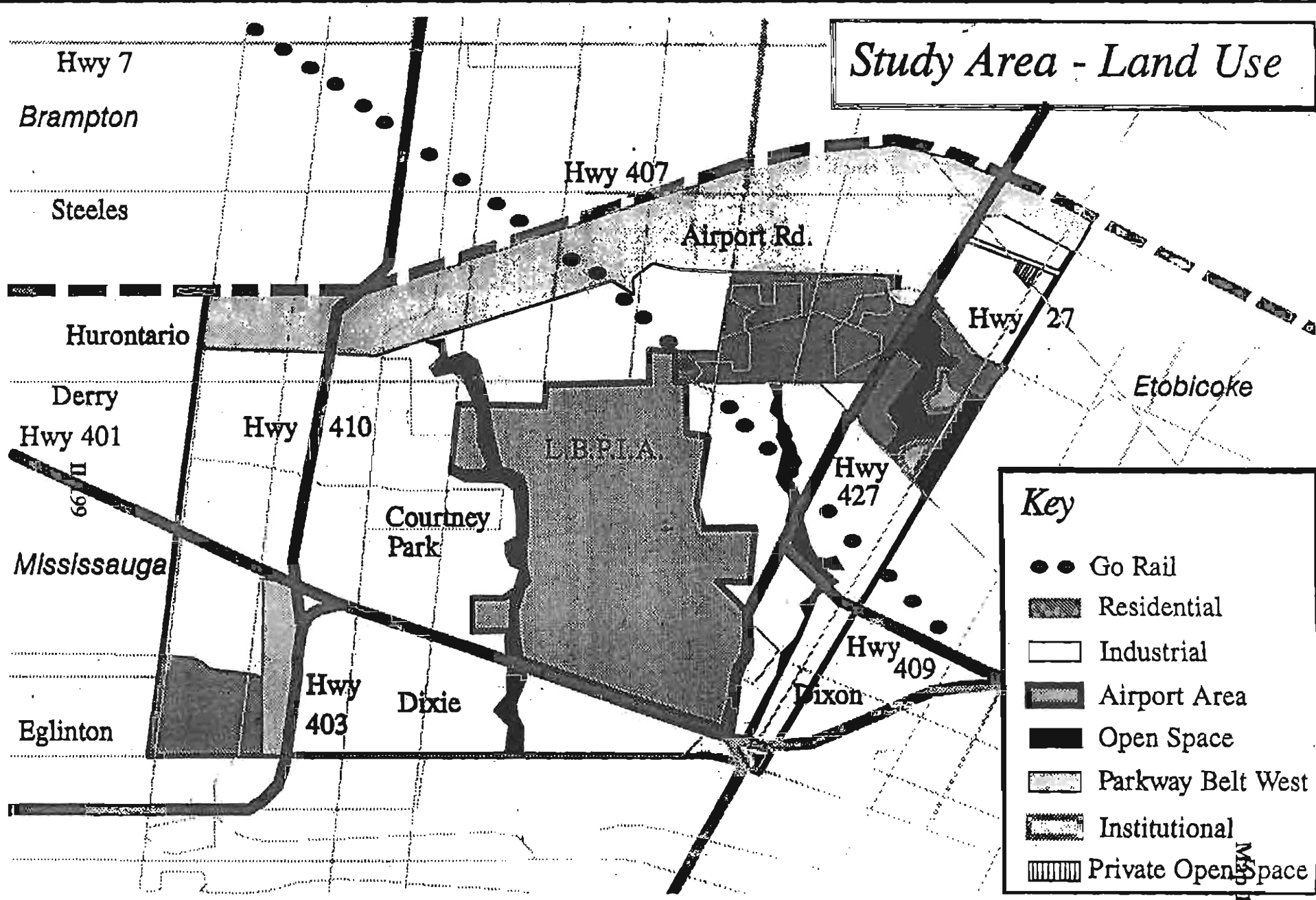
An extensive network of bus services operated by Metropolitan Toronto and the outlying municipalities also provide service to the airport. The Gray Coach, operated by the City of

²⁸⁷ Transit Access to Lester B. Pearson International Airport, Ontario Ministry of Transportation, July 1989. p.31.

²⁸⁸ Focus Group, Toronto, Canada: September 1994.

²⁸⁹ Rapid Transit to Pearson International Airport: Social and Economic Need and Justification Study, Ontario Ministry of Transportation, November 1992. p.2.

Study Area - Land Use



Key

- Go Rail
- ▨ Residential
- Industrial
- ▩ Airport Area
- Open Space
- ▤ Parkway Belt West
- ▦ Institutional
- ▧ Private Open Space

T 207

M 11

Toronto, is particularly well regarded for its convenient service between downtown Toronto and the airport. Like other mini-vans, the Gray Coach has ample accommodations for luggage and the drivers assist air passengers with loading and unloading luggage.

Private operators of intercity buses also provide service to the airport. Intercity operators must be licensed by the Ontario Ministry of Transportation and they pay an access fee to Transport Canada in order to pickup and drop-off passengers on airport property.

Currently, there is no direct rail access to LBPIA. The Greater Ontario (GO) commuter route between downtown Union Station and Georgetown is the only rail transit facility in close proximity to airport property. The next closest facility is the Spadina subway station which is located 15 kilometers from PIA. Air travelers using the GO rail line must transfer to a Gray Coach bus in order to complete their trip to the airport.

A summary of ground access modes is provided in Table 1 while modal shares to Lester B. Pearson International Airport are provided in Table 2.

Table 1: Ground Access to LBPIA²⁹⁰

MODE	TRAVEL TIME TO LBPIA FROM DOWNTOWN	1-WAY FARE
Private Automobile	25-40 minutes + parking	\$.31-\$.41 per kilometer
Taxi	25-40 minutes	\$30.00
Limousine	25-40 minutes	\$32.00
Gray Coach	40 minutes	\$8.50-\$10.75

²⁹⁰ Rapid Transit to Pearson International Airport: Social and Economic Need Justification Study, prepared for Ontario Ministry of Transportation, November 1992.

Table 2: Transportation Modal Shares²⁹¹

Mode	Share
Private Automobile	75%
Taxis and Limousines	20%
Transit - regular scheduled services (Gray Coach) and intercity operators	2.5%
Other	2.5%

Future Access Developments

In August 1989, a project was initiated by Transport Canada to develop a comprehensive study of ground transportation as an essential element for updating the Airport Master Plan being developed to address air side capacity objectives in the medium (year 2010) and long terms. The first phase of the project analyzed the transportation needs for the entire area surrounding the airport (refer to Map 1) and identified a list of alternatives. The second phase selected the preferred alternative and identified a staging strategy.

Based on an analysis of indicators such as population and employment projections, current traffic flows, and projected carrying capacities of projects already underway, the team determined that the existing highway network would require an additional capacity of 45,000 person trips per day.²⁹² These additional person trips included daily commute traffic, commercial traffic, and airport access. Using this data, the study team identified roughly 20 different alternative transportation improvements aimed at addressing various needs. It quickly became apparent individual efforts of the various municipalities would be insufficient to satisfy the needs. Furthermore, land use constraints negated any new major roadway initiatives other than those already committed. As a result, the study team concluded transportation shortages would have to be addressed through transit with the ultimate goal of

²⁹¹ Presentation at Focus Group, Toronto, Canada: September 1994. Anecdotal information only.

²⁹² LBPIA Transportation Study, Ontario Ministry of Transportation and Transport Canada Airports, August 1993.

increasing transit's share for all daily trips in the airport study area to 35% from the current share of 2.5%.

Eliminating many of the alternatives which were disjointed and only addressed a singular problem, the team arrived at four alternatives which addressed the transportation issues within the study area in a comprehensive manner. All four alternatives were based on using express bus service in HOV lanes which could be converted to rapid transit at a later date.

Alternative 1 showed rapid transit developments in the Mississauga corridor, the Highway 407 corridor, along Hurontario Street or Highway 410, and along Airport Road or Highway 427. (See Map 2) Significantly, the transit way in the Mississauga corridor has already been funded and the Highway 407 Rapid Transit Corridor is provincially committed, leaving only two corridor systems to be funded under this alternative.

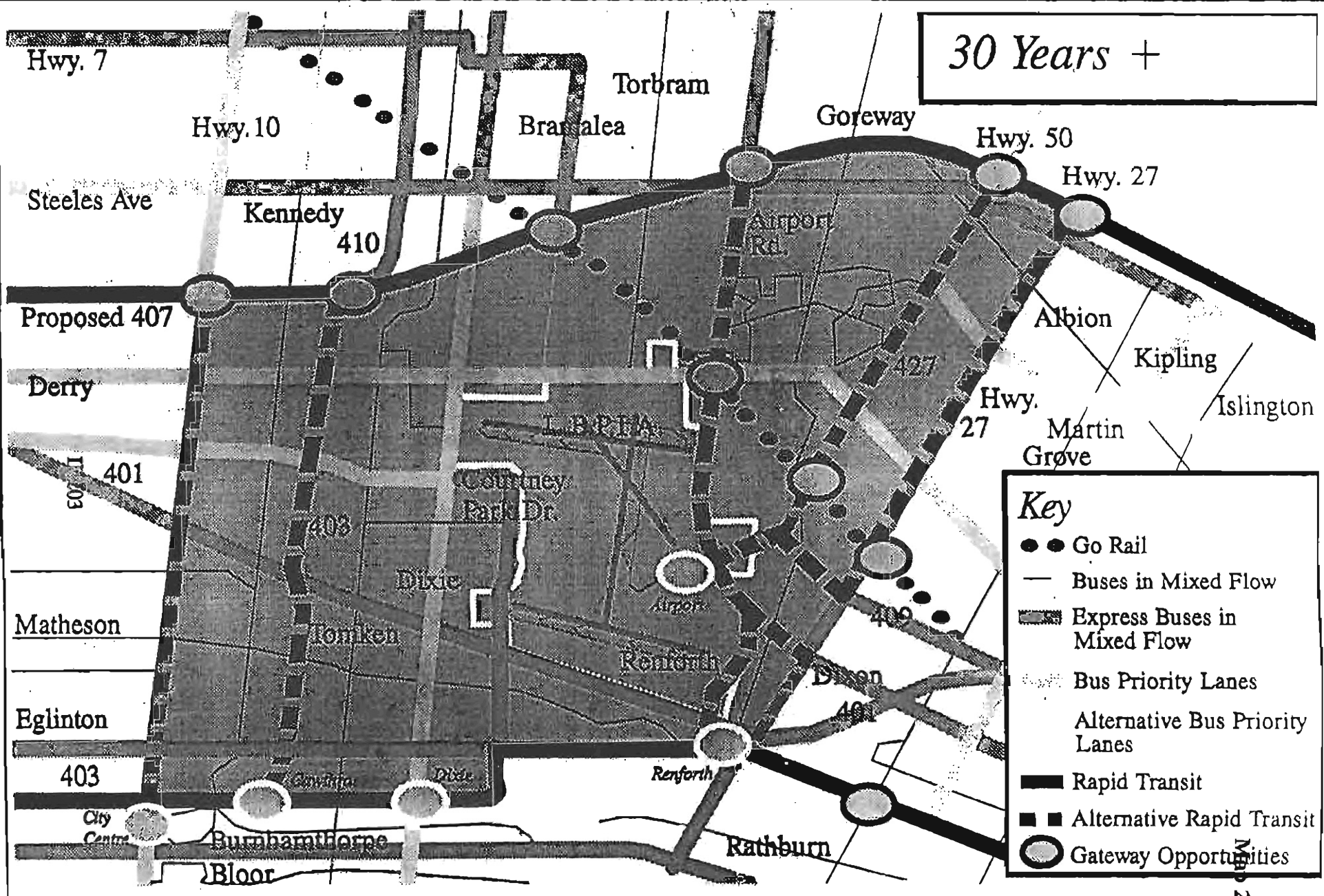
Alternative 1G built on Alternative 1 by extending the nearby GO commuter line into the airport. Likewise, Alternative 2 and 2G were identical to the first two options except for the addition of a transit corridor along Courtney Park drive which would serve a hypothetical fourth terminal. (See Map 2)

Alternatives 2 and 2G were set aside until the completion of the Airport Master Plan. After analyzing options 1 and 1G, several detrimental factors led to the rejection of the option diverting commuter rail into the airport. The 1G option was set aside due to the following reasons:²⁹³

- 1) Excessively high cost (about \$1 billion) for the extension loop into the airport, excluding additional improvements needed to the Georgetown GO Line itself
- 2) Comparatively low increase in ridership (only 2,000 riders per hour from the west and 1,100 per hour from the east destined to the airport)

²⁹³ LBIA Transportation Study: Executive Summary, Ontario Ministry of Transportation and Transport Canada Airports, August 1993

30 Years +



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Key

- Go Rail
- Buses in Mixed Flow
- ▨ Express Buses in Mixed Flow
- ⋯ Bus Priority Lanes
- ⋯ Alternative Bus Priority Lanes
- ▬ Rapid Transit
- ▬ Alternative Rapid Transit
- Gateway Opportunities

NETWORK STAGING

30 YEARS +

EXHIBIT

25

- 3) Possible deterioration of regular commuter service on Georgetown line during peak periods, resulting from scheduling accommodations made to achieve 15 minute headways on the proposed airport loop
- 4) Incompatibility of GO heavy rail technology with proposed long-term, rapid transit initiatives for accessing the airport

The final recommendation of the study team incorporated extensive use of express bus service and bus priority lanes in Alternative I, which could be gradually converted to "rapid transit" with the specific technology of rapid transit to be determined later.

As part of Phase II of the planning process, the study team developed one example of a reasonable staging sequence for implementing the transportation network in Alternative I. (See Attachment 1) However, the team recognized other sequences might become more viable as actual development and growth occurred and more precise transportation demands became identifiable.

At the end of 1993, having developed a plan for a transportation network which would require significant capital investment, the members of the advisory group faced the difficult task of conducting a formal environmental impact process and securing political approval and funding from the local municipalities and provincial government. During this phase, specific routes will be determined and various rapid transit technologies evaluated.

Decision Tools and Planning Process

While Transport Canada initiated the study of long-term ground transportation issues in the area surrounding Lester B. Pearson International Airport, day-to-day direction of the project was coordinated by the Ontario Ministry of Transportation under the leadership of a senior project manager.

The majority of the analysis was conducted by an outside consulting firm, but much expertise and input was provided by a Transportation Advisory Group comprised of members from all affected regional and area municipalities along with members from other relevant agencies such as GO Transit. This input was facilitated through regular meetings with this designated

**TABLE 4.1
LBPIA AREA TRANSPORTATION STUDY
SUMMARY OF KEY STAGING ISSUES**

FACILITY	MAJOR REQUIREMENTS OVER THE FOLLOWING TIME FRAMES				
	1-2 YEARS	2-5 YEARS	5-10 YEARS	10-20 YEARS	30(+) YEARS
EGLINTON AVENUE	-	<ul style="list-style-type: none"> • Bus Priority Lanes: <ul style="list-style-type: none"> - Cawthra Easterly (see also Hwy. 403) 	<ul style="list-style-type: none"> • No change 	(Introduce Rapid Transit)	<ul style="list-style-type: none"> • Rapid Transit
DERRY ROAD	-	-	-	<ul style="list-style-type: none"> • Bus Priority Lanes: <ul style="list-style-type: none"> - throughout study area 	<ul style="list-style-type: none"> • No change
HWY. 403	-	<ul style="list-style-type: none"> • Bus Priority Lanes: <ul style="list-style-type: none"> - Cawthra Westerly 	(Introduce Mississauga Transitway west of Cawthra)	(Mississauga Transitway)	(Mississauga Transitway)
COURTNEY PARK DRIVE	-	-	-	-	<ul style="list-style-type: none"> • Bus Priority Lanes
HURONTARIO STREET (HIGHWAY 10) AND HIGHWAY 410 ALTERNATIVES	-	<ul style="list-style-type: none"> • Bus Priority Lanes: <ul style="list-style-type: none"> - Matheson to south of City Centre 	<ul style="list-style-type: none"> • Bus Priority Lanes: <ul style="list-style-type: none"> - throughout the study area 	(Introduce Rapid Transit south of Hwy. 401; - Hwy. 410/403 is an alternate) (Rapid Transit on Hwy. 403 south of Hwy. 401; - Hurontario is an alternative)	<ul style="list-style-type: none"> • Rapid Transit south of Hwy. 407; - (either Hurontario or Hwy. 410) • Rapid Transit south of Hwy. 407; - (either Hurontario or Hwy. 410)
DIXIE ROAD	-	<ul style="list-style-type: none"> • Bus Priority Lanes: <ul style="list-style-type: none"> - south of Courtney Park 	<ul style="list-style-type: none"> • Bus Priority Lanes: <ul style="list-style-type: none"> - south of Steeles 	<ul style="list-style-type: none"> • No change 	<ul style="list-style-type: none"> • No change
RENFORTH \ HWY. 27 \ HWY. 427 \ AIRPORT ROAD \ HWY. 409 \ DIXON ALTERNATIVES (refer to Exhibits)	-	<ul style="list-style-type: none"> • Bus Priority Lanes: <ul style="list-style-type: none"> - connecting Georgetown GO to Eglinton 	<ul style="list-style-type: none"> • Rapid Transit connecting Georgetown GO to Eglinton • Bus Priority Lanes: <ul style="list-style-type: none"> - south of Hwy. 407 	<ul style="list-style-type: none"> • Rapid Transit from Hwy. 407 to Eglinton Corridor R.T. 	<ul style="list-style-type: none"> • No change

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Attachment 1

Transportation Advisory Group. The delegates to this group closely parallel the representatives on the Greater Toronto Coordinating Council (GTCC). The GTCC was formed to facilitate coordination among the municipalities comprising the Greater Toronto Area when it became apparent growth was blurring boundaries and jurisdictional policies were beginning to overlap. Consequently, the mission of the GTCC is to facilitate consensual solutions on infrastructure issues such as airport access.

Although no mention was made of any specific modeling techniques in the planning report (LBPIA Transportation Study, 1993), the report did indicate that a generous amount of data was synthesized in Phase I in order to determine projected transportation demands in the study area. Significant data from transit operators and from previous studies were available which were utilized for purposes of the project. Critical data included the existing volumes and capacities of transportation facilities; reasonable population/employment forecasts for the Year 2021; extrapolating trip distribution information to the year 2021; and estimating traffic destined to/from the airport.

Upon completing the long-term study, members of the Transportation Advisory Group were enthusiastic about launching the process for refining the staging plan and initiating the formal environmental impact studies. However, the momentum of the process was undermined by a political agenda which questioned the absence of an immediate link between downtown Toronto and the airport. Subsequently, the task fell to the GTCC to explore a "short-term" plan for implementing a link from downtown Toronto to the Airport.

Three alternatives were identified which could be implemented within five years. Two alternatives, a GO Rail spur and an LRT alternative were eliminated by the GTCC team because they would have seriously compromised any future plans for upgrading GO commuter service in the proposed corridor.²⁹⁴ The third option, a people-mover system linked to the GO-Train route, was considered feasible. But, when the costs were compared to the costs of an interim bus connection, it became clear the bus system proposed under the long-term plan was more cost-effective while providing greater flexibility.

²⁹⁴ Rapid Transit Access Alternatives to Pearson International Airport, Ontario Ministry of Transportation, March 1994.

Having completed this study, which further justified the original findings of the long-term report, the GTCC rejected all other short-term options and resumed discussions in 1994 towards establishing a process for refining the long-term staging plan. Under the proposed long-term plan, the first phase would implement a bus connection in the two to five year time frame.

Funding

Funding for transportation projects is standardized across Canada. Once a project is approved, the province provides 75% of the capital cost which is matched by 25% local funds. Members of the focus group agreed the funding control of the province enables the provincial ministries to exert greater influence over the planning process.²⁹⁵ As a result, when the province encouraged the municipalities in the Toronto area to formulate a joint planning mechanism, the GTCC emerged to address common issues.

As part of the approval process for securing provincial funding, the local municipalities must be able to demonstrate how the 25% matching share will be generated. For the most part, transportation projects have been supported through taxes or bond issues. However, there is a growing emphasis on securing private sector contributions either up front or retroactively in the form of development taxes.

Consequently, the funding for the preferred alternative will most likely be provided through the matching formula mechanism. However, given the long-term time frame, other opportunities may evolve.

²⁹⁵ Focus Group, Toronto, Canada: September 1994.

**Dulles International Airport
and Washington National Airport
Washington D.C. Region**

General Description of Metropolitan Area

The greater Washington area, which includes the District of Columbia and 19 jurisdictions in Maryland and Virginia, has a population of 4.68 million. The population of greater Washington is rapidly increasing. From 1985 to 1990, this region gained more than 80,000 new residents per year, making it the second fastest growing of the nation's ten largest metropolitan markets.²⁹⁶

Population is fairly dense within the Washington city limits (606,900 within an area of 63 square miles, equating to 9,633 per square mile). Commuter traffic congestion is heavy, since more than 2 million persons are employed in the city of Washington.²⁹⁷

The Washington/Baltimore region is served by three airports: Dulles International Airport, located approximately 26 miles west of the Central Business District (CBD) in Virginia; Washington National Airport, located in close proximity to downtown Washington; and Baltimore/Washington International Airport, located in Baltimore. (See Map 1) Two of these three airports (Dulles and National) are under the jurisdiction of the Metropolitan Washington Airport Authority.

Dulles International Airport

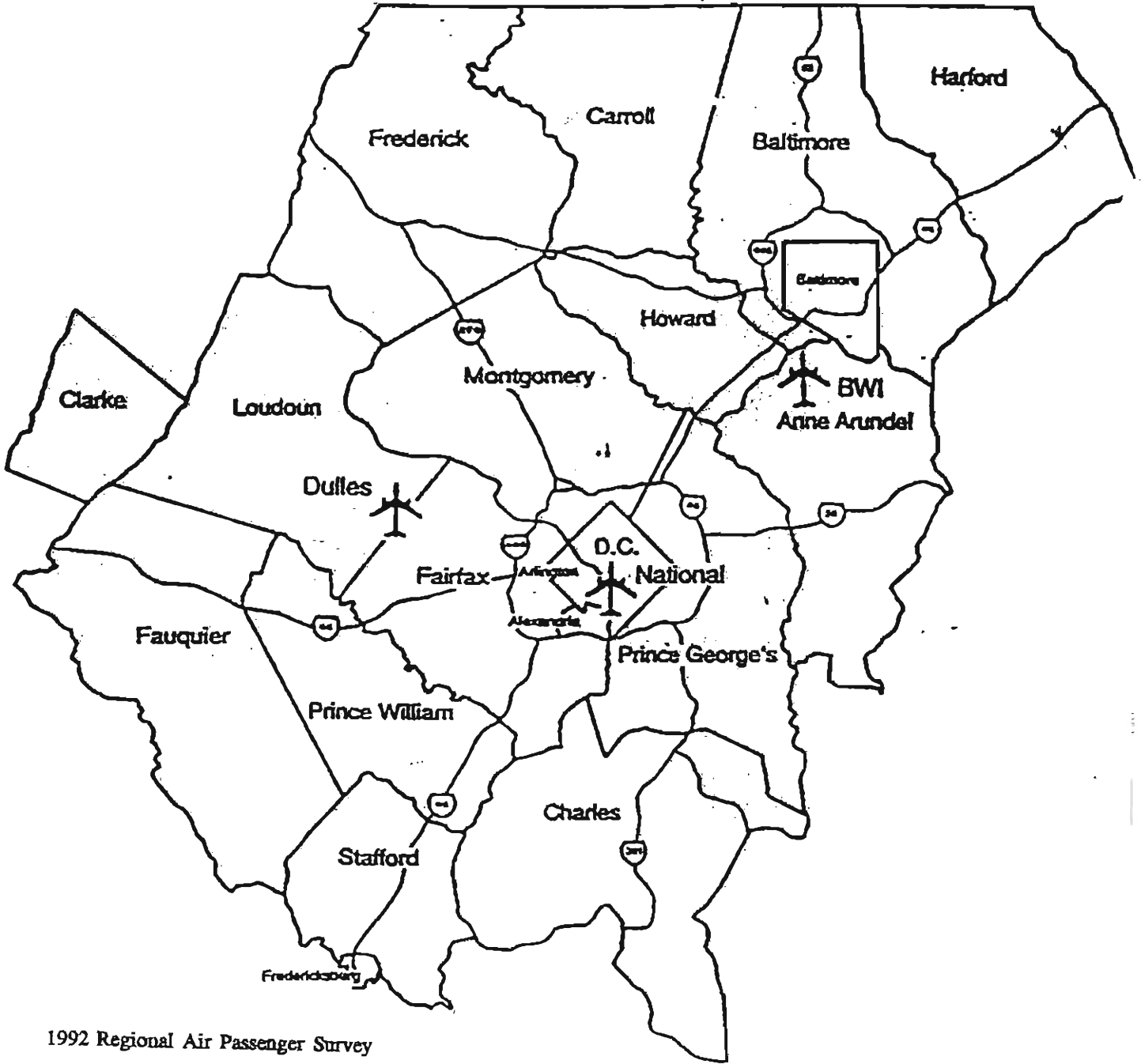
Dulles is the region's full-service domestic and international air travel hub. Air passenger traffic in the region has grown rapidly in recent years. Between 1982 and 1987, total enplanements at Dulles increased more than five-fold, from 1,010,000 to 5,404,000. By 1992, enplanements totaled more than 5.6 million.²⁹⁸

²⁹⁶ Greater Washington: A World Capital

²⁹⁷ World Almanac, 1993.

²⁹⁸ Metropolitan Washington Council of Governments: 1992 Washington-Baltimore Regional Air Passenger Survey (Volume I: Principal Findings), Table 1.

The Washington-Baltimore Region



1992 Regional Air Passenger Survey

Construction of Dulles International Airport began in 1958 and the airport opened in 1962. The site, which lies on the Fairfax/Loudoun county line in Virginia, was selected partly because of two key features: (1) its distance from other airports allowed for adequate air space, and (2) its size permitted the inclusion of an 8,000-foot "buffer zone" between airport operation areas and residential property. Construction cost approximately \$108 million, including \$19 million for Dulles' unique access highway.²⁹⁹

The Dulles access highway is one of the most interesting features of the Washington airport system. During the airport planning process, access to Dulles' remote location was a key issue. When proposals to re-route planned state and federal highways near the new airport proved unworkable, planners opted to include construction of a dedicated access highway as part of the airport development project. Right-of-way for the entire 17-mile highway was secured as part of the original airport development. The final stretch of the highway was completed by the Federal Aviation Administration (FAA) in 1983, creating a direct route which facilitated a half-hour trip to Dulles from Washington, D.C.³⁰⁰

Overview of Ground Access to Dulles

In view of challenges such as the heavily congested metro traffic and the remote location of Dulles, airport access is generally considered good. The Dulles access highway facilitates excellent rubber-tire access to the airport and private automobiles are the predominant mode of access to Dulles, followed by rental cars and taxis. However, a growing number of passengers are arriving by "Washington Flyer" airport buses.

²⁹⁹ Metropolitan Washington Airports Authority: Handbook of Information for Washington Dulles International Airport.

³⁰⁰ Metropolitan Washington Airports Authority: Handbook of Information for Washington Dulles International Airport.

Table 1: Modal Shares at Dulles³⁰¹

Private Car	58%
Rental Car	18%
Taxi	14%
Washington Flyer	5%
Hotel/Motel Courtesy Van	5%

Metrorail, the area's rail transit system, does not serve Dulles. Although passengers can combine rail with Washington Flyer service to travel to Dulles, this combination accounts for an extremely small percentage of ground arrivals at Dulles.³⁰²

Washington National Airport

The Washington metropolitan area is also served by Washington National Airport. National is the city's "short-haul" air travel facility. Business travelers (staying in the area two nights or less) comprise 62% of National's business, and surveys indicate locally originating passengers are just as likely to leave a local hotel to travel to National as to leave a residence. Of the three regional airports, National is generally preferred by travelers who are not local residents.

Between 1982 and 1987, total passengers at National grew slowly when compared to Dulles — increasing from 6.5 million to 7.5 million. For the next five years, traffic leveled off, showing a slight decrease (to 7.7 million) by 1992. In general, the Airport Authority would like to continue to maintain operations at National at the current level and direct growth towards Dulles. To this end, the Airport Authority has implemented an operations "cap" at National.

301 Information taken from Table 8, 1992 Washington-Baltimore Regional Air Passenger Survey, Volume I: Principal Findings, Metropolitan Washington Council of Governments.

302 Metropolitan Washington Airports Authority, 1993 Passenger Survey.

Overview of Ground Access to National

Highway access to National is provided by two major routes: the George Washington Memorial parkway and U.S. Route 1. In addition, the airport is connected to the Metrorail system (See Map 2) which covers a significant portion of the metropolitan Washington region. The current Metrorail station at National is an aerial platform located across from the old north terminal entrance. Airport renovations currently underway will bring the new north terminal closer to the station. In addition, access to the transit system will be simplified by moving walkways between the new terminal and the station.

Use of Metrorail by air passengers reached a modal share of 15% in 1987, making it the most successful airport-transit link in the United States. Reductions in modal share have largely been attributed to airport construction which has severely inconvenienced travelers attempting to use Metrorail. Airport and Metrorail officials expect usage of the system to rebound quickly, and then surpass previous levels, once the renovations are complete.³⁰³

A summary of modal shares to National is presented in Table 2.

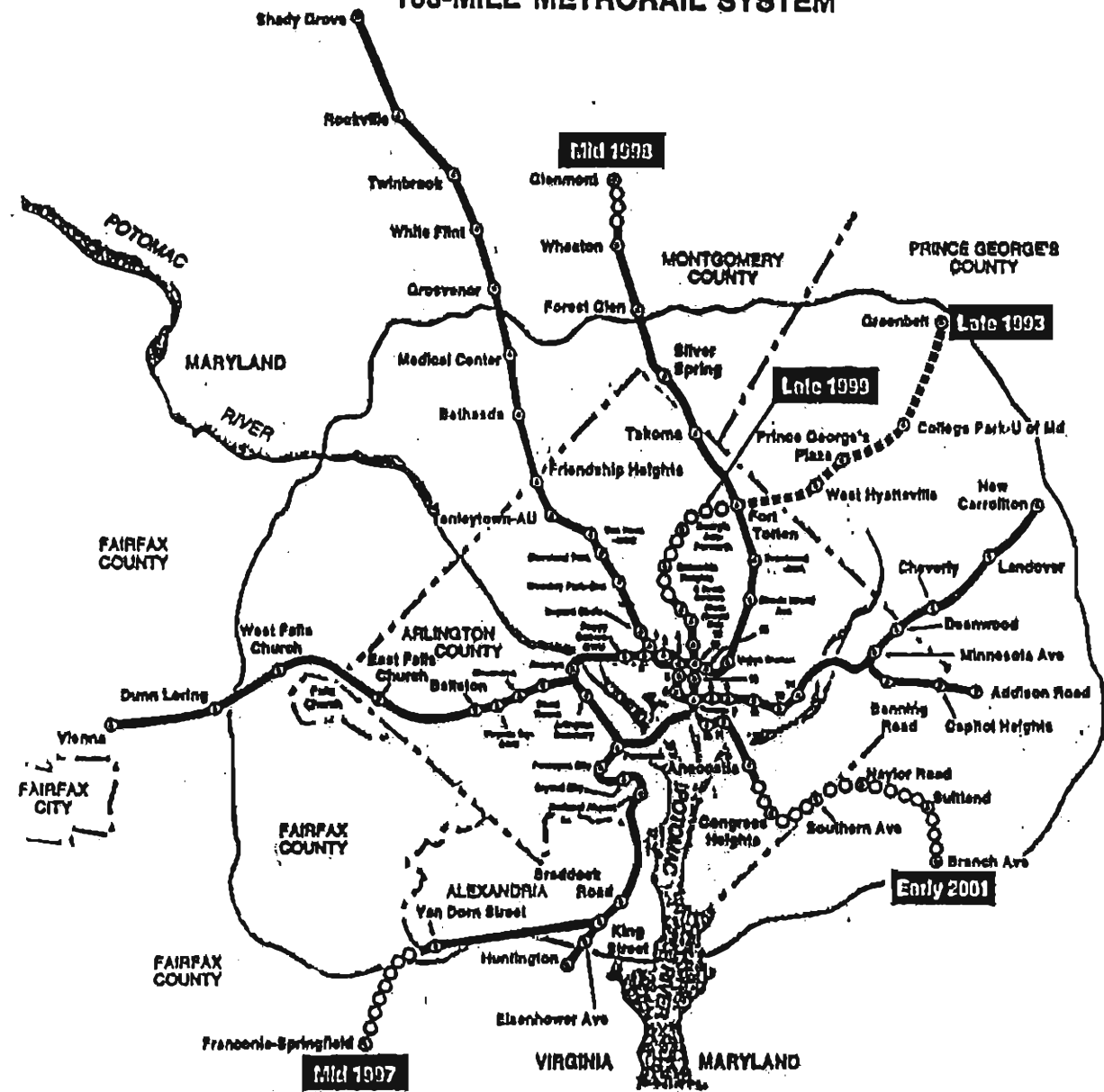
Table 2: Modal Shares at National³⁰⁴

Private Car	33 %
Rental Car	11 %
Taxi	36 %
Metrorail	9 %
Hotel/Motel Courtesy Van	6 %
Washington Flyer	3 %

³⁰³ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

304 Information taken from Table 8, 1992 Washington-Baltimore Regional Air Passenger Survey, Volume I: Principal Findings, Metropolitan Washington Council of Governments.

103-MILE METRORAIL SYSTEM



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Several aspects of the airport access situation in metro Washington deserve particular scrutiny:

- (1) Advantages and disadvantages of the Dulles access road in relation to the emergent growth and traffic along its corridor
- (2) Future ground transportation plans for different modes of transportation, including the Washington Flyer system, express bus service, and rail options.
- (3) Planning process and funding as affected by multiple government jurisdictions.

Dulles Access Road

The Dulles Access Road lies in a corridor which stretches from metropolitan Washington to the airport property. (See Map 3) The access road shares the corridor with a commuter toll road; and, right-of-way exists for a future rail project in the corridor.

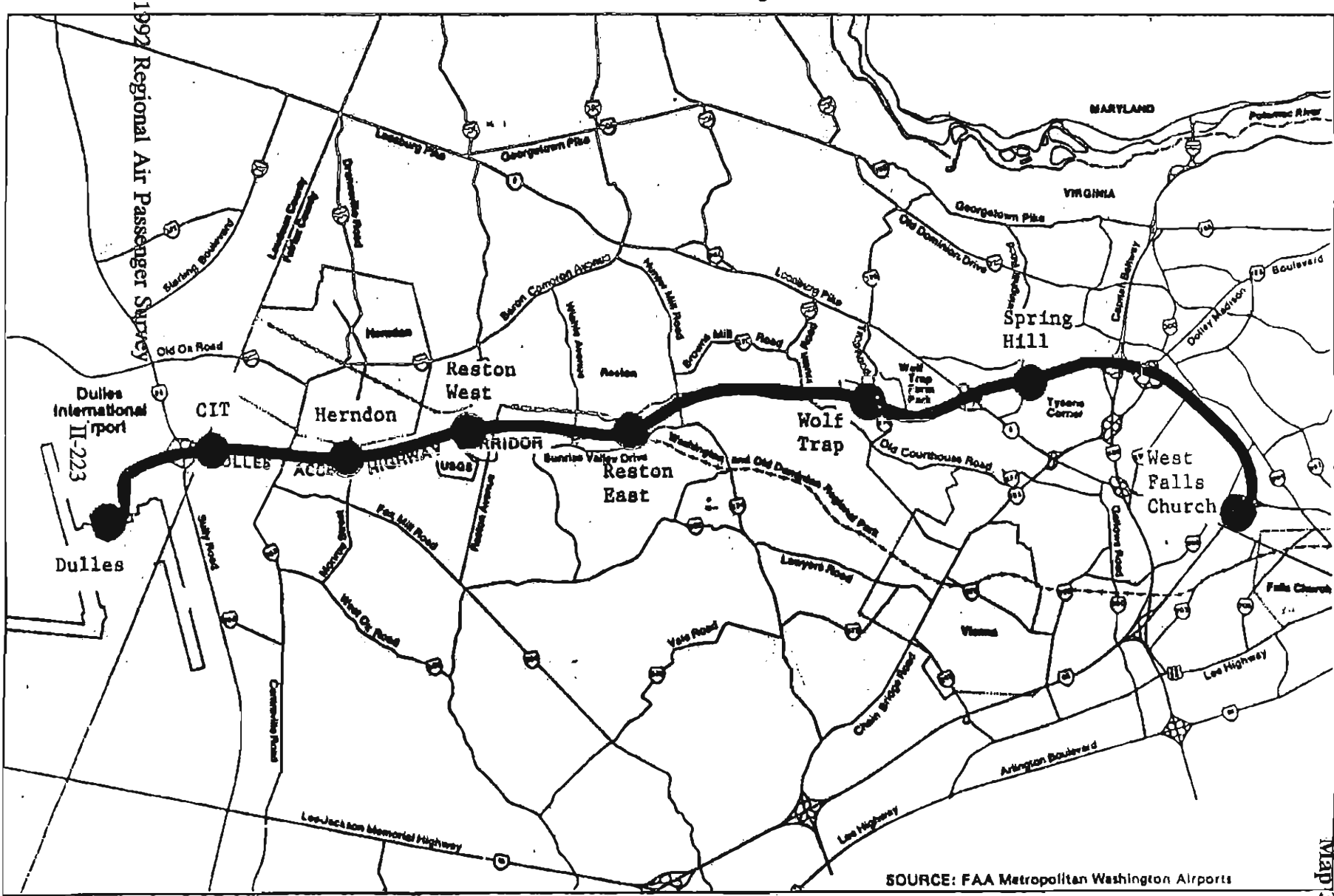
When Dulles was built in the late 1950s and early 1960s, its remote site was surrounded by rolling farmland - and not much else. Airport patronage was relatively low until the final "leg" of highway access to downtown Washington (Highway 66) was finished in the early 1980s. Shortly thereafter, Dulles airport traffic climbed rapidly from an average of one million passengers per year to a figure five times as high.³⁰⁵ A significant portion of this increase came from connecting flights, but the majority of the increase was undoubtedly due to growth facilitated by improved access to Dulles.³⁰⁶ At present, the access highway provides excellent access to Dulles International Airport, and is used by a variety of modes, including private auto, taxi, and Washington Flyer vehicles.

Air traffic patronage was not all that grew around Dulles in the 1980s. Significant commercial and residential development skyrocketed — outstripping the regional infrastructure virtually overnight. Property values soared; congestion became a major problem. Travel times of more than half-an-hour for trips of five to seven miles were normal as masses of commuters

³⁰⁵ Interview with Bill Lebergern, Metro Washington Airport Authority, June 16, 1994.

³⁰⁶ Metropolitan Washington Council of Governments: 1992 Washington-Baltimore Regional Air Passenger Survey (Volume I: Principal Findings).

Dulles Corridor Alignment



SOURCE: FAA Metropolitan Washington Airports

MAP 3

struggled along on roads built for rural traffic and transportation planners scrambled to catch up with the region's rapid growth.³⁰⁷

With the completion of Highway 66, the Dulles access corridor began to take on added importance — particularly as congestion swelled on the toll road adjacent to the airport access road. Planners estimate that traffic in the corridor has now climbed to 15,000 trips per day, but only 4,000-5,000 of those trips are airport related.³⁰⁸

The toll road, built inside the airport access corridor with bond and private funding, was meant to serve commuter traffic in the region; the access highway itself was intended for the exclusive use of airport travelers. As commuter traffic increased, commuters became politically active in expressing dissatisfaction with the toll road's high congestion, especially when the access road remained relatively uncongested. This political activity has led to fears among transportation experts that the access highway might become "cannibalized" in an effort to serve commuters — a use clearly alien to the original intent of the Dulles access highway.³⁰⁹

Thus far, the toll road continues to serve commuter traffic and the access highway continues to be reserved for airport access. The toll road contributes significantly to transportation revenues in the corridor — 15% of toll revenues are currently designated for transit use. This percentage will increase as bonds for the toll road's construction are paid down. Toll funds directed to transit are expected to increase to 35% in two years and will eventually climb as high as 85%³¹⁰ Due to increased congestion, future plans call for an expansion of the commuter toll road to include the addition of new traffic lanes.

Dulles Corridor Transportation Improvements

Once the toll expansion is built, further capacity increases will depend upon increasing the usage of the access road or implementing transit. Foreseeing this eventuality, planners have

³⁰⁷ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

³⁰⁸ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

³⁰⁹ Interview with Bill Lebergern, Metro Washington Airport Authority, June 16, 1994.

³¹⁰ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

conducted several studies of the region's future transportation needs. These studies have incorporated standard quantitative models, and have included major investment analyses of various proposed projects. One of the most important of these studies was completed in 1990 by KPMG Peat Marwick, "Dulles Airport Access Road Corridor Transit Alternatives Study." The report scrutinized ten different alternatives for developing commuter capacity in the corridor, analyzing each using a variety of methods. Alternatives examined included light rail transit, automated guideway transit, rail hybrid, and enhanced bus service. The report looked at alternatives in terms of travel demand, land use, capacity, cost, and implementation.

The report concluded that the incremental ridership to be gained by using any of the rail alternatives was "very marginal," and ineffective from a cost standpoint. As a result, the report recommended maximizing the corridor's main asset - the access highway - through use of an express bus service. Included in the recommendations were park-and-ride lots and major transit centers in the corridor which could be converted to rail-station use in the future, if rail alternatives became more attractive.³¹¹ (See Map 4)

Planners have interpreted the report's recommendation as a method to "build ridership" in the corridor as a precursor to future rail ridership. Ideally, a superior express bus service would build a core of ridership made up of those shifting from private auto to transit commuting. This core could then be easily shifted from bus to rail, providing built-in patronage and cost justification for the proposed rail line.³¹²

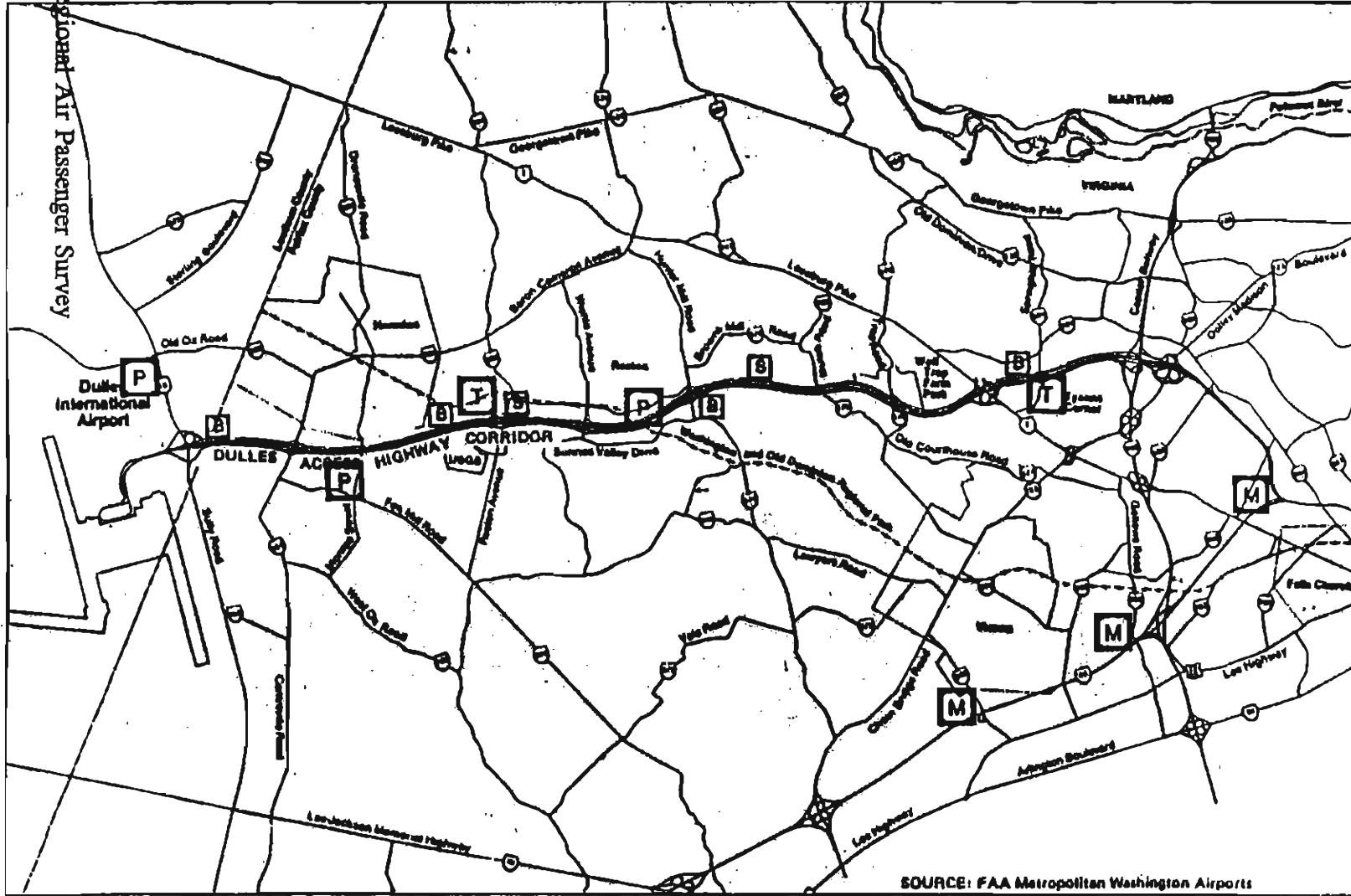
The bus-to-rail conversion plan enjoys general approval among transportation experts, but little support among members of the general public. Historically, metro Washington has had difficulties in operating buses across jurisdictional lines, resulting in the region's bus service being somewhat poor. Thus, the public appears reluctant to embrace a bus alternative. Furthermore, commuters may be unwilling to give up their private autos. Experts estimate that nearly three-fourths of Metro Washington women participate in the labor market, raising speculations that after-work connections with child care and other concerns make for a difficult

³¹¹ KPMG Peat Marwick: Dulles Airport Access Road Corridor Transit Alternatives Study (Technical Report), 1990.

³¹² Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

Corridor Facilities

1992 Regional Air Passenger Survey



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P Park and Ride Lots

S Slip Ramps

M Metro Stations

T Transit Centers

B Toll Bypass Lanes

Map 4

shift to mass transit.³¹³ This lack of public demand for bus service may make the bus alternative politically unfeasible.

With a rail extension being unworkable from a cost planning standpoint, and with heavy market resistance to enhanced bus service, it is unclear how planners will be able to solve the puzzle of serving the future needs of this booming corridor. What seems clear at this point is that a rail extension through the corridor is unlikely to be built in the foreseeable future.³¹⁴

Airport Ground Access Improvements

Given the increasing number of air travelers using Dulles, and the possibility of the airport access road being shared with some type of commuter transit system, Dulles faces a less favorable ground access situation. However, the Airport Authority's Washington Flyer ground transportation system may be able to circumvent congestion problems for a while.

The Washington Flyer is the airport authority's name for its full ground transportation system which includes buses, mini-buses, vans, and taxis. The Flyer is unique as a transportation system in that it is wholly-owned by the airport authority, which contracts its equipment (in some cases) to private operators. The system is tightly monitored and controlled, providing a consistent and reliable level of service to the airports.³¹⁵

The Washington Flyer ran into trouble in the 1980s when contractors frantically cut costs by decimating the system's equipment and reducing service levels. Consequently, in 1989, the airport authority took operational control of the system back and charged new management with the task of reducing the system's \$2.4 million annual subsidy. Last year, the subsidy had been pared to \$686,000, and the system is moving steadily toward self-sufficient operations.

Central to this accomplishment is management's efforts to market the Washington Flyer service. For example, management capitalized on the publicity generated when the Flyer

³¹³ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

³¹⁴ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

³¹⁵ Metro Washington Airport Authority: Washington Dulles International Airport: 1962-1992.

system began the use of natural gas fuel for its vehicles to position the Flyer as an environmentally-friendly alternative.³¹⁶ Other efforts will position the Flyer as customer-service oriented. One of the key plans for increasing customer satisfaction and ridership is the advent of a "door-to-door" air traveler service scheduled to begin operation in 1995. Patrons will be able to call Washington Flyer, give their flight's departure time, and receive an appointment for pick-up at their residence or place of business. No Flyer vehicle will make more than three stops en-route to Dulles International Airport, making the door-to-door service ultimately convenient to the local passenger. The Dulles access highway provides the Washington Flyer with a key asset in embarking on such an ambitious service.³¹⁷

Planners expect the door-to-door service to have a major effect on ridership. Currently, the Washington Flyer system serves some 1,200-1,500 passengers per day; experts estimate that figure to at least double with the emergence of door-to-door service. Consequently, preparations are being made to install the necessary infrastructure to handle the increased ridership, including natural-gas refueling stations and computerized transportation management systems.³¹⁸

While the Washington Flyer also serves Washington National Airport, airport officials look to the Metrorail system to ensure reliable ground access to National as highway congestion in the region continues to increase.

Decision Process

Government cooperation is an important aspect of transportation planning in any city. In metro Washington it is particularly challenging. Transportation issues are affected by many separate and autonomous jurisdictions in the metropolitan area including two states - Maryland and Virginia, as well as the District of Columbia and multiple county and municipal governments. This creates many layers of "sign-off" authority which affects the public policy process on transportation issues.

³¹⁶ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

³¹⁷ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

³¹⁸ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

In addition, part of the unique government structure in Washington is the lack of a regional source for transportation revenue. Instead of subsidizing metropolitan transportation through a metro tax, programs are "piece-mealed" by dividing costs and revenues among the several jurisdictions involved. With a fragmented program such as Washington's, planners are left to the mercy of the changing imperatives of each jurisdiction, any one of which may attach a low priority to public transit funding.³¹⁹ As a result, transportation agencies have resorted to funding projects through bonds, private money, operating revenues, and gas taxes.

Models/Decision-making Tools

In estimating various transportation policy alternatives, Washington-area planners use traditional, popular transportation models.³²⁰ The planning procedure involves demand forecasting, major investment analysis, costing, and designation of selection criteria.³²¹ One qualitative tool is the Metro Washington Airport Authority's Passenger Survey, which monitors traveler satisfaction with various ground-access modes.

³¹⁹ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

³²⁰ Metropolitan Washington Council of Governments: Washington-Baltimore Regional Airport System Plan (1993), p. 29.

³²¹ Focus Group, Washington Airports, Washington, D.C., June 16, 1994.

CHAPTER THREE: CROSS-AIRPORT ANALYSIS

INTRODUCTION

The authors have endeavored to develop a series of lessons and conclusions by comparing and contrasting the various airport locations which have been analyzed during the course of this study. This chapter presents the conclusions of this analysis in a wide variety of areas including who is the ground access customer, summaries of modal share, how is information obtained about ground access customers, the nature and types of funding mechanisms, strategies for interagency cooperation, tools and techniques to enhance the ground access decision processes. This information is the basis for recommendations presented in Chapter IV.

WHO IS THE GROUND ACCESS CUSTOMER?

One of the most difficult issues in understanding the ground access problem is to understand the characteristics of individuals who use ground access systems. There are three major market segments for ground access: Air travelers, airport employees, and "meeters and greeters."

A majority of air travelers are on business, with higher personal income levels than the population as a whole, and often with access to expense accounts. These traveler characteristics provide the business person with substantial flexibility in picking ground access alternatives. While leisure travelers account for a significant minority of air travelers, their income levels also tend to be higher than those of the general population. Hence, many segments of air travelers are not as price-sensitive in the selection of ground access alternatives as the general population.

Both business and leisure travelers spend a relatively short duration at destinations, often seeking to utilize their time to best advantage, and desiring to return home quickly after travel

activities. Hence, reduction of ground transit time is likely to appeal to business and leisure segments of the market as it is probably extremely crucial to them.

Employee Market. There are, of course, other markets which are important in the overall ground access picture. One market is represented by the employee who serves in direct support of the air traveler, or in related industries. Employees who work for the airline industry and are directly involved in supporting the transportation of air passengers are examples of this market. This market can be further divided between flight personnel, who are basically transients at the airport location, and individuals who reside in the metro area.

There are additional employee markets which consist of individuals who indirectly support the transportation of freight and passengers. These individuals may work in concession and food service businesses, for example.

The third category of employees is represented by individuals who work in the economic zone surrounding the airport. For example, there are often industries located on airport grounds which may or may not be directly related to air transportation but which require employees to support their overall operation.

Meeters and Greeters. There is another major market segment of the ground access market which is of considerable importance. This segment is known as "meeters and greeters," and includes those individuals who either greet the traveler upon his/her arrival or journey with the traveler to the airport at the time of departure.

One segment of the "meeters and greeters" market is represented by those who consider the airport as a destination, either for economic activity or for leisure. Examples of these types of markets are individuals who schedule meetings at the airport with people who are journeying to town. The purpose of these meetings is to conduct business. In some cases, these meetings are scheduled because of the convenience of the airport location and have little to do with air transportation.

Other Emerging Market Segments. In addition, there is another emerging market segment comprised of people who view the airport as a destination. Airports are starting to take on the

look of modern-day shopping malls. Concessionaires have widely expanded their offerings within these airport locations. Airports have become a magnet for shopping and/or leisure activities which have little to do directly with air transportation.

HOW DO TRANSPORTATION AGENCIES OBTAIN INFORMATION ABOUT THEIR GROUND ACCESS CUSTOMERS?

Airport authorities have placed considerable emphasis on developing comprehensive knowledge of the origin and destination for air travelers who are entering their facilities, as well as knowledge on their modal preference.

Market Information from Origin/Destination Studies. Origin and destination studies performed by airports across the country explore the issue of air traveler and employee transportation. These studies focus on origin/destination and modal split issues. Unfortunately, the studies often fail to address the issues of motivation, evaluation of ground access alternatives and significant demographic and psychographic variables.

Bona Fide Market Studies. There are some notable exceptions to the general lack of studies dealing with the motivations for travel preferences. For example, New York and San Francisco have undertaken systematic efforts toward understanding the relationship between market segmentation and the preferences for modal choice among travelers, and planners in Boston have developed surveys which help them assess the feasibility of new access plans in terms of market support.

New York was particularly interested in the factors which would contribute to the success of the proposed automated guideway transit (AGT) link to the city's airports. For that reason, the city's Department of Transportation conducted a full investigation of the Manhattan Air Passenger Market, in which air travelers were analyzed in terms of dozens of different (and overlapping) market segments. From this segmentation, they were able to reach conclusions regarding who would use the AGT link, and why. For example, visitors were thought to provide a major portion of potential ridership for a variety of reasons, including lack of familiarity with other modes, unwillingness to experiment with local modes, and susceptibility to AGT advertising and signage in the airport terminal. Convenience issues, which comprised

a significant part of the study's findings, provided support for the AGT system in light of perceived difficulties with other more multi-modal solutions.

This concept was supported by findings in San Francisco. There, the California Department of Transportation's ground access study also took a hard look at transit riders through the lens of market segmentation. That study also found that the segments most likely to use alternative modes of ground access favored door-to-door services over inter-modal travel, primarily because of the problems associated with baggage handling and modal transfers.

Boston's Logan International Airport used qualitative techniques to determine the rationale passengers used for choosing various ground access services. Planners in Boston developed a specific survey for assessing ground access decisions on the part of air passenger market segments. Data from this survey showed four primary markets: resident business travelers, non-resident business travelers, resident non-business travelers, and non-resident non-business travelers. In studying these segments, Boston planners found that the best market for shared transit was comprised of residents, traveling for both business and non-business purposes. They further honed their research using qualitative focus groups, and were able to pinpoint prime routes for new service. Coincidentally, Boston also devoted substantial resources to quantitative techniques in the development of this express bus service (the Logan Express), which was tailored to the needs of air travelers in an effort to move them out of cars and into shared transit.

In a similar vein, Metropolitan Planning Organizations (MPOs) within urban areas conduct detailed analyses of travel behavior for commutation patterns as well as leisure activities. However, these organizations have traditionally devoted little attention to the development of surveys which deal with ground access. Hence, their databases are of limited usefulness in understanding travel preferences for ground access. However, as indicated in Chapter One, MPOs have come under increasing pressure to address the ground access problem as part of their long-range planning activities. MPOs are just starting to deal with these issues and have little expertise in understanding airport-related markets.

The studies produced by agencies at various airport sites suggest that the ground access market is indeed very different from the general journey-to-work or recreational transportation

markets. While information exists in most major airport authorities regarding origin/destination and modal choice, little real information is available regarding the rationale for modal choice behavior or desired service attributes. Hence there is a major difficulty in understanding ground access problems within the United States as well as what types of existing and innovative services could be most useful in solving the problem.

HOW DO PEOPLE GET TO THE AIRPORT?

Modal Shares. As indicated in the modal split chart (See Attachments 1-3), private automobiles are by far the dominant mode at each airport location, regardless of the availability of multi-occupancy vehicles such as vans and shuttles or transit such as rail or bus. The use of the private automobile was lowest at LaGuardia (31.5%) and National (33.0%) and highest at Sea-Tac (78.8%) and Toronto's Lester B. Pearson (75.0%). The latter is quite interesting since Toronto is one of the more transit oriented cities in North America.

Rental cars are very similar to private cars: both are rubber-tire modes that generally hold a single occupant. The share of air travelers who use rental cars, or rental car shuttles, range from a low of 2.1% at St. Louis (shuttles), 3.8% (cars) at Kennedy, 12.9% at Cleveland (shuttles) to a high of 24.8% (cars) in Miami.

Taxicabs and private limousines are the next step in the continuum of rubber-tired modes. Taxi market shares range from a low of 2.6% at Sea-Tac to a high of 36.0% at National. Private limousines are a factor at the New York City airports where they comprise about 19% single-occupancy rubber-tire modes. Similarly, high private auto usage is correlated to low taxicab usage (Sea-Tac and Portland are examples).

Multi-occupancy vehicles on average account for 11.9% of the ground access markets at all airport locations. While these vehicles are still rubber-tire, they decrease congestion and air pollution when they are used substantially. The highest usage of multi-occupancy vehicles is at Cleveland Hopkins. Of the airports studied, Chicago has the highest usage of hotel courtesy vans at 7.8%, Kennedy the highest usage of airport shuttles at 8.4%, Portland the highest usage of shared limousines (10%) and Cleveland has the highest use of other shuttle services at 15.5%.

GROUND ACCESS ASSESSMENT OF NORTH AMERICAN AIRPORT LOCATIONS

Modal Choice	Atlanta	Boston			Chicago			Cleveland	Wash DC / Baltimore	
	Hartsfield	Logan	O'Hare	O'Hare	O'Hare	Hopkins	Hopkins	Hopkins	Entire Region	BWI
			Departing	Arriving		Departing	Arriving			
Automobiles/Private	59.9%	40.1%	50.8%	50.6%	50.7%	69.7%	47.2%	58.5%	46.0%	64.0%
Rental Cars	14.7%	14.0%							14.0%	17.0%
Trucks						0.7%	0.5%	0.6%		
Security or Police						0.4%	0.2%	0.3%		
Taxi	7.4%	18.2%			.	5.4%	7.4%	6.4%	24.0%	7.0%
Limo (Private)		8.4%								
Taxi or Limo			25.1%	22.9%	24.0%					
Subtotal Single Occupancy Vehicles	82.0%	80.7%			74.7%	76.2%	55.3%	65.8%	84.0%	88.0%
Hotel Bus/Van	3.7%	1.9%	6.4%	9.1%	7.8%	3.9%	7.5%	5.7%	5.0%	4.0%
Rental Car Shuttle						6.5%	19.3%	12.9%		
Airport Bus/Limo	2.2%	4.2%							5.0%	7.0%
Tour Bus/Cruise Line										
Limo (Shared)	3.6%	4.4%								
Other Shuttle	3.3%					13.4%	17.6%	15.5%		
Subtotal Multiple Occupancy Vehicles	12.8%	10.5%			7.8%	23.8%	44.4%	34.1%	10.0%	11.0%
Bus	2.4%									
Rail/Train									5.0%	
Bus &/or Train			5.8%	4.9%	5.3%					1.0%
Subway		5.8%								
Ferry		1.1%								
Subtotal Multiple Occupancy Public Transit	2.4%	6.9%			5.3%	0.0%	0.0%	0.0%	5.0%	1.0%
Other	2.8%	2.0%	11.8%	12.1%	12.0%				1.0%	1.0%
Don't Know/No Answer			0.4%	0.6%	0.5%					
Sum of Percentages	100.0%	100.1%	12.2%	12.7%	100.2%	100.0%	99.7%	99.9%	100.0%	101.0%

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Attachment I

GROUND ACCESS ASSESSMENT OF NORTH AMERICAN AIRPORT LOCATIONS

Modal Choice	Wash DC / Baltimore					Miami		Miami	Portland	Toronto
	Dulles	National	Newark	La Guardia	JFK	MIA		MIA	PDX	LBPierson
						Weekday Departing	Weekend Departing			
Automobiles/Private	58.0%	33.0%	51.8%	31.5%	43.2%	42.8%	32.1%	37.5%	63.0%	75.0%
Rental Cars	18.0%	11.0%	11.5%	5.0%	3.8%	25.5%	24.0%	24.8%	23.0%	
Trucks										
Security or Police										
Taxi	14.0%	36.0%		32.8%	17.4%	12.2%	14.3%	13.3%	3.0%	
Limo (Private)			19.1%	19.3%	19.9%	1.9%	0.7%	1.3%		
Taxi or Limo										20.0%
Subtotal Single Occupancy Vehicles	90.0%	80.0%	82.4%	88.6%	84.3%	82.4%	71.1%	76.8%	89.0%	95.0%
Hotel Bus/Van	5.0%	6.0%	2.5%	1.1%	3.1%	3.7%	4.0%	3.9%		
Rental Car Shuttle						See Rental Car Above				
Airport Bus/Limo	5.0%	3.0%	4.8%	7.1%	8.4%	1.7%	2.1%	1.9%		
Tour Bus/Cruise Line						7.6%	19.8%	13.7%		
Limo (Shared)			1.7%	2.0%	2.8%				10.0%	
Other Shuttle						3.4%	2.7%	3.1%		2.5%
Subtotal Multiple Occupancy Vehicles	10.0%	9.0%	9.0%	10.2%	14.3%	16.4%	28.6%	22.5%	10.0%	2.5%
Bus										
Rail/Train		9.0%								
Bus &/or Train			1.1%	1.1%	1.1%	1.2%	0.4%	0.8%	1.0%	
Subway										
Ferry				0.1%						
Subtotal Multiple Occupancy Public Transit	0.0%	9.0%	1.1%	1.2%	1.1%	1.2%	0.4%	0.8%	1.0%	0.0%
Other	0.0%	1.0%			0.3%					2.5%
Don't Know/No Answer										
Sum of Percentages	100.0%	99.0%	92.5%	100.0%	100.0%	100.0%	100.1%	100.1%	100.0%	100.0%

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Attachment 2

GROUND ACCESS ASSESSMENT OF NORTH AMERICAN AIRPORT LOCATIONS

Modal Choice	Seattle	Philadelphia	St. Louis	San Francisco	Oakland			
	Sea-Tac	PHL	Lambert	SFO	OAK			
						Average	Minimum	Maximum
Automobiles/Private	78.8%	49.0%	63.4%	46.0%	70.3%	54.1%	31.5%	78.8%
Rental Cars	5.2%	18.0%		13.0%	15.0%	13.8%	3.8%	24.8%
Trucks						0.6%	0.6%	0.6%
Security or Police						0.3%	0.3%	0.3%
Taxi	2.6%	5.0%	12.0%	11.0%		14.2%	2.6%	36.0%
Limo (Private)		10.0%	0.1%	2%		10.2%	0.1%	19.9%
Taxi or Limo					5.6%	16.5%	5.6%	24.0%
Subtotal Single Occupancy Vehicles	86.6%	82.0%	75.5%	72.0%	90.9%	82.7%	65.8%	95.0%
Hotel Bus/Van	3.7%	3.0%	6.1%	6.0%	2.5%	4.4%	1.1%	7.8%
Rental Car Shuttle			2.1%			7.5%	2.1%	12.9%
Airport Bus/Limo	6.6%	4.0%	0.9%			4.9%	0.9%	8.4%
Tour Bus/Cruise Line		3.0%		4.0%		6.9%	3.0%	13.7%
Limo (Shared)			0.8%	3.0%		3.4%	0.8%	10.0%
Other Shuttle	1.7%		12.5%	12.0%	1.9%	7.0%	1.7%	15.5%
Subtotal Multiple Occupancy Vehicles	12.0%	10.0%	22.4%	25.0%	4.4%	13.2%	2.5%	34.1%
Bus		1.0%				1.0%	1.0%	1.0%
Rail/Train		2.0%				5.3%	2.0%	9.0%
Bus &/or Train	1.4%			3.0%	4.2%	2.0%	0.8%	5.3%
Subway						#DIV/0!	0.0%	0.0%
Ferry						0.1%	0.1%	0.1%
Subtotal Multiple Occupancy Public Transit	1.4%	3.0%	0.0%	3.0%	4.2%	2.2%	0.0%	9.0%
Other		5.0%	2.1%		0.5%	2.5%	0.0%	12.0%
Don't Know/No Answer						0.5%	0.5%	0.5%
Sum of Percentages	100.0%	100.0%	100.0%	100.0%	100.0%	101.1%	92.5%	101.0%

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Attachment 3

Public transit usage — whether bus or rail — is quite low at all sites across the country. On average, only 2.3% of air travelers use transit. The highest market share of transit is at National where rail accounts for 9% of the market share while Boston's subway captures 5.8% of the market of the ground access market share. It is interesting to note that low private usage is often offset by the use of taxis and private limousines (especially at LaGuardia) which are still rubber-tire.

The data used for the above comparisons are not the only sources of information available. Other, more limited O/D studies have been done showing varying market shares. For example, in Boston the airport authorities have seen great success with the Logan Express and report that about 2% of air travelers use the services. Yet the broader O/D study reports no bus market share. Therefore, there are some questions about what modes are counted in O/D studies. In Cleveland, the broad-based origin and destination study showed no transit usage. Yet the Regional Transit Authority (RTA) estimates that 6% of all air travelers use the bus service to the airports. The limited study seems to inflate the transit usage.

Overall, it appears that if private automobile usage is low, it is due to excellent transit (National) and/or a high usage of taxi and limo services (LaGuardia). Multi-occupancy vehicles are much more of a factor in ground access than public transit, with some markets showing upwards of a third of all passengers arriving by multi-occupancy vehicles.

Ultimately the private automobile is the predominate mode of transportation to airports, and will continue to hold the majority market share for air travelers. Transportation officials generally agree there is probably a limit to the modal share which transit can capture due to widely dispersed origins and destinations, the variety of individual trip purposes, and the U.S. "love affair" with the private automobile. For example, Atlanta's highway system is relatively "unclogged" and parking rates at the airport are reasonable — thus air travelers have little motivation to abandon the convenience, comfort, and privacy of their automobiles.

WHAT FACTORS INFLUENCE GROUND ACCESS CHOICES?

A careful examination of some of the above sites would suggest that providers of ground access are faced with a number of controllable and uncontrollable factors which significantly affect their ability to attract significant patronage. From the perspective of controllability the level of service is vitally important in luring as many segments to the multi-occupancy rail link. In particular, segments are going to value in varying degrees factors such as reliability. Can they really depend on this mode choice for getting them to the particular place they are going to in a reasonable fashion or are head ways just too long or irregular to ensure high levels of reliability?

Market segments are going to also consider issues like conflicts with commuters. Are vehicles designed for commuters or are they designed for air travelers? Safety is another issue which will prove of significant concern. Is the system safe during all hours of operation? Dependability is obviously another issue of great concern. If travelers arrive at a certain hour can they expect the ground access system to actually be operating or is it likely that they will arrive at an hour where they will find that they cannot depend upon that system because it is just not available or it is closed.

Perhaps the most limiting factor in terms of providing attractive service levels for ground access is to understand that the traditional transit philosophy is unlikely to lure large segments of the air traveler market. Air travelers, depending upon the particular segment of leisure or business traveler, are looking for fairly high levels of service. Since the cost of ground access is such a small percentage of the trip cost, and time and convenience are valued so highly, they are unlikely to tolerate the same service levels that transit traditionally accords to commuters. Even the adoption of a customer oriented attitude may not produce enough attractive elements of service to warrant consideration by air travelers.

It is important to recognize that among controllable variables that there is a tremendous interaction among at least three factors which dictate the acceptability of ground access. These three factors are service, parking fees, and competition from other modes. While we have addressed service above, the issue of parking fees is a most important issue because it embodies trade-offs between needs of airport authorities and the goals of transit agencies.

Airport operators try to strike some medium or trade-off between generating the revenue they need to support the airport through parking fees versus the sensitivities of air travelers. If the fees are too high, air travelers may very well seek alternatives to using the parking facilities such as limousines, taxis or rides to the airport from friends and relatives. Hence, the airport authority may lose revenues. However, it is just the stiffness of such parking fees for air travelers which drives many price sensitive air travelers on to publicly or privately provided ground access alternatives which are multi-occupancy in nature. While airport operators clearly are concerned about the use of multi-occupancy vehicles and publicly provided transit services, it is likely that revenue generation is the key factor which determines the level of parking fees which face air travelers in using their facilities.

Competition is also an important controllable factor which faces publicly provided rubber tire operators and also rail transit links. Obviously competition is subsidized by the provision of right of way, although this is often mitigated by tolling. However, public transit ridership is going to be a function of the competition. How effectively do automobiles, taxis and limousines provide cheap and reasonable convenience to air travelers?

COMMON ALTERNATIVE SOLUTIONS

Common alternatives for dealing with ground access issues are connecting public bus and rail, developing bus or mini-van service, and developing rail access.

Connecting Public Bus and Rail

At several of the airport sites, public bus service to the airport's terminal has been greatly reduced or practically eliminated with the advent of a rail system. While this practice may be logical in terms of avoiding duplication of services, it may not be practical in terms of serving customer needs. For example, in Chicago, the suburban bus operator, PACE, provides only two routes to O'Hare; however, officials note that many PACE routes connect to the CTA rail system, which (in turn) connects to O'Hare. Similarly, in Atlanta and St. Louis, the bus system has been re-configured to serve as a "feeder" network into the rail system. In essence, an air traveler could use public transportation for the entire trip to the airport. Realistically, whether air travelers would actually make the one or more transfers necessary is highly questionable.

Park-and-Rides. One alternative which seems to hold some potential in terms of stimulating market share growth through inter-connections is the use of park-and-ride lots to connect to the rail system. For example, officials in Atlanta and St. Louis admit it would be very unlikely for the traveling public outside the rail service area to transfer from private auto to bus to rail in order to access the airport. However, planners in both regions have observed an apparent willingness on the part of air travelers to use park-and-ride lots to connect to the rail system. Consequently, both regions are considering expansion of this type of inter-modal connection. It is unclear, however, that a rail park-and-ride would be any more effective than a park-and-ride used for express bus service to the airport. Portland experimented with this concept during the 1994 holiday season, and officials report that the experiment was successful.

Inter-modal Connections. There is little evidence to suggest that bus to rail to airport connections are successful in enhancing the market share of public transit in the journey to the airport. It is likely the complexity and uncertainty of navigating multiple connections in conjunction with the inconvenience of handling luggage deters the majority of air travelers from using bus to rail connections, except in a case of extreme necessity where no other options are available.

Perhaps one of the fundamental problems in examining ground access from a marketing perspective is that the various agencies involved in ground access do not carefully consider the service from a user perspective. Airport authorities, MPO's, and other agencies involved in providing services tend to be preoccupied in providing a particular type of service rather than a service which closely reflects the needs of the air traveler. Air travelers seemingly could care less about the type of transportation they use, but clearly do care about the service attributes provided. Air travelers are seemingly concerned about transit time, convenience of the service, and (as a less important factor) its cost. Hence, there appears to be a need to study ground access services from the perspective of how they are presented to and function for particular segments of air travelers, rather from the technical production-oriented approach to service provision. Obviously, airport ground access is a fertile ground for the provision of innovative services which come closer to meeting the service attributes of travelers.

Developing Bus or Mini-Van Service

Dedicated bus services have proven somewhat successful at both Boston and Washington. Airport ground access officials in Boston have developed an express bus service which supplements the rail system. Thus, air travelers in outlying suburbs use park-n-ride lots to access the express bus service which delivers them directly to the terminals. Similarly, the airport authority in Washington has operational responsibility for the "Washington Flyer" service which includes buses, mini-buses, and vans.

Upgraded bus services, such as dedicated express lines, seem to fulfill providing the type of services desired by air travelers. These services tend to provide reasonable transit time and convenience at a reasonable cost. While some effective services are operated by transit agencies, the most effective types of express bus operations seem to be developed and operated by airport authorities or contracted after development to private sector operators. The effectiveness of these operations seem predicated on a thorough understanding of origins and destinations, well understood and orchestrated marketing campaigns, the involvement of the airport authority, cooperation with local transit agencies, and subsidization.

Boston, in particular, took a proactive approach to researching potential markets before implementing its service. In contrast, the Washington Flyer emerged out of an "obligation" to provide ground access. However, current management has taken many steps toward understanding its customers' needs, and is in the process of developing additional services such as door-to-door pickup/delivery.

A different approach to bus service is being pursued in Toronto, where future regional transit improvements are based on extensive use of express bus service and dedicated bus lanes for commuter service (as well as airport access). Bus was chosen over rail when planning studies showed a rail extension to the airport to be exorbitantly expensive and possibly incompatible with future rapid transit technologies. The proposed busway system has the advantage of flexibility if growth patterns change and bus lanes can be converted to rapid transit with low "throw away" costs.

Developing Rail Access

In recent years, rail transit links to the airport have become a potentially important priority in the development of ground access facilities. However, rail links to the airport typically have difficulty attracting sufficient ridership to justify their significant capital cost. Exceptional rail linkages to airports in North America achieve 9% market shares while more typically market shares are in the 2% to 6% range. Market shares in the upper portion of this range commonly occur in cities where population densities are high and rail service is truly competitive in terms of overall service quality and a host of other conditions.

Compounding the issue of a low market share is the problem of ridership composition. Ridership in many locations, is usually dominated by airport employees rather than by air travelers. The system often attracts the riders who are most likely to accept the low service levels and convenience of the system. In essence, rail links often fail to achieve significant market share because of inherent service limitations.

Relatively low market shares are often difficult to explain for ground access issues. The authors have sought to assemble data for ground access at SMSA's around North America as noted in the table entitled, Ground Access Information for Selected SMSA's, (See Table A). This table includes population, enplanements, distance to the CBD, approximate travel time by car in minutes, daily parking fees, rail transit ridership, rail transit cost to the CBD, travel time by rail transit to CBD in minutes, cost of a taxi to CBD, and cost of a bus to the CBD. The initial data, population and enplanements, while having some effect on ridership, seem to have limited effect on market share. Distance to the central business district also would seem to have limited effect on market share unless there are major differences in travel time.

Rail transit, buses and taxis serving the CBD compete for riders to this area. Cost and time in transit often determines the most effective competitor for price sensitive market segments going to the CBD. Hence, rail transit often competes with buses and taxis between the airport and the CBD. While buses and taxis also have the capability to serve non-CBD locations, North American rail links do not typically serve these locations without the inconvenience of either changing modes or through circuitous service routing, e.g. few North American airport links are similar to highly integrated European systems.

TABLE A
GROUND ACCESS INFORMATION FOR SELECTED SMSA'S

	Population (in millions)	Employments	Distance to CBD (in miles)	Approximate travel time by car (in minutes)	Daily parking	Rail transit ridership (F)	Rail transit cost to CBD	Travel time by rail transit to CBD (in minutes)	Cost of taxi to CBD	Cost of Bus to CBD	
Atlanta Hartsfield	3.2	27.4	18	15-20 25	\$4-\$12		\$1.25	15	\$18-\$20	\$8.00 one way \$20.00 round trip	
Baltimore B.W.L.	2.0	4.4	10	15-23	Terminal Garage: first ¼ hr. Free second ¼ hour \$1 additional ¼ hr. \$2 maximum per day \$20 Daily Lot: hourly \$3 maximum per day \$10 Express Service: hourly \$4 maximum per day \$13 Satellite Lot: hourly \$1 maximum per day \$5	N.A.	\$2.70	19	\$18-\$18	\$2.70	
Boston Logan International	2.9	12	3-3 1/4	10-15	1st hour free \$10.00 2nd hour \$15.00 3rd hour \$20.00 4-24 hours	\$800 per day	\$.83	20	\$10-\$15	No Public Buses to Airport Private \$2-\$6	
Chicago O'Hare	3.7	24	2-3	10-15 20-40	\$11-\$13		\$1.50	45	\$25-\$28	\$1.50	
Midway	3.7	24	1-4	30-60	\$1.75-\$7.00	25,000	\$1.50	45-60	\$14-\$21	\$1.50	
Cleveland Hopkins	1.4	3.3	12	20 min.	Short term - \$16 per day Long term - \$11.00 per day	700/day	\$1.50	20 min.	\$27	\$2.00	
Miami MIA	1.9	24.7	6	Peak-30 min. Off-Peak-10 min.	\$8.00/day	N.A.	N.A.	N.A.	\$12-\$15	\$1.25	
New York Kennedy	18	30.0	15	40-60 1:20-2:00	\$24	-	(P) \$2.50	-	\$28-\$32	\$11	
LaGuardia	18	8	8	40-60 1:20-2:00	\$18	-	(F) 1.25	-	\$18-\$22	\$8.50	
Newark	18	18	18	20 20-40	\$22	-	(F) 2.50	-	\$25-\$35	\$7.00	
Philadelphia	5.8	16	7	15-20 minutes	Economy (Outside) \$3.50/day Long-Term (Garage) \$14.00/day Short-Term (Garage) \$30.00/day	3,000/day	\$3.00 one way with minimum fare of \$6.00 including transfers	20-25 Min	\$25-\$35	Car: \$1.60 Transfer: \$4.00	
Portland	1.8	6.3	7	10 minutes	Economy \$2.00 per hour \$6.00 per day, Seventh day is free. Long-Term \$2.00 per hour. \$9.00 per day. Short-Term \$1.00 per ½ hour. \$22.00 for a 24 hour stay	N/A	N/A	45-50 Min	\$22-\$26	\$1.00 one way fare	
St. Louis	1.8	21	13	13 off peak 20-30 min.	\$4.00-\$7.00	2,000	\$1.00	20-25 min.	\$26	\$8.00	
San Francisco SFO	6.0	21	12	15 min no traffic ½ hour w/ traffic	Long-Term \$11.00 per day. Short-Term \$1.00 per ½ hour. \$22.00 for a 24 hour stay	CalTrans 300.00 per day. BART 910.00 per day.	CalTrans \$2.75; \$1.75 for the train plus another \$1.00 for bus to down town. BART \$2.75 what a \$1.00 shuttle bus fare	30 Min	\$35.00	Public \$1.00 (local) or \$2.00 (express) Private \$9.00 (employees can purchase ticket book which reduces cost to \$2 Door to Door Van \$8.00 to \$17.00. Most popular service charges \$11.00	
Seattle	1.6	11.3	14	10-40	Economy \$4.00 First Hour \$2.00 Each hour thereafter. Long-Term \$15.00 per day	2400.00 per day	\$1.60 \$1.10	Peak hours off peak hours	30	\$32.00	\$1.60
Dallas	4.7	6.2	26	30 min.	Economy \$1.00/hr. \$5.00 max. Daily \$5.00/hr. \$10.00 max. Hourly \$4.00/hr	N.A.	N.A.	N.A.	\$50.00	\$1.10 cost \$1.10 transfer	
National	4.7	7.7	2	5 min.	Short-term \$28.00 per 24 hrs. @2.00 each add. hour Garage \$12.00 per 24 hrs. \$2.00 each add. Hour Long-term \$8.00 per 24 hrs. \$1.00 each add. Hour	3200	\$1.33 Peak \$1.10 Non-Peak	5 min.	\$5-\$13	\$1.10 cost \$1.10 transfer	

Therefore, the potential market for airport rail transit is quite limited by CBD routing, lack of integration, and lastly, its appeal to principally price sensitive segments. In the air travel market, this is probably the business person with limited resources and or the leisure traveler who are sensitive to price and has time flexibility. Ultimately, the potential market for low level rail transit technology is going to be driven by price sensitive ridership. However, price sensitivity will be determined by trade-offs being price versus time.

Ground access managers suggest that parking prices are often set independently of bus, taxi, and rail transit prices, but may influence overall transit ridership if parking fees are perceived as high. Certain segments of air travelers and employees may perceive transit alternatives as more attractive. However, it is often difficult to determine, as indicated in the SMSA information table, (See Table A), the exact nature of the relationship. Airports usually price their parking facilities according to their revenue needs and in relation to the convenience of the facility. Close-in parking, which involves a short walk to terminals is usually priced much higher than parking facilities which are removed and require a transfer to an alternative mode to get to the terminal. Airport authorities also price on the basis of short-term, medium-term, and long-term parking offering long-term parkers some sort of daily discount. However, it is likely that authorities seldom assess the total cost of the trip to and from the airport in arriving at their parking rates.

Driving Variables for Rail Links and Other Transit

Perhaps a more effective way of explaining rail transit market shares is to develop a schema of uncontrollable and controllable variables which seem to drive market share, (See Table B). Uncontrollable variables are those which public officials or transit managers have difficulty in changing in the short run. Uncontrollable factors include non-existent or poor system integration with the remaining rail or rubber-tire transit system, low population densities, multiple origins and destinations, levels of congestion, and the price elasticities of various market segments.

System Integration

Various studies of European systems have suggested that one of the reasons that rail transit enjoys comparably higher market shares in the European environment is because airport rail transit is integrated with the total ground transportation system. European systems often

Table B

**RAIL TRANSIT MARKET SHARE
HYPOTHESIZED DRIVING VARIABLES**

UNCONTROLLABLE VARIABLES	CONTROLLABLE VARIABLES
- SYSTEM INTEGRATION	- SERVICE LIMITATIONS
- LOW POPULATION DENSITIES	Reliability
- MULTIPLE ORIGINS & DESTINATIONS	Safety
- LEVELS OF CONGESTION	Features
-PRICE ELASTICITIES OF VARIOUS MARKET SEGMENTS IN THE GROUND ACCESS MARKET	Conflicts with Commuters
	- SERVICE PHILOSOPHY
	-PARKING FEES

feature airport rail links which connect into well developed tram, subway and bus systems. Hence, the constraint of airport to CBD service is not present in many of the European systems. System integration at European locations is however, more than efficient connection into the tram, subway and bus systems. Many European airports have successfully developed links with high speed ground transport systems which offer arriving and departing passengers access not only to the metropolitan area but also efficient and effective access to many inter-city locations as well as inter-country locations. Prominent examples include Charles De Gaulle with its connection into the TGV system and connections planned for German high speed rail connections at Frankfurt and Munich.

Low Population Densities and Multiple Origins and Destinations

There are, of course, other uncontrollable variables besides than system integration. SMSA's which have developed in the Post WWII period are characterized by low population densities and multiple CBD's which lead to many different origins and destinations within the SMSA. Rail transit may be particularly unsuitable in the areas in these SMSA's because of these two characteristics. Failure to develop extensive system integration coupled with the density and multiple O & D problem severely constrains the opportunity for rail to provide viable airport service for all but a very limited market.

Levels of Congestion

Congestion, often has a favorable impact on market shares associated with rail transit airport links. However, this variable is basically a given for managers of the rail transit system and airport link. Their ability to induce congestion in the short-term is limited by the politics.

Price Elasticities of Various Market Segments in the Ground Access Market

The price elasticities of various market segments in the ground access market are also relatively stable. While it is possible to manipulate the price elasticities by placing surcharges or taxes on certain competitors of airport rail links, such actions would likely be opposed by airport authorities and other aviation interests.

Service Limitations

While these uncontrollable factors are probably important in predicting market share, the controllable factors also are significant in determining ridership levels. Inherent service

limitations occur in areas such as service reliability, safety, features, price of service, and conflicts with commuter needs. These service limitations may limit the ability of the system to attract many market segments.

Reliability

Reliability may be one of the most important factors for the ground access traveler. Given the consequences of delay, the traveler may feel that a rail transit link presents considerable risk in making appointments or in catching a flight.

Safety

Air travelers may often exhibit concerns about the safety and security of rail transit links. These travelers have to consider whether the system is able to provide sufficient security to ensure their safe passage from the airport to their final destination. Will this safety and security be maintained at the odd hours that they may use the system? Further, does the rail link pass through neighborhoods which may increase fears about their personal security?

Features

The potential market share of the airport to CBD oriented rider may be severely inhibited by the lack of proper features for air travelers (e.g., baggage facilities). Convincing air travelers to change transit vehicles to outlying destinations by going through the CBD may be impossible if these facilities are not amenable for air travelers.

Conflicts with Commuters

Atlanta and St. Louis have made provisions to accommodate air passengers with luggage, but systems in Chicago, Boston, and Washington D.C. have made few efforts to facilitate mixed passenger usage. While the monetary cost of using these systems is low, transit officials have failed to recognize that luggage-handling and convenience are important service attributes for air travelers. The perceived aggravation of dealing with baggage on a system that is hostile to such requirements may outweigh the low monetary cost when travelers make a ground access choice.

New systems are seeking to deal with some of these problems. Initial reports regarding the St. Louis system seem to suggest that there is some potential for airport to CBD services where

the service is conveniently located at or near the terminal. Again, the issue of time and convenience in getting to the connection is probably more important than distance. The MetroLink system in Washington D.C., in its service to National Airport, has also succeeded in providing a service which meets some of the business traveler/air traveler market characteristics.

Service Philosophy

Service philosophy may also be a controllable factor which has a significant impact on market shares produced by rail transit links or by other types of transit services to the airport. Many transit agencies are reluctant to develop airport service for a number of different reasons. Some transit agencies feel that this is primarily an airport service which should be paid for by airport authorities. They feel that the principal benefit is for air travelers rather than the population of the metropolitan area. As a consequence, airport links for rail or bus service are given a fairly low priority.

When transit authorities do provide service to the airport they often feel the only politically feasible way to sell such services to their constituencies is to provide it as overall commutation service. Often, rail links which serve airport locations are also designed to provide commutation services. As a consequence, the facility is often required to serve dual purposes without special provisions for air travelers. While financially more viable than designing separate access facilities for air travelers, the success of this approach burdens transit planners with satisfying dual market needs. Evidence suggests that planners are just now coming to initial and fringe solutions to this problem.

Transit authorities often embrace a service philosophy which seeks to provide a bare-bones service for air travelers. Such service will only attract a limited number of market segments and often leaves transit providers in a position where their service seems to be under utilized. The authorities seem to be developing ways to distinguish the needs of different segments and provide necessary service differences, e.g., customer service representatives at O'Hare. In many cases, transit agencies would be far better off to purge the establishment of private sector operators.

Parking Fees

Other significant controllable factors are items like parking fees at airport facilities. Airport authorities are often reluctant to increase parking fees to high levels which discourage the use of on-site parking. The higher such fees, the greater the use of transit facilities.

One topic associated with existing and planned rail transit link to the airport is that such service seems to be accompanied by significant operating deficits which are a chronic long term problem. Few systems are willing to divulge much information about rail airport access budget deficits. Whether the reluctance to discuss such results are a function of the inseparability of system costs or the size of the deficits is difficult to determine.

Assessing Airport Rail Transit and Other Transit Measures

One of the key issues facing metropolitan areas and their associated airport authorities, is simply how do we improve ground access? Do airport rail links and other transit measures really improve the ground access picture, and if so why? The authors feel that this question cannot be answered directly, but may be answered by evaluating surrogate measures of the effectiveness and efficiency of these systems. These measures include such issues as market share, type of system, type of ridership, ability to deal with environmental issues, growth and development.

As indicated in the modal split chart, (See attachments 1-3), all the airport locations with rail links have experienced very low market shares of the overall ground access market. While the overall market share is low, these rail links have seemingly managed to achieve respectable market shares of potential market or the market which is available to the rail transit link, e.g., airport to CBD. This market share achievement has been made despite a number of service limitations. These service limitations include the lack of baggage facilities, high noise levels, and co-mingling with commuter traffic on lines such as the Blue Line in Chicago and the poor placement of the subway stop of the Metro at National Airport.

The evidence which is available suggests that rail transit links from the CBD to the airport have failed to win wide acceptance among the market segments which could potentially utilize this service. The evidence suggests that this service appeals to market segments consisting of price conscience travelers and airport employees. Airport links have failed to clearly broaden

their appeal to other market segments in spite of marketing dollars and heightened awareness, because of the service limitations of the system and high discretionary income characteristics of non-users. It is possible to speculate that even if service limitations were removed, significant increases in ridership would not occur among present day non-users.

Regular transit services have had the same limited success as rail links. The fundamental reasons are somewhat similar. However, there is evidence to suggest that public/private cooperation may produce noteworthy success with specialized bus services in carefully planned programs. Specialized bus services which are carefully researched and tailored to more upscale markets can have some market share impacts. The success of the Super Shuttle at many North American airport locations would seem to suggest that while public private cooperation is helpful in this process, it is not a prerequisite nor a guarantee for success.

It is also important to note that well designed specialized bus services seem to have the capability to make a limited but important contribution to market share when part of a well developed program. Further, these specialized bus services seem to have the ability to reach into more upscale segments than transit has successfully penetrated. Part of this success may be well planned public efforts, but it may also be private sector innovation which develops services which suits the needs potentially lucrative market segments.

At the same time, the claims of various critics that airport rail links have had favorable environmental impacts, is a claim that lacks documentation at the present time. The low number of actual riders and the relatively low market share of total metropolitan trips to the airport would suggest that its impact on environmental air quality seems minimal. Rather than viewing airport rail links as a panacea to environmental problems, it may be well to suggest that an airport rail link is one weapon in a portfolio of tools designed to improve environmental quality. Specialized bus services have the same potential.

One of the key issues which remains unresolved is what are the capital costs and operating deficits created by building and maintaining rail links to airports? Critics have suggested that systems incur significant capital costs with limited returns and chronic long-term deficits. In reality, capital costs are often mitigated by service to other existing communities on the line. However, criticism of capital expenditures have accurately suggested the nature of this

problem when referring the cost of segments or spurs such as at O'Hare, San Francisco and Newark. Capital cost criticisms may have validity when directed at totally new proposed lines whose primary rationale is airport service, e.g., Dulles.

Perhaps the strongest arguments that can be made for airport rail links revolve around mobility, employment opportunities, economic development, and an opportunity to guide and develop transportation corridors better. Transit alternatives such as rail seem to offer better mobility to precisely those who need it. Further, there seems to be some evidence that they use it. Similarly, these transit operations do offer employment opportunities as well as access for lower socio-economic classes to share the employment generated by airports.

Agencies in some locations have viewed rail links as tools of economic development. They feel that the development of a rail link almost automatically increases the value of real estate adjacent to station stops by increasing the flow of economic activity which is centered around these stops. Besides stipulating activity at the various station stops of these facilities, there is also substantial activity at the terminal. Airport authorities in Vancouver have considered zoning taxes to capture the increased value of such activity.

Some locations have suggested that a rail link or other transportation investment is an excellent guide to growth in underdeveloped corridors. Rail links specifically have the opportunity to determine the nature, location and type of growth through the locations, number, and nature of stations.

With these caveats in mind, rail transit probably has a significant role in the ground access plan for certain North American airport locations over the long term i.e., beginning in the early 21st Century. The precise data of start-up and the accompanying lead time is likely a function of the level of operating deficits, service convenience and competitiveness, corridor development, and the willingness of the public to accept disincentives which view the automobile as a less than desirable environmental factor. More importantly, the 21st Century rail linkage is likely to be much more successful if developed as part of an existing overall rail transit system.

The long-term operating deficit is a most interesting issue. In cases of separate segments or lines for airport service, critics charge that the service is costly and other solutions are cheaper. The critics may be right however, transit agencies or airport authorities are willing and able to calculate this cost.

WHAT ARE SOME IMPORTANT FUNDING STRATEGIES?

Urban transportation projects have traditionally been funded through a combination of federal and local sources. In recent years, the federal contribution to local projects (such as airport access initiatives) has not kept pace with the overwhelming demand for new transportation initiatives, placing a heavier burden on such local sources as property taxes, gas taxes, and municipal/revenue bonds. Since these sources are already burdened to the full extent of their capacity in many urban centers, planners have been pressed to come up with creative solutions to funding problems.

There are almost as many funding alternatives for ground-access initiatives as there are initiatives. In most cases, planners seek to create funding sources which are tailored to the particular local circumstances. Certain similarities among cities can be identified, but a good generalization is to present funding as one of the more individualized aspects of U.S. airport ground access.

Prioritization of Ground Access Funding at Regional Level

"Corridor" Approach. Given the limited number of public dollars available for transportation projects, airport ground access improvements must compete with other regional projects. What is becoming popular as a paradigm for considering transportation needs is a "corridor approach." Within this approach, planners and officials are challenged to develop a transportation plan which satisfies diverse needs within one or multiple corridors of a metropolitan area.

The corridor approach is characterized by a tendency to consider a variety of needs at once. Planners do not treat transportation initiatives as individual, self-contained projects, but as contributors to the overall system. Tolls from one project are used not only to maintain that

project, but to cross-subsidize others. Revenues are pooled, and redistributed according to need.

What this means to airport access initiatives is that they need to be designed to fit well within overall urban transportation structures. Increasingly, projects need to provide utility to as many users as possible. An example is the conflict sometimes encountered between airport travelers and local commuters. Since local commuters and transportation users are generally more numerous and vocal than air travelers (many of whom are out-of-town visitors), ground access is often assigned a fairly low priority by government officials. This is why research conducted at the airport sites indicates major multi-modal transit investments for airport access, such as rail or light rail, are more likely to be economically and politically viable when linked to the transportation infrastructure for the entire region.

Significant numbers of airport access projects have been developed as components of highway systems, commuter rail or subway networks. For example, in Philadelphia, the highway systems which were developed around the airport were designed not only to provide commuting capabilities, but also to provide airport access. The airport came first and the extensive road system came second.

Philadelphia also provides a demonstration of this concept in terms of the rail link which was built to the airport. The link does serve airport traffic, but predominantly serves commuter traffic. Examples of this commuter airport access concept in terms of rail and subway networks exist in Atlanta, Baltimore, and St. Louis.

MPO's particularly seem to favor "corridor" approaches to airport access because they are able to satisfy diverse transportation needs with limited transportation resources. Individuals requiring transportation service in returning to work as well as airport access are essentially served by the same facility with the same resources. Further, the corridor approach typically provides high service levels for the individuals who are most likely to support the MPO'S both in political and financial terms: local residents.

Dedicated Airport Access Corridors. Where ground access has been developed specifically to serve the needs of air travelers, funding had to be obtained from a separate and distinct

source in order to avoid public protest over the use of transportation money for what some vocal constituents considered a "special interest" purpose. There are two primary examples of this type of funding. They include the development of the Dulles airport access route and New York's proposed Airport Access Project (AAP). The Dulles airport access route was originally built by the federal government and New York's proposed AAP is planned to be funded through passenger facility charges (PFCs).

What Are Common Funding Mechanisms?

A wide variety of funding mechanisms have been utilized for airport ground access. At some sites — for example, Baltimore, Atlanta, Dulles, and St. Louis — ground access planning and funding were tightly intertwined. At other sites, such as Chicago and New York, planning efforts were executed when fortuitous circumstances made funding available.

State Funding Pool. In Baltimore, projects compete for "pooled" funds from the Maryland Department of Transportation. This transportation trust fund is pooled from a variety of sources, including gas taxes, federal aid, and operating revenue; it is disbursed to various uses, including operating and capital expenditures and debt service. Since the Baltimore airport is considered an important component of the overall transportation system, proponents of light rail gained an advantage over supporters of other alternatives by including an extension to the airport in their plans.

Regional Funding. A "traditional" funding method was used for Atlanta's rail system, which was designed in 1971 and funded over the next twenty years with sales tax revenues. Thus, the system and funding mechanisms were deliberately planned to coincide with the region's growth; airport access was simply included in the overall plan.

Federal Funding. Similarly, funding for the Dulles airport access road was linked to completion of the final blueprints for the airport. However, in contrast to Atlanta, the federal government (which owned Dulles and the access right-of-way) took a critical role by supplying funds through FAA programs.

Asset Leveraging. Although planning and funding were still closely related, a slightly different funding approach was taken in St. Louis. St. Louis applied for federal money; however, unwilling to implement a tax increase to raise matching funds, city officials in St. Louis sought another method for raising the local match. As a result, physical assets, such as land, were leveraged as the local share of funding. After operation of the first "spine" of St. Louis' light rail system proved successful in terms of total ridership and fare box recovery rate, elected officials, in partnership with a citizen support group, were able to convert to a taxation funding mechanism. In 1994, light rail proponents successfully advocated a sales tax which will provide funding for expansion of the St. Louis system over the next twenty years.

Highway Trade-ins. Rail extensions to O'Hare and Midway airports in Chicago were incorporated into transit plans for major travel corridors and funded as a combination of federal and state money became available. In particular, officials were able to utilize cancellation of a major highway project in the Chicago region (the Crosstown Expressway) to create an opportunity to redirect state money toward extension of the Chicago Transit Authority's rail system to both O'Hare and Midway airports. In Portland, a major urban highway project was canceled, and the funds (nearly \$700 million) were diverted toward the development of transit capital projects and improvements.

Incremental Funding. Toronto is refining a "staged" implementation process for regional transportation improvements - stretching out the funding requirements over a thirty year time period. Other methods of incremental funding mentioned by transportation planners include municipal bond offerings and toll roads. With bonds and tolls, pieces of transportation plans may be funded as separate projects. As competition increases for limited dollars, elected officials and airport authorities are likely to create other funding mechanisms as well.

Examining these funding mechanisms, it is easy to conclude that urban approaches to funding airport access initiatives are diverse and highly individual. Local circumstances often suggest implementation of certain types of funding policies. Perhaps the most universal trend indicated by the current research is the general proclivity toward a corridor approach to planning, and a tendency to view initiatives (and funding) from a system-wide perspective.

What Are Potential Peripheral Aids to Funding?

"Land Banking." Importantly, as a benefit of mapping an entire system, rail developments in both Atlanta and Chicago were aided by the preservation of right-of-ways. This "land-banking" significantly reduced building costs over the years. Likewise, St. Louis and Miami are currently taking advantage of pre-existing rights-of-way. Newark is taking the land-banking concept one step further by upgrading existing track to handle light rail — essentially recycling the existing right-of-way. Looking to the future, Toronto has identified land which is critical to future transit developments. As a result, Toronto is attempting to determine a mechanism for protecting or acquiring those areas.

Passenger Facility Charges (PFCs). Even more innovative than the funding approach used in St. Louis is the approach being used in New York.

Facing strong public opposition to the use of transportation money for transit projects serving a small special interest group (air travelers), New York officials leapt at an opportunity to secure funds through new federal legislation proposing a passenger facility charge (PFC) to be levied on every enplaning air traveler. Consequently, New York lobbied for wording in the bill which would allow airports to use PFC money for ground access purposes. Pending final FAA approval, New York's implementation of an airport-only service will open the way to future proposals for airport ground access improvements using PFC money.

In 1990 Congress authorized airports to collect head taxes of up to \$3, or PFCs, as a supplement to airport airway improvement grants. While typically it is illegal to divert airport income for off-airport uses, there are exceptions. For example, authorities who sponsor and coordinate several modes of transportation have greater latitude in the use of airport funds for other modes related to air transportation. The law also exempts airports that were authorized to divert revenue prior to 1982, when the act creating the Airport Improvement Project (AIP) was passed.

The FAA is reviewing the position that the New York project, in one form or another, is appropriate since the purpose of the feasibility study was to determine whether the system will increase airport capacity (the criterion for using PFC collections) and whether the New York

Port Authority can get control of the rights-of-way (which would put the system on airport property).

Zoning Fees. Another funding alternative is being considered in Vancouver. After examining the constituencies likely to benefit from public infrastructure investments near the airport, planning officials determined that private sector developers are often the major beneficiaries. Consequently, some form of zoning fee is being discussed as a means for partially recouping development costs.

Like funding, alternative transportation plans should be tailored to match local conditions. Each alternative discussed here has particular strengths and weaknesses. Bus-to-rail-to-airport connections work well in eliminating system duplication, but the inherent multiple transfers make this option less user-friendly. Bus/Minivan systems are user-friendly, but highway congestion can severely impact service levels. Rail systems are costly to produce, serve limited corridors, and typically in North America, attract only 2% to 6% of all airport-bound travelers and employees.

The primary lesson learned with regard to access funding is that the appropriate funding source (or combination of sources) varies with circumstances from city to city. Studying airport financing cases can yield ideas about how access can be funded, but the essential task faced by transportation agencies in a metropolitan area, including the airport authority, is to analyze what local opportunities exist and to tailor a funding program which best exploits those opportunities.

One principle which is appropriate for general application in airport access funding is that of funding diversity. Planners should tap as many sources as possible: federal, state, regional, private, and recapture alternatives. Cross-subsidization — the use of funds generated from one program to support another — is a common theme in urban transportation. Where possible, creative leveraging of resources can go far as a framework for access funding.

HOW DO YOU FOSTER INTER-AGENCY COOPERATION?

Transportation systems are likely to cross jurisdictional boundaries. As a result, transportation plans need the cooperation of a variety of governmental stakeholders in order to be successful. Transportation planners are challenged to create programs which satisfy the diverse requirements of stakeholders.

Lead-Agency Contributions to Inter-Agency Cooperation

While each airport location was unique in its physical and political geography, all successful planning efforts seemed to share one common element — a leader or lead agency with a clear vision of the future transit system for the region. In most cases, the lead entity formulated an initial proposal which could then be "sold" to other stakeholders. Once preliminary endorsements from other stakeholders had been achieved, the lead agency usually transferred the detailed analysis to the planning body best-suited for the purpose. However, the initial leader or lead agency usually remained closely involved with the project through the inter-agency negotiating process and successive planning iterations.

Cooperation as a Function of Metropolitan Structure

Metropolitan areas differ in structure, and the differing structures make distinct impacts upon transportation planning. Some metro areas are more cohesive, comprised of no more than a handful of municipalities in a single county. Others are far more complex, including several cities and townships, multiple counties, and (in some cases) multiple states.

Cohesive Structures. Examples of cohesive metropolitan structures which facilitated good inter-agency cooperation were found in Miami, Baltimore, Atlanta, New York, Toronto and St. Louis. In Miami, a "metropolitan" or county-based government structure reduces obstacles created by differing city and county agendas.

The Atlanta Regional Commission facilitates a technical advisory board which includes transportation officials from every county and major city in the greater Atlanta area plus representation from state and federal transportation agencies, affording a high degree of

linkage across agencies. In New York, a steering committee comprised of federal, state, and local stakeholders was essential in overcoming system challenges and directing promotion efforts to address concerns raised by the general public. Likewise, in St. Louis, a coalition of congressional legislators from Missouri and Illinois, in partnership with city leaders, was the key factor in securing approval for the MetroLink system — despite the reservations of St. Louis County officials.

In the case of Portland, various transportation agencies were united by a joint policy advisory committee as well as a technical committee which sought to develop coalitions regarding the future vision of the transportation network in the metropolitan area. These committees were helpful in pulling together different agencies with diverse missions and agendas. Interestingly, Portland has enjoyed good inter-agency cooperation without a highly cohesive structure, since cancellation of a highway project in the 1970's left planners with sufficient monetary resources to preclude the need for protracted conflict between jurisdictions over proposed plans.

Fragmented Structures. In contrast, St. Louis and Chicago provide examples of how a single stakeholder can jeopardize the success of a modal alternative either during the decision making process or even after implementation. In St. Louis, airport officials were less than enthusiastic about a light rail system which they believed would give indigents easy access to the airport. When airport renovation plans changed, effectively blocking the completion of the system, airport officials remained unmoved by negotiations to remedy the situation. Only a change in the airport's director was able to facilitate a solution and salvage the vision. In Chicago, the airport authority's rigid post-implementation signage guidelines hampered efforts by the Chicago Transit Authority to effectively promote its subway service to downtown Chicago.

The greater Washington area further demonstrates the impact of cooperation on transit planning efforts. One can conceptualize metropolitan areas as existing on a continuum, with "highly cohesive" structures at one end, and "highly fragmented" structures at the other; in this sense, Washington D.C. would occupy a position very close to the "highly fragmented" end of the continuum.³²² As transportation planners in Washington struggle with commuting growth in the region, they must devise a system which crosses multiple city, county, state, and

³²² It could be argued that Miami, with its "county-based" metropolitan government structure, would occupy an opposite position as perhaps the most cohesive of the structures examined.

federal boundaries. Since each of these political entities has a different transportation agenda, building consensus toward any particular plan is a very time-consuming process. Adding to the difficulty is the absence of a regional transportation funding source.

This illustrates the reason for good inter-agency cooperation: plans move from initiation to implementation much more quickly when diverse organizations can work together toward common goals.

Another key principle is to adopt a whole-system approach, blending-in airport access issues as appropriate to the local situation. This includes taking a proactive stance regarding preservation of future rights-of-way.

The degree to which governmental agencies must cooperate in the adoption and implementation of transportation policies is a critical factor in facilitating airport access. Access initiatives are more likely to be implemented intact (and in a timely manner) when a cohesive structure exists. If there is a system which "forces" inter-agency cooperation, such as a regional funding mechanism or state-controlled approval process, the structure expedites planning and eliminates "sandbagging."

Without this luxury, the policy implementation process is more difficult; however, much can still be accomplished if there is a strong leader-organization which can communicate a vision and bring the other stakeholders to the table. It also helps to be able to show a true economic imperative (as was the case in New York). Stakeholders must be shown a realistic vision, replete with bona fide benefits. As was noted in Portland, another valuable aid to interagency cooperation is the existence of sufficient resources so that there is little conflict and competition between initiatives or between stakeholders

WHAT TOOLS ARE HAVING AN IMPACT ON THE GROUND ACCESS DECISION-MAKING PROCESS?

The public-policy decision making process can be characterized generally as the result of interplay between professional planning and the political process. Transportation programs often begin with a vision of a system, developed professionally by planners using a variety of models and heuristic methods. Once described, the program then passes through an iterative

process by which stakeholder preferences are negotiated and the program altered to meet various public needs. The end product, ideally, is a program which is both well-planned and politically viable.

For this reason, a wide array of variables affect the transportation policy decision process in the metropolitan areas studied. Some benefit is derived from quantitative modeling techniques, but decisions generally derive much of their support from data gathering activities and qualitative methods. Data gathering methods include origin/ destination studies, while qualitative methods include focus groups and other forms of public involvement.

Quantitative Modeling

Transportation experts point out that most of the models in use today were developed in the late 1970's or early 1980's for use in general urban transportation modeling. Consequently these models, although somewhat adaptable, have limited capability to address airport ground access issues. For example, current models generally do not forecast the effects of airport ground access on air quality and economic development. Sporadic efforts have been made to "retro-fit" specific trip generators for airports and airport-related activities to these models with varying degrees of success. However, as greater emphasis is placed on multi-modal transportation systems, more sophisticated models will evolve.

As a result of the model limitations, there seems to be agreement among transportation planners in many different regions that the final decision to approve or reject a new transportation system is seldom determined by data generated from travel demand forecasting models. Planners in virtually every metropolitan area except Chicago voiced this conviction. Instead, it appears models are universally used to validate the reasonableness of a particular project and to provide the documentation necessary to secure state and federal funding.

Political Vision

Comments by planners in Atlanta, Cleveland, New York and St. Louis indicated that the vision of elected officials and business leaders played a much more significant role in developing and implementing transportation projects. For example, leaders in Atlanta have a long-standing record of envisioning the infrastructure required to move the city from its singular sphere of influence in the South to its position as a prominent economic player in the global market. As a result, Hartsfield Airport was built with the capability of handling international jets. In addition, Atlanta leaders envisioned a rail transit system which would expedite commuting in the region as the population grew.

Origin/Destination Studies

In contrast to the limited applicability of forecasting models, planners in several regions referred to the importance of conducting origin/destination (O/D) studies to understand ground access. These studies serve three main purposes: to identify potential markets for alternative modes, to determine ridership characteristics of current users of transit modes to airports, and to provide basic data necessary for applicable modeling techniques. Examples include:

- This type of information was a key factor in determining whether an airport-only transit service from Manhattan to JFK and LaGuardia was financially viable. Based on the information that 54,000 air travelers per day have origins or destinations in Manhattan, planners could then forecast potential revenue scenarios for the proposed Airport Access Project.
- Similarly, Massachusetts Port Authority planners used O/D data to identify the location of significant air traveler markets in outlying suburbs. This knowledge formed the basis for developing an express bus service to Logan International Airport in Boston.
- Likewise, in Miami, O/D research quantified what regional officials already suspected — the cruise ship market had created a heavily-traveled route between the airport and the seaport. Thus, transportation officials could consider options for serving this particular market.

Origin and destination information in Atlanta confirmed transit officials' perceptions regarding the difficulty of attracting air patrons outside the rail system service area. Given the widely dispersed origins and destinations in the outlying suburbs, transit officials determined park-and-ride lots were likely to be the most feasible alternative for encouraging air travelers to use the MARTA system.

- In addition to identifying significant air traveler markets which can support alternative ground access modes, O/D studies can also provide information about users of current transit systems. For example, in Chicago, O/D studies revealed the majority of riders of the train at the O'Hare airport station were business travelers with destinations downtown. However, the business traveler market in general was completely unaware of the service from O'Hare to downtown. Consequently, transit officials determined better airport signage and brochures oriented specifically toward business travelers could increase ridership on the "Blue Line."
- San Francisco's Inter-modal Transportation Management System (ITMS). Bay area planners are experimenting with a new approach to transportation planning in the form of an Inter-modal Transportation Management System. Designed as a structure for allocation of funding, the ITMS combines several models which assess transportation alternatives in terms of a variety of criteria, including multi-modality, volume, connectivity, and inter-regionality.

Information is gathered from the private sector, the MPO'S, and the regional transportation planning agency. Alternatives are then "scored" in terms of several performance measures, including mobility, costs and revenues, economy, environment, safety, and quality of life. What results is a cross-evaluative forecasting system which enables planners to estimate modal shifts for goods and people. Reports, maps, and graphs are disseminated to planners and MPO's officials in an effort to facilitate cross-modal analysis, "what-if" analysis, and corridor (or system) level analysis.

- Miami's Three-Tier Evaluation. Another example of a fresh approach to multi-modal transportation planning is the "three-tier" approach used in Miami. This approach is a

framework for assessing alternatives with a view toward eliminating the weakest options quickly — thereby conserving resources for analyzing more viable options.

Employing a matrix which helps structure evaluation criteria, transportation planners and elected officials rate each aspect of a proposed transportation development.

The first "tier" of the three-tiered evaluation is based on previous experience and expertise in transportation. When these evaluations are pooled, generally the weakest alternatives drop out. The remaining alternatives usually appear to be fairly comparable. Consequently, limited research is authorized to provide the basis for evaluations in the second tier. Finally, having narrowed the field to the most promising alternatives, a full-scale cost analysis and public scoping process is conducted in order to facilitate the final decision in Tier Three.

A combination of quantitative and qualitative techniques is necessary for the development of ground access. Transportation experts can provide analysis of various alternatives based on technical and cost criteria. But, these alternatives must also be assessed in regard to the total potential of the market to be served and customer requirements for transportation services. To this end, O/D information and customer focus groups are important tools in the decision making process.

WHAT TECHNIQUES ARE USED IN GROUND ACCESS PLANNING TO ENHANCE PUBLIC INVOLVEMENT?

Transportation initiatives require public involvement for two purposes: (1) to collect data early in the seminal stages of planning and (2) to ensure political feasibility during the approval stage. Four techniques used in ground access include:

EIS Scoping Meetings. Transit projects in Chicago, Cleveland and Atlanta were planned and approved in the 1960's and 1970's. Public involvement was garnered through a series of standard "scoping" meetings required as part of the environmental impact process. Public involvement largely focused on the system as a whole.

Non-Profit Advocacy Group. More interesting is the process used in St. Louis to generate public support for the MetroLink system. Having a basic plan outlined, elected officials met with key business leaders to present the vision and ask for support. In turn, these business leaders initiated a community support group and underwrote the initial costs for the support group's promotional efforts, including flyers and posters. In addition, this group of private citizens became actively involved in speaking to other community organizations about the MetroLink project. Over the period of two years, this citizen group evolved into a formal non-profit organization which continues to advocate light rail extensions and which holds property in trust for future routes.

Public Relations Campaigns. A different tactic has been employed in New York where the Port Authority of New York and New Jersey has undertaken a significant public relations campaign to inform the public about the proposed Airport Access Project.³²³ To this end, the Port Authority met with many civic organizations, developed a video presentation which has been sent to other community groups, and mailed brochures to citizens who inquired about the project. These efforts have largely been designed to keep the public informed rather than to solicit any planning input.

Focus Groups. At three of the airport sites — Boston, Washington and New York — airport planners emphasized the value of conducting focus groups with air travelers. In these cases, focus groups were used following origin/destination studies to further refine the service requirements for an alternative ground access mode prior to implementation. In Boston, planners indicated focus group sessions for the proposed express bus service assisted with locating access sites, scheduling, setting fares, and adopting service standards for cleanliness and timeliness. Similarly, in Washington, new Washington Flyer shared-van services will be operating in 1995 based on the customer requirements voiced in focus groups. In New York, focus group comments about safety, cleanliness, and convenience further justified an airport-dedicated transit system separate from the subway.

There is little real structure at the present time to public involvement efforts regarding the issue of ground access. While substantial improvement has been made in methodologies for

323 The Airport Access Project in New York is an ambitious endeavor to link JFK and LaGuardia Airports to Manhattan using Automated Guideway Transit systems. Officials and planners in New York agree that poor airport access presents a social and economic problem to the city's future development. For more information, see "New York Airports" in Section U.

public involvement and statewide transportation planning, a cross-fertilization of these methodologies has not taken place with agencies involved in ground access issues. There is substantial room for development of methodologies which will enhance public involvement processes.

WHAT ARE ADDITIONAL TRENDS WHICH HAVE POTENTIAL IMPACTS ON THE OUTLOOK FOR GROUND ACCESS PROBLEMS?

Despite the limited funds available for developing transportation systems, transportation authorities at some sites (with the support of the community) are developing and promoting airport access. Commitments to maintaining and improving airport access are based on a region's perception of the airport as a key economic generator.

New York is an example of a community's fight to maintain the economic health of the region — having recognized deteriorating airport access as a contributor to businesses' decisions to relocate away from New York. Similarly, Dulles airport officials are utilizing economic reasons to communicate the importance of maintaining the airport access road as a limited-use highway focused on the needs of air travelers.

Recognition of Airport as an Air Quality Factor

Most major cities in the United States are struggling to comply with federal air quality standards. Transportation planners at each of the airport research sites recognize airport trips impact the city's or region's air quality — to a greater or lesser degree in each area. Consequently, alternative modes are developed not only to sustain the economic viability of the airport, but also to attempt to reduce air pollution.

Recognition of Airport Link to Future Multi-Modal Centers

Looking into the future of transportation, airport officials, regional planners, and transit operators are struggling to determine the best mechanisms for coordinating and connecting various components of the existing infrastructure with future construction. One proposal is the development of inter-modal centers.

Miami is at the forefront of innovation for the inter-modal center concept. The Miami Inter-modal Center (MIC) will serve as a central transfer point for regional trips and become an extension of Miami International Airport's land side terminal functions.

Cleveland is revamping the downtown rail station (Tower City) which figures prominently in plans to improve the quality of transit to major employment, tourism, and entertainment centers. Similarly, Boston is renovating a bus and subway station which could evolve into an inter-modal center.

Other cities are considering remote land side operations similar to those proposed in Miami — namely ticketing, baggage check through, and connections to ground transportation. In Philadelphia, particular emphasis is being given to linking the new convention center to the airport. Whereas in New York, officials have postulated that access sites for the airport access project would not only have the capability to handle passenger services and baggage, but could also serve as collecting points for small package cargo. As yet, no airport is operating remote land side operations.

CONCLUSIONS

Each airport site studied offers particular lessons for transportation planners and officials. In this chapter shows an examination across airport sites affords a unique opportunity to develop theories regarding the more effective methods for accomplishing airport access. While it is difficult to identify any universal attributes or strategies in the field, certain general characteristics of airport ground access strategies and planning trends do become apparent as a result of cross-airport analysis.

Though planners have been diligently developing public transit, disincentives for private-auto travel are still not very great. Furthermore, public transportation agencies usually have limited resources to carry out promotional efforts for airport access except in the case of dedicated services (such as the Logan Express and the Washington Flyer).

CHAPTER FOUR: RECOMMENDATIONS

INTRODUCTION

Cross-airport analysis of ground access issues gives rise to several key recommendations for ground access planning. These recommendations represent a compendium of valuable lessons from examining ground access issues at a variety of domestic and international airports. Implementation of these recommendations will serve to enhance the overall effectiveness of ground access at North American airport locations.

Recommendations address critical ground access issues explored in this study, including marketing, funding, inter-agency cooperation, and decision-making processes. In order to properly frame these recommendations, each discussion will begin with overall objectives regarding the issue, proceed to strategies for achieving these objectives, and conclude with specific suggested tactics for advancing these strategies.

MARKETING RECOMMENDATIONS

Overview

Responsiveness to the needs of the market is critical to the success of any transportation initiative, and airport ground access is no exception. The ground access market has been identified in this study as distinct from a city's commuter market, and segmented within itself into three primary categories (air travelers, employees, and meeters/greeters). Critical market service issues have also been identified, including convenience (especially regarding baggage handling) and transit time. It is not enough to merely provide access to the airport; access alternatives must be planned and considered with market characteristics in mind, and systems must address these critical issues.

The primary marketing objective should be to create an airport access system at North American airport locations which is fully responsive to the needs of the area's airport access market. This objective is of critical importance, since utilization of the ground access system will depend upon responsiveness to the market. Every consideration of the market, properly implemented, will be another step toward a more effective access system which enjoys higher ridership and better overall public approval.

Three general strategies for achieving this objective are recommended. First, officials must develop programs which analyze and aid planners in fully understanding the airport access market. The development of a responsive system is dependent upon understanding the market to which the system is meant to respond. Interestingly, this study shows that access plans are often implemented without the benefit of sufficient knowledge of the markets they serve.

Second, the responsible agencies should make the access system responsive to the market as it actually exists. Understanding the market is not enough; once specific key issues are discovered, planners must strive to incorporate a range of services into their plans for access systems.

Finally, officials must keep the target markets informed about efforts made to provide a responsive ground access system. This is one piece of an overall marketing strategy. Ground access systems gain popularity as users see their needs being met. Communication with the market must be a two-way street.

With these strategies in mind, the following recommendations are made:

Recommendation #1: Recognize that the dominant mode of transportation to the airport will continue to be rubber tire.

Airport access data from around the country clearly shows the importance of automobile access to the airport. On average, 75-80% of all air travelers access the airport by automobile (private, rental, and taxi) nationally. Road access is particularly important, given the wide dispersion of population growth and business. Philadelphia and Washington/Dulles provide good examples of cities which have made a careful and planned commitment to rubber tire modes for airport access.

The primary factors which discourage emphasis on rubber-tire access are the deterioration of air quality and potential congestion. Mitigation of these factors may necessitate the creation of disincentives for single occupancy vehicles. Such disincentives may cause a shift from single occupancy vehicles to multiple occupancy vehicles. Disincentives for single occupancy vehicles and or incentives to use multiple occupancy vehicles may be monetary; i.e. parking fees, transit fares, and tolls.

In recent years, rail transit links to the airport have become a potentially important priority in the development of ground access facilities. However, rail links to the airport typically have difficulty attracting sufficient ridership to justify their significant capital cost.

Critics have suggested that systems incur significant capital costs with limited returns and chronic long-term deficits. In reality, capital costs are often mitigated by service to other existing communities on the line. However, capital cost criticisms may have validity when directed at totally new proposed lines whose rationale is airport service.

Exceptional rail linkages to airports in North America achieve 9% market shares while more typically market shares are in the 2% to 6% range. Market shares in the upper portion of this range commonly occur in cities where densities are high and rail service is truly competitive in terms of overall service quality and in relation to other options.

Compounding the issue of low market share is the problem of ridership composition. Ridership in many locations, is usually dominated by airport employees rather than by air travelers. The system often attracts the riders who are most likely to accept the low service levels and convenience of the system. In essence, rail links often fail to achieve significant market share because of inherent service limitations.

In looking at assorted variables related to ground access that could potentially affect market share and ridership levels, population and enplanements may have some impact on ridership, but little effect on market share. Similarly, distance to the CBD also has a limited effect on market share unless there are major differences in time travel. Even then, rail transit competes with buses and taxis serving the CBD and various outside locations.

While buses and taxis generally serve these non-CBD locations, rail transit typically does not without the inconvenience of changing modes or through circuitous service routing which may increase both cost and time needed to reach the final destination. This effectively may eliminate rail as an option for price and time sensitive market segments.

Therefore, the potential market for airport rail transit is quite limited by CBD routing, lack of total system integration and lastly, its appeal to principally price sensitive segments. Ultimately, the potential market for low level rail transit technology is going to be driven by price sensitive ridership. However, price sensitivity will be determined by trade-offs being price versus time.

Relatively low market shares are a complex issue driven by both uncontrollable and controllable factors. Uncontrollable factors include non-existent or poor system integration with the remaining rail or rubber tire transit system, low population densities, multiple origins and destinations, level of congestion in transit modes, and lastly, the price elasticities of various market segments.

System Integration

Various studies of European systems have suggested that one of the reasons that rail transit enjoys comparably higher market shares in the European environment is because airport rail transit is integrated with the total ground transportation system. These systems often feature rail links which connect into well developed tram, subway or bus systems thus eliminating the constraint of airport to CBD service.

Low Population Densities and Multiple Origins and Destinations

Many SMSA's which have developed since WWII are characterized by low population densities and competing CBD's resulting in multiple origin and destinations. These two

reasons can make rail transit seem unsuitable for airport ground access links. Failure to develop extensive system integration coupled with the density and multiple O & D problems severely constrains the opportunity for rail to provide viable airport service for all but a very limited market.

Congestion

While this factor may generally have a favorable impact on market share for rail transit, the ability to induce congestion in the short-term is limited politically.

Price Elasticities of Various Market Segments in the Ground Access Market

The price elasticities of various market segments in the ground access market are relatively stable. While it is possible to manipulate these elasticities by placing surcharges or taxes on certain competitors of airport rail links, such actions would likely be opposed by airport authorities and other aviaional interests.

These uncontrollable factors are important in predicting market share, however, the controllable factors also are significant factors in ridership levels. Inherent service limitations in areas such as service reliability, safety, features, cost of service, and conflicts with commuter needs may limit the ability of the system to attract many market segments.

Reliability

Air travelers highly value reliability and given the consequences of a delay may feel that a rail transit link presents considerable risk in making appointments or catching a flight. As a result, to circumvent this risk the air traveler more than likely will to choose the mode that offers the most reliability-this historically being the automobile.

Safety

In the safety category, air travelers must be given a sense of security about not only the physical equipment, but also the path which the line takes. Are they being asked to go through neighborhoods that may increase their fears about personal safety? Additionally, they need to be able can count on safe, secure, and reliable service at all hours of operation.

Features and Conflicts with Commuters

The potential market share for the rider going from the airport to the CBD may be severely constrained by both the lack of proper features for those carrying luggage and conflicts with commuters that arise from mixed passenger usage. While the monetary cost of using these systems is low for both categories of users, transit officials have failed to recognize that luggage handling and convenience are important service attributes for air travelers and lack of such requirements may outweigh the low monetary cost when travelers make a ground access choice. Additionally, routing lines to service both the air traveler and business traveler while keeping connections convenient and timely is a challenge that only recently has been addressed with some success.

Service Philosophy

Service philosophy may also be a controllable factor which has a significant impact on market shares produced by rail transit links or by other types of transit services to the airport. Many transit agencies are reluctant to develop airport service because they feel it is for the principal benefit of the air traveler versus the general population of the metropolitan area and that such services should be paid for by the airport authority. This mentality generally results in a low priority status for airport links let alone airport rail links.

When transit authorities do provide service to the airport, they feel that in order to get the buy-in of their constituencies they must present it as an overall commutation service. Consequently, the service is designed with a dual purpose in mind, but often lacks the service amenities needed by air travelers. If mixed passenger usage is indeed required, then transit authorities need to develop ways to distinguish the needs of different segments and provide necessary service differences. Otherwise, the rail link will continue to attract limited market shares and have under utilization of the system by these market segments.

Parking Fees

Other significant controllable factors are items like parking fees at airport facilities. Airport authorities are often reluctant to increase parking fees to high levels which discourage the use of on-site parking and decrease airport facility revenue. However, the higher such fees, the greater the use of transit facilities.

The competition is another significant factor which limits the potential for rail transit. It is difficult for rail transit to outperform the private automobile, taxi and private limousine service, and express and direct bus service. Besides the issue of subsidies these particular modes of transportation can be in many circumstances more effectively utilized for the trip from diverse multiple origins and destinations to the airport location. In addition, the particular characteristics of this mode may facilitate the traveler arriving more conveniently and closer to their actual check-in location at the airport.

The evidence which is available suggests that rail transit links from the CBD to the airport have failed to win acceptance among the market segments which could potentially utilize this service. The evidence suggests that this service appeals to market segments consisting of price conscience travelers and airport employees. Airport links have failed to clearly broaden their appeal to other market segments in spite of marketing dollars and heighten awareness, because of the service limitations of the system and high discretionary income characteristics of non-users. It is possible to speculate that even if service limitations were removed, significant increases in ridership would not occur among present day non-users.

At the same time, the claims of various critics that airport rail links have had favorable environmental impacts, is a claim that lacks documentation. The low number of actual riders and the relatively low market share of total metropolitan trips to the airport would suggest that its impact on environmental air quality seems minimal. Rather than viewing airport links as a panacea to environmental problems, it may be well to suggest that an airport rail link is one weapon in a portfolio of tools designed to improve environmental quality.

Perhaps the strongest arguments that can be made for airport rail links revolve around mobility, employment opportunities, economic development, and an opportunity to guide and develop transportation corridors better. Transit alternatives such as rail seem to offer better mobility to precisely those who need it. Further, there seems to be some evidence that they use it. Similarly, these transit operations do offer employment opportunities as well as access for lower socio-economic classes to share the employment generated by airports.

Agencies in some locations have viewed rail links as tools of economic development. They feel that the development of a rail link almost automatically increases the value of real estate

adjacent to station stops by increasing the flow of economic activity which is centered around these stops. Besides stipulating activity at the various station stops of these facilities, there is also substantial activity at the terminal.

Some locations have suggested that a rail link or other transportation investment is an excellent guide to growth in underdeveloped corridors. Rail links specifically have the opportunity to determine the nature, location and type of growth through the locations, number, and nature of stations.

With these caveats in mind, rail transit probably has a significant role in the ground access plan for certain North American airport locations over the long term i.e., beginning in the early 21st Century. The precise data of start-up and the accompanying lead time is likely a function of the level of operating deficits, service convenience and competitiveness, corridor development, and the willingness of the public to accept disincentives which view the automobile as a less than desirable environmental factor. More importantly, the 21st Century rail linkage is likely to be much more successful if developed as part of an existing overall rail transit system.

Recommendation #2: Remove barriers and create incentives to companies offering commercial multi-occupancy vehicles service at North American locations should be reviewed. Changes to state and local statutes and regulations should be investigated, where appropriate, to encourage better utilization of existing highway capacity through greater use of multi-occupancy vehicles.

The key to reducing access highway congestion is to increase utilization of multi-occupancy vehicles of all types. The higher the proportion of multi-occupancy vehicles, the less highway capacity and transportation investment will be needed over time.

In the area of commercial multi-occupancy vehicles, such as taxi and limousine services, the Public Utility Commissions have liberalized their rules. However, there are still barriers to the development of commercial services. In a fully competitive market, the demands of the customers control the schedules, prices, capacity, and types of services. Economic regulation

potentially hinders free markets. While some regulation of commercial multi-occupancy services for the protection of the public (e.g., safety), are necessary there are opportunities to re-examine regulatory barriers and other disincentives. If the barriers are economic in nature, there may be regulatory changes which can be made to foster a fully competitive market.

The entity which reviews these barriers and disincentives may be a special task force lead by an existing agency. Agencies involved in this review should include the transportation staff of the Public Utility Commission, airport ground transportation personnel, officials of the State Departments of Transportation, Metropolitan Regional Transportation Districts, local Metropolitan Planning Organizations, and commercial vehicle operators. The purpose of the task force will be to pro-actively offer recommendations for policy modifications which will benefit and encourage multi-occupancy vehicles serving North American airport locations. Recommendations which have the effect of liberalizing or encouraging multi-occupancy vehicles may have favorable impacts on air quality and the required amounts of highway capacity.

Recommendation #3: There is a need to coordinate courtesy shuttle/hotel van service at many North American airports.

Privately-owned shuttle services, such as hotel courtesy vans, rental car shuttles, tour service shuttles, have the potential to make a major impact on ground transportation access. The percent of ground access traffic served by shuttle and van services is of course dependent upon the airport with low-end shares being 3%-5% and high-end shares being 7%-12%. Cleveland recorded a 21% share for van service, but much of this does come from rental car vans.

A coordinating agency or mechanism is needed to bring together representatives from the State Departments of Transportation, Public Utilities Commissions, the Regional and Metropolitan Transportation Districts, the local Metropolitan Planning Organizations, airport authorities, transit operators, and hotel operators to review, coordinate, and enhance existing plans for privately-owned hotel/courtesy van services in the area. Plans for incentives, access fees, license/operating fees, and allowable schedules should be reviewed and enhanced by the task force.

Recommendation #4: Airport locations need to collect data which clearly identifies market segments and to assess users' travel behavior characteristics and service requirements.

The modal-share data collected nationally show that public transportation alternatives to airport ground access do not capture large markets. In situations where public transportation has gained ridership shares above the national average, key factors have usually been assessed: (1) origin and destination and (2) customer need. Assessing these factors provides empirical basis for transportation alternatives to the auto that are convenient, comfortable, safe, and reliable.

Customer needs studies are excellent starting points from which to develop multiple occupancy rubber tire alternatives. Such studies, as opposed to a traditional origin and destination study, identify market segments and their travel behavior characteristics. Major market segments identified should include business air travelers, airport employees, recreational visitors, occasional travelers, and meeters/greeters. The study collects demographic, psychographic, and travel behavior data. Particular care must be taken to capture the data accurately; for example, most business travelers begin or end their trip not from a place of business, but from home. Airport employees need to be divided into detailed classifications: primary personnel (pilots and flight attendants), secondary personnel (mechanics, agents, baggage handlers), and tertiary personnel (business workers who operate adjacent to the airport). Analysis of the data should reveal potential markets for public transportation and the needs of each market segment. Particular attention should be paid to identifying requirements for transit time and travel convenience.

Officials should create a system for gathering and analyzing ground access data at the customer level, with a view toward providing a responsive access system. Profiles should be assembled using demographic and psychographic analysis, and should include conclusions regarding the importance of such issues as convenience, safety, and transit time. Travel convenience entails many different factors including door-to-door service, baggage handling, headways, physical condition of the vehicle, and driver assistance.

This information should be gathered directly from ground access users. Instruments may include surveys (written and/or verbal), and may range to "frequent flyer cards" which could be swiped at the point of sale. In addition, it may be possible to assemble some of this information from vehicle identification systems which automatically collect parking data and commercial vehicle data.

Recommendation #5: Based on the results of the study of market segments and travel behavior, assess the feasibility of developing public transportation alternatives which appear generally to have worked in other cities and are responsive to the service requirements of travelers.

Express bus service has proved successful in Boston. Using qualitative data for market analysis and outside contractors for services has created a growing demand for quick and efficient service. This is an excellent example of how such studies aid public and private sectors on working together to create new options.

Super shuttles have provided door-to-door van service which is successfully meeting the needs of passengers in the California market. While the market shares are low, the shuttles have seemingly delivered the right type of service at the right price to display significant growth potential.

Express bus terminals (or "park-and-rides") should provide long-term parking, and should also accommodate the needs of meeters and greeters, if possible, in order to provide for the rituals associated with meeting travelers and bidding them farewell (moving these rituals off the airport grounds, if possible).

An inter-modal connection center, such as the one proposed for Miami, could serve as a central transfer point for regional trips and become an extension of an airport's land side terminal functions. Modes of access which may be a part of the inter-modal center rail (local, light rail, and intercity rail), buses for local as well as regional routes, an airport people-mover to connect with the airport's main terminal, rental cars, taxis, and others.

Recommendation #6: Develop a demonstration project which provides seamless public transportation service between remote terminals and airports.

While there is obviously a need for public transportation ground access service at airport locations, it is recommended that transit agencies and airports seek funding for the development and implementation of a cooperative seamless public transportation service as a demonstration project. This service would operate from small remote terminals in metropolitan areas and would provide the highest levels of service in terms of multi-occupancy ground access. In particular, the service should provide a premium service at a commensurate price. Ideally, this service should include door-to-remote-terminal service, remote check-in of passengers and baggage, and quick and efficient service to the airport. The demonstration service would be assessed to determine its impact in terms of ridership, pricing, service quality, and external factors, such as air quality.

A well-publicized and user-friendly service operating from either of these areas would have every opportunity for success, and would provide a good model for expansion of the concept to future locations. Further, it would provide important information about the demographics of potential new ridership for a seamless service. It would also determine what level of service should be provided and the inherent problems in providing those services.

Recommendation #7: Recognize the need for a marketing strategy for ground access providers at airport locations which is holistic in nature. Develop, market, and promote existing and new public sector ground access services which are responsive to customer needs. Investigate the feasibility of public-private partnerships that promote private sector ground access services.

The provision of ground access services is the domain of both public and private providers. A review of ground access lessons around the country suggests that both types of providers benefit from a carefully developed macro-marketing strategy based on a thorough knowledge of available markets. Few public or private sector organizations truly understand all aspects of their markets, are willing to make modifications in services, and initiate through marketing

campaigns. There is a need for a dialogue between public and private sector participants to develop effective marketing strategies.

A marketing campaign to entice the people to try public systems is necessary to build a customer base. Follow-up advertising is needed to maintain loyal passengers. In order for advertising to be effective, one must know the market segment characteristics prior to developing a campaign. Once the characteristics are known, the appropriate market segments can be targeted. The focus on these target markets must be maintained over time. One technique is to advertise systems directly to their users, which is particularly feasible if a database instrument (such as an electronic frequent-user card) can be used at the point of sale. Frequent user cards could be swiped at the bus box or park-and-ride location.

An important aspect of travel convenience is familiarity with the ground access system. Proper and attractive signage can go far toward promoting a market-responsive ground-access system. Information kiosks located inside airports can direct travelers to ground access alternatives and other businesses. Consistent and unique use of vehicle color and type assists the public in identifying the service. Finally, advertising can be directed at particular market segments of air travelers. An example is to include advertising in any visitor or tourism publications.

There is also a need to investigate public-private partnerships which link the information of the public sector with the talents of the private sector providers. For example, airports and regional or metropolitan transportation districts have the capability to provide substantial information to private sector operators about existing and potential markets of ground access ridership. In addition, they have the capability to serve as central focus points for direct dial phone lines providing ground access information for both the public and private services. The public interest is maximizing ground access through environmentally acceptable means: a goal which is shared by private sector operators.

Recommendation #8: Develop a focal point, or designated agency, to develop and maintain a continuous service quality program that measures how well the transportation system satisfies customer needs and identifies ways in which the service can be improved.

An integral component of any public transportation service is a continuous assessment of overall service quality. Service quality measurement provides important feedback regarding user satisfaction and management's ability to deal with the needs of the customers. If collected properly, service quality data pinpoints weaknesses in the service and the information needed to improve service. Essential to service quality are user satisfaction surveys and quality of service measurements. These instruments should measure how well the transportation system meets key criteria, such as convenient schedules and headways, acceptable transit time, reliability of transit time and physical comfort as well as other user expectations. Equal effort should be spent understanding why the service is not used by certain market segments. This information is needed to understand what measures are necessary to increase ridership. In order for this assessment to be effective, one entity should be given responsibility of the service quality program. This person, company, or agency should be objective and not attached to any of the major stakeholders in airport ground access.

Conclusion:

Meeting the objective of providing a fully-responsive ground access system requires a market-driven approach to developing and promoting rubber-tire transportation alternatives to the automobile. Many airports service a large region which contains different market segments for transportation services. Developing transportation alternatives that come close to matching the convenience and safety of the automobile is a goal that is within reach and is shared by municipalities and the general public. Given the information municipalities have on local opportunities, lessons learned by cross-airport ground access analysis, and the results of market analyses, transportation services can be explored which have the potential to be modes of choice for airport access for a significant share of air travelers, airport employees, and employees working near the airport.

FUNDING RECOMMENDATIONS

Overview:

As explored in the previous chapter, the share provided by the federal government of funding for airport access initiatives is steadily decreasing. Taking action to fill the void created by dwindling federal resource allocation will be critical to the success of ground access initiatives.

The primary funding objective must be to assemble sufficient funding to provide for the creation of appropriate ground access systems, using whatever creative means are necessary. The importance of this goal is obvious.

Two key strategies for achieving the system's funding objective are recommended. First, officials must continue to stress an airport's importance as an economic engine for their area, positioning the airport (and ground access) as critical state transportation issues. Accomplishing this is crucial to the creation of the strong public support necessary to implement appropriate programs. Ultimately, successful ground access programs are easier if airports are perceived as economic engines delivering wide-ranging benefits.

The second recommended strategy is critical: The responsible agencies, including State Departments of Transportation, must take care to ensure that airport access initiatives are linked in a regional sense to the area's overall transportation infrastructure. The potential conflict between commuters and airport travelers is a powerful force to be reckoned with, but can be mitigated by blending airport access into the overall corridor approach to transportation planning in the region. When an initiative enjoys popularity among commuters, the likelihood of significant political support for the program is high; this is crucial to the program's viability, and will be the key to assuring implementation of appropriate ground access systems.

The cost of developing the transportation infrastructure is high. Initial funding is needed from the region. Once developed, however, the opportunity exists to partially recover the cost of developing the transportation infrastructure from those who benefit from it.

From the perspective of these key strategies come several recommendations:

Recommendation 9: Use existing state and regional resources to support the development of a regional transportation infrastructure which includes provisions for airport ground access.

Since most airports represent a huge investment to the people of the areas they are located in, it may be possible to secure strong regional support, as well as statewide support, for funding the development of a transportation infrastructure for an airport access system. By positioning the airport as an economic engine for the region and the state, the airport becomes an integral part of a state's growth strategy.

An in-depth economic impact study should be conducted to measure the financial impact of an airport on the local economies. The results of the economic impact study could be used to initiate a campaign for the use of existing state and regional resources to enhance ground access. Other potential sources of funds may also exist, including revenue generated by other study recommendations.

Recommendation #10: Pursue Federal, State, or regionally funded demonstration projects which deal with airport ground access.

Federal funds for highway development are limited and decreasing. However, federal funding opportunities have traditionally existed, particularly for new and innovative projects. For example, San Francisco is pursuing federal funding for an SLRT demonstration project. Pittsburgh received FAP funds for an airport toll road. Las Vegas received funding from CMAQ for an airport access park-and-ride program. For regional highway projects that result in increased multiple-occupancy vehicle capacity or innovative demonstration projects, federal funding and other demonstration grants should be pursued. Despite limited funding opportunities at the Federal level, airport ground access is an area which offers unique opportunity for experimentation at the state and regional level.

Recommendation #11: "Bank" land for future airport ground access projects.

As an airport matures, there is likely to be a need for additional land either adjacent to the airport or in corridors leading towards the site. "Land banking" has been an important peripheral funding aid in several U.S. cities. Acquiring land at current prices will represent a significant savings when future systems are built. On occasion, rights-of-way can be acquired inexpensively from utility companies, land developers, and railways that have abandoned old lines. The effect of land-banking is not only preservation of rights of way, but also guidance of corridor growth.

Both this recommendation and #10 provide opportunities for public-private partnerships. In St. Louis land was transferred from the private sector to the public sector to serve as the local match for federal funds used for the construction of the MetroLink rail transit system. There is no reason why land cannot be transferred from the private sector to the public sector and banked as a source of future local matching funds.

Recommendation #12: Initiate a dialogue with airport authorities and other transportation organizations regarding the use of passenger facility charges for airport ground access initiatives.

For most airports it is very likely there will be a need to use passenger facility charges (PFCs) to support the airports. However, it seems to be possible to divert PFC revenues to support airport ground access improvement projects. Traditionally, PFCs could only be used to fund transportation projects on airport grounds. However, transportation planners in New York and Boston are trying to pry these funds loose for off-airport projects. New York is attempting to develop a dedicated rail line between Manhattan and their airports using PFCs. Boston is connecting PFC uses to air quality improvement projects related to mass transit and airport ground access in order to use PFC money.

Designation of a small portion of passenger facility charges (PFCs) could represent a significant source of funding for airport access projects. While future availability of PFC funds for funding off-airport transit projects is questionable, the feasibility of this option should be explored as improvement occurs in airport revenue streams.

Recommendation #13: Explore the feasibility of creating special tax districts in the area around and adjacent to the main corridors accessing major airports.

The purpose of the special tax districts would be to pay for transportation improvements in the area. The creation of a special district will allow bonds to be sold which could be used for transportation improvements in airport access corridors. These funds will facilitate regional transportation planning which focuses on these corridors as a means of access to the airport. The creation of special tax districts will provide relatively painless revenue streams to finance state bond initiatives.

Recommendation #14: Explore the possibility of incorporating zoning fees as a funding source for ground access.

There is considerable development adjacent to airports. Since private sector developers will benefit from airport and public infrastructure investment near it, zoning fees can be used as a means for partially recouping development costs.

Conclusion:

Officials will be forced to come up with creative funding mechanisms to supply resources which previously could be obtained from the federal government. These recommendations provide some such creative solutions.

INTER-AGENCY COOPERATION RECOMMENDATIONS

Overview:

In order to effectively implement ground access solutions, various organizations must work cooperatively together. Since the variety of agencies involved in airport access projects have diverse (often conflicting) agendas and missions, this can be difficult. However, nothing is

more important to the creation of effective ground access systems than an adequate level of inter-agency cooperation.

The primary inter-agency objective should be to ensure that the challenges of working across organizational boundaries do not create significant hurdles to program success. This does not mean that agencies must work in perfect harmony, only that an adequate level of cooperation must exist between and within organizations.

Achieving this objective would require different strategies in different cities, since the structure of metropolitan cities varies greatly.

Throughout this study it has become apparent that many if not most successful systems were championed by a leader or lead-agency with a clear mission to make the airport accessible. The lead agency should be a coalition of important agencies and organizations.

Recommendation #15: Use a Transportation Policy Committee housed in a metropolitan planning organization or other agency as a mechanism for creating a coherent and clear vision of the future transit system for the region, including appropriate airport ground access.

The organization of transportation agencies within a particular airport service area generally reflect a traditional orientation toward transportation planning. State Departments of Transportation primarily control highways, with some involvement in transit; regional and local transit districts control bus and rail within their district; State Regulatory Authorities often regulate taxi and van service; and hotels control their own van services. Most metropolitan planning organizations conduct inter-modal transportation planning, but have no operational control. This committee, while embodying diverse modal solutions, has yet to enlist the support of all organizations in multi-modal approaches to the ground access issue. Now is the time for such committees to re-energize themselves by including City and County airport officials as well others from the region who represent the ground access issues for their areas. Clearly there is a need for either this Committee or another focal point to develop a unified vision of this issue.

Conclusion:

There is no way to force effective inter-agency cooperation. However, failing to consider this aspect of the ground access problem can cause serious delays and even failure in the implementation process. A strong leader with a clear and unified vision of the final project result will go far toward mitigating this possibility.

DECISION PROCESS RECOMMENDATIONS**Overview:**

The process by which ground access decisions are made can make or break the delivery of an effective system. In order to create a system which is both intelligent and politically viable, planners must consider a wide variety of variables; careful and appropriate consideration of all variables can help facilitate the ensuing exchanges which comprise the decision process.

The objective of a smooth decision process is to anticipate the needs of all contributing stakeholders by considering all pertinent decision variables. When this is achieved, the process runs as smoothly as possible.

The recommended overall process strategy involves using both quantitative and qualitative methods to take all salient variables into full account. Contrary to what may be intuitive, most access programs are designed based primarily on qualitative data rather than quantitative analysis. However, blending both sources, where possible, is prudent.

Considering this basic strategy, the following recommendations are made:

Recommendation #16: Enhance the quantitative and qualitative capabilities of local and regional multi-modal transportation planning models.

There is a need to develop quantitative and qualitative models for evaluating groundness and ground access related projects. For example, quantitative modeling techniques such as traditional urban transportation models require modification to recognize airport facilities as

specific trip generators. Such attempts are currently underway in a small number of metropolitan areas such as San Francisco.

Qualitative analysis has also become increasingly important in recent years as a method to understand the market needs in a multi-modal transportation planning environment. Such techniques lend important credibility to efforts which seek to understand public perceptions and attitudes about transportation decision alternatives. There exists an opportunity to be in the forefront of incorporating qualitative techniques in multi-modal transportation planning. Miami has made substantial progress in this area and potentially warrants emulation.

Multi-modal transportation planning and its applications to ground access issues are at the infantile state of development in all areas of the country. The key to making progress in multi-modal planning requires modification of existing quantitative techniques to recognize new economic realities as well as the hard to quantify needs of a 21st Century public.

Recommendation #17: Existing processes and committees responsible for developing transportation multi-modal models should focus on ground access; if existing processes fail, other bodies may be constituted to oversee model development.

There are many processes currently in place that develop data models. However, data collected and analyzed behind closed doors often lead to results that do not support a given agency's advocated position; such analysis is then subject to disbelief and rejection by the doubting agency. Furthermore, modal choice and travel demand forecasting models are necessarily restricted in their ability to analyze a wide range of socio-economic factors. Again, the outcomes of these assessments are subject to disbelief.

In Miami, the decision process is aided by the work of a technical advisory committee which develops and operates the multi-modal model with the assistance and full participation of transportation and municipal agencies. The openness and fairness of the process guarantees that all transportation alternatives are evaluated consistently, and without bias. This is critical to a smooth and effective decision process. Arguments over modeling results and data validity are avoided by building consensus among all parties regarding model formulation and

calibration prior to actual data analysis. If the results of the data analysis are inconclusive or misleading, then the committee should review the model formulation and calibration stages. Only if consensus is reached should the models be modified.

If the current processes (or committees) do not work efficiently or effectively, perhaps another body should be constituted to oversee the development of multi-modal models. This body should have broad representation matching that of the expanded Policy Advisory Committee described above.

Recommendation #18: At a designated focal agency or organization, maintain a detailed and comprehensive description of airport ground access system operations, results of multi-modal modeling, and market survey findings.

Multi-modal modeling and data analysis will be used to evaluate many alternative proposals for improving airport ground access. The proposals will be evaluated on many different dimensions, including air quality, cost, public demand and need, land use, congestion, and travel time. The evaluation of each proposal will need to be matched against the evaluation of competing proposals. In turn, winning proposals will need to be evaluated collectively as a portfolio to determine if all local and regional goals are satisfied. Project status data is needed to track development, and service quality information is needed to assess project success and to identify future improvements.

The magnitude of this task requires computer support for organizing, documenting, and communicating the results of in-depth analyses of ground access issues. Recent advances in telecommunications and computer technology have made it possible to provide Transportation Policy Committees, Technical Advisory Committees, and their support personnel with on-line computer access to multimedia representations ground access trends and data, study recommendations, and planned projects.

The prototype Executive Information System enables decision makers to review decisions, public demands and needs, and the overall performance of the airport ground access system. A demonstration prototype of this system was developed by the project team at the University

of Colorado at Denver. The contents of this prototype system included information from the Public Utilities Commission (schedules of van/limo services, service areas and routes, daily capacity, etc.), the Department of Transportation (highway volumes in and around DIA, vehicle identification system data), the Regional Transportation District (schedules, routes, fees, passengers, etc.) and the Denver International Airport (takeoffs and landings, passengers, carrier market share, parking, ground transportation, etc.).

Recommendation #19: Enhance public involvement in the decision process.

A variety of tools have been used for this purpose in cities where ground access initiatives were successful. Among these tools are environmental impact scoping meetings, public relations campaigns, and traveler focus groups. Metropolitan Planning Organizations' and other agencies' officials should incorporate these tools in the decision process in order to facilitate public support and interagency cooperation within the process. Community support is essential to making improvements to ground access.

Public meetings alone are not public involvement. There are a wide variety of methodologies to develop community support, which are typically referred to as public involvement efforts. One successful combination of techniques utilized in Colorado has featured wide-ranging telephone surveys with the results more fully explained by focus groups. This technique was pioneered in the recent statewide transportation planning effort in Colorado, described in a document entitled, "Developing a Customer Focus in the Statewide Transportation Planning Process: Phase III Recommendations," available from the Colorado Department of Transportation.

Conclusion:

Collecting and incorporating data which support a variety of stakeholder needs and concerns is an important step toward ensuring the smoothest decision process possible. Management of the data collection process and data analysis must be done cooperatively and with full participation of important transportation and municipal agencies. As long as separate agencies and stakeholders continue to build their own models, conflict regarding data and analyses will

continue. These recommendations are aimed at creating a shared database of credible information.

APPENDIX A
INTERVIEW LIST

THESE PEOPLE CONTRIBUTED TO THE ASSESSMENT OF ISSUES FOR
THE FIRST PHASE OF THE STUDY. THOSE ISSUES ARE LISTED IN
CHAPTER ONE OF THIS REPORT.

David Basket, Regional Transportation District (RTD)

Peggy Catlin, HNTB

Janice Finch, Colorado Department of Transportation (CDOT)

DuWayne Ebertowski, Federal Highway Administration (FHWA) - Colorado
Division

Jeff May, Denver Regional Council of Governments (DRCOG)

Terry Rosapep, City and County of Denver

Audrey Wilkins, City and County of Denver