

TCRP

REPORT 83

TRANSIT
COOPERATIVE
RESEARCH
PROGRAM

Strategies for Improving Public Transportation Access to Large Airports

Sponsored by
the Federal
Transit Administration



TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

**TCRP OVERSIGHT AND PROJECT
SELECTION COMMITTEE**
(as of June 2002)

CHAIR

LINDA S. WATSON
Corpus Christi RTA

MEMBERS

DANNY ALVAREZ
Miami-Dade Transit Agency
KAREN ANTION
Karen Antion Consulting
GORDON AOYAGI
Montgomery County Government
JEAN PAUL BAILLY
Union Internationale des Transports Publics
J. BARRY BARKER
Transit Authority of River City
RONALD L. BARNES
Central Ohio Transit Authority
LINDA J. BOHLINGER
HNTB Corp.
ANDREW BONDS, JR.
Parsons Transportation Group, Inc.
JENNIFER L. DORN
FTA
NATHANIEL P. FORD, SR.
Metropolitan Atlanta RTA
CONSTANCE GARBER
York County Community Action Corp.
FRED M. GILLIAM
Capital Metropolitan Transportation Authority
SHARON GREENE
Sharon Greene & Associates
KATHERINE M. HUNTER-ZAWORSKI
Oregon State University
ROBERT H. IRWIN
British Columbia Transit
JOYCE HOBSON JOHNSON
North Carolina A&T State University
CELIA G. KUPERSMITH
*Golden Gate Bridge, Highway and
Transportation District*
PAUL J. LARROUSSE
National Transit Institute
DAVID A. LEE
Connecticut Transit
CLARENCE W. MARSELLA
Denver Regional Transportation District
STEPHANIE L. PINSON
Gilbert Tweed Associates, Inc.
ROBERT H. PRINCE, JR.
DMJM+HARRIS
JEFFERY M. ROSENBERG
Amalgamated Transit Union
RICHARD J. SIMONETTA
pbConsult
PAUL P. SKOUTELAS
Port Authority of Allegheny County
PAUL A. TOLIVER
King County Metro

EX OFFICIO MEMBERS

WILLIAM W. MILLAR
APTA
MARY E. PETERS
FHWA
JOHN C. HORSLEY
AASHTO
ROBERT E. SKINNER, JR.
TRB

TDC EXECUTIVE DIRECTOR

LOUIS F. SANDERS
APTA

SECRETARY

ROBERT J. REILLY
TRB

TRANSPORTATION RESEARCH BOARD EXECUTIVE COMMITTEE 2002 (Membership as of July 2002)

OFFICERS

Chair: *E. Dean Carlson, Secretary of Transportation, Kansas DOT*
Vice Chair: *Genevieve Giuliano, Professor, School of Policy, Planning, and Development, USC, Los Angeles*
Executive Director: *Robert E. Skinner, Jr., Transportation Research Board*

MEMBERS

WILLIAM D. ANKNER, *Director, Rhode Island DOT*
THOMAS F. BARRY, JR., *Secretary of Transportation, Florida DOT*
MICHAEL W. BEHRENS, *Executive Director, Texas DOT*
JACK E. BUFFINGTON, *Associate Director and Research Professor, Mack-Blackwell National Rural
Transportation Study Center, University of Arkansas*
SARAH C. CAMPBELL, *President, TransManagement, Inc., Washington, DC*
JOANNE F. CASEY, *President, Intermodal Association of North America*
JAMES C. CODELL III, *Secretary, Kentucky Transportation Cabinet*
JOHN L. CRAIG, *Director, Nebraska Department of Roads*
ROBERT A. FROSCH, *Sr. Research Fellow, John F. Kennedy School of Government, Harvard University*
SUSAN HANSON, *Landry University Prof. of Geography, Graduate School of Geography, Clark University*
LESTER A. HOEL, *L. A. Lacy Distinguished Professor, Depart. of Civil Engineering, University of Virginia*
RONALD F. KIRBY, *Director of Transportation Planning, Metropolitan Washington Council of Governments*
H. THOMAS KORNEGAY, *Exec. Dir., Port of Houston Authority*
BRADLEY L. MALLORY, *Secretary of Transportation, Pennsylvania DOT*
MICHAEL D. MEYER, *Professor, School of Civil and Environmental Engineering, Georgia Institute of
Technology*
JEFF P. MORALES, *Director of Transportation, California DOT*
DAVID PLAVIN, *President, Airports Council International, Washington, DC*
JOHN HEBENSDORF, *Vice Pres., Network and Service Planning, Union Pacific Railroad Co., Omaha, NE*
CATHERINE L. ROSS, *Executive Director, Georgia Regional Transportation Agency*
JOHN M. SAMUELS, *Sr. Vice Pres.-Operations Planning & Support, Norfolk Southern Corporation,
Norfolk, VA*
PAUL P. SKOUTELAS, *CEO, Port Authority of Allegheny County, Pittsburgh, PA*
MICHAEL S. TOWNES, *Exec. Dir., Transportation District Commission of Hampton Roads, Hampton, VA*
MARTIN WACHS, *Director, Institute of Transportation Studies, University of California at Berkeley*
MICHAEL W. WICKHAM, *Chairman and CEO, Roadway Express, Inc., Akron, OH*
M. GORDON WOLMAN, *Prof. of Geography and Environmental Engineering, The Johns Hopkins University*

EX OFFICIO MEMBERS

MIKE ACOTT, *President, National Asphalt Pavement Association*
REBECCA M. BREWSTER, *President and CEO, American Transportation Research Institute, Atlanta, GA*
JOSEPH M. CLAPP, *Federal Motor Carrier Safety Administrator, U.S.DOT*
THOMAS H. COLLINS (Adm., U.S. Coast Guard), *Commandant, U.S. Coast Guard*
JENNIFER L. DORN, *Federal Transit Administrator, U.S.DOT*
ELLEN G. ENGLEMAN, *Research and Special Programs Administrator, U.S.DOT*
ROBERT B. FLOWERS (Lt. Gen., U.S. Army), *Chief of Engineers and Commander, U.S. Army Corps of
Engineers*
HAROLD K. FORSEN, *Foreign Secretary, National Academy of Engineering*
JANE F. GARVEY, *Federal Aviation Administrator, U.S.DOT*
EDWARD R. HAMBERGER, *President and CEO, Association of American Railroads*
JOHN C. HORSLEY, *Exec. Dir., American Association of State Highway and Transportation Officials*
MICHAEL P. JACKSON, *Deputy Secretary of Transportation, U.S.DOT*
ROBERT S. KIRK, *Director, Office of Advanced Automotive Technologies, U.S. DOE*
WILLIAM W. MILLAR, *President, American Public Transportation Association*
MARGO T. OGE, *Director, Office of Transportation and Air Quality, U.S. EPA*
MARY E. PETERS, *Federal Highway Administrator, U.S.DOT*
JEFFREY W. RUNGE, *National Highway Traffic Safety Administrator, U.S.DOT*
JON A. RUTTER, *Federal Railroad Administrator, U.S.DOT*
WILLIAM G. SCHUBERT, *Maritime Administrator, U.S.DOT*
ASHISH K. SEN, *Director, Bureau of Transportation Statistics, U.S.DOT*
ROBERT A. VENEZIA, *Earth Sciences Applications Specialist, National Aeronautics and Space Administration*

TRANSIT COOPERATIVE RESEARCH PROGRAM

Transportation Research Board Executive Committee Subcommittee for TCRP
E. DEAN CARLSON, *Kansas DOT (Chair)*
JENNIFER L. DORN, *Federal Transit Administration, U.S.DOT*
GENEVIEVE GIULIANO, *University of Southern California, Los Angeles*
LESTER A. HOEL, *University of Virginia*
WILLIAM W. MILLAR, *American Public Transportation Association*
JOHN M. SAMUELS, *Norfolk Southern Corporation, Norfolk, VA*
ROBERT E. SKINNER, JR., *Transportation Research Board*
PAUL P. SKOUTELAS, *Port Authority of Allegheny County, Pittsburgh, PA*
MICHAEL S. TOWNES, *Transportation District Commission of Hampton Roads, Hampton, VA*

TCRP REPORT 83

**Strategies for Improving
Public Transportation
Access to Large Airports**

LEIGH FISHER ASSOCIATES
San Mateo, CA

in association with

MATTHEW A. COOGAN
White River Junction, VT

and

MARKETSENSE
Boston, MA

SUBJECT AREAS

Public Transit • Aviation • Planning and Administration

Research Sponsored by the Federal Transit Administration in Cooperation with the Transit Development Corporation

TRANSPORTATION RESEARCH BOARD

WASHINGTON, D.C.

2002

www.TRB.org

TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions*, published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transportation Association (APTA), *Transportation 2000*, also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA; the National Academies, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

Research problem statements for TCRP are solicited periodically but may be submitted to TRB by anyone at any time. It is the responsibility of the TOPS Committee to formulate the research program by identifying the highest priority projects. As part of the evaluation, the TOPS Committee defines funding levels and expected products.

Once selected, each project is assigned to an expert panel, appointed by the Transportation Research Board. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, TCRP project panels serve voluntarily without compensation.

Because research cannot have the desired impact if products fail to reach the intended audience, special emphasis is placed on disseminating TCRP results to the intended end users of the research: transit agencies, service providers, and suppliers. TRB provides a series of research reports, syntheses of transit practice, and other supporting material developed by TCRP research. APTA will arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by urban and rural transit industry practitioners.

The TCRP provides a forum where transit agencies can cooperatively address common operational problems. The TCRP results support and complement other ongoing transit research and training programs.

TCRP REPORT 83

Project B18-A FY'99
ISSN 1073-4872
ISBN 0-309-06764-2
Library of Congress Control Number 2002112461

© 2002 Transportation Research Board

Price \$21.00

NOTICE

The project that is the subject of this report was a part of the Transit Cooperative Research Program conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council. Such approval reflects the Governing Board's judgment that the project concerned is appropriate with respect to both the purposes and resources of the National Research Council.

The members of the technical advisory panel selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and while they have been accepted as appropriate by the technical panel, they are not necessarily those of the Transportation Research Board, the National Research Council, the Transit Development Corporation, or the Federal Transit Administration of the U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical panel according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

Special Notice

The Transportation Research Board, the National Research Council, the Transit Development Corporation, and the Federal Transit Administration (sponsor of the Transit Cooperative Research Program) do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the clarity and completeness of the project reporting.

Published reports of the

TRANSIT COOPERATIVE RESEARCH PROGRAM

are available from:

Transportation Research Board
Business Office
500 Fifth Street, NW
Washington, DC 20001

and can be ordered through the Internet at
<http://www.national-academies.org/trb/bookstore>

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. On the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Bruce M. Alberts is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. William A. Wulf is president of the National Academy of Engineering.

The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, on its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both the Academies and the Institute of Medicine. Dr. Bruce M. Alberts and Dr. William A. Wulf are chair and vice chair, respectively, of the National Research Council.

The **Transportation Research Board** is a division of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's mission is to promote innovation and progress in transportation by stimulating and conducting research, facilitating the dissemination of information, and encouraging the implementation of research results. The Board's varied activities annually engage more than 4,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation. **www.TRB.org**

www.national-academies.org

COOPERATIVE RESEARCH PROGRAMS STAFF

ROBERT J. REILLY, *Director, Cooperative Research Programs*
CHRISTOPHER JENKS, *TCRP Manager*
DIANNE S. SCHWAGER, *Senior Program Officer*
EILEEN P. DELANEY, *Managing Editor*
ANDREA BRIERE, *Associate Editor*

PROJECT PANEL B-18A

Field of Service Configuration

MICHELE L. JACOBSON, *Lea & Elliot, Inc., San Francisco, CA* (Chair)
ZALE ANIS, *Volpe Center, Cambridge, MA*
CHRISTINA CASGAR, *Foundation for Intermodal Research and Education, Greenbelt, MD*
RICHARD C. FEDER, *Port Authority of Allegheny County, Pittsburgh, PA*
GRACE HUGHES, *Marin Airporter, San Rafael, CA*
LAURENCE KIERNAN, *Federal Aviation Administration*
ALFRED LAGASSE, *International Taxicab and Livery Association*
JEROME M. LUTIN, *New Jersey Transit Corporation*
RICHARD MARCHI, *Airport Council International, Washington, DC*
TERESITA WAGNER, *Miami-Dade Aviation Department*
SCOTT A. BIEHL, *FTA Liaison Representative*
DAVID VOZZOLO, *FTA Liaison Representative*
ARTHUR L. GUZZETTI, *APTA Liaison Representative*
JOSEPH A. BREEN, *TRB Liaison Representative*

FOREWORD

*By Dianne S. Schwager
Staff Officer
Transportation Research
Board*

This report will be of interest to individuals involved in planning and implementing improved public transportation access to large airports. The report presents the results of the second phase of a two-part research effort. The results of the first phase of the research were published as *TCRP Report 62: Improving Public Transportation Access to Large Airports*. The two reports provide considerable information and practical guidance.

Under TCRP Project B-18A, “Strategies for Improving Public Transportation Access to Large Airports,” the research team of Leigh Fisher Associates, Matthew A. Coogan, and MarketSense prepared the report. In response to the project objective, the researchers identified strategies to improve public transportation access to large airports through market-based planning and improved management of ground access to airports.

TCRP Report 83: Strategies for Improving Public Transportation Access to Large Airports provides practical information on how to plan and improve public transportation access to large airports. Chapter 1 provides background on why this study is important at this time, which is because congestion at large airports continues to increase. Chapters 2, 3, and 4 present aspects of a market-based approach to planning ground access services to airports. Specifically, Chapter 2 presents the results of research on the characteristics of public ground transportation use to large U.S. airports and describes the market environment in which these services operate. Chapter 3 examines the influence of demographic segmentation on the propensity to choose public mode services to access airports, both in Europe and the United States. Chapter 4 describes ways to increase the use of public transportation services for work trips by employees who work at airports.

Chapters 5, 6, and 7 examine management strategies for improving the quality of public transportation services to large airports. Chapter 5 focuses on business arrangements, such as open and exclusive agreements with transportation operators, that effect the day-to-day operations of passenger ground transportation at airports. Chapter 6 reviews a variety of strategies for accommodating baggage carried by travelers en route to and from airports, set in the context of increased priority for the security of transportation operations. Chapter 7 examines new and evolving information technology intended to provide intermodal information and ticketing options to air travelers.

Chapter 8 integrates the entire report. This chapter summarizes key elements of the previous seven chapters and presents a guidebook for a market-based strategy for improving public transportation access to large airports. The six-step process outlined in the guidebook includes (1) establishing public policy goals, (2) undertaking a program for data gathering and system monitoring, (3) understanding the markets revealed and their relationship to candidate solutions, (4) designing a program of services and

strategies, (5) managing the airport to encourage higher-occupancy-vehicle use for ground access to airports, and (6) getting the word out. The report identifies additional research opportunities associated with each of these areas.

An important conclusion presented in the report is that strong leadership, often within airport management, and a willingness to spend the needed money are generally both required to improve public transportation ground access to airports.

CONTENTS

1	SUMMARY
13	CHAPTER 1 A Planning Process Based on the Needs of the User Context of Chapter 1, 13 Airport Ground Access as a National Policy Issue, 13 Airport Access as a Regional Issue, 15 Ground Access Issues and Airport Asset Management, 16 Building on the Previous Research Effort, 18 Understanding the Scale of Ground Access Markets, 24 Understanding the Scale of Public Transportation Capacity, 25 Developing a New Approach to Airport Ground Access Planning, 27
28	CHAPTER 2 Documenting Airport Market Conditions Supportive of Public Ground Transportation Services Context of Chapter 2, 28 Terms Used to Describe Airport Ground Transportation Markets, 28 Air Passenger Trip-End Densities Associated with Ground Access Markets, 29 Trip-End Densities Associated with Fixed-Route and Schedule Services, 32 Trip-End Densities Associated with Shared Door-to-Door Services, 38 Express Modes from Regional Collection Points, 44 The Geography of Public Ground Transportation to Airports, 47 Summary of Findings, 48
51	CHAPTER 3 The Importance of Demographic Segmentation Context of Chapter 3, 51 Basic Concepts of Market Segmentation in Airport Access, 51 Variation by Demographic Segment: Total Airport Markets, 53 Variation by Demographic Segment: Prime Geographic Markets, 57 Variation by Demographic Segment: Prime U.S. Markets, 60 Additional Segmentation in Scandinavia, 64 Mode Shift to New Services: Variation by Market Segment, 67 Conclusions, 68
70	CHAPTER 4 Improving Public Mode Share for Employees Context of Chapter 4, 70 Factors Influencing Employee Use of Public Transportation—Initial Hypotheses, 70 Airport Employee Survey Results, 71 Key Considerations for Improving Employee Public Transportation Mode Share, 74 Conclusion: The Importance of the Airport Employee Market, 77
79	CHAPTER 5 Strategies for Improving the Management of Airport Ground Access Services Context of Chapter 5, 79 Airport Ground Transportation Management Strategies, 79 Measures to Encourage Use of Public Transportation, 81 Business Arrangements at Airports to Improve Service to the Traveling Public, 87 Regulatory Constraints to the Introduction of New Services, 88
91	CHAPTER 6 Baggage, Off-Airport Processing, and Security Context of Chapter 6, 91 Understanding the Need for Baggage-Handling Strategies, 91 Strategies for Improving Baggage Handling for Public Mode Services, 92 Strategies that Use Off-Airport Baggage Check-In, 92 Strategies that Do Not Assume Off-Airport Check-In, 97 Hybrid Strategies: Strategies for Partial Processing, 98 Implications of Baggage-Handling Strategies, 101 Other Changes from Recent Regulations, 102

104 CHAPTER 7 Getting Intermodal Information to the Customer

Context of Chapter 7, 104

Market Research and Marketing Strategies, 104

Intermodal Information at the Time of Trip Planning, 106

Integration of Aviation and Ground Information Systems, 106

Local Passenger Information Systems in the United States, 108

Integration of Aviation and Ground Passenger Information

Systems in Sweden, 110

Non-Aviation Intermodal Passenger Information Systems in Europe, 112

Multijurisdictional Passenger Information Systems, 115

New Airline Reservation System Technology—Implications for

Ground Access, 117

Joint Ticket Sales—Air and Rail, 117

Conclusions, 121

122 CHAPTER 8 Putting It All Together: Six Steps in a Market-Based Strategy for Improving Airport Ground Access

Context of Chapter 8, 122

Step 1: Establish Public Policy Goals, 122

Step 2: Undertake the Program of Data Gathering and System Monitoring, 124

Step 3: Interpret the Markets and Their Relationship to Candidate Modes, 127

Step 4: Design a Program of Services and Strategies, 130

Step 5: Manage the Airport to Encourage HOV Use, 133

Step 6: Get the Word Out, 135

Conclusions, 137

Further Research Recommendations for Each Step, 137

138 REFERENCES

139 GLOSSARY

STRATEGIES FOR IMPROVING PUBLIC TRANSPORTATION ACCESS TO LARGE AIRPORTS

SUMMARY OVERVIEW AND REPORT STRUCTURE

This Summary presents a shortened description of the conclusions of TCRP Project B-18A, which incorporates many of the concepts developed in TCRP Project B-18, published in 2000 as *TCRP Report 62: Improving Public Transportation Access to Large Airports (I)*. The eight chapters reflect four main themes: context; methods; strategies; and guidance, in the form of a “guidebook.”

Context

Chapter 1 puts forth the key reasons for the study and the reasons for a policy interest in the subject of airport ground access services in the United States. It presents a brief summary of the major data presented in *TCRP Report 62*, which called for a planning process based on the revealed characteristics of the several submarkets within each large airport’s overall ground access market. *As it evolved, TCRP Project B-18A focused more on the understanding of market segments than on the inherent characteristic of any particular mode or technology.*

Methods

Chapters 2, 3, and 4 present the basic method of market research proposed in the Project B-18 program. Chapter 2 examines the relationship between trip-end density and the access modes that are supported by a variety of market conditions. Chapter 3 adds the dimension of demographic market segmentation to the previous discussion of geographic market segmentation. Chapter 4 expands the market research concept to cover the critically important airport employee market.

Strategies

Chapters 5 and 6 examine strategies to improve the quality of public mode services to large U.S. airports. Chapter 5 defines a series of strategies to better manage the airport,

particularly for rubber-tired modes. Chapter 6 looks at a series of innovations for off-site airport activities set against the public policy concern for safety and security. Chapter 7 addresses marketing, examining the issues of getting critical information to the market segments that have been identified and targeted in the market-based planning process.

Guidance

Chapter 8 presents a “guidebook” summary of steps needed to undertake a market-based planning process to improve public mode access, pulling together information presented in the first seven chapters of the report. The chapter includes recommendations for further research.

A glossary of abbreviations, acronyms, and airports cited follows Chapter 8.

Chapter 1: A Planning Process Based on the Needs of the User

Context

Increasingly, transportation managers in the United States are dealing with close interrelationships between modal services that have historically been seen, and managed, as separate entities. The scale of trip generation at major airports is of concern to the regional transportation and environmental manager; the airport manager finds that strategies for higher-occupancy ground access solutions have become an accepted precondition to the expansion and better use of the assets of the airport. Across the country, metropolitan planning organizations are becoming involved in problem solving for the difficult issue of public mode airport ground access. The chapter establishes a sense of scale for the amount of travel to airports and to other points of intermodal transfer on a national scale. The extent to which air travel has become an integral part of the U.S. travel experience is dramatic. The American Travel Survey (ATS) describes about 365,000,000 annual total ground access trips to and from U.S. airports in the survey year, 1995.

Growth

While the extent of growth of major U.S. airports is clouded by the market reaction to the events of September 11, 2001, and while any precise forecasts are clearly beyond the scope of this study, there has been considerable consensus on the scale of growth expected over time. The International Air Transport Association (IATA), based in Geneva, believes that while the previous decade saw an increase in overall American activity at a rate of 3.7% per year, the next decade will see growth at 3.9%. While air passenger activity in the Americas totaled 792 million passengers in 1996, IATA forecast that 1.4 billion passengers would be carried in the year 2011 (2).

Asset Management

Throughout the United States, the provision of improved ground transportation strategies is seen as an integral component of plans to increase capacity and efficiency at major airports. Over the last 2 years (since the publication of *TCRP Report 62*), ground access strategies have been advanced in San Francisco, Los Angeles, Miami, Portland (Oregon), Minneapolis, and Newark and at New York’s JFK airport. New

combinations of services are being explored in Chicago (both at O'Hare and Midway) and at Dallas-Fort Worth, Baltimore-Washington, Seattle, and Dulles Airports.

Market Scale

Chapter 1 shows that the largest number of daily public mode airport access users in the United States is to San Francisco International Airport, with about 7,200 riders a day accessing the airport. There is wide variation by airport in this selected sample. The airport at San Francisco attracts more than five times the public transportation volume of either New York airport, which each attract some 1,400 public mode users per day.

Airports with more than 4,000 passengers choosing public mode services exist in San Francisco, Los Angeles, Chicago (at O'Hare), and Las Vegas. This implies that a peak-hour volume of between 400 and 800 persons arrive at these five large U.S. airports in an average peak hour. From the available data, large U.S. airports are experiencing a wide variety of public mode volumes arriving at the airport, ranging from 100 to 800 per hour.

Mode Selection

For most metropolitan areas, a comprehensive program to improve public mode airport ground access services and to raise the overall vehicle-occupancy levels will require a variety of modes and a variety of operational strategies. Modal technologies from multiparty taxi sharing to regional rapid transit have all been found to be relevant to the U.S. experience. For each of these services, the transportation planner must match the characteristics of the supporting market with the characteristics of the candidate mode. In many cases, the capacity of a given mode, such as express bus service, has been considered a limiting factor in a long-term role of airport ground transportation. However, in virtually all cases under consideration, the capacity of bus, light rail, rapid transit, or commuter is vastly higher than that required for airport related services. As discussed in Chapter 1, *the choice of airport access mode has more to do with policy decisions made for the rest of the regional transportation system than with any capacity limitations inherent to any given mode.*

Lessons Learned from Project B-18

In the United States, public modes of airport ground access are attaining smaller market shares than in the rest of the world. The upper ranges of public transportation use in most U.S. cities appear to be about 10% to 15%, even at airports with rail service. At only four airports—San Francisco International, Boston-Logan, Washington's Reagan National, and New Orleans—do public mode services capture more than 15% of the airport ground access market. And, significantly, the geographic areas experiencing the greatest growth in airport use lie outside of the traditional central business district. The data revealed in Project B-18 clearly shows that the national debate about airport access should not focus on the basic "rail versus bus" decision.

TCRP Report 62 examined successful international systems in terms of service attributes, most of which are not exclusive to one mode or another. The attributes of good airport connection, good line-haul connections to downtown, good coverage beyond the downtown, and the need to deal with baggage are all characteristics of services that could be supplied with bus or rail. At the conclusion of Project B-18, it became clear to the

project panel that a new planning process should be developed—one that did not focus on the applicability of any one mode, or even debates about the relative characteristics of modes, but a process in which the service attributes would be developed from an understanding of the separate needs of the separate submarkets existing for different ground access services.

Chapter 2: Documenting Airport Market Conditions Supportive of Public Ground Transportation Services

Context

Chapter 2 presents the results of research into patterns of public ground transportation use at large U. S. airports and describes the market environment in which these services operate. Information from air passenger surveys conducted at 13 airports is used to determine where air passengers begin their ground transportation trip to the airport and which modes they prefer. Public ground transportation services typically available at large airports are organized into three categories and reviewed in detail. The three categories are traditional bus or rail, shared door-to-door vans, and express bus service from a regional collection point.

Structure

The chapter begins with a review of the terms used in describing airport ground transportation markets and establishes a standard measure of ground transportation activity called “trip-end density.” This measure combines the quantitative and geographic components that describe ground transportation markets and provides a way to compare ground transportation trip activity at different airports.

Based on the data available to this study, 13 large airports are described in terms of land area and trip-end density. Densities are summarized into four categories and used to compare the ground access markets at a number of airports. Comparison of airport ground access markets reveals similarities in broad-scale patterns of trip activity. From this exercise comes the recognition of the primary ground access market—a relatively small area of an airport’s entire ground transportation service area that generates the majority of the trips to the airport. The concept of a primary market is borrowed from the field of marketing geography and is important to understanding the role of various categories of ground transportation in serving an airport’s ground transportation market.

Findings

The research findings indicate that each ground transportation service category is associated with or supported by a roughly defined range of air passenger activity. Table S-1 has been developed based on the empirical evidence available from air passenger surveys. For each public ground transportation mode, Table S-1 lists the size of the primary market associated with the mode and the number of annualized air passengers generated from the primary market area.

There is consistency in the range of air passengers supporting the public ground transportation services reviewed in this study. Express bus service, either from downtown or from a regional collection point, is dependent upon a market of roughly 1.2 to 1.6 million annual air passengers. Shared door-to-door modes serve geographic areas generating 2.0 to 4.9 annual air passengers, and rail service is found in areas with 6.6 million to 8.2 million annual air passengers.

TABLE S-1 Primary markets associated with public ground transportation services

Mode	Size of Primary Market for Public Mode (square miles)	Total Annualized Origin/Destination Air Passengers (two-way trips)
Rail/Subway	60–90	6,600,000 8,200,000
Shared Door-to-Door	60–450	2,000,000–4,900,000
Express Bus (Regional)	275–550	1,200,000–1,600,000
Express Bus (Downtown)	4	1,300,000
Multi-Stop Bus	75	1,000,000

SOURCE: MarketSense, based on airport air passenger surveys.

Chapter 3: The Importance of Demographic Segmentation

Structure

Chapter 3 examines the influence of demographic segmentation on the propensity to choose public mode services, both in Europe and in the United States. From the combination of Chapters 2 and 3 emerges the observation that geographic segmentation should be undertaken first, followed by demographic segmentation. Chapter 3 is divided into four sections:

1. The concepts of demographic and geographic market segmentation are reviewed.
2. The variation in mode share by demographic segment is first observed for the airport market as a whole.
3. The variation in mode share by demographic segment is observed for specific geographic market areas that have been identified by a process of geographic segmentation.
4. The role of the demographic segments in the propensity to shift modes in response to new services is documented.

Context

TCRP Project B-18 has advocated a planning process that is built up from an understanding of the needs of the passenger rather than down from preconceived ideas about what mode is “best” for airport ground access. There is no “one market” for airport ground access services, but rather a series of market segments, each of which might require a separately designed service response. Chapter 3 explores the influence of demographic variables on the propensity to choose public mode services for these market segments.

With a basic understanding of the geographic distribution of trip origins and with an understanding of the modes historically supported by such market concentrations, the process can further examine each of the targeted market in terms of four demographic market segments:

1. Resident business,
2. Resident non-business,
3. Non-resident business, and
4. Non-resident non-business.

The superimposition of the two levels of analysis should provide the analyst with an understanding of the scale of the market in aggregate and of the propensity for various submarkets to choose to consume the services.

Applying Demographic Segmentation

Chapter 3 examines the public mode shares in three cities, each of which has a prime market area served by three separate airports. It examines the modal share patterns by market segment for travel from inner London to London's three largest airports: Heathrow, Gatwick, and Stansted. It examines the same mode-share patterns from central Washington, D.C., to Baltimore-Washington International (BWI), Dulles, and Reagan National Airports. It examines the mode-share patterns from Manhattan to LaGuardia, JFK, and Newark Airports. In each case, a common "prime market area" has been defined that has significant traffic from all three regional airports. This stratification will allow comparison among public mode-share patterns for services from a constant origin area to regional airports. Within a given airport, it will allow for the observation of differences in mode choice stemming from differences in the four demographic segments, for a fixed set of geographic assumptions.

Conclusions

Market segmentation by geographic area and by demographic characteristics is a powerful tool that allows the analyst to understand market conditions on a more disaggregate basis. It allows the comparison of "apples with apples," which in turn can reveal pronounced differences in market behavior by parallel market groups in different cities and in different continents. It allows many variables to be held constant while highlighting legitimate differences between target groups.

Most importantly, the application of the two levels of market segmentation allows the transportation manager to carefully design services that will attract more people into efficient, higher-occupancy modes for airport ground access. Although there are profound differences in the level of public transportation use between the United States and Europe, the tools of market research can be profitably used in both situations. Managers from both continents can use these tools to improve their market strategies.

Chapter 4: Improving Public Mode Share for Employees

Structure

Chapter 4 describes ways to improve the public transportation mode share for employees who work at an airport. The chapter begins with hypotheses of factors that influence employee use of public transportation. The results of a survey of the current situations at representative airports are then summarized. The findings from an examination of the summary are then used to discuss the key considerations for improving employee public transportation mode share at airports.

Adequate public transportation at airports is good for business because it can increase the size of the potential labor pool. Airports offer a full range of job opportunities. A large amount of both skilled and non-skilled labor is required by the airport operator, airlines, and other tenants. Because airports are frequently located in suburban locations, the lower-paying non-skilled positions can sometimes be more difficult to fill.

Public transportation that is linked to populations with low rates of automobile ownership can make the airport a possible work location for those who rely on transit.

Determinant Factors

An examination of the potential trends indicated by the limited data and consideration of basic transit planning principles led to hypotheses that included the following four factors:

1. The availability of transit service at the employee residences,
2. The accessibility of the employee's worksite to transit service,
3. The extent to which employees work non-traditional hours, and
4. The availability and cost of parking for employees.

These factors were used as a starting point to expand the available knowledge base for identifying ways to improve employee usage of public transportation at airports.

Challenges

There are a number challenges, however, to implementing successful public transportation services for employees at an airport. First, airports are usually located in suburban locations, which can be difficult to serve with transit because of nearby lower population densities. Second, airports represent a unique operating environment. An airport is a 24 h-per-day operation with many work shift times differing from typical work shift times. Third, there are multiple employers working under a variety of constraints and regulations. Individual airports can have other unique challenges as well.

Chapter 5: Strategies for Improving the Management of Airport Ground Access Services

Structure

Chapter 5 describes management strategies frequently used by airport management to ensure the safety and convenience of the traveling public at the airport and to encourage the use of public transportation. The measures and business strategies used by airport management to enhance public transportation service and operations and the hurdles that are typically encountered are also addressed. The chapter describes the following:

- Strategies used to manage ground transportation services on and off an airport,
- Use of business arrangements to improve service and balance demand with supply, and
- Constraints to the introduction of new public transportation services.

Goals

The goals of most airport operators include providing the traveling public with safe, convenient, and efficient access to all airport facilities and encouraging the use of public transportation by airline passengers and employees in a manner that is consistent with other goals of the airport and the community it serves. To accomplish these goals, airport managers typically seek to manage and control public transportation and commercial

ground transportation services operating at the airport to the extent permitted by local, state, and federal laws.

Business Arrangements

Chapter 5 reviews a variety of business arrangements with ground transportation operators used by airport management to ensure that the traveling public is provided a high level of customer service and to encourage the use of public transportation. The most common forms of business arrangements are open access, exclusive or semi-exclusive concession agreements, and third-party management contracts. Increasingly, airport managers appear to be establishing exclusive or semi-exclusive agreements because with these arrangements (as described below), the airport operator has a better ability to ensure service quality and performance and the operator has a greater financial incentive to maintain the desired standards.

Open Systems

With open-access systems, any ground transportation operator, properly licensed by the local regulatory authority, can pick up passengers at an airport. The primary benefit of this system is that any business, large or small, can serve the airport, thereby providing customers with options and promoting competitive fares and services. As such, the system is often favored by small ground transportation operators who lobby local politicians to implement or maintain such arrangements.

Exclusive Agreements

Most airport managers have agreements with concessionaires to provide certain services on an exclusive (e.g., a hotel or food and beverage operator) or semi-exclusive (e.g., rental car companies) basis. These agreements specify the services that the companies are allowed to offer at the airport, the manner in which the services are to be offered, the prices or mark-up permitted, and the airport fees and charges.

Concession agreements allow airport management to ensure the appropriate balance between supply and demand as the concessionaire can direct company-employed drivers to serve or not to serve the airport as warranted. The concessionaire is responsible for ensuring that the drivers/employees are assigned an appropriate number of trips and an opportunity to earn a fair salary. In the absence of a concession agreement, a limited number of options are available to airport management to balance supply and demand.

In addition to entering into contracts that require concessionaires to provide certain ground transportation services, airport management may also enter into contracts that require a third-party contractor to manage and enforce ground transportation operations at the airport. Although management of both airports retain the responsibility for establishing policies, fees, and regulations, the third-party contractor can significantly influence the level of service provided to the traveling public.

Chapter 6: Baggage, Off-Airport Processing, and Security

Structure

A major impediment to the choice of a public mode for ground access is the difficulty in accommodating baggage. Chapter 6 reviews a wide variety of strategies to deal

with the challenge of baggage, set in the context of an increased priority for the security of transportation operations. The chapter commences with a review of various strategies from best case practices to deal with the problem of baggage, some of which do assume off-site processing and others of which do not assume off-site processing. A second theme of the chapter concerns the implications of the September 11, 2001, terrorist attacks on airplanes on national policies toward dealing with security issues that impact baggage handling and other aspects of airport ground access.

Strategies

Chapter 6 examines three categories of baggage-handling strategies: (1) those that do assume off-airport baggage check-in services, (2) those that do not assume off-airport baggage check-in services, and (3) hybrid combinations that provide for some but not all desired services. Within the first category, strategies are examined in which the airlines provide the baggage processing as well as strategies in which a third party provides the baggage processing. Within the second category, strategies are reviewed to improve baggage handling for dedicated airport ground access services and for services shared with traditional fixed-route and schedule operations. Within the third category, strategies are reviewed in which baggage check-in services are provided for some, but not all segments of the trip; strategies are reviewed in which some, but not all, baggage-processing services are provided off-site.

Recent Constraints

The ability to process passenger baggage at remote locations (i.e., away from the terminal building) was constrained by regulations established by the FAA prior to September 2001, with more stringent requirements subsequently imposed by the FAA and Congress. For purposes of comparison, this chapter summarizes the federal requirements that existed prior to September 2001 and the requirements imposed by the Aviation and Transportation Security Act and newly formed Transportation Security Administration.

The Emergency Security Amendment implemented by the FAA on September 12, 2001, imposed Alert Level IV security measures on all U.S. airports. These measures, most of which remain in effect at the time this report was prepared, include the Prohibition of Remote Baggage Check at Hotels and Other Locations regulation. This regulation resulted in the temporary discontinuance of all the remote baggage-handling services described in the chapter. At the time this report was prepared, major operators were seeking amendments to security procedures to re-institute their remote baggage check-in services.

In November 2001, the Aviation and Transportation Security Act was signed into law. This act, which established the Transportation Security Administration (TSA), requires that the TSA and the airlines (1) ensure either the inspection of all (100%) of checked passenger baggage by staff, specially trained dogs, or explosive detection systems (EDS) or the implementation of baggage-reconciliation procedures that match all baggage and airline passengers on board an aircraft (i.e., positive passenger bag match) and (2) inspect all checked passenger baggage using EDS by the end of 2002 if equipment is available. Prior to September 11, 2001, all checked baggage screening was performed only for international flights originating or terminating in the United States and for selected passengers on domestic flights.

Thus, to comply with these regulations, it would be necessary for a remote terminal seeking to provide baggage check-in services (1) to provide 100% positive baggage matching and (2) by the end of 2002, for the operator (or its designee) to install and

supervise the operation of EDS equipment. At present, certified EDS equipment costs more than \$1 million per screening unit.

Hybrid Strategies

Between the option of no help to the customer and the full implementation of the airline-operated downtown check-in facility, there exists a wide variety of “compromise” or hybrid strategies, each of which should be examined by U.S. decisionmakers contemplating a downtown airline-operated facility. The concept that a third party could be authorized to deal with baggage issues has been taken to a high degree of effectiveness in Switzerland and in Las Vegas.

For those U.S. cities that examine full downtown check-in terminals and reject them because of cost, there are “compromise” or hybrid strategies that should be thoroughly examined to deal with this constraining factor in public mode usage. The implementation of the airline-operated check-in at the Newark Airport Rail Station stands as a good example of a hybrid strategy, giving help to the traveler for some, but not all, segments of his or her trip. The concept of outsourcing some of the job of baggage processing to third parties should be explored. Similarly, finding cost-effective solutions for the integration of baggage onto dedicated buses should be a research priority.

Chapter 7: Getting Intermodal Information to the Customer

Structure

Chapter 7 examines the development of new and evolving information technology to bring intermodal information and ticketing options to the traveler. It describes the last phase of an integrated program of market-based improvements to airport ground access public modes concerning the need to get information about the services to the customer. A series of more immediate, near-term strategies to improve passenger information are reviewed in Chapter 5.

Context

TCRP Project B-18 recommended that market segmentation be undertaken at two levels: submarkets need to be identified based on their geographic characteristics, and these submarkets need to be further examined in terms of demographic segmentation. Each of the market segments has separate constraints and distinct sensitivities to price and service quality. Each of the market segments requires a marketing strategy designed around the revealed needs of the user.

Timing of Information

Three major timeframes accessing information can be defined. Passenger information is needed

1. At the time of trip planning,
2. At the time of trip commencement, and
3. While en route.

The Need for Pre-trip Information

The study of airport ground access inherently focuses on the collection segment (decision of mode and path *to* the airport) and on the distribution segment (decision of mode and path *from* the airport to the destination). It is a characteristic of the choice of the airline segment that the *decision is made long before the day of departure, often weeks before the trip is made*, particularly if lower fares are sought. Thus, for those marketing airport ground access services, it is considered highly desirable to sell the ticket at the time of the purchase of the airline ticket. In this manner, the task of convincing the traveler to purchase the ground access service is already accomplished by the time the traveler commences that trip segment.

Transit Passenger Information

In many cases, the potential users of public mode services simply do not know that high-quality alternatives to the automobile or taxi exist. The U.S. transit industry is now in the process of adopting highly effective origin-destination trip itinerary planning systems that show how any given trip, such as one to or from the airport, can be accomplished by public transportation. In Europe, these programs have been applied on a nationwide, and even international, scale. As yet, the full integration of ground transportation information with aviation-based passenger information has yet to be implemented anywhere.

Chapter 8: Putting It All Together: Six Steps in a Market-based Strategy for Improving Airport Ground Access

Structure

Chapter 8 presents a “guidebook” summary of the key elements in the creation of a market-based strategy for improving the quality of public mode services from U.S. airports. This chapter reviews the key steps for improving public transportation access to airports and summarizes portions of the content of the previous seven chapters. It is intended to point the reader to best case U.S. practices that can be explored for additional information on each of the concepts. Six steps in the process area outlined in this chapter.

Step 1. Establish the public policy goals:

- Form the collaborative effort that will be needed for implementation, and
- Understand the travel behavior of the longer-distance traveler.

Step 2. Undertake the program for data gathering and system monitoring:

- Design the survey to reveal key market characteristics, and
- Emphasize accurate geography and market segmentation for both air passengers and airport employees.

Step 3. Interpret the markets and their relationship to candidate modes:

- Understand the makeup of the overall airport market,
- Establish the target markets at several levels of trip-end density, and
- Understand the precedents for market support of various modes and services.

Step 4. Design a program of services and strategies:

- Understand the quality attributes achieved by successful services,
- Match modes with markets, and
- Acknowledge the role for dedicated higher-cost services.

Step 5. Manage the airport to encourage higher-occupancy use:

- Examine priorities and implications of curbside allocation and pricing, and
- Evaluate the level of amenity experienced by the public-mode user.

Step 6. Get the word out:

- Provide basic service description to the users, and
- Develop programs for integrated passenger information and ticketing.

Conclusions

A major theme that emerges from this analysis is the need for some party to take leadership—very often that happens at the level of the airport management. The professional ground access staffs at leading airports such as San Francisco International and BWI take a pro-active role in examining the extent of coverage and in providing incentives (such as the granting of exclusive rights to serve a given area). In each of these cases, it is understood that there are costs associated with the establishment of high-quality services; there are often costs associated with the continued subsidy of these services. In nearly all of the best case practices, there have been financial costs to bear. There is no working assumption that solutions to these problems will be without costs.

Chapter 8 concludes with a listing of further research recommendations for each of the six steps. A glossary of acronyms, abbreviations, and airports cited follows Chapter 8.

REFERENCES

1. Leigh Fisher Associates, M.A. Coogan, and MarketSense. *TCRP Report 62: Improving Public Transportation Access to Large Airports*. Transportation Research Board of the National Academies, Washington, DC (2000).
 2. Air Transport Action Group. *The Americas' Air Passenger Traffic: 1985–2011*. Geneva (1998); p. 10.
-

CHAPTER 1

A PLANNING PROCESS BASED ON THE NEEDS OF THE USER

CONTEXT OF CHAPTER 1

This report presents the conclusions of TCRP Project B-18A, which incorporates many of the concepts developed in TCRP Project B-18, published in 2000 as *TCRP Report 62: Improving Public Transportation Access to Large Airports (I)*. The research results are presented in this final report in three sections. Chapter 1 puts forth the key reasons for the study and the reasons for a policy interest in the subject of airport ground access services in the United States. It presents a brief summary of the major data presented in the B-18A project, which called for a planning process based on the revealed characteristics of the several submarkets within each large airport's overall ground access market. This research focused more on the understanding of market segments than on the inherent characteristic of any particular mode or technology. The chapter reviews the extent to which concern about the quality of airport ground access has become an integral part of the process of environmental and political approval of airport expansion and efficient use of key national assets. The chapter reviews some basic facts concerning the characteristics of candidate modes for use in a comprehensive airport ground access strategy.

Report Structure

Chapters 2, 3, and 4 present the basic method of market research undertaken in this project. Chapter 2 examines the relationship between trip-end density and the access modes that are supported by a variety of market conditions. Chapter 3 adds the dimension of demographic market segmentation to the previous discussion of geographic market segmentation. Chapter 4 expands the market research concept to cover the critically important airport employee market.

Chapters 5 and 6 examine strategies to improve the quality of public mode services to large U.S. airports. Chapter 5 defines a series of strategies to better manage the airport, particularly for rubber-tired modes. Chapter 6 looks at a series of innovations for off-site airport activities set against the public policy concern for safety and security. Chapter 7 address marketing, examining the issues of getting critical information to the market segments that have been identified and targeted in the market-based planning process.

Chapter 8 presents a summary of steps needed to undertake a market-based planning process to improve public mode access, pulling together information originally presented in the first seven chapters of the report.

A glossary of abbreviations, acronyms, and airports cited follows Chapter 8.

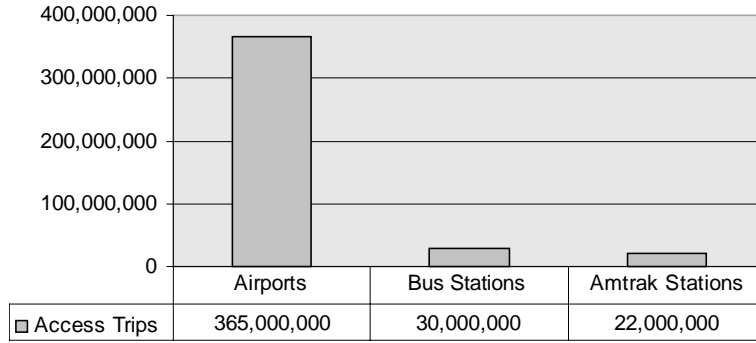
AIRPORT GROUND ACCESS AS A NATIONAL POLICY ISSUE

Airport Access as a Part of Our National Travel Patterns

Increasingly, transportation managers in the United States are dealing with close interrelationships between modal services that have historically been seen and managed as separate entities. The scale of trip generation at major airports is of concern to the regional transportation and environmental manager; the airport manager finds that strategies for higher-occupancy ground access solutions have become an accepted precondition to the expansion and better utilization of the assets of the airport. Across the country, metropolitan planning organizations (MPOs) are becoming involved in solving the difficult issue of public mode airport ground access. To begin this review of the policy interest behind improving airport ground access, it is important to establish a sense of scale for the amount of travel to airports and to other points of intermodal transfer on a national scale.

The extent to which air travel has become an integral part of the U.S. travel experience is dramatic. Understanding that sense of scale helps to establish the ubiquity of ground access travel in larger metropolitan areas. The American Travel Survey (ATS) describes about 365 million annual ground access trips to U.S. airports in the survey year. In the ATS, these trips are categorized by whether they occur in the traveler's area of residence or in the non-home portion of the longer-distance trip. In Project B-18, travelers in the first category are described as "the resident market," and those in the second category are described as "the non-resident market" for purchase of ground transportation services.

Figure 1-1 shows the scale of the 365 million trips to all U.S. airports, which can be compared with the scale of trip making to long-distance bus stations (about 30 million trips) and the volumes serving Amtrak (about 22 million annual trips).



SOURCE: American Travel Survey, 1995; Greyhound, and Amtrak.

Figure 1-1. Access trips to intermodal terminals.

Terminal Access in the Home Area

Looking at the mode of ground access selected from a national aggregate perspective, ground access modes to all three kinds of terminals are dominated by the private automobile. In this “resident” market, those accessing a bus or a train have a significantly higher propensity to select a mode other than the private automobile, with combined mode shares for taxi, limousine, and public mode at nearly 30% market share.

Figure 1-2 shows that bus, van, limousine, and rail capture about 20% of the market to long-distance bus and rail terminals, but capture only 8% of national travel to airports, excluding taxis. Unfortunately, the ATS does not allow private limousines to be examined separately from higher-occupancy vans in this national overview. Project B-18 has obtained airport-specific data that allows this important distinction to be made in the analysis.

Terminal Access at the Non-Home End of the Trip

From a nationwide data perspective, it can be observed that the long-distance traveler has a greater propensity to pur-

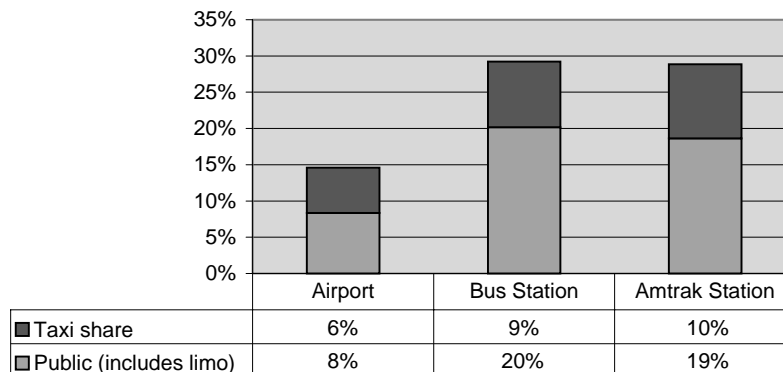
chase a ground access service while in the non-home portion of the long-distance trip than while in his or her home area. Figure 1-3 shows market behavior in the other geographic area, the none-home area. In the non-home area, the public mode share to the airport is nearly twice as high as in the home area. Non-home area public mode shares to long-distance bus and rail terminals also are greater than in those in the home area.

Just as the residency status of the traveler is relevant to the propensity to choose a ground access mode other than the automobile, the purpose of the long-distance trip being taken is also relevant.

Why Do Air Travelers Travel?

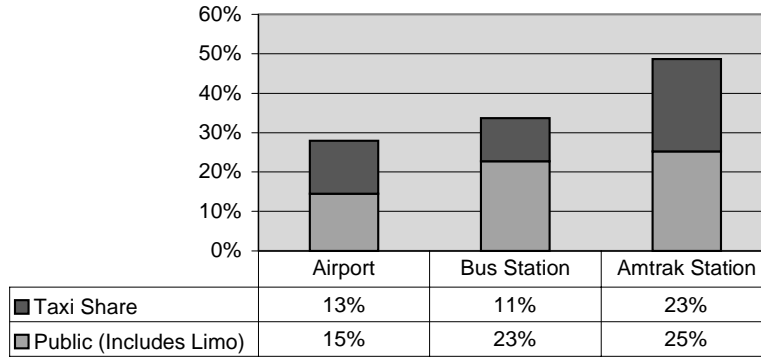
Air travelers are more likely to be traveling for business purposes than are long-distance travelers as a whole. Onboard the commercial airplane, an average of 41% of air travelers are traveling on business, compared with a national average of only 22% of overall travel for this purpose (see Figure 1-4).

From a national perspective, the scale of air travel creates a major category of travel for gaining access to and from air-



SOURCE: American Travel Survey, 1995.

Figure 1-2. Access mode—resident market.



SOURCE: American Travel Survey, 1995.

Figure 1-3. Access mode—non-residential market.

ports. The national data can support highly aggregate observations about change in ground access modal choice as a function of residency and trip purpose. For these market research efforts to be meaningful, however, the observations need to be made on a metropolitan scale and to be based on an airport-by-airport review of travel behavior. The combined efforts of TCRP Projects B-18 and B-18A have created the ability to observe airport ground access patterns based on metropolitan-scale airport-specific data sources.

AIRPORT ACCESS AS A REGIONAL ISSUE

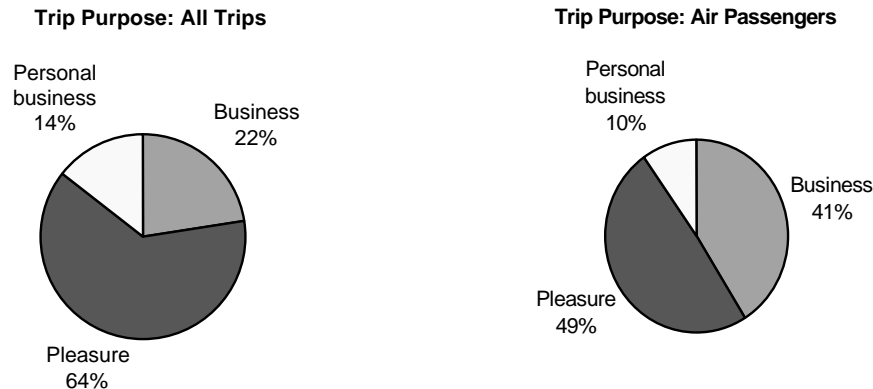
Seen from the vantage point of the airport manager, airports around the world are realizing that key decisions to utilize existing assets, and expand upon those assets, are often interrelated with approvals through the environmental and the local political processes. Airport managers in Los Angeles, San Francisco, and Boston—like managers in London, Zurich, or Amsterdam—are understanding that key environmental and political approval processes for more airport airside capac-

ity require a planning process that specifically addresses the impacts of airport ground access.

Seen from the vantage point of the regional transportation manager, travel-demand management strategies are being implemented to deal with vehicle-miles of travel from major activity centers. A large airport of greater than 45,000,000 passengers per year can be associated with the generation of 5,000,000 vehicle-miles of ground access travel per day; a smaller airport of 5 million passengers per year can be associated with 500,000 vehicle-miles of travel per day. A public official charged with the creation of a congestion management system cannot help but note the rate of traffic growth of major airports and their role in the regional growth of vehicle-miles traveled (VMT).

Visions of Growth over the Next Decades

Although the extent of growth of major U.S. airports is clouded by the market reaction to the events of September 11, 2001, and although any precise forecasts are clearly beyond



SOURCE: American Travel Survey, 1995.

Figure 1-4. Trip purpose for air passengers versus all trips longer than 100 miles.

the scope of this study, there has been considerable consensus on the scale of growth expected over time. The International Air Transport Association (IATA), based in Geneva, believes that while the previous decade saw an increase in overall American activity at a rate of 3.7% per year, the next decade will see growth at 3.9%. Although air passenger activity in the Americas totaled 792 million passengers in 1996, IATA forecasts that 1.4 billion passengers would be carried in the year 2011 (2).

Some U.S. airports concur in these aggressive forecasts. The Southern California Association of Governments (SCAG), the MPO for the Los Angeles area, forecasts a regional increase at an annual rate of 4%, dealing as it does with a growing market of services between Asia and the Americas. Over a 23-year period ending in 2020, Los Angeles authorities expect to see a 94% growth rate for the region's several airports. Between 1960 and 2000, the airport experienced nearly a 10-fold increase in air passenger activity, handling more than 60 million passengers per year. All of this growth is set in the context of a projected increase in the role of the other airports in the region, from their original share of 12% of the region's demand to 33% in the target year (3).

GROUND ACCESS ISSUES AND AIRPORT ASSET MANAGEMENT

The need to acknowledge and deal with the problems of ground access has become an accepted part of the process of gaining environmental approvals for major growth in airports. Environmental regulations deal with the air quality implications of transportation facilities, both those on-site and those generated entirely off the airport. Issues that at one point seemed separate are now seen in an integrated intermodal systems perspective.

Throughout the United States, the provision of improved ground transportation strategies is seen as an integral component of plans to increase capacity and efficiency at major airports. Over the last 2 years (since the publication of *TCRP Report 62*), ground access strategies have been advanced in San Francisco, Los Angeles, Miami, Portland (Oregon), Minneapolis, and Newark and at New York's JFK. New combinations of services are being explored in Chicago (at both O'Hare and Midway) and at Dallas-Fort Worth, Baltimore-Washington, Seattle, and Dulles Airports.

Los Angeles: Early Cooperation with the Regional Planning Organization

The Regional Context

In Los Angeles, work is underway to ensure the coordination of aviation planning with the other components of the region's transportation strategy. At the MPO, a professional and dedicated aviation staff works closely with other modal

specialists in the development of the Regional Transportation Plan (RTP). According to SCAG,

“The adopted Regional Aviation Plan needs to be supported by complementary ground access programs and projects at existing and proposed regional commercial airports. The aviation plan is a component of the Regional Transportation Plan . . . federally mandated long-range transportation plan . . .” (3).

In order to accommodate the projected air travel demand, the Los Angeles aviation planning process focused attention on two areas. In a highly unusual role for an airport master planning process, attention was devoted to the possible use of high-speed ground transportation services in redistributing the demand away from Los Angeles International Airport (LAX) toward other existing airports such as Palmdale and El Toro. The development of the airport's Master Plan has likewise focused on the actions that the airport agency can take to deal with ground access issues.

Master Plan Objectives

The development of all alternatives in the Master Plan took place within a heightened policy awareness of the importance of higher-occupancy strategies and of the connection with regional transit. Los Angeles World Airports (LAWA) describes the three goals of the Master Plan as follows:

- Maximizing access to and from regional transportation systems,
- Providing opportunities for people to connect to mass transit systems, and
- Protecting neighborhoods by minimizing or mitigating any impacts on local streets. (4)

The plan states that

In order to relieve traffic impacts on area residents and ease congestion on surface streets and freeways around LAX, LAWA is committed to a Master Plan that improves access to and circulation around the airport and *develops alternatives to the increased use of single occupancy vehicles.* (4)

Early Action Projects

Some of the ground access commitments are already underway and do not require delay until the approval of the Master Plan environmental documentation. In October 1999, the Board of Airport Commissioners approved an \$18 million program to improve the existing Van Nuys FlyAway bus facility by adding more than 500 spaces. In terms of the amenities, the agency notes that they have “been working with the FAA on a major passenger convenience program . . . [under which] patrons will be able to purchase their tickets, check their bags and get their boarding passes right at the FlyAway Terminal” (4). The agency expects that additional locations for

the program would be included in the mitigation program included with the final environmental impact statement (EIS).

The need to preserve and expand upon the assets of the Los Angeles International Airport has brought about a planning process that was regional, rather than local, and multimodal, rather than modal, in nature. Ongoing planning efforts are examining the most efficient manner in which to create a direct connection between the Green Line and the check-in process, which is currently lacking. In short, the dominant airport in one of the nation's most automobile-oriented cities is making a significant commitment to new rail and new airport bus access, a policy commitment to "develop alternatives to the continued use of single occupant automobiles" (4).

Management Policies in San Francisco

In a situation directly parallel to that experienced in Los Angeles, the management of the San Francisco International Airport is now addressing the environmentally challenging task of creating new runway capacity and examining the future growth of the airport. Simultaneously with the discussion of the expansion of this major regional asset, the airport adopted a formal policy on the importance of managing the airport to make public transport modes work at the airport. The airport management has adopted a "transit first" policy, which includes aggressive marketing programs, a transportation information program, a commuter check program, and automobile parking fees. John Costas, Deputy Airport Director, describes the policy as "a systematic approach of physical development, operational program and transit policies that provides the most efficient and environmentally friendly access to SFO [San Francisco International Airport]" (5).

Preparing for Growth at Boston-Logan Airport

The development of one of the most successful ground transportation operations in the United States—the Logan Express in Boston—also occurred during a period when the airport management was concerned with the environmental impacts of continued airport growth. Specifically, development of a major commitment to an environmentally sensitive public ground access policy occurred as the Massachusetts Port Authority sought approval to change the terms of a very restrictive constraint on the parking available to air travelers.

Focusing on the Pick-Up/Drop-Off Problem

The development of a comprehensive ground access policy in Boston was first driven by the creation in 1975 of the Logan Airport Parking Freeze. Over the following decade, it became clear to many parties that the freeze on passenger parking, but not on employee parking, was having the unintended side effect of encouraging travelers to resort to the pick-up/drop-off mode of access. The Massachusetts Port

Authority (Massport) stated the following: "One central goal of the Freeze Amendment is to reduce the curbside pick-up and drop-off of Logan passengers, since these involve multiple ground trips per air passenger, and thus increased burdens on local and regional air quality." Any change in the parking freeze had to be approved by the Massachusetts Department of Environmental Protection (DEP) and by the Environmental Protection Agency (6).

The Massachusetts DEP approved the changes in 1989 for incorporation into modifications of the State Implementation Plan under the Clean Air Act. Additionally, a local environmental group, the Conservation Law Foundation, offered to monitor the situation or bring a lawsuit against the proposed changes. In August 1989, Massport committed to the Conservation Law Foundation to undertake efforts in two areas: "reductions of employee parking at Logan, and price based and non-price based encouragement of higher occupancy modes" (6).

Actions Taken to Support Airport Growth

During this period, Massport committed to a program of monitoring the environmental performance of the system and made major capital investment in the Logan Express program with new terminals in Braintree, in Framingham, and, later, in Woburn. The results of the program included a change in parking-rate structure to charge higher fees for short-term parkers, and a decrease in longer multiday rates. Spaces originally allocated to employees, with two or three turnovers per day, were changed to spaces allocated to passengers, turning over once every 2 or 3 days. The net VMT generated by the fixed number of spaces fell considerably. In addition, the high rates charged for the passenger spaces were used to subsidize the off-airport strategies for the employee spaces.

The airport managers succeeded in maintaining the vital economic activities of the airport by taking a proactive approach to minimizing overall ground access-related VMT. The interconnection between the proactive concern for airport ground access and needed environmental approvals was unusual at the time and has become more widely accepted today.

Environmental Approvals in London and Zurich

The need for definitive action to deal with the environmental impacts of airport growth has been spelled out explicitly in environmental approvals recently issued in other cities, including London and Zurich.

Conditions for the Approval of Heathrow Terminal 5

At the end of 2001, the British Government signed off on an environmental approval for the development of Heathrow

Terminal 5—an approval process decades in development. In the long process of approval, it was made clear to the airport owners that the extension of both the Heathrow Express and the London Underground rail services to the new terminal was a necessary precondition to opening the new terminal once constructed. The approval of the project was actually made more stringent than recommended by the public inquiry process. The British Secretary of State noted that

. . . in addition to imposing *the conditions recommended by the Inspector requiring the provision of both of these railway extensions before the core terminal building is opened*, the Secretary of State considers that it is necessary to impose two further conditions preventing the main Terminal 5 permission. . . . (7)

In this recommendation, the report resulting from the public inquiry process went beyond the requirement that the on-airport railways be built before the new terminal could be opened. The Inquiry recommended further that new, additional service on a different line be initiated with four trains per hour, in addition to the four trains operating at present. The airport owner was being asked to double the existing service on the Heathrow Express, on facilities not owned or leased by the airport owner. The final recommendation provided the airport management with more flexibility while making the approval's link to another rail project quite clear:

However, the Secretary of State expects BAA [the British Airports Authority] to comply with their commitment to encourage the introduction and use of additional public transport services at Heathrow and to consider securing a four trains an hour service linking Terminal 5 to St. Pancras and the opening of the Gateway North Station, before Terminal 5 is opened. (7)

In fact, the environmental and political approval of the massive terminal expansion project was, at least in part, the result of years of commitment by the airport management to deal with off-airport environmental impacts, including the investment of more than \$600 million in the Heathrow Express rail system. The airport program, called “FreeFlow Heathrow,” includes the design and subsidization of new local bus routes for employees working at the airport.

Linking Airport Expansion: Zurich

In Switzerland, the approval for a new airport expansion program was made conditional upon the commitment of the airport authority to make a significant improvement in the overall public mode share for both passengers and employees. Until March 2000, the Zurich Airport was owned by the local government (called a “canton”), and every expenditure had to be approved in a town-meeting-like process. At the

time of the referendum to approve the airport expansion project, the airport had an overall public mode share of 34%. As part of the political approval of the expansion project, the airport committed itself to raising that mode share to 42% by the end of the period covered by the capital investment.

This commitment has become a driving force in the redesign of the airport, including the decision to place all of the new check-in facilities—60 stations—within the rail station and the additions of shorter, more direct walking paths from baggage pick-up to the rail station. The expansion program brings about a new central bus terminal with a bus-only lane to serve it. The agency has begun a program to subsidize specific local bus services for local employees working at the airport (8).

Conclusion: Ground Access and the Expansion Approval Process

Although it is possible to see airport growth and the use of scarce assets in a vacuum, policymakers around the world are undertaking significant capacity expansions by acknowledging the serious issue of off-airport environmental impacts associated with ground-access patterns. Some, like the managers at Oslo or Hong Kong International Airports, have had the luxury of system design from a clean slate, with simultaneous commitments to build a rail system as part and parcel of the airport investment program. But most airport managers around the world must face working around the constraints of the existing operating airports and, at one time, must undertake the retrofit of the airport and the introduction of new public transportation services at the same time. In each of these cases, the planning for the environmental mitigation for the landside impacts of the expanded airport was considered an integral element of the multimodal airport system planning effort.

BUILDING ON THE PREVIOUS RESEARCH EFFORT

The analysis undertaken for TCRP Project B-18A builds directly on the work undertaken for the predecessor study, Project B-18, the results of which are published as *TCRP Report 62*. Project B-18 reviewed the opportunity for rail, bus, and van service at U.S. airports and the use of these services by airline passengers at large airports in the United States and overseas. Based on airline passenger mode share data revealed in that data analysis, it is revealed that only 10 U.S. airports have public mode shares greater than 10%, and only 3 of those 10 have public mode shares of greater than 15%. Those most suited to choosing rail services are passengers with trip ends in downtown areas (or other areas well served by rail), with little or no baggage, who are familiar with the rail service, and who can walk from the rail station to their final destination.

Airports are among the largest activity centers in most regions and often generate a greater number of trips than the downtown of the largest city in the region. For many years, transportation planners and airport operators have sought to promote the use of efficient access modes by airline passengers and airport employees in order to reduce traffic volumes on roadways providing regional access to airports and internal circulation at airports. Transportation plans in some communities have emphasized providing rail service to the airport; other communities have emphasized bus and van service. Project B-18 reviewed the opportunity for rail, bus, and van service (i.e., shared-ride, door-to-door van service) at U.S. airports and the use of bus and rail services by airline passengers at large airports in the United States and overseas.

Definitions for TCRP Projects B-18 and B-18A

The data compiled in TCRP Project B-18 represent the most recent data available on the use of transit by airline passengers at large airports (the top 40 U.S. airports ranked by the number of originating passengers). The data have been reviewed by the individual airport operators and organized to ensure a consistent use of definitions of ground transportation services. The definitions used are as follows.

1. **Private vehicles:** vehicles used to transport airline passengers or visitors (e.g., family members, employees, friends, or clients), typically at no cost to the passenger, that are privately owned and privately operated.
2. **Rental cars:** vehicles used to transport airline passengers or visitors that are leased by the passenger (or visitor) from an agency doing business at or near the airport and rented for the duration of the passenger's trip.
3. **Courtesy vehicles:** door-to-door, shared-ride transportation provided for customers of hotels, motels, rental car agencies, parking lots (both those privately operated and airport-operated) and other services. Service is provided using a variety of vehicles, including full-size buses, minibuses, vans, and station wagons.
4. **Airline-crew vehicles:** shared-ride transportation between airports and hotels provided for airline-crew members by the employer at no charge. Service is provided using a variety of vehicles, including full-size buses, minibuses, vans, and station wagons.
5. **Taxicabs:** privately operated door-to-door, on-demand exclusive transportation (i.e., for a single party, typically no more than five persons). Fares are usually calculated according to trip length and travel time using a taximeter and according to rates established by a city or county licensing agency (e.g., a taxicab commission or public services commission), but may also be zone fares, flat fares (predetermined fares between certain points such as the airport and downtown), or negotiated fares.
6. **Town cars (on-demand limousines):** privately operated, door-to-door, on-demand ground transportation services that typically charge premium fares calculated on a per-mile and per-hour basis, available at the curbsides of some airports. These exclusive transportation services are typically provided using luxury town cars, sedans, or limousines.
7. **Prearranged limousines:** door-to-door services providing exclusive transportation requiring prior reservations. Prearranged limousine services are typically provided using luxury sedans or stretch vehicles, and include private car services ("black cars"), luxury limousine services, and suburban taxicabs (i.e., prearranged taxicab service provided by an operator not licensed to provide on-demand service at the airport).
8. **Chartered buses and vans:** door-to-door services providing exclusive transportation requiring prior reservations. Chartered bus or van services are provided using buses, minibuses, and vans (seating eight or more passengers) and include tour buses, cruise-ship buses, and other prearranged transportation for more than five passengers.
9. **Shared-ride, door-to-door vans:** shared-ride, door-to-door transportation services, which charge customers a predetermined flat fare per passenger or zone. Typically, transportation from the airport is on-demand; transportation to the airport requires prior reservations. Vehicles may be licensed as shared-ride vans, airport-transfer vans, or, in some communities, as taxicabs or prearranged/chartered vans. In most communities, the service is operated using radio-dispatched, eight-passenger vans.
10. **Scheduled buses:** scheduled service operating to established stops or terminals, typically on a scheduled basis, along a fixed route that charges a predetermined flat fare per passenger or zone. In many communities there are two classes of bus service:
 - *Express (including semi-express) transportation* between the airport and major destinations in the region, often provided by a private operator licensed by state or regional agencies but, in some communities, provided by a public operator. These services are sometimes referred to as "airporters." Project B-18A will further differentiate between express services from downtown and express services from regional collection points.
 - *Multistop transportation* between the airport and the region, typically operated by a public agency (i.e., traditional bus service).
11. **Rail service:** fixed-route rail service operating to established stops or terminals on a scheduled basis. Customers are charged a predetermined flat fare per passenger or zone. Types of trains used to provide this service include light rail, commuter rail, and rapid transit.

Defining “Public Modes”

For both Project B-18 and B-18A, public transportation services are defined as *those that are available to the general public and are intended to transport more than one passenger or small group of passengers traveling together*. The term “public mode” is used interchangeably with the term “public transportation” in the Project B-18 documents. Thus, public transportation includes rail, express and multistop buses, and shared-ride and door-to-door vans, but excludes courtesy vehicles, prearranged limousines and charter buses and vans, taxicabs, rental cars, and private cars. These excluded modes are referred to as “private vehicles” or “non-public transportation.”

Use of Rail Service Reported in Project B-18

TCRP Report 62 documented that direct rail service (i.e., those services with stations at or within walking distance of the terminal building) is available at eight airports in the United States. As shown in Figure 1-5, the U.S. airport with the largest share of rail ridership is Washington, D.C.’s Reagan National, where 14% of all passengers use rail. At both Hartsfield Atlanta and Midway (Chicago), about 8% of all passengers use rail; 4% use rail at O’Hare (Chicago). Rail service is used by fewer than 3% of all passengers at the other four airports that have direct rail service (Baltimore/Washington, Cleveland Hopkins, Philadelphia, and Lambert St. Louis International Airports).

Direct rail service was analyzed at more than 16 cities in Europe and Asia. As shown in Figure 1-6, rail is used by greater than 30% of the airline passengers at the airports serving Oslo, Tokyo (Narita), Geneva, Zurich, and Munich (Franz Josef Strauss). A larger proportion of passengers use rail at European and Asian airports than at U.S. airports, with a few exceptions (e.g., Paris Orly and Manchester).

Shuttle bus service to rail stations at or near airports is available at 11 large U.S. airports. These airports include those serving Fort Lauderdale, Los Angeles, Miami, Newark, New York (John F. Kennedy International and LaGuardia Airports), Oakland, San Francisco, San Jose, and Washington (Dulles International Airport). As shown in Figure 1-5, the airports with largest proportion of passengers using shuttle bus service to access rail service to an airport are Boston-Logan (5.5%) and Metropolitan Oakland (4.1%). At the other nine airports, 1% or fewer of the passengers used rail service.

Opportunity for Rail Service

Rail ridership is greater at overseas airports in part because of the significant reliance on rail in European and Asian cities as the dominant form of public transportation and because of the extensive intercity (or regional) and intra-urban networks.

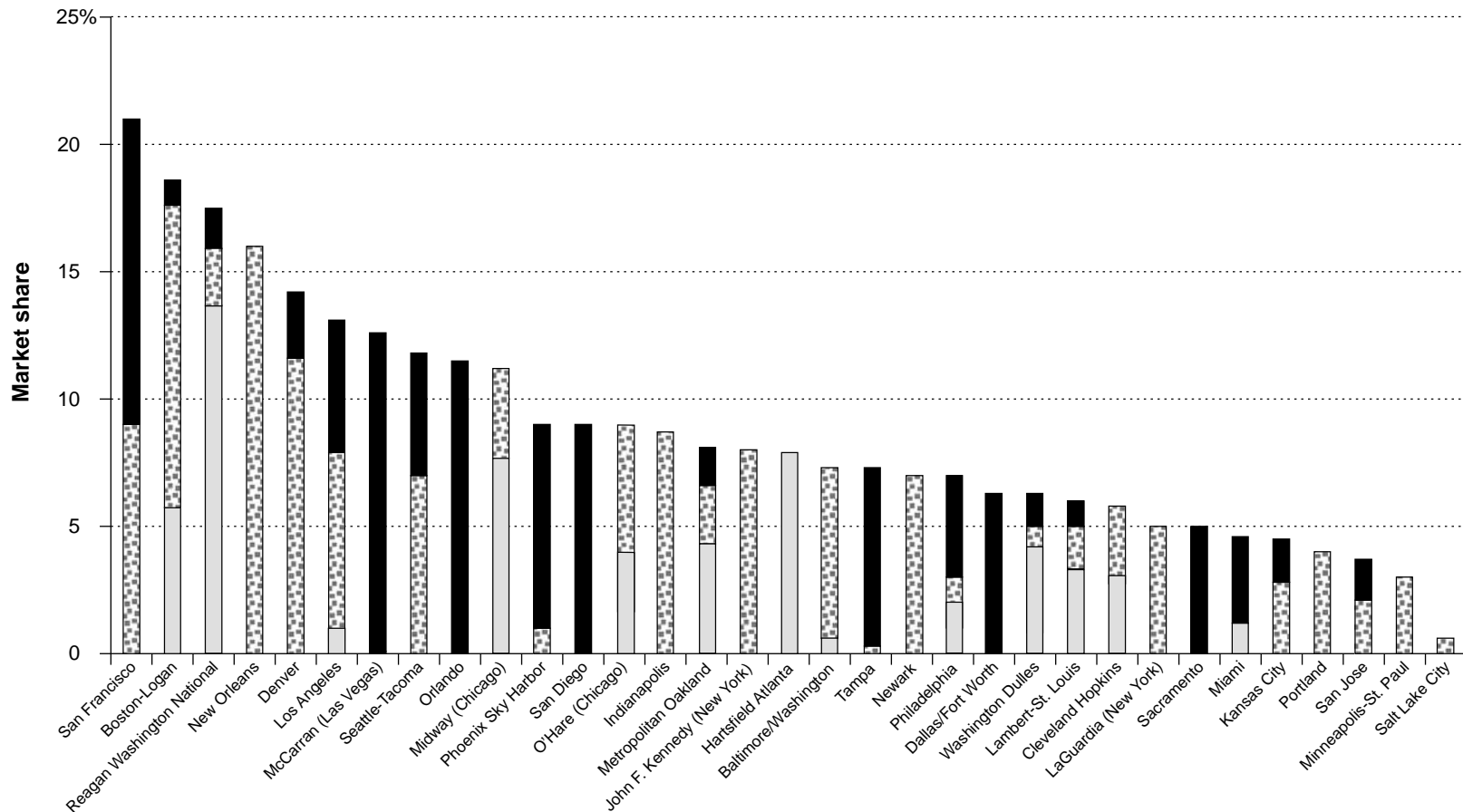
In several cities (e.g., Oslo, Geneva, Zurich, Munich, and Frankfurt), rail serves as the feeder connection to long-haul flights, much as commuter and other short-haul flights connect to long-haul flights in the United States. For these and other reasons, as discussed in subsequent paragraphs, many of the factors that allow rail to attract large market shares at the European and Asian airports are not directly transferable to conditions in most cities in the United States.

In the United States, the market shares gained by public mode services are lower than those found in Europe or Asia. Public transportation use exceeds 15% at only three U.S. airports—those serving San Francisco (21.0%); Boston (18.6%); and Washington, D.C. (Reagan National) (17.5%). Public transportation use by airline passengers exceeds 10% at the airports serving New Orleans, Denver, Los Angeles, Las Vegas, Seattle and Tacoma, Orlando, and Chicago (Midway).

Interpreting Project B-18 Results for the Rail Market

Project B-18 reviewed a wide variety of factors associated with the success or lack of success of airport rail services around the world. Key factors affecting the use of rail service have been shown to include the following

- **Proportion of airline passengers with trip ends in downtown or in the transit-rich core areas.** For example, at Reagan National Airport, about 33% of all passengers have trips ends in the downtown area. Other airports where large proportions of passengers have downtown trip ends include those serving Boston, Chicago, New York, and San Francisco. At most airports, fewer than 15% of all airline passengers have trip ends in the downtown area. Thus, in most communities, the geographic service area directly served by a downtown rail service represents a relatively small percentage of the total airline passenger market.
- **Characteristics of passenger market.** Passengers with little or no checked bags are more likely to use rail service. Large family groups are less likely to use rail. Thus, airports serving a high proportion of business trips (e.g., Hartsfield Atlanta International and Reagan National Airports, where greater than 40% of the passengers are making business-related trips) are more likely to attract rail users than those serving tourist destinations (e.g., Las Vegas and Orlando, where fewer than 30% of the passengers are making business-related trips). The proportion of passengers familiar with regional transit systems (e.g., understand the schedules and how to purchase a ticket) is also important.
- **Regional travel time.** The availability of direct service between the airport and downtown (or major activity centers) allowing passengers to avoid transfers or multiple stops is important. Passengers traveling between the airport and downtown encounter 6 to 9 station stops

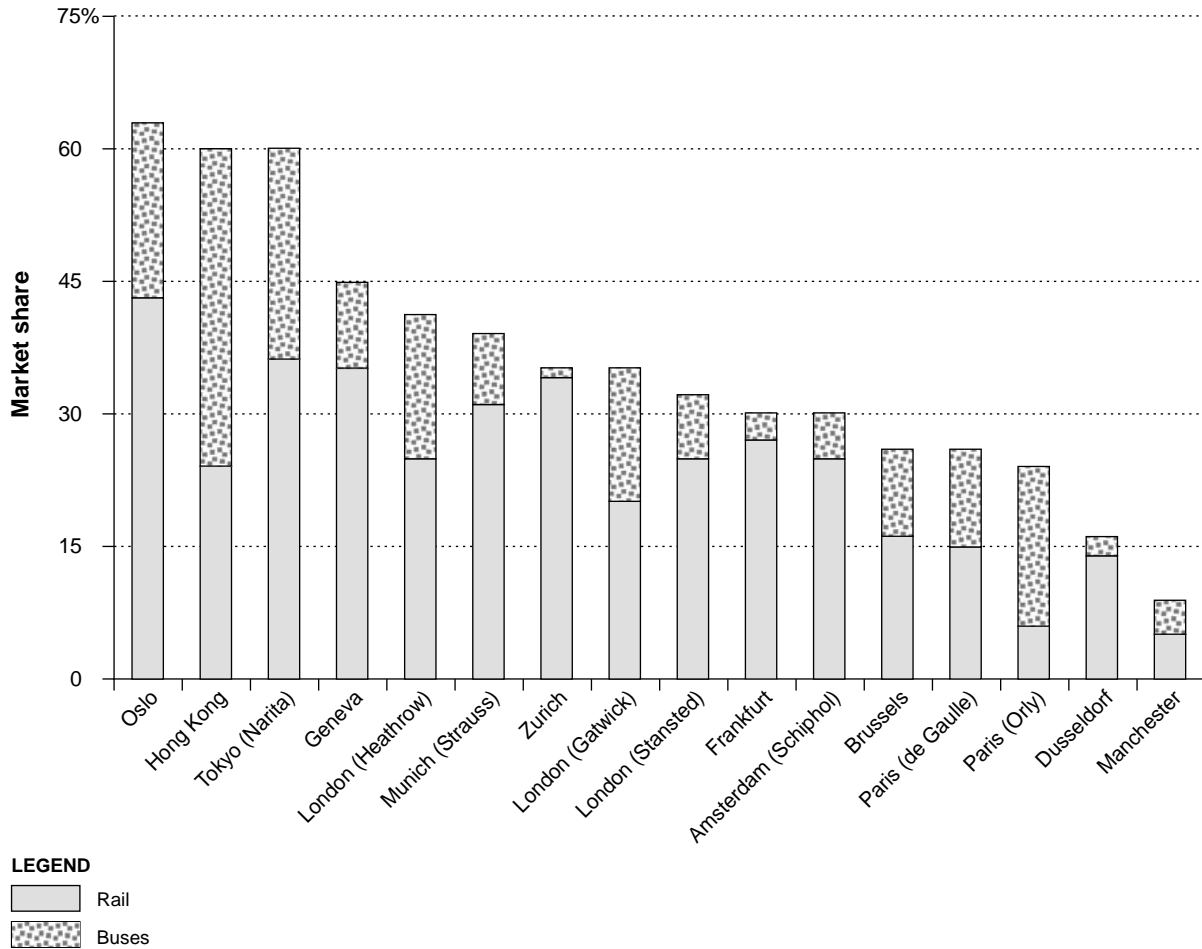


LEGEND

-  Rail
-  Buses
-  Shared-ride vans

SOURCE: Leigh Fisher Associates, based on information provided by airport management.

Figure 1-5. Public transportation market share at large U.S. airports.



SOURCE: Matthew A. Coogan, *TCRP Report 62 (1)*.

Figure 1-6. Market shares of rail and bus at international airports.

at Washington, D.C.'s Reagan National Airport versus 15 or more stops on less successful rail systems. As evidenced by the data, passengers tend to use rail service when they are concerned about (1) unreliable travel times on access roadways or encountering traffic delays enroute to the airport and (2) the lack of convenient parking at the airport and the need to search for an available space.

- **Ability to walk between station and destination.** Passengers may find using rail service more attractive if their final destination is within walking distance of the station and less attractive (and less convenient) if they must transfer to a second mode (e.g., a bus or taxicab) to travel to or from the station. The need for rail passengers to wait for and transfer to a second mode may provide a travel time advantage for door-to-door services.
- **Extent of regional coverage.** A comprehensive rail network, serving a large catchment area, will serve a larger potential market and provide passengers with more travel opportunities (e.g., those who may wish to leave from their place of work and return to their home) than does

a rail system consisting of a single line between downtown and the airport.

- **On-airport travel time.** The time (and distance) passengers are required to travel between the station and their gate is also important. It is easier to provide convenient rail service at airports that have a single terminal (e.g. Hartsfield Atlanta International or Midway) than at airports with multiple terminal buildings (e.g., JFK, Boston-Logan, or Charles de Gaulle International Airports) where passengers must use intermediate shuttle buses or people movers to travel to the rail station.
- **Frequency of service.** Waiting times of 10 min are preferred. The rail service at one U.S. airport operates on 30-min headways while a taxicab ride downtown at the same airport requires only 15 to 30 min. The availability of late-night and weekend service is also important.
- **Availability of parking at transit stations.** Many transit agencies prohibit overnight parking at stations, discouraging passengers who may wish to leave their cars at the rail station for their duration of their trips.

The upper values for the use of public transportation are higher at European and Asian airports. Public transportation market shares are higher than 35% at three European and two Asian airports—the airports serving Oslo (63%), Hong Kong (60%), Tokyo (59%), Geneva (45%), London (Heathrow) (40%), and Munich (38%). It appears that these data are not transferable to the United States because of the extensive public transportation networks, limited highway access, regional population densities, and the use of rail as a feeder service.

Use of Bus and Van Services

Figure 1-5 also depicts the use of bus and van service at 33 large U.S. airports. As shown, five of these airports have public transportation market shares that are higher than the airports with direct rail service or shuttle service connection with rail (excluding Reagan National Airport). These airports (and their public mode market share) include New Orleans (16%), Denver (14%), Las Vegas McCarran (12.6%), Seattle-Tacoma (12%), and Orlando (11.5%) International Airports. At more than 10 airports, express buses are used by more than 5% of the airline passengers. These airports include those serving Baltimore, Boston, Denver, Indianapolis, Los Angeles, Newark, New Orleans, New York (JFK International and LaGuardia), Oakland, San Francisco, and Seattle.

Shared-ride, door-to-door services are used by more than 5% of the airline passengers at 7 of the 33 large airports. These airports include those serving Los Angeles (12.5%), San Francisco (12.0%), Orlando (11.5%), San Diego (9.0%), Tampa (7.0%), Denver (6.3%), and Sacramento (5.0%).

Data available from European airports indicate that 10% or greater of the passengers use bus services at the airports serving Hong Kong (36%), Tokyo (23%), Oslo (20%), London (Heathrow and Gatwick airports) (15%), Paris (Charles de Gaulle) (11%), Brussels (10%), and Geneva (10%).

At several of these airports, publicly or privately sponsored express buses serve specific markets (e.g., the Logan Express in Boston and the Van Nuys FlyAway in Los Angeles). In Europe, bus service is often coordinated with or operated by the airlines (e.g., Lufthansa regional bus service at Frankfurt or the Roissybus provided by Air France).

Opportunities for Bus and Van Services

TCRP Report 62 documented that airline passengers represent a unique market that differs from traditional daily commuters. Compared with daily commuters, airline passengers are typically more time-sensitive and less cost-sensitive, have more baggage, use the transit system less often, and are more likely to use the system outside of normal commute hours. It is often easier to design a special bus or van service to respond to this market than to try to adapt a commuter-oriented, multi-stop bus (or rail) service to meet the needs of both daily com-

muters and airline passengers. Door-to-door van and express bus services are examples of airport access modes that respond to the desire of airline passengers for greater convenience and faster travel times than are typically offered by multistop bus services. Many operators of rail service prefer not to have airport-dedicated vehicles (e.g., with special baggage racks) because these special vehicles reduce their flexibility in the use of equipment.

Bus and van services, particularly privately owned services, operate in a different environment than do rail services. While a few express bus services are publicly operated or subsidized by an airport operator, most bus services and all shared-ride van services are privately operated. Private operators are required to (1) obtain an airport permit in order to pick up passengers at an airport, (2) abide by airport regulations, and (3) pay established fees. Public transit agencies are usually exempt from such airport fees and may even receive subsidies from the airport operator.

Requirements for Successful Bus and Van Services to Airports

As with rail systems, numerous studies have documented the requirements for a successful bus and van transportation service. At an airport, the key factors affecting the use of bus and van services include the following.

- **Door-to-door transportation.** Many airline passengers are willing to pay additional fares for the convenience offered by door-to-door services because they value travel time (particularly reliable travel time) more highly than they value travel costs. Such services also allow passengers to avoid transferring between airport access modes.
- **Express bus service.** Express bus services, particularly those that offer travel time savings and service from intercept lots near regional access roads, have proven attractive to specific airline passenger market segments.
- **On-airport travel time.** The time (and distance) that passengers are required to travel between the terminal and the boarding area are important considerations. As with rail systems, a single airport terminal building allows better levels of service (i.e., fewer stops and faster travel time) than does an airport with multiple terminals or bus stops.
- **Pick-up/drop-off locations.** To best serve the needs of passengers, drop-off locations should be located immediately adjacent to ticket counters and pick-up should occur next to baggage-claim areas, preferably in areas reserved for buses, vans, and other commercial vehicles.
- **Frequency of service.** The availability of off-peak, late-night, and weekend service is also important because many airline passengers travel during non-commuter hours (e.g., the peak hours at many airports are 11 A.M. to 1 P.M. on weekdays).

- **Regional travel time.** The availability of high-occupancy vehicle (HOV) lanes on airport access routes can allow bus and van services to offer a travel time savings compared with private vehicles. The abilities to stop at major activity centers and to avoid the need to use a second connecting travel mode at the non-airport end of the trip are advantages.
- **Form of competition.** The measures used to control competition among bus, van, and other rubber-tired services (e.g., taxicabs and limousines) are important. In an open market, a legitimate operator offering high-quality service will find it difficult to compete financially with an operator who (1) uses vehicles that are improperly maintained and lack proper insurance and (2) uses owner-operator drivers who lack proper training and are encouraged or required to improperly solicit business.
- **Regional coverage and passenger characteristics.** The proportion of airline passengers whose trip ends is near the bus stops or stations is also important. The degree of population density and automobile ownership may also influence the use of door-to-door service. For example, the proportion of passengers using shared-ride vans at San Francisco International Airport is much higher than the proportions at Metropolitan Oakland or San Jose International Airports, perhaps because of the greater population densities and lower automobile-ownership rate in San Francisco.

Although not addressed in detail in *TCRP Report 62*, airport employees represent a major potential market for bus and rail service. Many of the factors described above are also applicable to employees. However, key considerations are (1) the availability of service to areas where employees live (which are often in the opposite direction from downtown and the traditional transit corridors); (2) the frequency of service during late night and weekends (because of employee working hours and shifts); (3) the accessibility of employee worksite to transit; and (4) the availability and cost of parking for employees. These factors are explored in Chapter 4 of this report.

Lessons Learned: Planning to Meet Market Needs

In the United States, airport ground access public modes are attaining smaller market shares than in the rest of the world. The upper ranges of public transportation use in most U.S. cities appear to be about 10% to 15%, even at airports with rail service. In only four airports—San Francisco International, Boston-Logan, Washington’s Reagan National, and New Orleans—do public mode services capture more than 15% of the airport ground access market. And, significantly, the geographic areas experiencing the greatest growth in airport use lie outside of the traditional central business district. The data revealed in TCRP Project B-18 clearly shows that the national debate about airport access should not focus on

the basic “rail versus bus” decision. The research revealed the need to redefine the planning process to design services based on the needs of the customer.

TCRP Report 62 examined the successful international systems in terms of service attributes, most of which are not exclusive to one mode or another. The attributes of good airport connection, good line-haul connections to downtown, good coverage beyond the downtown, and the need to deal with baggage are all characteristics of services that could be supplied with bus or rail. At the conclusion of Project B-18, it became clear to the project panel that a new planning process should be developed—one that did not focus on the applicability of any one mode, or even debates about the relative characteristics of modes, but a process in which the service attributes would be developed from an understanding of the separate needs of the separate submarket existing at all airports. TCRP Project B-18A work program was developed in response to this policy direction from the project panel.

UNDERSTANDING THE SCALE OF GROUND ACCESS MARKETS

U.S. airports have a wide variation in the scale of their ground transportation issues. In order to support the development of comprehensive ground access strategies, it is valuable to establish a sense of scale to the problem because this directly affects the kinds of modes and technologies that are considered to solve the problem. Table 1-1 ranks the top 10 U.S. airports in terms of their overall market share to public modes, as reported in *TCRP Report 62*. A variety of airport scales are included in the top 10, which does include 2 airports below 5 million annual passengers but does not include several large airports with mode shares fewer than 10%.

Most airports describe their scale in terms of total airport passenger movement, which includes both enplanements and deplanements. Airports in Chicago and Atlanta are generally described as airports with more than 60,000,000 passengers. (In the technical literature, this is often referred to as “MAP” for million airport passengers—e.g., “Chicago and Atlanta have more than 60 MAP.”)

TABLE 1-1 U.S. airports ranked by public mode share

Airport	Market Share	Originating Passengers in Millions
San Francisco	21%	12.5
Boston	19%	10.4
Reagan National	17%	6.5
New Orleans	16%	4.1
Denver	14%	9.0
Los Angeles	13%	18.3
Las Vegas	13%	11.1
Seattle-Tacoma	12%	9.6
Orlando	11%	11.2
Chicago Midway	11%	4.5

SOURCE: *TCRP Report 62* (1).

The scale of airport ground access markets is best seen in terms of a daily volume from point origin to the airport and, if possible, in terms of an hourly volume number. This report refers to ground access flows *to* the major airports for the simple reason that the vast majority of airport ground access surveys are collected in the airline departure function, for a variety of reasons of survey accuracy and reliability.

The relationship between annual passenger activity figures and hourly flows of persons on public modes is illustrated in the following steps.

“Typical” Ground Flows for Large U.S. Airports

A “typical” airport access volume for public mode use can be estimated from the available data. The steps to calculate an average daily ground access public mode volume are straightforward.

Step 1: From Passengers to Enplaning Passengers

The scale of an airport is generally categorized in terms of annual total airport activity. For example, in 1998, Boston-Logan was generally described as an airport of roughly 26,000,000 passengers. For the analysis of ground access, it is functional to examine movements on one direction; thus, Boston could be just as well described as an airport of 13,000,000 *enplanements*.

Step 2: From Total Enplanement to Originating Passengers

The most important step in observing the overall scale of the ground access market is to delete the airplane-to-airplane connecting movements from the total enplanements. When this is done, Boston-Logan can be observed to have 10.4 million *originating* passengers, making it the ninth-largest ground access market in the United States. As such, we can use it as a “typical” larger airport in our sample of about 20 airports.

Step 3: From Annual to Daily Originating Passengers

In Boston, 10.4 million passengers get to Logan Airport on the ground transportation system per year. For an average day, about 28,000 air passengers start their trips from Logan. (In this case, 10.4 million is divided by 365 days. The analyst also might choose a “design” day, in which case the daily volume would be higher.)

Step 4: Applying the Airport-wide Mode Share

There are 10 U.S. airports with total mode share generally between 10% and 20% share to all public modes, so a “typi-

cal” successful public mode share might be set at 15%. Thus, a typical volume of passengers arriving at a typical large U.S. airport can be calculated at about 4,300 per day.

Step 5: From Daily to Hourly Volume

Empirically we can observe that over that 24-h period, about 10% of the daily passengers arrive in 1 peak hour. (This will vary sharply by airport.) Our “typical” large airport is attracting about 430 passengers per peak hour by all public modes from all points of origin in the region.

Actual Public Mode Flows at Selected Major U.S. Airports

The steps taken to create the typical public mode flow into the airport can be applied to each U.S. airport for which the data is available. Table 1-2 illustrates the sense of scale for ground transportation users at selected U.S. airports. The table shows that the largest number of daily public mode users in the United States is to San Francisco International Airport, with about 7,200 riders a day accessing the airport. There is wide variation by airport in this selected sample. At present, the airport at San Francisco attracts more than five times the public transportation volume of either New York airport, which each attract some 1,400 public mode users per day.

Airports with more than 4,000 passengers choosing public mode services exist in San Francisco, Los Angeles, Chicago (O’Hare), and Las Vegas. (Comparable data for Atlanta is not available.) This implies that a peak-hour volume of between 400 and 800 persons arrive at these five large U.S. airports in an average peak hour. From the available data, we can note that large U.S. airports are experiencing a wide variety of public mode volumes arriving at the airport, ranging from 100 to 800 per hour.

UNDERSTANDING THE SCALE OF PUBLIC TRANSPORTATION CAPACITY

For most metropolitan areas, a comprehensive program to improve public mode airport ground access services and to raise the overall vehicle-occupancy levels will require a variety of modes and a variety of operational strategies. Modal technologies from multiparty taxi sharing to regional rapid transit have all been found to be relevant to the U.S. experience. For each of these services, the transportation planner must match the characteristics of the supporting market with the characteristics of the candidate mode. In many cases, the capacity of a given mode, such as express bus service, has been considered a limiting factor in a long-term role of airport ground transportation. However, in virtually all cases under consideration, the capacity of bus, light rail, rapid transit, or commuter rail is vastly higher than that required for airport-related services. As discussed below, *the choice of*

TABLE 1-2 Selected airports ranked by number of public mode users to airport

Airport	Daily Public Mode Volume to Airport	Public Mode Market Share	Annual Originating Passengers in Millions
San Francisco	7,200	21%	12.5
Los Angeles	6,500	13%	18.3
Boston	5,400	19%	10.4
Chicago-O'Hare	4,000	9%	16.1
Las Vegas	4,000	13%	11.1
Denver	3,500	14%	9.0
Orlando	3,400	11%	11.2
Seattle-Tacoma	3,200	12%	9.6
Reagan National	3,000	17%	6.5
New Orleans	1,800	16%	4.1
Chicago Midway	1,400	11%	4.5
JFK New York	1,400	8%	6.2
LGA New York	1,400	5%	10.2

SOURCE: TCRP Report 62 (1).

airport access mode has more to do with policy decisions made for the rest of the regional transportation system than with any capacity limitations inherent to any given mode.

Capacity of Urban Rail Systems

There are many available sources documenting the capacity of urban transportation systems. One good source of the European view of modal capacity is the book *Transportation and Town Planning* by K. Liebbrand. His work is based on a wide variety of European experiences, particularly in terms of light-rail transit. The calculations of theoretical transit capacities are summarized in Table 1-3 (in his calculations, a 75% load factor was assumed). (9)

In the U.S. literature, a general rule is that light-rail transit is designed to serve a range between 3,000 and 15,000 passengers past a peak-load point. What emerges is a range for light-rail capacity limits of 15,000 passengers per hour in the U.S. literature to more than 40,000 in the European literature. Liebbrand calculates the capacity of a single car trolley as very similar to that of an articulated bus—roughly 19,000 persons per hour.

TABLE 1-3 Theoretical hourly capacity of urban transit modes

Mode	Length (in ft)	Headway (in sec)	Capacity (in persons/h)
Articulated bus	60	24	18,600
Light rail	83	30	19,800
Articulated light-rail vehicle	135	37.5	25,200
Two units	270	45	42,000
Rapid transit	540	90	45,000

SOURCE: Liebbrand, 1964 (9).

Capacity of Urban Bus Systems

Over the past decades, considerable technical work has been undertaken to examine the upward potential of capacity for carefully managed urban bus systems. A major study financed by the German government looked at the upper limits of buses, including the examination of buses operated in platoons. In the U.S. experience, marshaling stations to set up such platoons have been built, but not used, in the Seattle bus tunnel. Using both U.S. and German data, the upper limits of buses operating a tight platoon were estimated at 70,000 passengers per hour (see Table 1-4) (10).

Further study of the capacity of bus systems is available from the analysis of operations of the express bus lane on I-495 in New Jersey. For example, in the analysis of ridership from the New Jersey Waterfront to Manhattan, the express bus lane to the mouth of the Lincoln Tunnel was forecast to carry about 910 buses per hour. With buses carrying 50 seats each, this assumption worked out to a capacity for one bus lane of more than 45,000 passengers per hour, which is similar to the conclusion drawn earlier from theoretical studies (11).

Relevance of Capacity to Airport Access

The literature review concerning public transportation capacity leads to the conclusion that capacity is simply not a

TABLE 1-4 Theoretical capacity of bus systems

Traffic Condition	Buses per Hour	Passengers per Hour
Observed values	175	9,000
Exclusive bus lane	573	25,000
Peak of peak in bus lane	817	42,000
Experiments with platoons	1,450	70,000

SOURCE: *Bus Transit Systems*, SNV 1982 (10).

relevant issue in the decision between a busway solution and rail solution for airport-generated volumes. Liebbrand defines the upwards capacity of both “light rail” and urban rapid transit as somewhere above 42,000 passengers per hour, which is about the same volume currently carried through the Lincoln Tunnel’s express bus lane in northern New Jersey. Again, when assumptions are changed, such as adding platooning to a bus system or an express track to a rail system, those upside estimates of capacity can easily double.

What emerges from the literature is the irrelevance of “capacity” numbers in the selection of a mode for airport ground access. The earlier paragraphs noted that the “typical” large U.S. airport would attract fewer than 500 passengers per hour. Creating a policy scenario in which the mode share is doubled would result in 1,000 passengers per hour, and so forth. It becomes clear that volumes this low can be handled by virtually any mode now available to the transit designer. (The capacity of the Vancouver Sky Train has been reported at 5,700 persons per hour [12].)

Factors That Are Determinant: Regional Context and Transportation Policy

In the U.S. experience, the selection of a mode to serve the dense-urban-market portion of the total airport market will be influenced by many factors. The selection of mode to the city center will be more influenced by the regional transportation policy than by the demands placed on the system by the airport volumes. When a region has made a commitment to rail transit services in the affected corridor, a busway solution may be difficult, if not impossible, to implement. If a region has invested in regional priority lanes for buses, the creation of a parallel right-of-way for airport rail may not make sense. In effect, the choice of mode for a service to the airport is more dominated by the regional commitment to a given form of public transportation than it is by the demands

placed on the system by the airport travelers. All of this argues for the closest of cooperation between the airport strategist and the established regional transportation planning process.

DEVELOPING A NEW APPROACH TO AIRPORT GROUND ACCESS PLANNING

Project B-18 concluded that *there is no one market for airport ground transportation services: there are a series of clearly definable submarkets, or market segments, each of which requires specific services based on the analysis of need.* The research plan for Project B-18A was developed to create a planning process based on the needs of the user, without regard to initial assumptions about the appropriateness of any given mode.

Based on lessons learned from the freight industry and other trends in the management of transportation, it is clear that the creation of a multi-element strategy for any large U.S. airport must be based on the understanding of the needs of the customers. Project B-18A’s work program was designed to show how such a process could be created. The details of implementation in local areas will vary depending upon the needs revealed in that specific area.

The chapters that follow propose a specific program to develop alternative strategies and actions to improve the performance of airport ground transportation by public mode. The proposed process has been designed to develop plans and strategies based upon the revealed needs of several market groups at U.S. airports. This report presents national data against which the analyst can observe the overall characteristics of the market revealed by the data. Using quick comparisons with other U.S. airports, the overall nature of the market can be categorized based on its patterns of ground transportation trip-end density.

CHAPTER 2

DOCUMENTING AIRPORT MARKET CONDITIONS SUPPORTIVE OF PUBLIC GROUND TRANSPORTATION SERVICES

CONTEXT OF CHAPTER 2

Chapter 2 presents the results of research into patterns of public ground transportation use at large U.S. airports and describes the market environment in which these services operate. Information from air passenger surveys conducted at 13 airports is used to determine where air passengers begin their ground transportation trip to the airport and which modes they prefer. Public ground transportation services typically available at large airports are organized into three categories and reviewed in detail. The three categories are traditional bus or rail, shared door-to-door vans, and express bus service from a regional collection point.

This research supports the improvement of public ground transportation services because it increases our knowledge and understanding of the ground transportation customer and his or her trip to the airport. Groundwork in market research sets the stage for developing a realistic planning approach to improving airport ground transportation services and to configuring transportation services that are responsive to the customer and supportive of airport ground access objectives.

In the airport ground transportation environment, the market has both a quantitative (i.e., number of ground access trips) and geographic (i.e., origin location of ground access trips) component. The combination of these two elements into one measure provides a standard way of presenting market characteristics. It also provides a means to evaluate the viability of an airport market for a particular ground transportation service and to compare it with similar services at other airports. The purpose of this chapter is to provide evidence of the combined quantitative and geographic characteristics of airport markets that support public transportation modes currently in operation.

Summary

The chapter begins with a review of the terms used in describing airport ground transportation markets and establishes a standard measure of ground transportation activity called “trip-end density.” This measure combines the quantitative and geographic components that describe ground transportation markets and provides a way to compare ground transportation trip activity at different airports.

Based on the data available to this study, 13 large airports are described in terms of land area and trip-end density. Densities are summarized into four categories and used to compare the ground access markets at a number of airports. Comparison of airport ground access markets reveals similarities in broad-scale patterns of trip activity. From this exercise comes the recognition of the primary ground access market—a relatively small area of an airport’s entire ground transportation service area that generates the majority of the trips to the airport. The concept of a primary market is borrowed from the field of marketing geography and is important to understanding the role of various categories of ground transportation in serving an airport’s ground transportation market.

The next sections of the chapter are concerned with the three categories of public ground transportation services. Discussion about each category progresses from general descriptions of airport mode shares to specific examples of trip-end density associated with each mode. First, mode shares are provided for a selection of airports at which the particular transportation service can be clearly identified (because of variations between airports in the naming of various ground transportation modes, it is not always possible to do so). Second, the market for each service category is discussed using trip-end densities, the same measure used in describing the entire airport ground access market. Whenever possible, the characteristics of individual service operations within the general categories are presented.

The chapter concludes with a summary of the research findings concerning the trip-end densities associated with public ground transportation and a discussion of the implications of the research for planning airport ground transportation services. Additional recommendations are provided based on the research experience with data collected for this project.

TERMS USED TO DESCRIBE AIRPORT GROUND TRANSPORTATION MARKETS

Trip Ends

For consistency in discussing airport ground transportation markets, a further refinement to the description of a trip is needed. A ground transportation trip can be more precisely defined using the measure of trip ends. The definition of a trip

end is the origin or destination point of an air passenger's ground access trip; one trip end is at the airport and the second trip end is located somewhere within the airport's market or service area. Therefore, each ground transportation trip made to or from an airport by an air passenger involves two trip ends. The discussion in this chapter concerns the non-airport end of an air passenger's ground access trip. To standardize the discussion, all references to air passenger trip ends are based on average daily ground access trips made by departing air passengers only. The reason for discussing the one-way ground access trip of departing air passengers is a result of the survey methodology used by most airports whereby surveys are administered to air passengers as they wait for their flights in airline departure lounges.

Trip-End Density

The definition of an airport ground transportation market has a geographic and a quantitative component. Geographically, it is a physical area surrounding an airport where air passengers begin or end their ground transportation trip. Quantitatively, it is the total number of ground transportation trips made by air passengers from that area. A measure that combines these two components is trip-end density. For this study, it is the number of air passenger trip ends per square mile of land area.

Trip Origin Zones/Zonal System

Information presented in this chapter is obtained from airport surveys conducted at 13 large U.S. airports—San Francisco International (SFO); Reagan National (DCA) serving Washington, D.C.; LaGuardia (LGA) serving New York; John F. Kennedy International (JFK) also serving New York; Boston-Logan International (BOS); Los Angeles International (LAX); Dulles International (IAD) serving Washington, D.C.; Seattle-Tacoma International (SEA); Denver International (DIA); Tampa International (TPA); Newark International (EWR); Baltimore-Washington International (BWI); and Portland International (PDX) in Oregon. The ground access market for each airport is defined using the origin or non-airport location where an air passenger begins his or her ground access trip. The land area associated with an airport market or service area can be measured using a variety of geographic units such as zip codes, census tracts, or traffic zones. Regardless of the type of geographic information available, trip ends must be summarized using some system of zones in order to have the area dimensions needed for calculating trip-end densities. In the majority of airport surveys available to this study, the zip code associated with each air passenger's access trip was collected and recorded as part of the survey database. For four airports—Los Angeles, Reagan National, Dulles, and Baltimore-Washington—zip codes were not available in the survey database, and air passenger trip

ends were summarized according to an aviation analysis zone system unique to that region (Radam zones in Los Angeles and aviation analysis zones in the Baltimore-Washington region). Therefore, with the exception of four airports, the geographic zone system used for analyzing access trip ends is the zip code.

AIR PASSENGER TRIP-END DENSITIES ASSOCIATED WITH GROUND ACCESS MARKETS

Not surprisingly, a wide range of trip-end densities is found in the ground transportation markets associated with large U.S. airports. Densities range from less than 1 trip end in 100 square miles to more than 2,000 trip ends in one square mile using zip code zones. Comparing airport ground transportation markets using this wide range of trip-end densities would be difficult, so the trip-end densities are summarized in a smaller number of categories in order to discern patterns.

In order to visualize trip-density patterns on maps for each airport, trip-end densities are summarized in four categories. Using a geographic information system (GIS) software program, trip-end densities by zip code are summarized according to naturally occurring breaks in the density categories. The result is a set of four categories: 50 or more, 5 to 50, 1 to 5, and less than 1. These categories are based on observed patterns and changes in densities in airport ground transportation markets rather than on an arbitrary summarization of trip density information. Additional categories could be presented; however, limiting the number of categories to four results in recognizable patterns that can be compared among all of the airports available for this study.

Summarizing airport ground access markets using the four trip-end density categories provides a broad context in which to begin research into public ground transportation modes at different airports. Table 2-1 presents information about the ground transportation markets for each of the 13 airports in this study. The market information provided in Table 2-1 (1999 population, trip ends, and land area) should not be used to rank the airports in terms of size or market area coverage. There are number of reasons for this caution. First, the survey data provided for each airport does not represent a common year; the year in which each survey was conducted is noted under the airport name. Second, the estimated square miles of land area and the number of air passenger trip ends do not reflect the actual size of an airport's respective ground transportation market. Rather, the numbers represent all air passenger trip ends that could be successfully matched to zip codes and the land area associated with these zip codes. In all cases, there are a number of survey records that had no zip code or other geographic information available. Third, trip-end densities of less than 0.01 (one air passenger trip end per 100 square miles) are not included in the table. Including trip-end densities of less than 0.01 would add very little to

TABLE 2-1 Ground access market areas

Airport (Survey Year)	Trip-End Density Category	Land Area in Square Miles	Number of Average Daily Air Passengers Represented	1999 Population Estimate (thousands)	Average Trip-End Density Within Category
New York LaGuardia (1997)	.01-.09	2,490	130	1,064	.05
	.1-4	4,340	3,700	6,509	.85
	5-49	715	8,150	7,555	11.00
	50+	29	11,700	1,615	409.00
New York JFK (1997)	.01-.09	3,400	200	913	.05
	.1-4	7,240	5,400	11,007	.70
	5-49	588	7,750	7,561	13.00
	50+	34	10,450	1,932	310.00
San Francisco (1998)	.01-.09	4,100	200	459	.05
	.1-4	6,600	5,120	4,220	.80
	5-49	681	8,200	2,984	12.00
	50+	79	18,000	911	225.00
Boston- Logan (1999)	.01-.09	1,972	100	380	.05
	.1-4	5,800	5,700	3,711	1.00
	5-49	900	11,100	2,400	12.00
	50+	44	9,300	543	210.00
Newark (1997)	.01-.09	2,605	120	530	.04
	.1-4	8,200	6,900	11,244	.80
	5-49	1,400	15,300	7,135	11.00
	50+	29	6,200	1,193	215.00
Seattle- Tacoma (1996)	.01-.09	12,100	400	241	.03
	.1-4	7,050	4,000	1,808	.60
	5-49	600	7,400	2,278	12.00
	50+	37	4,700	241	126.00
Denver (1998)	.01-.09	5,050	200	83	.04
	.1-4	7,600	9,100	1,045	1.20
	5-49	800	11,900	1,420	15.00
	50+	86	8,600	320	100.00
Los Angeles (1993)	.01-.09	2,393	90	131	.04
	.1-4	5,315	5,030	4,974	1.00
	5-49	1,382	21,040	8,597	15.00
	50+	169	12,970	1,518	77.00
Tampa (1997)	.01-.09	819	50	115	.06
	.1-4	4024	2,800	1,925	.70
	5-49	460	6,300	1,226	14.00
	50+	24	3,025	81	126.00
Portland (1996)	.01-.09	14,390	450	763	.03
	.1-4	6,921	3,390	2,161	.50
	5-49	415	5,115	1,213	12.00
	50+	10	650	72	66
Reagan National (1998)	.01-.09	2,322	130	NA	.06
	.1-4	3,769	3,270	NA	.87
	5-49	439	5,665	NA	13.00
	50+	45	9,840	NA	216
Dulles (1998)	.01-.09	2,775	135	NA	.05
	.1-4	3,950	3,170	NA	.80
	5-49	476	6,730	NA	14.00
	50+	39	4,280	NA	110
Baltimore- Washington (1998)	.01-.09	706	40	NA	.06
	.1-4	6,324	5,825	NA	.92
	5-49	590	6,625	NA	11.00
	50+	9	1,865	NA	205

SOURCE: MarketSense, based on airport air passenger surveys.

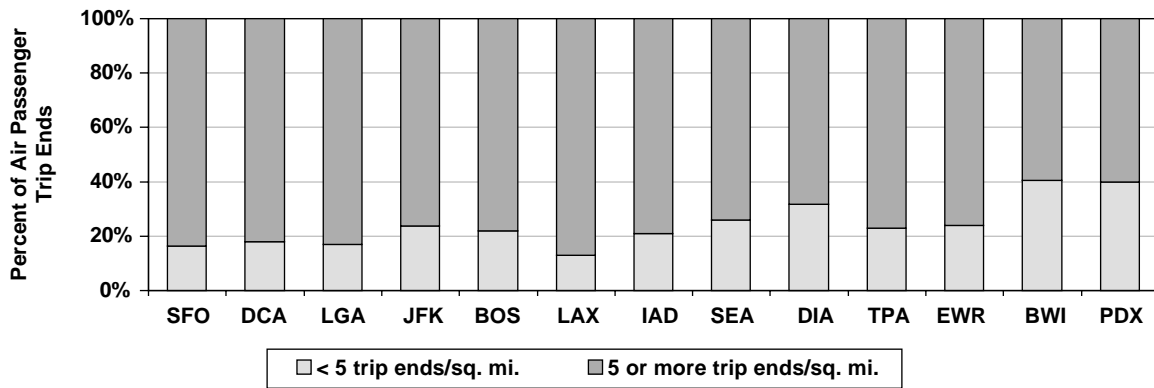
the number of air passengers represented and include areas on the extreme fringe of airport ground access markets.

A Comparison of Trip-End Density and the Land Area

There is broad similarity in the distribution of trip-end densities for each of the 13 airports. To illustrate this point, two graphs have been prepared based on the data in Table 2-1. First, the number of air passenger trip ends and associated land area at each airport are compressed from four into two categories; areas having a density of five or more trip ends

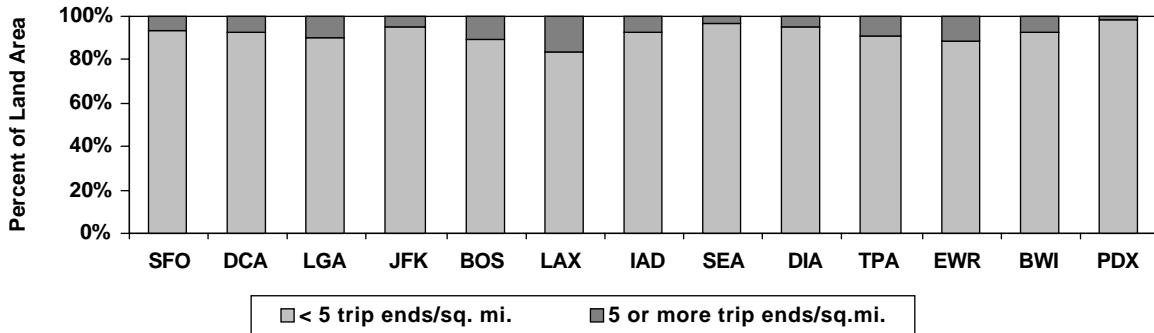
per square mile and areas having less than five trip ends per square mile. The results can be seen in Figures 2-1 and 2-2. Figure 2-1 illustrates that the majority of air passengers start their ground access trips from areas having five or more trip ends per square mile. Figure 2-2 illustrates that the majority of the land area within a ground access market is composed of areas with less than five trip ends per square mile.

The proportional relationship between trips ends and land area for airport ground transportation markets is dramatic. Figures 2-1 and 2-2 illustrate that a relatively small area of land in each ground access market is associated with a very high proportion of air passenger trip ends. In most cases, approximately 60% to 80% of all air passenger trip ends are



SOURCE: MarketSense, based on airport air passenger surveys.
 NOTE: SFO = San Francisco; DCA = Reagan National, Washington D.C.; LGA = LaGuardia, NY; JFK = John F. Kennedy, NY; BOS = Boston-Logan; LAX = Los Angeles; IAD = Dulles, Washington D.C.; SEA = Seattle-Tacoma; DIA = Denver; TPA = Tampa; EWR = Newark; BWI = Baltimore-Washington; and PDX = Portland, OR.

Figure 2-1. Ground access market areas for 13 large U.S. airports—air passenger trip ends.



SOURCE: MarketSense, based on airport air passenger surveys.
 NOTE: SFO = San Francisco; DCA = Reagan National, Washington D.C.; LGA = LaGuardia, NY; JFK = John F. Kennedy, NY; BOS = Boston-Logan; LAX = Los Angeles; IAD = Dulles, Washington D.C.; SEA = Seattle-Tacoma; DIA = Denver; TPA = Tampa; EWR = Newark; BWI = Baltimore-Washington; and PDX = Portland, OR.

Figure 2-2. Ground access market areas for 13 large U.S. airports—land area.

generated from an area equaling not more than 10% of the total area associated with ground transportation trips to an airport. All airport ground transportation markets exhibit this general pattern to some degree. This observation has implications for designing airport ground transportation services because it suggests that a large proportion of all ground transportation trips to an airport are generated from a relatively small physical area. In planning airport ground transportation services, the area with five or more trip ends per square mile should be the focus for maximizing mode share potential.

The Importance of Primary Ground Transportation Markets

The previous section highlighted the significance of geographic areas in which trip-end densities equal or exceed 5 trip ends per square mile. A meaningful term that can be used to describe this area is the “primary market.” Borrowed from the field of marketing geography, a primary market is defined as “the area associated with at least 60% of all customers,” in this case, air passengers using ground transportation. It is important to the success of any ground access service to understand where the majority of potential customers is located in order to find the area that contains the highest concentration of passengers. The share of air passengers using a particular access mode from a given area will vary depending upon a number of factors, one of which is the origin location of passengers’ access trip to the airport. Identifying the primary market for an entire airport is the first step in defining the markets for various public transportation modes.

Applying the definition of primary market to the four trip-end density categories, we find that for all the airports, the primary market is described by the sum of the first two highest categories of trip-end densities. Therefore, primary mar-

kets for all of the airports under discussion have average densities of five trip ends per square mile or higher. As shown in Table 2-2, primary markets account for 59% to 87% of all trip ends and 2% to 17% of the land area associated with the ground transportation service area of an airport. For the majority of airports, the land area in their primary market is between 400 and 950 square miles, the exceptions being Newark (1,429 square miles), Los Angeles (1,551 square miles), Tampa (484), and Portland (435). Table 2-2 summarizes the characteristics of the primary ground transportation markets for the 13 airports.

The concept of a primary market area is important for understanding the service and operating environment of an airport’s ground transportation network. It is also an important concept to remember when evaluating the role of an individual ground transportation service. The primary market provides a framework for assessing operations and the potential demand for a new service and for comparing market characteristics of a new service to those supporting existing services. As we examine the three categories of ground access services covered in this chapter, we will see that all of them focus on areas with five or more trip ends per square mile, that is, on primary ground transportation markets. Only one service—the express bus operating from a regional collection point—can effectively serve areas outside of an airport’s primary ground access market.

TRIP-END DENSITIES ASSOCIATED WITH FIXED-ROUTE AND SCHEDULE SERVICES

Airports with Rail Service

Rail is responsible for transporting a significant proportion of air travelers to Boston’s General Edward Laurence Logan

TABLE 2-2 Primary ground transportation markets

Airport	Land Area (square miles)	Percent of Total Ground Transportation Market Area	Number of Air Passenger Trip Ends	Percent of Total Air Passenger Trip Ends	1999 Population Estimate (thousands)
LaGuardia	744	10%	19,850	84%	9,200
JFK	622	6%	18,200	76%	9,500
San Francisco	760	7%	26,200	83%	3,900
Boston-Logan	944	11%	20,400	78%	2,950
Newark	1,429	13%	21,500	75%	8,300
Seattle-Tacoma	637	3%	12,100	72%	2,500
Denver	886	7%	20,500	69%	1,750
Los Angeles	1,551	17%	34,000	87%	10,100
Tampa	484	9%	9,325	77%	1,300
Portland	425	2%	5,765	60%	1,300
Reagan National	484	7%	15,500	82%	NA
Dulles	515	7%	11,010	77%	NA
Baltimore-Washington	599	8%	8,490	59%	NA

SOURCE: MarketSense, based on airport air passenger surveys.

International Airport and Washington, D.C.'s Ronald Reagan Washington National Airport. In addition, a modest proportion of air travelers flying out of Baltimore-Washington International Airport use intercity Amtrak service from Washington, D.C. Information from air passenger surveys conducted at each of these three airports indicates the airport mode shares presented in Table 2-3. It should be noted that the Boston and Baltimore-Washington regional surveys were conducted in April 1999 and May 1998, respectively, making the mode share comparisons consistent in terms of the season of the year.

From a comparison of mode shares at the three airports, Metrorail service to Reagan National is the access mode of choice for almost 12% of the airport's air passengers and far exceeds the rail mode shares found at the other two airports; the Massachusetts Bay Transportation Authority (MBTA) subway service to Boston-Logan is used by 7% of air passengers, and Amtrak service to Baltimore-Washington International Airport is used by a modest 2% of air passengers. These mode share comparisons are based on the entire ground transportation market for each respective airport.

Primary Markets for Rail Service

Individual rail service mode shares are quite different at the three airports after applying the definition of the primary market and focusing on the specific areas within the entire market that are responsible for the majority of rail users. Information about the primary rail service markets for the three airports are presented in Table 2-4. As defined, the primary market for rail is that area of the respective airport ground transportation market in Washington or Boston that generates at least 60% of all air passenger trip ends by rail. For Washington and Boston, rail use is concentrated in urban areas in which the respective ground transportation markets average at least 125 trip ends per square mile. The trip-end density associated with the primary Amtrak market for Baltimore-Washington International Airport is considerably less at 25 trip ends per square mile; however, it is important to

TABLE 2-3 Airports with rail service mode shares

Arrival Mode	Reagan National	Boston-Logan	Baltimore-Washington
Private car	28.7%	37.3%	57.3%
Rental car	10.3%	12.3%	19.1%
Taxi	31.5%	20.2%	8.0%
Airport bus/limo	9.8%	20.0%	9.6%
Metrorail (DCA)			
Subway (BOS)	11.6%	7.1%	1.9%
Amtrak (BWI)			
Hotel/motel courtesy	7.9%	2.0%	3.1%
Other	<u>0.2%</u>	<u>1.1%</u>	<u>0.6%</u>
	100.0%	100.0%	100%

SOURCE: MarketSense, based on the 1998 Baltimore-Washington Regional Air Passenger Survey and the 1999 Logan International Airport Air Passenger Survey.

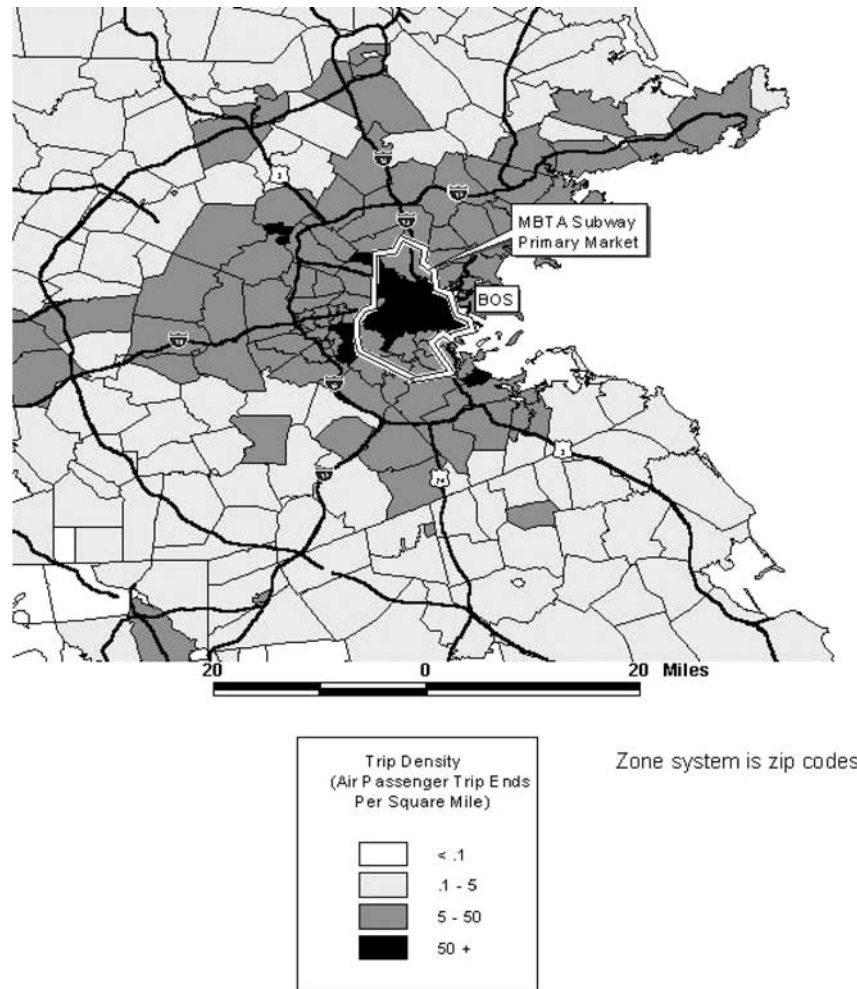
remember that this is an example of an intercity rail service and may have different market characteristics than would a metropolitan rail service. In Figures 2-3, 2-4, and 2-5, the rail market for each of the three airports is shown on trip-end density maps. Figure 2-3 illustrates the ground access market for Boston-Logan International Airport. The primary airport rail market, outlined as "MBTA Primary Subway Market," is an area that generates 76% of all trips made by rail to the airport. In Figure 2-4, the primary market for Metrorail to Reagan National Airport is outlined on a map of the airport's ground access market. It is an area that generates 72% of all Metrorail trips to the airport. For both airports, the primary market for rail service includes areas in the highest trip-end density category extending along principal rail routes to each airport. In Figure 2-5, the area of Washington that can be considered the primary Amtrak market for Baltimore-Washington International Airport is outlined on a map showing the total ground transportation market for the airport.

In both Washington and Boston, the primary rail market is a relatively small area of land that generates a high proportion of all airport ground access trips by rail. The primary market for Metrorail in Washington (92 square miles) is almost twice the size of the MBTA subway market in Boston (59 square miles); yet, the trip-end densities for rail are very similar in

TABLE 2-4 Airports with rail service primary geographic markets

Airport	Rail Service	Mode Share	Market Size		Trip Ends per Square Mile		
			Trip Ends by All Modes	Area in Square Miles	Total	Resident	Non-Resident
Reagan National	Metro-rail	13%	11,500	92	125	30	95
Boston-Logan	MBTA Subway	16%	8,900	59	151	79	72
Baltimore-Washington	Amtrak	14%	1,400	57	25	9	16

SOURCE: MarketSense, based on the 1999 Logan Air Passenger Survey and the 1998 Baltimore-Washington Regional Air Passenger Survey.



SOURCE: MarketSense, based on the 1999 Logan Air Passenger Survey.

Figure 2-3. Boston-Logan ground access market—MBTA primary market.

the two cities. In large part, this is the reason Washington has a much higher rail mode share when compared with Boston for the airport overall. It is interesting to note that the mode share for Amtrak service to Baltimore's airport (14%) from the primary Washington area market is very similar to the other two examples of rail mode shares.

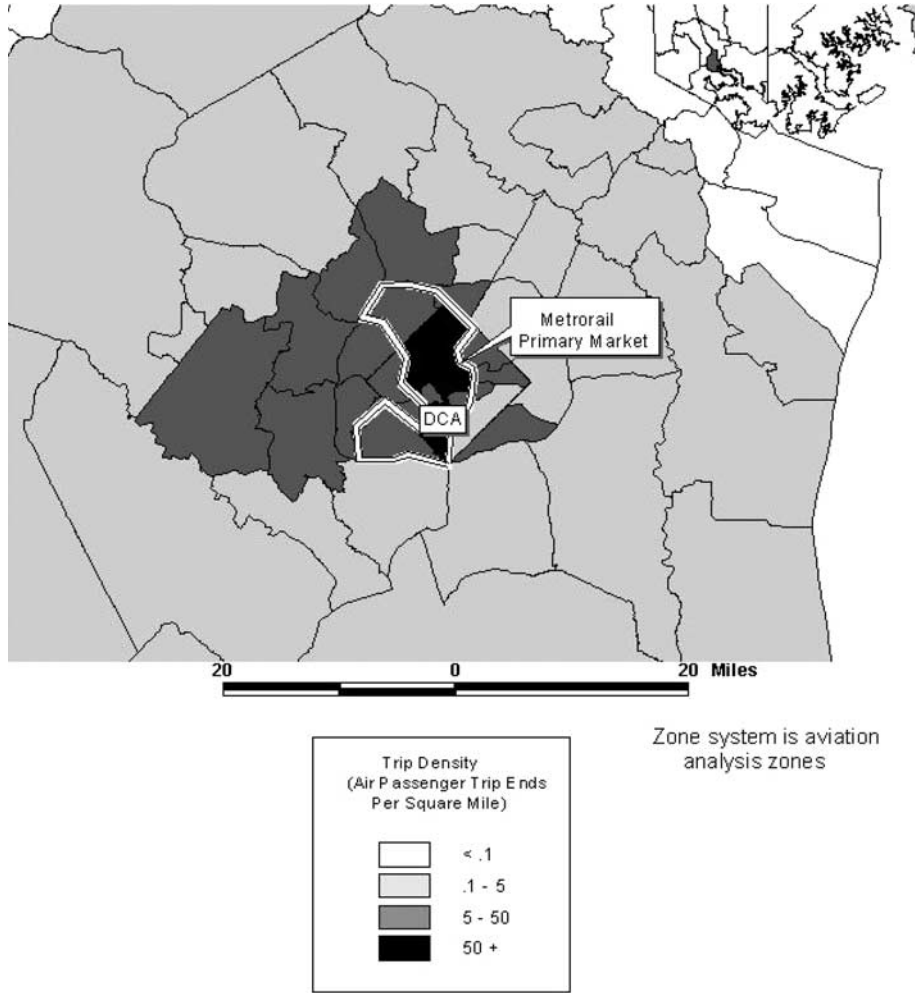
The Washington-Baltimore Regional Air Passenger Survey also asked passengers about their use of light rail and Amtrak service to Baltimore-Washington International Airport. Light rail service was relatively new at the time of the survey, so it is unlikely that current use of the service is reflected accurately in the survey findings. At the time of the survey, light rail was used by 1.9% of air passengers to reach BWI.

Market Segments Using Rail

Although all air passenger market segments use rail at each of the three airports, the distribution of use among the market

segments is different for Washington's Metrorail, Boston's MBTA subway, and Baltimore's Amtrak service. Table 2-5 provides rail use by market segment for the three airports. In Washington, approximately 60% of Metrorail and 72% of Amtrak users are visitors to the region while in Boston, 60% of MBTA rail users are residents of the region. The highest proportion of rail users to Reagan National is the non-resident air passenger on a business trip; the highest proportion in Boston is the resident air passenger on a non-business trip.

These differences in use of rail by air passenger market segments is likely due to the different focus of activities found in the urban area served by rail in Washington and Boston. The large student population of the Boston area is a significant component of the resident non-business air passengers using rail to access Boston-Logan Airport. In contrast, the focus of government and tourist activities in the areas well served by the Washington Metrorail supports high use of the mode by non-residents, both business and non-business travelers alike.



SOURCE: MarketSense, based on the 1998 Washington-Baltimore Air Passenger Survey.

Figure 2-4. Reagan National ground access market—Metrorail primary market.

Airports with Bus Service

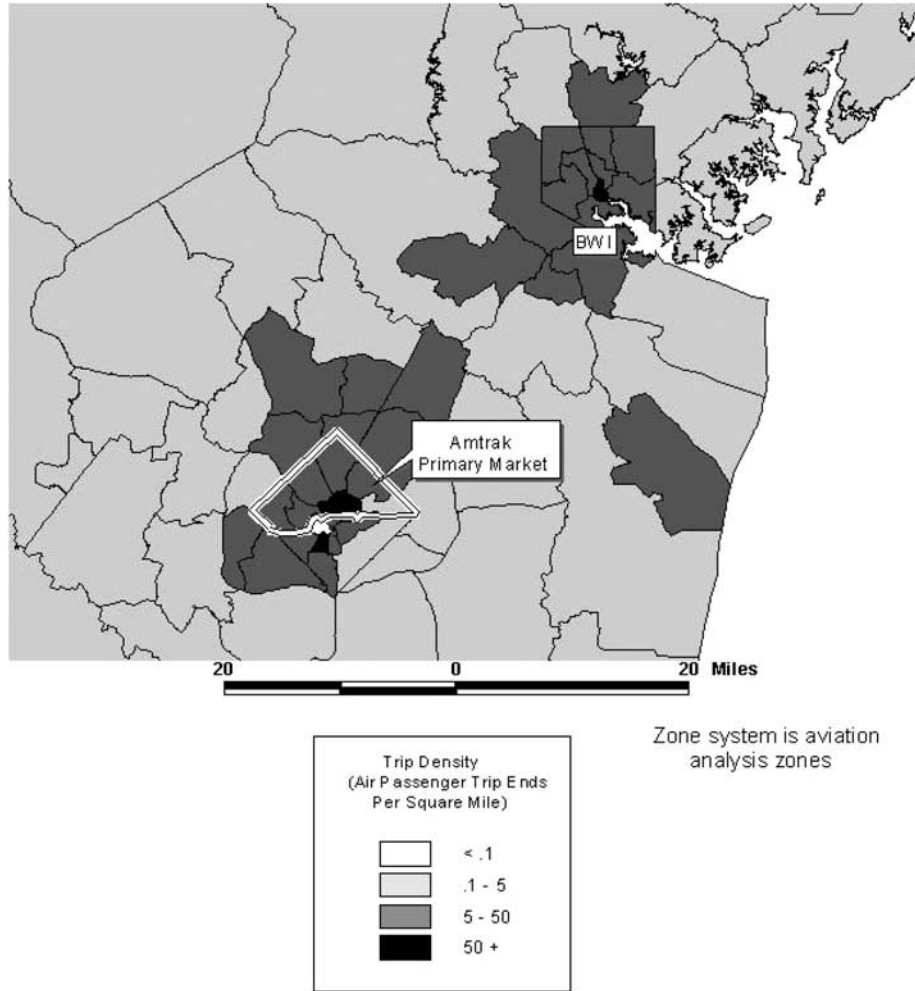
Another form of fixed-route service is bus. Some airport bus services from selected locations in urban downtowns are successful in attracting significant numbers of air passengers; however, public bus services with multiple stops do not perform well even in areas with high trip-end densities. Because of the way in which responses to air passenger survey questionnaires are summarized, it is not always possible to separate responses in the scheduled bus/van category into the separate types of ground transportation services included in this category. A few examples are available from airport surveys available to this research project. For scheduled bus services, the Grayline service from Seattle-Tacoma Airport to downtown Seattle and the service to Manhattan from JFK Airport are used as examples. For public multistop bus service, three examples are provided: Portland International Airport, LaGuardia Airport, and JFK International Airport (bus service to the airport from the Howard Beach Subway Station). Table 2-6 provides

the mode shares for each of the airports. Scheduled bus service averages from 1.8% to 2.5% for the Seattle and Manhattan services respectively and in the three examples of public multistop bus service presented, all of the mode shares are less than 2%.

As previously noted with rail, it is important to look at the primary markets for public multistop bus and scheduled bus services in order to fully appreciate their potential to transport travelers to the airport. Measuring a ground transportation service’s ability to carry air passengers using entire airport mode shares obscures the true potential to serve selected regions within a market.

Primary Markets for Public Multistop Bus Service

City bus service from Manhattan and Long Island to LaGuardia and the combined A-train/bus service to JFK are examples of public transportation services in operation in very



SOURCE: MarketSense, based on the 1998 Washington-Baltimore Air Passenger Survey.

Figure 2-5. Baltimore-Washington airport ground access market—Amtrak primary market.

high trip-end density locations. As is shown in Table 2-7, the mode share in the primary markets for these services is approximately 3%, which is only slightly higher than the mode share measured for the overall airport market. Figure 2-6 illustrates the market for public multistop bus service to LaGuardia airport and Figure 2-7 illustrates the same for the A-train/bus combination service. Central Manhattan is the primary market generating 60% of the passengers using public bus to the airport; an area of Long Island between JFK and LaGuardia accounts for another 10% of the market. For the combination A-train and bus to JFK, Manhattan is also the primary market, generating 67% of all passengers; an area of Brooklyn generates another 10% of the market. Another example of public multistop bus service to an airport is found in Portland—Tri-County Metropolitan Transportation District of Oregon’s (Tri-Met’s) bus service. This service does not perform much better in transporting air passengers to the airport than either of the New York services. Looking at the

primary market for the Portland Tri-Met bus service, one finds a mode share of 5% (note that this is considerably higher than the 0.6% mode share calculated for the entire airport market as shown in Table 2-6). In Figure 2-8, the primary market for Tri-Met bus in Portland is outlined on a map of Portland International Airport’s ground transportation market.

Market Segments Using Public Multistop Bus

Not surprisingly, the majority of bus users are non-business travelers at all three of the airports, as is shown in Table 2-8. For both LaGuardia and JFK, the non-business traveler accounts for the majority of air passengers using public bus to access the airport, 73% and 89%, respectively. In Portland, 84% of travelers using multistop bus service are non-business trips.

TABLE 2-5 Composition of rail market by segment

Airport	Service	Market Segments			
		Resident Business	Resident Non-Business	Non-Resident Business	Non-Resident Non-Business
Boston-Logan	Subway	16%	42%	22%	20%
Reagan National	Metrorail	20%	20%	35%	25%
Baltimore-Washington	Amtrak/MARC	9%	19%	29%	43%

SOURCE: MarketSense, based on the 1999 Logan Air Passenger Survey and the 1998 Baltimore-Washington Regional Air Passenger Survey.

Scheduled Bus Service from Downtown Locations

Examples of scheduled bus services from downtown locations include the Grayline Express from downtown Seattle to the airport and express bus from downtown Manhattan to JFK Airport. The scheduled airport bus services have a higher share of the airport ground transportation market compared with public multistop bus services (see Figure 2-9).

Primary Markets for Scheduled Bus Service

Reviewing the primary markets for these services indicates mode shares of 15% for the Seattle service and 7% for

TABLE 2-6 Airports with local and scheduled bus service mode shares

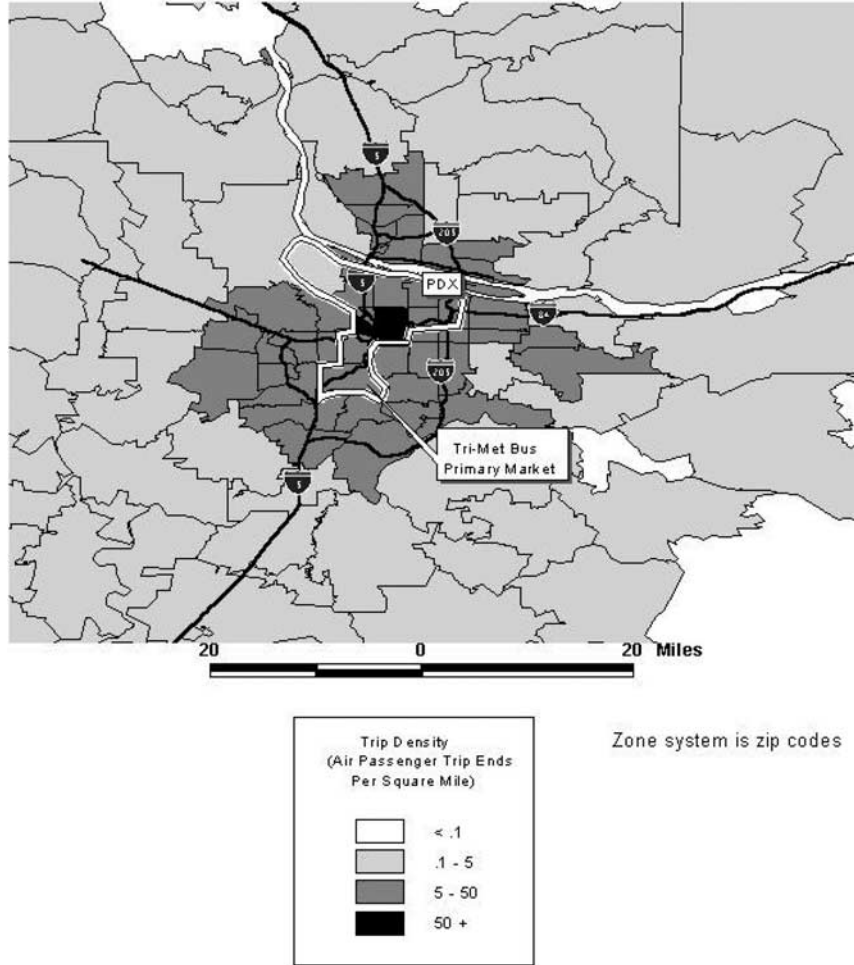
Arrival Mode	Portland	New York LaGuardia	New York JFK	Seattle-Tacoma
Private car	66.1%	36.8%	42.2%	56.8%
Rental car	17.9%	4.4%	2.9%	19.8%
Taxi	3.8%	28.5%	22.1%	3.1%
Scheduled airport bus/limo	5.4%	3.4%	2.3%	6.0%
Grayline Express (SEA)	NA	NA	2.5%	1.8%
Manhattan (JFK)				
Private limo	1.3%	21.9%	16.9%	0.7%
Shared limo		0.9%	3.0%	4.2%
Charter bus	0.1%	1.5%	3.7%	0.4%
Tri-Met bus (PDX)				
City bus (LGA)	0.6%	1.7%	1.7%	0.9%
A-Train/bus (JFK)				
Hotel courtesy bus	4.6%	0.8%	1.8%	5.3%
Other	<u>0.2%</u>	<u>0.1%</u>	<u>0.9%</u>	<u>1.0%</u>
	100.0%	100.0%	100.0%	100.0%

SOURCE: MarketSense, based on Port Authority of NY & NJ 1997 Air Passenger Survey, 1996 Portland International Airport Air Passenger Survey, and Port of Seattle 1996 Enplaning Air Passenger Survey.

TABLE 2-7 Airports with multistop and scheduled bus service primary geographic markets

Airport	Bus Service	Mode Share	Market Size		Trip Ends per Square Mile		
			Ground Trans. Ends by All Modes	Area in Square Miles	Total	Resident	Non-Resident
Multistop Bus							
Portland	Tri-Met	5%	1,600	73	22	16	6
New York LaGuardia	City bus Manhattan	3%	8,300	11	750	245	505
New York JFK	A-train/Bus Manhattan	3%	9,200	14	635	166	469
Scheduled Bus							
New York JFK	Manhattan	7%	9,200	14	635	166	469
Seattle-Tacoma	Grayline Express	15%	1,750	4	475	110	365

SOURCE: MarketSense, based on Port Authority of NY & NJ 1997 Air Passenger Survey, 1996 Portland International Airport Air Passenger Survey, and Port of Seattle 1996 Enplaning Air Passenger Survey.



SOURCE: MarketSense, based on the 1996 Portland International Airport Air Passenger Survey.

Figure 2-6. Portland airport ground access market—Tri-Met bus primary market.

the service from Manhattan to JFK (see Table 2-7). For New York, the primary market for scheduled bus is the same as that for public bus service. Scheduled bus service to an airport usually has a limited number of stops at locations accessible to large numbers of air passengers. The primary markets for scheduled bus in Manhattan and Seattle have very high trip-end densities typically associated with downtown areas of major cities. In Manhattan, the trip-end density is 635, and in Seattle, it is 475 for the Grayline Express market (see Figure 2-9). These densities are primarily the result of high concentrations of non-resident destinations in downtown areas of both cities.

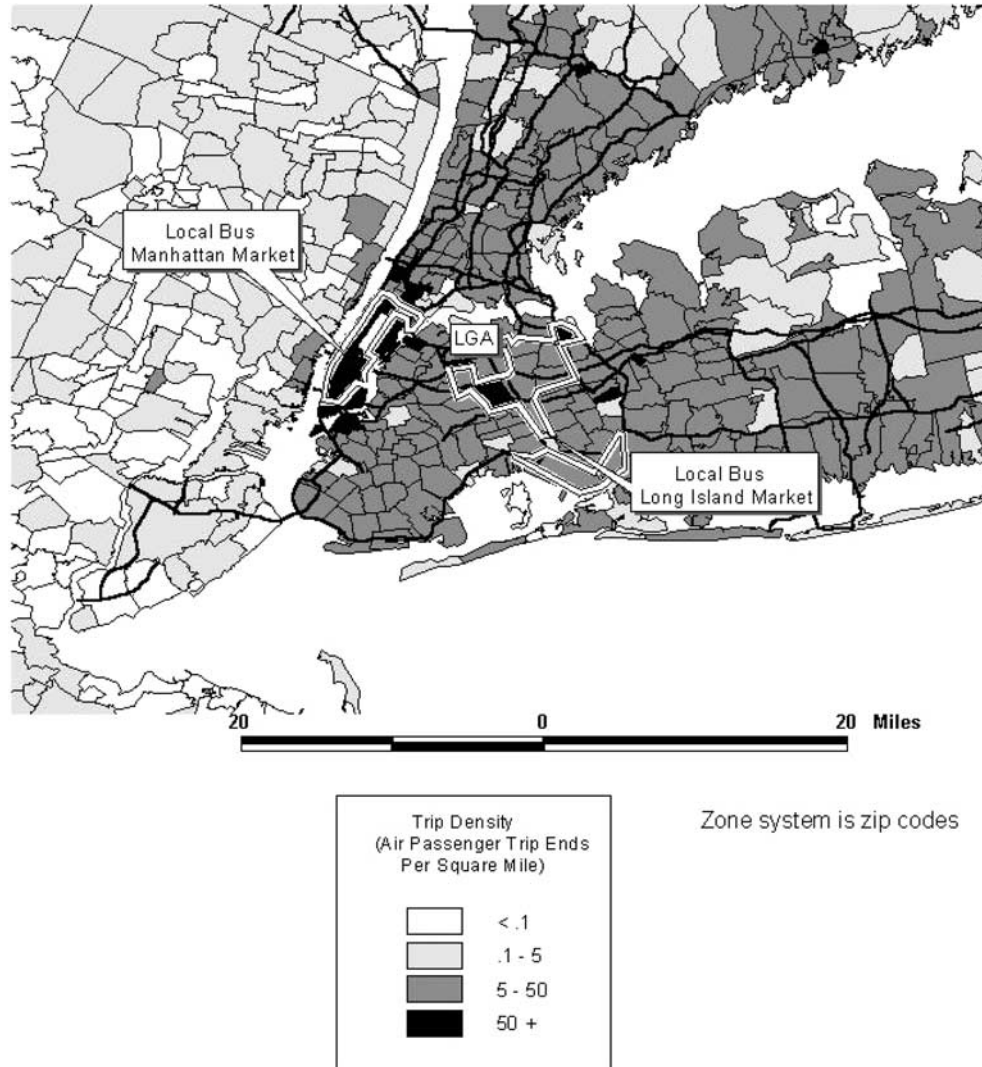
Market Segments Using Scheduled Bus Service from Downtown Locations

As is shown in Table 2-8, the non-resident portion of all scheduled bus users is greater than 75%. Consistent with the large number of trip ends attributable to non-residents, almost

60% of all scheduled bus passengers from Manhattan are non-resident travelers on non-business trips, and, in Seattle, the majority of users are non-resident business (48%) and non-business (38%) travelers alike.

TRIP-END DENSITIES ASSOCIATED WITH SHARED DOOR-TO-DOOR SERVICES

Flexibly routed door-to-door service is a category of ground transportation identified by a pre-reserved pick-up of a traveler from his or her place of origin. Typically, the service provider operates a fleet of similarly painted vans; the vans pick up individual travel parties and then run express to the airport from the last pick-up location. Usually, a fixed fare is charged by general region. On leaving the airport, a traveler proceeds to the terminal curb from which these services operate and boards a vehicle with a number of other people (usually the maximum number of drop-offs or pick-ups is limited



SOURCE: MarketSense, based on the Port Authority of NY & NJ 1997 Air Passenger Survey.

Figure 2-7. LaGuardia ground access market—local bus primary market.

to three or four). Each individual travel party is then driven to her or her respective destination.

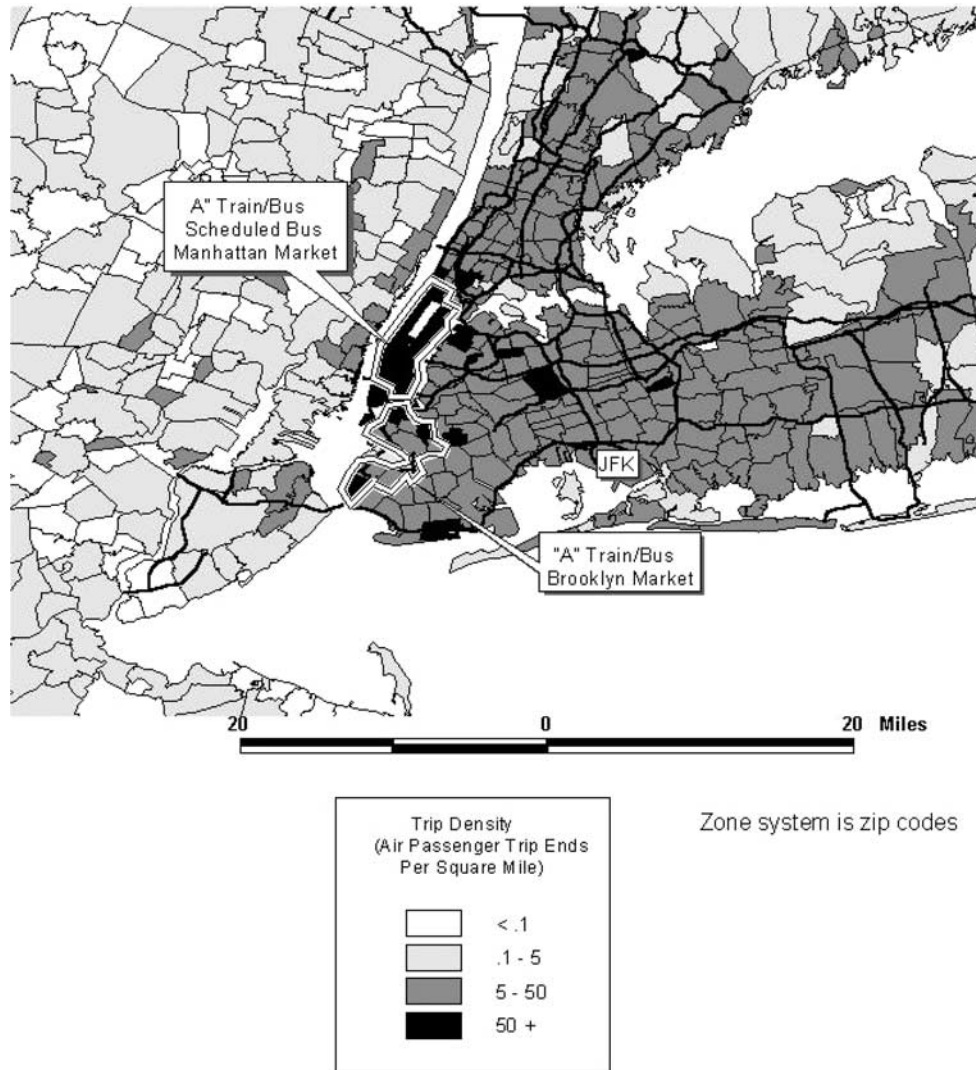
Airports with Shared Door-to-Door Services

Most large airports in the United States have one or more shared door-to-door services in operation. At some airports, an individual operator is granted exclusive rights to serve the ground transportation market; at other airports, a number of shared door-to-door services are in operation. To effectively study the market for this type of service, it is important to identify the individual markets associated with each door-to-door operation. Airport passenger surveys are not consistent in the way in which information about these services is recorded. In some cases, door-to-door shared-ride services are included in one category along with other unscheduled ground access services such as private limousine. In other

cases, individual service operations are not identified, but are grouped together as one class of ground transportation. From survey information available to this study, shared door-to-door services could be clearly separated from other access modes at four airports—San Francisco, Seattle, Boston, and Los Angeles—and individual operators could be separated out in only the Seattle and Boston airport surveys.

As is shown in Table 2-9, door-to-door services capture 12.6% of the ground access market at San Francisco International Airport. This mode share represents the proportion of air passengers using door-to-door services from multiple operators.

In Seattle, the survey category of shuttle/bus/van accounts for 17.3% of all ground access passengers. This category can be broken down into the categories of hotel courtesy, airporter (which appears in Table 2-9 as “Scheduled airport bus/limo”), and shared-ride service because the Seattle airport survey



SOURCE: MarketSense, based on the Port Authority of NY & NJ 1997 Air Passenger Survey.

Figure 2-8. JFK ground access market—A-train/bus primary market.

distinguishes individual service providers. Super Shuttle, the door-to-door van service (Super Shuttle also operated scheduled service at the time of the survey), had 4.2% share of the ground access market at the time of the Seattle airport survey.

The Boston-Logan Airport air passenger survey combines all non-scheduled ground transportation services into a single category called “door-to-door limo”; this category includes shared door-to-door van services as well as reservation limousine services. In total, this category has approximately 10% of the ground access market. The survey allows further division of the door-to-door limo category by individual service provider. One of the providers, U.S. Shuttle, operates a service similar in configuration to that of San Francisco’s door-to-door van services and Seattle’s Super Shuttle service. According to the Boston-Logan airport survey, the door-to-door van service of U.S. Shuttle has approximately 1% of the

airport’s ground access market. Although a small proportion of the total ground access market, U.S. Shuttle had the largest market of any door-to-door van service in the Boston area at the time of the airport survey.

In Los Angeles, door-to-door shared services had approximately 5% of the ground transportation at the time of the most recent air passenger survey conducted in 1993. This information is now almost 10 years old and may not reflect the role of shared door-to-door services currently at Los Angeles International Airport.

Primary Markets for Shared Door-to-Door Services

Figures 2-10 through 2-13 illustrate the ground transportation markets for San Francisco, Seattle-Tacoma, Boston, and

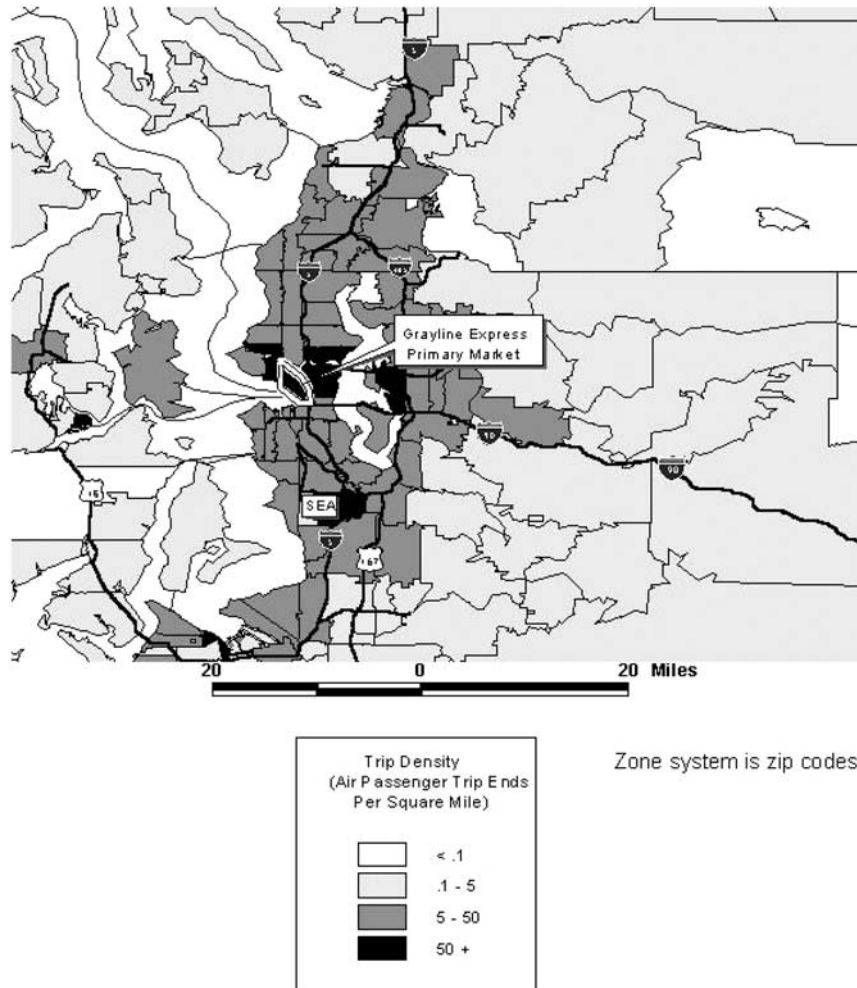
TABLE 2-8 Composition of multistop and scheduled bus market by segment

Airport	Market Segments			
	Resident Business	Resident Non-Business	Non-Resident Business	Non-Resident Non-Business
Multistop Bus				
LaGuardia	15%	39%	12%	34%
Kennedy (A-train/bus)	4%	29%	7%	60%
Portland	14%	60%	2%	24%
Scheduled Bus				
Kennedy	7%	16%	18%	59%
Seattle-Tacoma	7%	7%	48%	38%

SOURCE: Port Authority of NY & NJ 1997 Air Passenger Survey, 1996 Portland International Airport Air Passenger Survey, and Port of Seattle 1996 Enplaning Air Passenger Survey.

Los Angeles with the primary market for shared door-to-door services outlined. As explained previously in this chapter, it is the primary market for a ground transportation service that illustrates the true potential of a mode to transport air passengers to the airport. The primary markets for door-to-door services were developed by first plotting the entire distribution of air passenger trip ends for door-to-door van service at each of the three airports. The areas with the highest proportion of trips were selected and then outlined as shown on the maps of each airport’s ground access market.

Based on the trip-end density maps for the four airports, the primary markets for all examples of door-to-door operations include areas in which densities exceed five trip ends per square mile. The Los Angeles and San Francisco markets represent multiple service providers while the Boston and Seattle markets represent individual providers. Therefore, it is not possible to generalize about the relative size of primary markets for door-to-door services. The characteristics of the door-to-door van market at each airport are provided in Table 2-10.



SOURCE: MarketSense, based on the Port of Seattle 1996 Enplaning Air Passenger Survey.

Figure 2-9. Seattle-Tacoma airport ground access market—Grayline Express primary market.

TABLE 2-9 Airports with shared door-to-door service mode shares

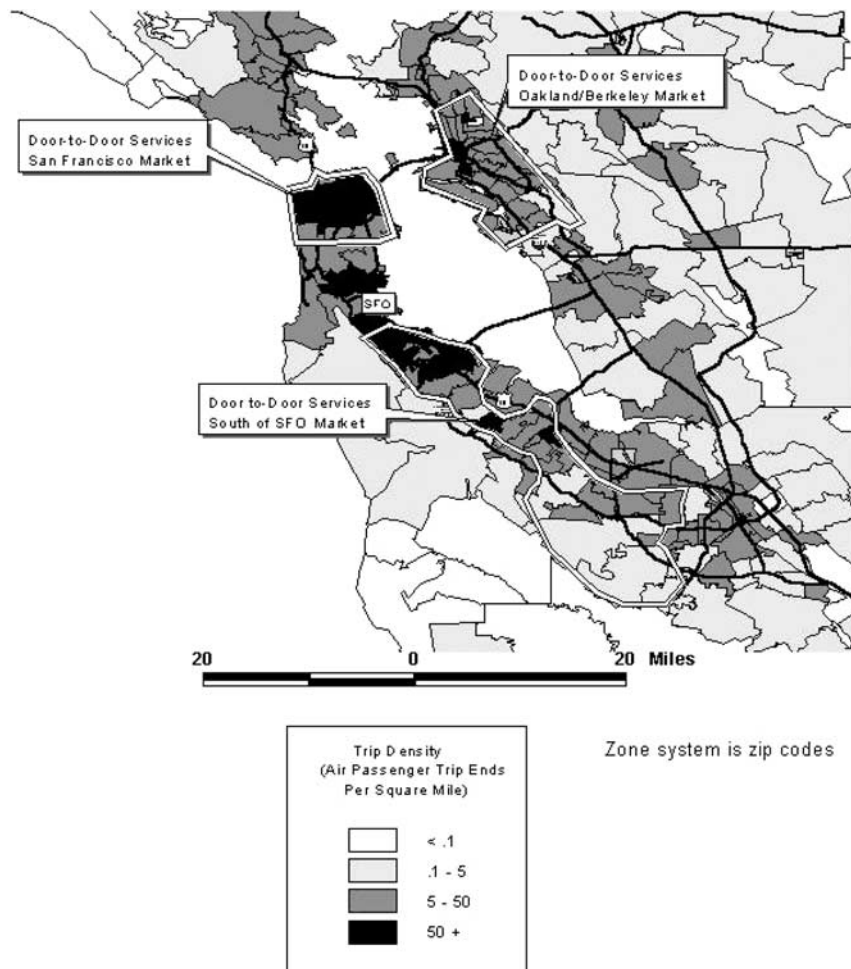
Arrival Mode	San Francisco	Seattle-Tacoma	Boston-Logan	Los Angeles
Private car	37.9%	56.8%	37.3%	49.4%
Rental car	19.8%	19.8%	12.3%	18.3%
Taxi	10.4%	3.1%	20.2%	5.5%
Scheduled airport bus/limo ¹	6.9%	7.7%	10.0%	7.3%
Private limousine	3.7%	0.7%	8.8% ²	1.7%
Shared door-to-door van/limo	12.6%	4.2%	1.0% ³	5.2%
Subway/rail	NA	NA	7.1%	NA
Charter bus	1.0%	0.4%	NA	4.5%
Local bus	NA	0.9%	0.2%	1.3%
Hotel courtesy	6.5%	5.4%	2.0%	5.0%
Other	<u>1.3%</u>	<u>1.0%</u>	<u>1.1%</u>	<u>1.8%</u>
	100.0%	100.0%	100.0%	100.0%

SOURCE: MarketSense, based on airport air passenger surveys.

¹ Includes express bus services.

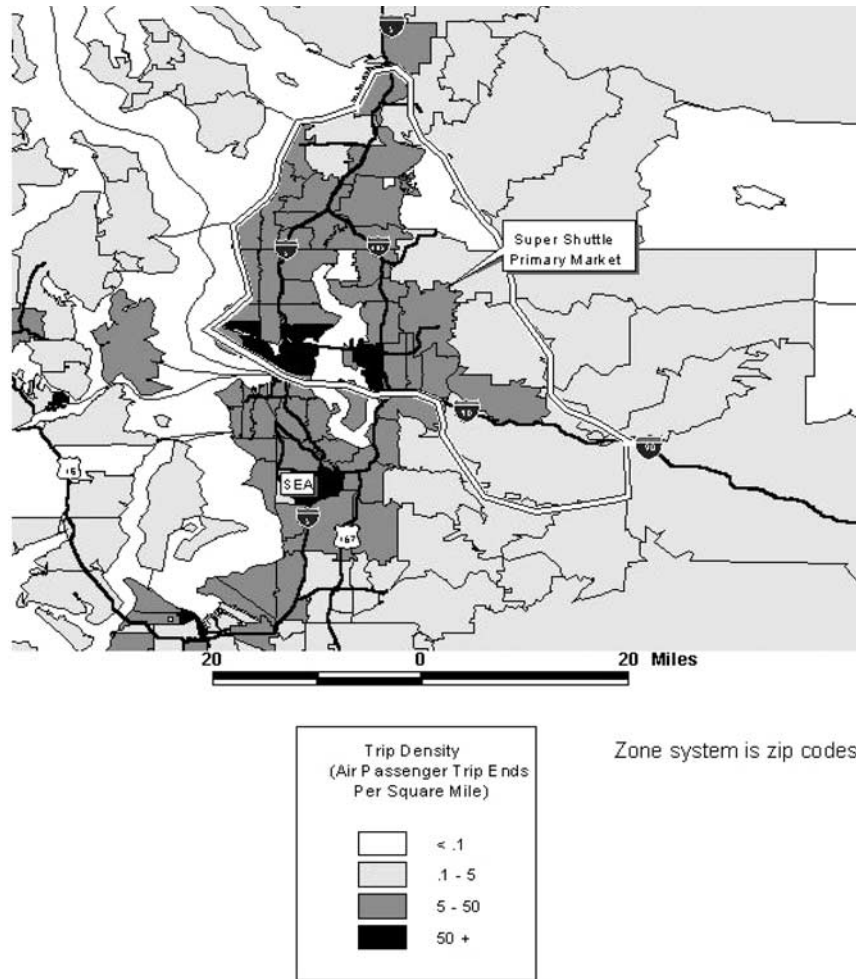
² Includes all shared door-to-door services except U.S Shuttle.

³ U.S. Shuttle shared door-to-door service only.



SOURCE: MarketSense, based on the 1998 SFO Air Passenger Ground Access Survey.

Figure 2-10. San Francisco airport ground access market—door-to-door services.



SOURCE: MarketSense, based on the Port of Seattle 1996 Enplaning Air Passenger Survey.

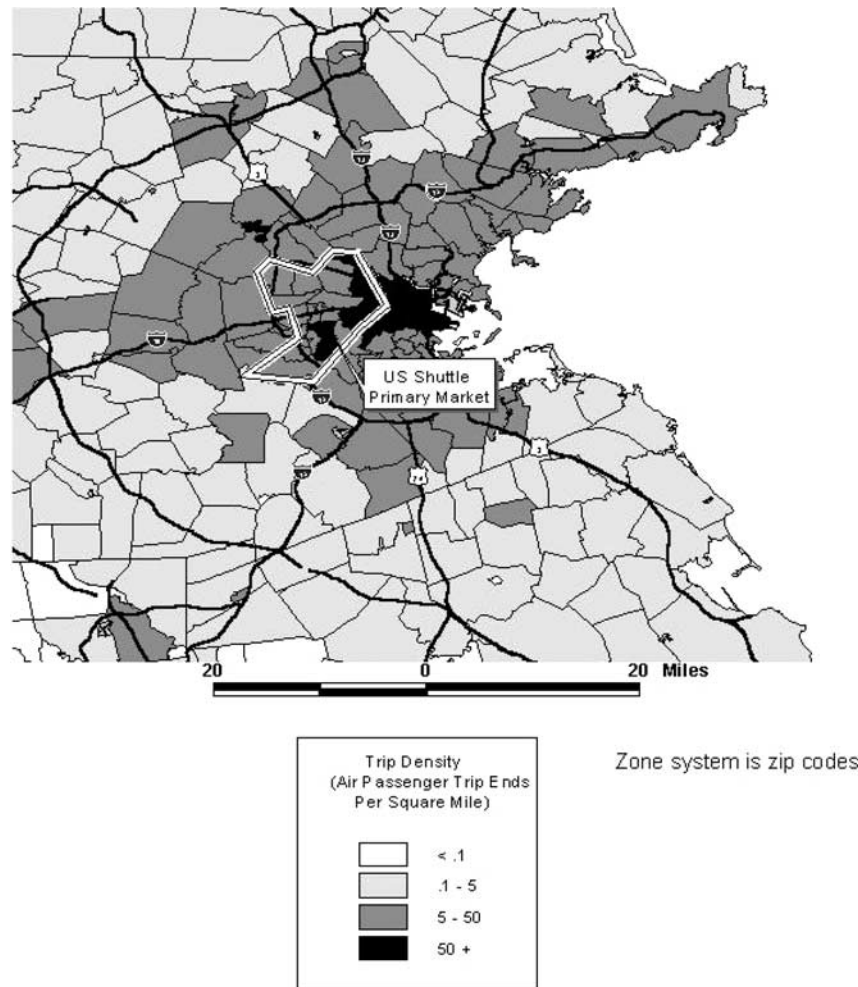
Figure 2-11. Seattle-Tacoma airport ground access market—Super Shuttle primary market.

The primary market for door-to-door services to San Francisco International Airport is the city of San Francisco, where trip-end densities are high and on average exceed 300 trip ends per square mile. The mode share is 21%; however, it is important to remember that this includes a number of door-to-door operations. A high mode share of 19% for door-to-door services is also found in the Oakland area market (which is outlined in Figure 2-10), where trip-end densities average only 17 trip ends per square mile. These high mode shares are in contrast to a 7% mode share for door-to-door service from south of the airport in areas with trip-end densities of more than 20 trip ends per square mile. Although the city of San Francisco is the primary market for these services, the market areas along the peninsula and around Oakland are presented because they illustrate market share differences that occur in areas with similar trip-end densities. Once again, the inability to identify individual shared door-to-door services is obscuring the meaning of trip-end densities that support this form of public airport ground transportation.

In Boston, Seattle, and Los Angeles, the mode share for door-to-door services does not exceed 7% with densities of approximately 15 to 50 trip ends per square mile in the primary markets. The lower end of this range of trip-end densities is typically found adjacent to major highways and roads serving the respective airport.

Market Segments Using Shared Door-to-Door Services

The air passenger market segments using door-to-door services vary by city although, with the exception of Boston, the least likely segment using this service is the non-resident business traveler. In all markets except Boston, about 65% to 70% of the travelers using this service are on non-business trips. In San Francisco, it is the non-resident non-business traveler who most uses this access mode; in the other cities, it is the resident non-business traveler. Boston's U.S. Shuttle service is an exception, the second highest use is by the non-resident



SOURCE: MarketSense, based on the 1999 Logan Air Passenger Survey.

Figure 2-12. Boston-Logan ground access market—U.S. Shuttle primary market.

business travel segment. Table 2-11 provides a comparison of the market segments using shared door-to-door services.

EXPRESS MODES FROM REGIONAL COLLECTION POINTS

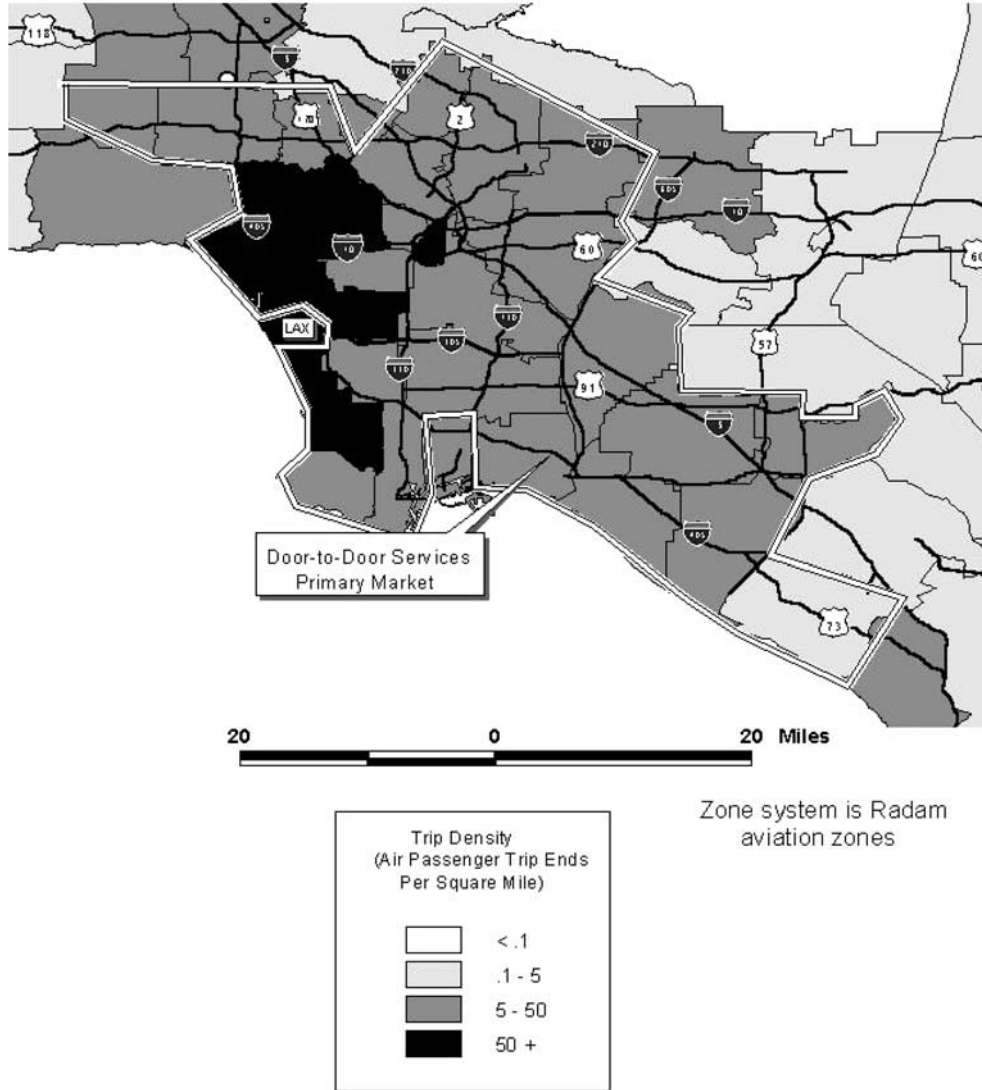
The operating characteristics of individual express bus services may differ, but there are important service elements in common contributing to their success. These services have frequent and reliable schedules, run express from a selected regional location at a minimum distance of 10 miles from the airport, and have an off-airport terminal location situated at a major regional roadway location.

Airports with Express Bus Service from Regional Collection Points

There are three large airports where remote express bus services have been successful in attracting a significant share

of air passengers. The Marin Airporter serving San Francisco Airport, the Van Nuys FlyAway serving Los Angeles Airport, and the Logan Express routes serving Boston-Logan Airport are all examples of successful express bus operations that serve some of the lower-density regions of their respective airports' ground transportation markets. All three services—the Van Nuys FlyAway, the Logan Express, and the Marin Airporter—run express services from a remote terminal at a distance of 10 to 20 miles from the airport. The Marin Airporter has two additional stops upstream from its Larkspur terminal; however, the majority of passengers use the Larkspur Terminal. All three services operate 7 days a week. The Van Nuys FlyAway operates 24 h per day, while the Logan Express and Marin Airporter operate from early in the morning until late in the evening seven days a week. All of the services operate on 30-min headways. During peak times additional buses are added on the Logan Express and service is every 15 min on the Van Nuys FlyAway.

Table 2-9 shows that these services are included in the category of scheduled airport bus and limousine service and have



SOURCE: MarketSense, based on the 1993 Los Angeles Airport Air Passenger Survey.

Figure 2-13. Los Angeles airport ground access market—door-to-door primary market.

TABLE 2-10 Airports with shared door-to-door services primary geographic markets

Airport	Shared Door-to-Door Service	Mode Share	Market Size		Trip Ends per Square Mile		
			Ground Trans. Trip Ends by All Modes	Area in Square Miles	Total	Resident	Non-Resident
San Francisco	City of San Francisco	21%	14,350	46	312	94	218
Seattle-Tacoma	Super Shuttle	7%	7,850	488	16	9	7
Boston Logan	U.S. Shuttle	6%	3,250	62	53	31	22
Los Angeles	Los Angeles area	5%	29,100	1,075	27	12	15

SOURCE: MarketSense, based on airport air passenger surveys.

TABLE 2-11 Shared door-to-door service by market segment

Airport	Market Segments			
	Resident Business	Resident Non-Business	Non-Resident Business	Non-Resident Non-Business
Boston	19%	40%	32%	9%
San Francisco	18%	24%	18%	40%
Seattle	21%	39%	14%	25%
Los Angeles	19%	39%	13%	29%

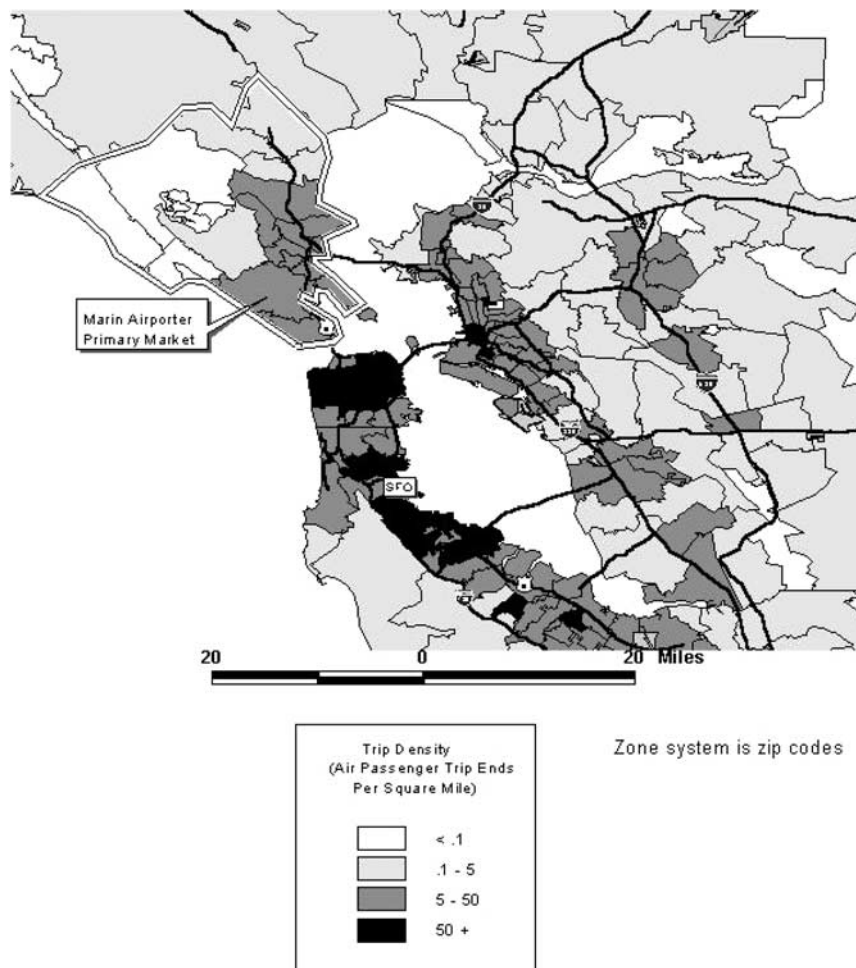
SOURCE: MarketSense, based on airport air passenger surveys.

about 7% of the ground transportation market at San Francisco and Los Angeles airports to 10% at Boston-Logan Airport. This category must be disaggregated in order to understand the actual mode share experienced by each of the individual services in their respective markets. In the case of the three services, air passenger survey information could be tied to the

individual services and was supplemented by additional surveys conducted specifically for the express bus services.

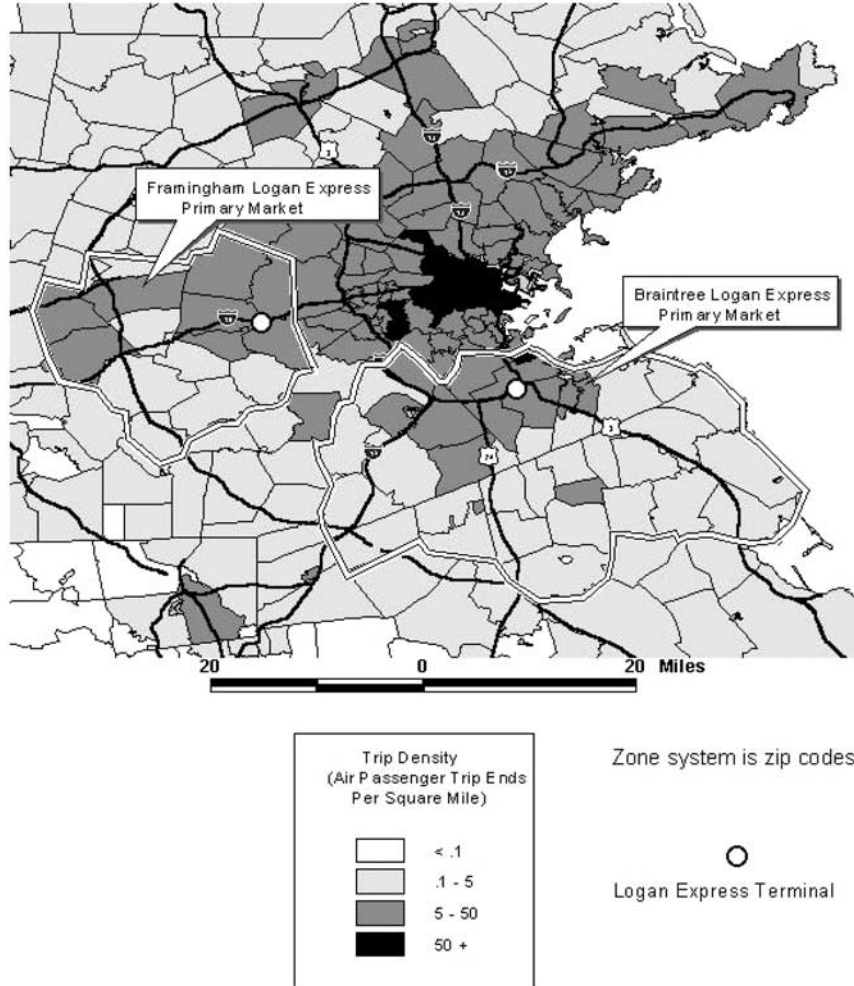
Primary Markets for Express Bus Service from Regional Collection Points

Examining the primary markets for the individual express bus services uncovers a similarity in mode shares and trip-end densities supporting the operations. Figures 2-14, 2-15, and 2-16 illustrate the primary markets for the Marin Airporter (San Francisco), the Framingham and Braintree Logan Express (Boston-Logan), and the Van Nuys FlyAway (Los Angeles). (There are two additional Logan Express services in operation; however, one began service in 2001 and the other relocated to a new site during the same period. As such, the market characteristics of the two services are not represented in the air passenger survey information available to this study and, therefore, could not be included in the current discussion.)



SOURCE: MarketSense, based on the 1998 SFO Air Passenger Ground Access Survey.

Figure 2-14. San Francisco airport ground access market—Marin Airporter primary market.



SOURCE: MarketSense, based on the 1999 Logan Air Passenger Survey.

Figure 2-15. Boston-Logan ground access market—Framingham Logan Express and Braintree Logan Express primary markets.

The primary market for each express bus service includes geographic areas linked by major regional roadways to the remote terminal locations. In all cases, the express bus terminal is located within the geographic boundaries of the primary ground access market for the airport, and, because of good highway access to the remote terminal sites, areas outside of the primary airport ground access market with low trip-end densities are also served by the express bus operations. Because of the regional significance of the remote terminal sites, the sites function as collection points for trips starting in areas of low trip-end densities outside the primary ground access market for each respective airport. Table 2-12 presents the characteristics of each express bus service.

Each individual service does not have more than a 2% share of the entire airport ground access market; however, when we look at the geographic areas they are serving, we find that the services have a substantial portion of their respective primary markets. The four services have a mode share ranging from 17% to 31% of their primary markets. The physical size of the areas they serve ranges from 264 square miles to

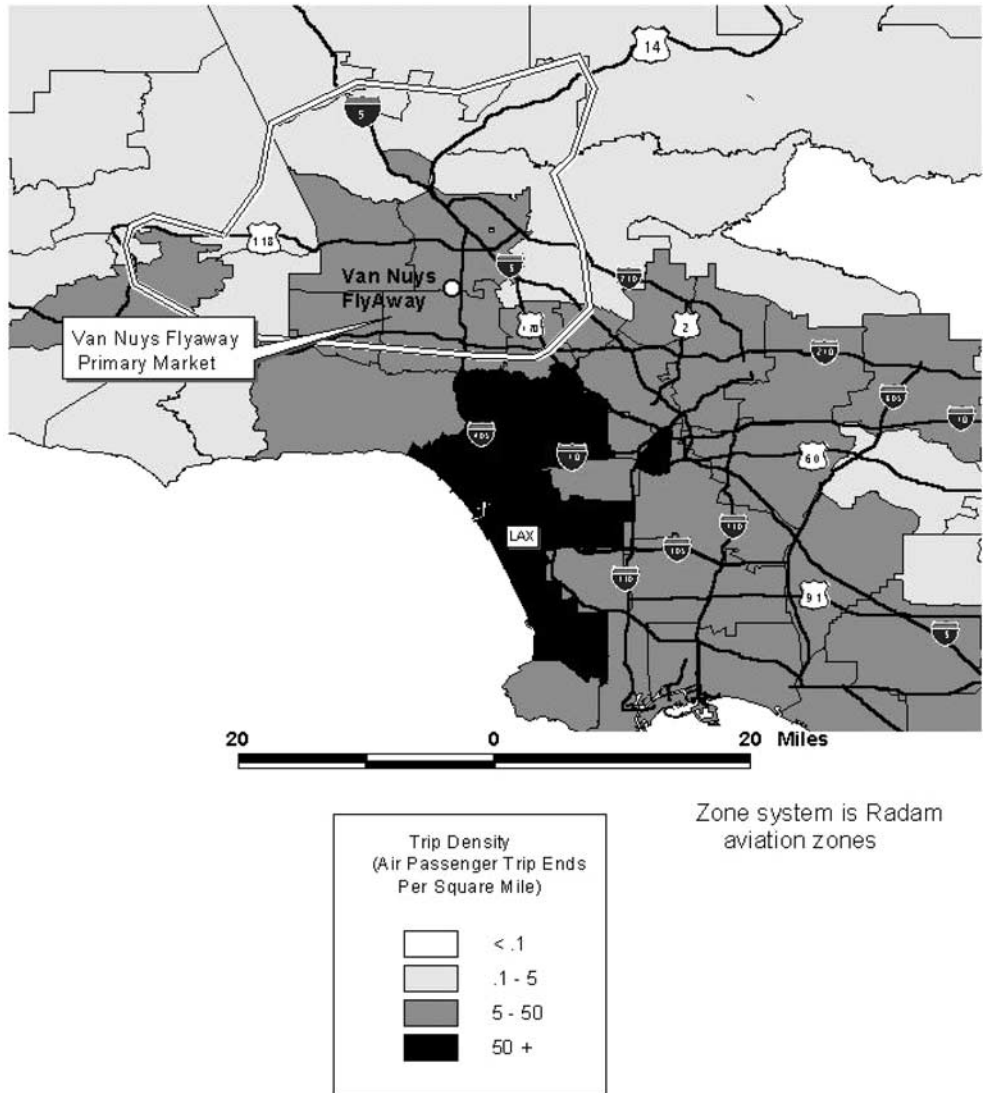
564 square miles. On average the trip-end density in their primary markets is very low, from four to eight trip ends per square mile.

Market Segments Using Express Bus Service

Because the terminal facility for each service is located at a distance from the airport, these services are used primarily by resident air travelers. Table 2-13 provides the market segment distribution of air passengers using the four services.

THE GEOGRAPHY OF PUBLIC GROUND TRANSPORTATION TO AIRPORTS

Multiple forms of ground transportation are required to meet the needs of the many travelers using today’s airports. Planning new or improved public transportation services requires an understanding of the geographic markets supportive of the particular modes under consideration. Summarizing the



SOURCE: MarketSense, based on the 1993 Los Angeles Airport Air Passenger Survey and the 1999 LAWA Van Nuys FlyAway Survey.

Figure 2-16. Los Angeles ground access market—Van Nuys FlyAway primary market.

geographic patterns of public transportation use at large airports is a way of identifying these characteristics.

Most discussions of airport ground transportation focus on the mode share for general categories of ground transportation available at an airport. While this is a valid measure of how well ground transportation is serving an airport’s entire ground access market, it is not a good measure of the market potential for an individual service. It is important to link the assessment of mode share to a realistic description of a service’s market area in order to develop market profiles comparable among airports.

The information presented in this chapter represents an initial study of the market for public ground transportation services to large airports. Research conducted into market conditions supporting three basic categories of public ground transportation leads to initial observations about the composition of airport ground transportation markets and the distribu-

tion of air passenger trip ends within those markets. The public transportation services examined in this study are focused on a geographic area of the airport ground transportation market more appropriately called “the primary market.” It is an area surrounding an airport in which at least 60% of all ground transportation trips to an airport are generated. Empirical data from this study indicates that primary ground transportation markets for large airports circumscribe a geographic area in which trip activity is five or more air passenger trip ends per square mile.

SUMMARY OF FINDINGS

Traditional Fixed-Route Services

Existing traditional rail services that can be considered successful (mode shares of 15% or greater in their primary

TABLE 2-12 Airports with express bus services primary geographic markets

Airport	Express Bus Service	Mode Share	Market Size		Trip Ends Per Square Mile		
			Ground Trans. Trip Ends by All Modes	Area in Square Miles	Total	Resident	Non-Resident
San Francisco	Marin Airporter	31%	1,300	310	4	3	1
Boston-Logan	Braintree Log. Exp.	18%	2,400	564	4	3	1
Boston-Logan	Framingham Log. Exp.	25%	1,520	264	6	4	2
Los Angeles	Van Nuys FlyAway	17%	3,600	460	8	5	3

SOURCE: MarketSense, based on discussions with Marin Airporter management, the 1999 Logan Air Passenger Survey, Braintree and Framingham Logan Express Surveys, and the 1993 Los Angeles Air Passenger Survey.

market) are located in urban areas with high trip-end densities. Primary markets for the two successful services presented in this research—Washington, D.C.’s Metrorail and Boston’s MBTA subway services—average 125 to 150 trip ends per square mile in an area encompassing 60 to 100 square miles.

No successful examples of traditional multistop bus services were found in this study. Public multistop bus services in New York and Portland, Oregon, have mode shares of 3% to 5% in their respective primary markets. Trip-end densities associated with public multistop bus services had a very wide range, from slightly more than 20 trip ends per square mile to more than 600 trip ends per square mile, indicating that there are other factors affecting the performance of this service.

Scheduled bus services operating from downtown locations and running express to the airport have considerably higher mode shares in their respective primary markets. The examples included express service from downtown Seattle to the airport with a 15% share of the market and express service from Manhattan to JFK with a 7% mode share. Very high densities of 475 to 600 trip ends per square mile found in narrowly defined urban downtowns support these services.

Shared Door-to-Door Services

Observations about market characteristics supportive of shared door-to-door services are limited because of the manner in which available survey information is recorded. From examples in this study, shared door-to-door services operate in a variety of markets, in which densities range from 15 to more than 300 trip ends per square mile. Mode shares in primary markets for these services range from 5% to 21%; however, the examples do not necessarily represent individual services, making it difficult to understand the fundamental market requirements for this category of public ground transportation. The physical size of the primary markets identified for shared door-to-door services also have a very wide range, from 50 to 500 square miles in area.

Express Bus Service from a Regional Collection Point

Express bus transportation operating from remote suburban terminals serving San Francisco, Los Angeles, and

TABLE 2-13 Market segments using express modes

Airport	Service	Market Segments			
		Resident Business	Resident Non-Business	Non-Resident Business	Non-Resident Non-Business
San Francisco	Marin Airporter	33%	44%	5%	18%
Boston-Logan	Braintree Logan Express	48%	36%	5%	11%
Boston-Logan	Framingham Logan Express	25%	56%	6%	13%
Los Angeles	Van Nuys FlyAway	18%	49%	8%	25%

SOURCE: MarketSense, based on air passenger surveys.

Boston-Logan International Airports are examples of successful public ground transportation services. This category of public transportation is the only example found in the current research providing some measure of service to geographic areas outside of primary airport ground transportation markets in which trip-end densities are very low (less than five per square mile). All of the services operate from locations that are at least 10 miles from the airports they serve and are located at a major regional collection point where the roadway network funnels automobile access trips destined for the airport.

Available market information for express bus services indicates that the average density in the primary markets for individual services ranges from four to eight trip ends per square mile. The physical size of market areas for these services range from approximately 250 to 500 square miles. Mode shares of 17% to 31% in primary markets are the highest found among the three types of public ground transportation to airports.

A Hierarchy of Markets for Public Ground Transportation Services

The research findings indicate that each ground transportation service category is associated or supported by a roughly defined range of air passenger activity. Table 2-14 has been developed based on the empirical evidence available from air passenger surveys. For each public ground transportation mode, Table 2-14 lists the size of the primary market associated with the mode and the number of annualized air passengers generated from the primary market area.

There is consistency in the range of air passengers supporting the public ground transportation services reviewed in this study. Express bus service, either from downtown or a regional collection point, is dependent upon a market of roughly 1.2 to 1.6 million annual air passengers. Shared door-to-door modes serve geographic areas generating 2.0 to 4.9 annual air passengers and rail service is found in areas with 6.6 million to 8.2 million annual air passengers. These results provide a general indication of the air passenger activity supporting of public ground transportation services at large airports and point to the role of public transportation modes in the family of ground transportation services needed to support a large airport.

Defining the market conditions that support individual public transportation services provides analogous models to

TABLE 2-14 Primary markets associated with public ground transportation services

Mode	Size of Primary Market for Public Mode (square miles)	Total Annualized Origin/Destination Air Passengers (two-way trips)
Rail/Subway	60–90	6,600,000–8,200,000
Shared Door-to-Door	60–450	2,000,000–4,900,000
Express Bus (Regional)	275–550	1,200,000–1,600,000
Express Bus (Downtown)	4	1,300,000
Multistop Bus	75	1,000,000

SOURCE: MarketSense, based on airport air passenger surveys.

use in planning new or improved services for airport ground transportation markets.

Priorities for Airport Data Collection

Information needed to describe and analyze the market for public ground transportation services is not readily available for most large airports. At approximately half of the 30 largest airports in the United States, air passenger survey information is collected at irregular intervals, and the ground transportation information that is collected is not summarized using consistent terminology among airports. In some cases, a public transportation mode is summarized in one category along with other modes. The sample sizes used in surveying individual airports is different, which affects the level of detail available for defining geographic markets. Without information about the origin locations of airport ground transportation trips, it is not possible to develop meaningful measures of market characteristics for public ground transportation services, nor is it possible to compare the characteristics of successful services at one airport with potential markets at another airport.

The research effort required to administer air passenger surveys does not represent a significant financial burden for most large airports. An estimate of funds required to administer and process an air passenger survey at a large airport with sufficient detail to delineate geographic patterns of ground transportation is in the range of \$100,000 to \$250,000. For smaller airports, a smaller budget could be considered. Airport administrations should consider the benefits of developing geographic air passenger databases and the multiple planning uses that could be made of the information.

CHAPTER 3

THE IMPORTANCE OF DEMOGRAPHIC SEGMENTATION

CONTEXT OF CHAPTER 3

Effective planning for public transportation access to airports should be built up from an understanding of the needs of the passenger rather than down from preconceived ideas about what mode is “best” for airport ground access. There is no one market for airport ground access services, but rather a series of market segments, each of which might require a separately designed service response. Chapter 3 now explores the influence of demographic variables on the propensity to choose public mode services for these market segments.

Chapter 2 has reviewed the relationship between geographic characteristics of the market and the market’s ability to support various modes of airport ground access, focusing particularly on the density of the trip ends at the non-airport end of the ground access trip.

Chapter 3, building on that analysis, will review the demographic segmentation mechanisms proposed in *TCRP Report 62* and apply them to airport markets in several cities. The analysis will examine the interaction of both elements of market research: identifying strong markets in terms of *geographic* segmentation and in terms of *demographic* segmentation. The methodology proposed suggests that the examination of public mode markets for airport ground access should commence with an examination of geography to determine the geographic area in which a given service makes sense; following that, an examination for the influence of the demographic variables in that defined area should be undertaken.

Structure of the Chapter

This chapter is divided into four sections:

1. The concepts of demographic and geographic market segmentation are reviewed.
2. The variation in mode share by demographic segment is first observed for the airport market as a whole.
3. The variation in mode share by demographic segment is observed for specific geographic market areas that have been identified by a process of geographic segmentation.
4. The role of the demographic segments in the propensity to shift modes in response to new services is documented.

BASIC CONCEPTS OF MARKET SEGMENTATION IN AIRPORT ACCESS

The Importance of Submarkets

There is no *single market* for ground access services to airports: there are *a series of submarkets*, or market segments, that each have distinct and documentable characteristics. Very often, it is necessary to create separate services for separate market segments; usually, the form of marketing, pricing, and promotion of services will vary by the market segment that is being sought. In many of the case studies presented in *TCRP Report 62*, high overall rates of public transportation market share were attained as the cumulative result of a series of separate services, each designed to fit the needs and requirements of a specific market niche. At Tokyo’s Narita Airport, for example, three separate rail companies offer services at three separate ticket-price levels. At London’s Heathrow Airport, the original combination of a good rapid transit service plus tourist-oriented buses was augmented by the addition of the higher-priced Heathrow Express premium rail service. In Paris, French decisionmakers are now determining the best strategy to add a new premium CGD Express to the existing combination of commuter rail and specialty bus service from Paris’ Charles de Gaulle Airport. In each case, demographic characteristics in support of a given service were identified, and the service was designed to serve those market-driven requirements.

Geographic Segmentation

The logic of separate examination by geographic area should be clear from the analysis in Chapter 2. For almost any specific service, there will be areas that are well served and areas that are poorly served. The use of aggregate geographic areas causes the behavior of the travelers with a high propensity to choose the service to be lumped together with the behavior of those who have little logical chance of choosing the service. This causes the analysis of average conditions, which may conceal very real behavioral patterns in the targeted group. In each case examined in this chapter, local market researchers have undertaken a two-step process: first, they examine overall patterns to look for strong geographic markets, and second, they apply a more fine-grained demographic segmentation for the specific market identified.

Demographic Segmentation

Four-Cell Matrix

For any given geographic market area defined for analysis, whether it be the entire ground access market for an airport or a highly localized submarket (such as airport to a convention center/hotel area), *TCRP Report 62* proposed the examination of four demographic segments. The tripmakers are examined through the application of a 2-dimensional matrix: simultaneously, the tripmakers are segmented (1) by their status of residency and (2) by the purpose of their trip. The two levels of residency are Resident or Non-resident of the catchment area of the airport. The two levels of trip purpose are Business and Non-business. There are, of course, variations to these definitions as applied around the world. The Non-business category, for example, in many studies is labeled as “leisure.” Under such a definition, a trip to a funeral or to college would be categorized as a leisure trip; the term “non-business” has been adopted here because of its open-ended, inclusive definition. (The term “leisure” is sometimes used in this text when referring to data originally defined by that word.)

When the dimension of residency is arrayed against the dimension of trip purpose, the four market segments are commonly referred to as “the four-cell matrix,” as illustrated in Figure 3.1. In this report, a standard graphic format has been developed that expresses variation among the four segments in a vertical chart with four bars representing each segment; each bar can include several modes under examination. The influence of each of the four segments on the propensity to choose public mode services will be discussed and analyzed in this chapter. (In the graphic charts included in this chapter, the four segments are usually shortened to Res Biz, Res Non-biz, Non-res Biz, and Non-res Non-biz. Some graphs

Residency Status	Resident	Resident Business Segment	Resident Non-business Segment
	Non-resident	Non-resident Business Segment	Non-resident Non-business Segment
		Business	Non-business
		Trip Purpose	

Figure 3-1. Four-cell matrix of demographic segmentation.

with difficult space requirements are labeled RB, RNB, NRB, and NRNB.)

Impact of Residential Status

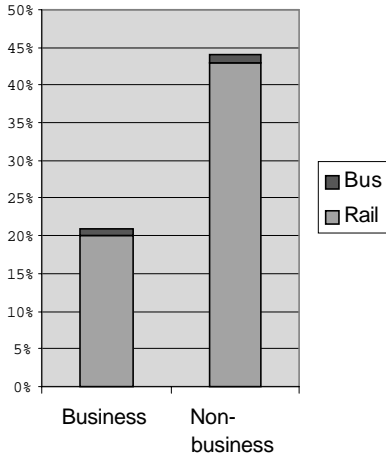
In terms of residential status, the Resident has more access to his or her personal automobile than does the Non-resident. Resident travelers show high use of personal automobiles, whether in the “kiss-and-ride” or the “park-and-ride” mode. Non-residents have to purchase some form of transportation for the airport ground trip (unless they are picked up by others). In many cases examined in this chapter, the density patterns of the residential areas are lower than the density patterns of the major destination areas for visitors, negatively influencing the Resident group’s propensity to choose public transportation services. On the other hand, residents of the area may be more likely to know about superior services at the airport and thus use them more.

Thus, the Resident segment, when compared with the Non-resident, may be less prone to select public transportation services because of lower trip-end density at the origin of the trip and because of increased levels of personal automobile availability. At the same time, the Resident segment is more likely to be aware of the existence of relevant services, supporting the use of public modes. For the Resident group, both the location of housing and automobile availability pushes public mode share down while familiarity can push it up.

Impact of Trip Purpose

The second component element of the four-cell matrix is the dimension of trip purpose. The business traveler is simultaneously characterized by an increased sensitivity to time and a decreased sensitivity to cost, revealing a low elasticity with respect to time and a high elasticity in terms of cost. The result is an increased amount of selectivity over the options, with the business travelers more likely than the non-business to purchase superior public transportation services, which are priced higher than competing modes. In the context of the majority of services offered by the public modes, however, the Business market segment most often has a lower market share to public transportation services.

Figure 3-2 shows the impact of trip purpose for rail ground access to the Zurich Airport, with the market share of the Non-business category twice that of the Business category. Additional analysis of the Zurich data suggests that as the distance from the airport increases and the relative time superiority of the train over the car increases, the rail mode share of the business traveler increases to that of the leisure traveler. As rail becomes the superior good, the business travelers choose it, with little constraint by price. But, overall, the



Segment: Total Airport
 SOURCE: Zurich Airport Survey, 1989.

Figure 3-2. Variation by trip purpose—Zurich Airport.

Non-business market for public mode services is stronger in Zurich than is the Business market.

In the following sections of this chapter, the four demographic market segments will be applied twice. First, the four demographic segments will be applied to the airport as a whole; that is, they are applied without prior demographic segmentation. Second, the four demographic segments will be applied to prime geographic market areas for public transportation services that were created by the process of geographic segmentation. Our concern throughout is to understand the influence of two separate factors—geography and demographics—on the propensity to select public transportation services. Once geographic conditions are held constant, it becomes possible

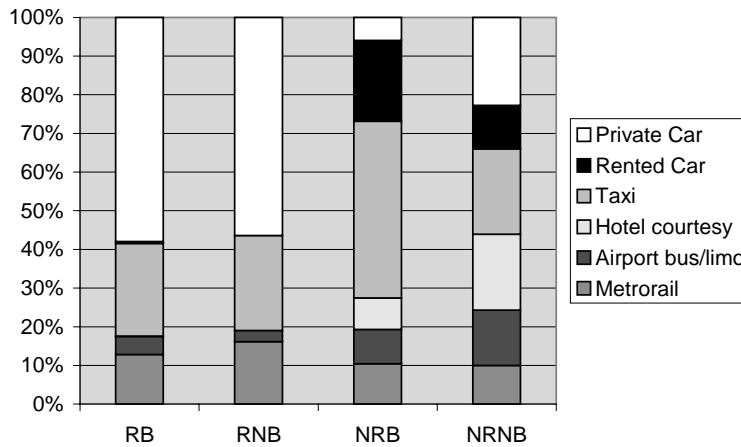
to isolate the variation in market behavior stemming from the unique characteristics of the four demographic segments.

VARIATION BY DEMOGRAPHIC SEGMENT: TOTAL AIRPORT MARKETS

Reagan National: Variance by Demographic Segment (Total Airport)

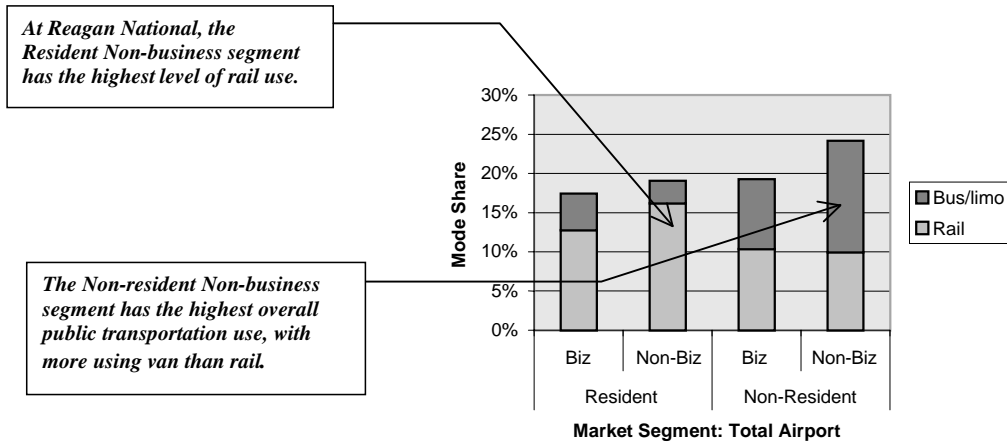
As an introduction to the examination of the separate behavior of the separate groups, Washington, D.C.’s Reagan National—the U.S. airport with the highest rail mode share (12%)—can be used as a case study. Figure 3-3 shows the variation in all mode shares by the four market segments. Of the total number of air passengers at Reagan National Airport, 21% use public transportation services. The chart reveals a fundamental difference between the Resident and the Non-resident market: the use of private automobiles. For the Resident group as a whole, both business travelers and non-business travelers access the airport by car for more than 55% of the trips. In many U.S. airports, the Non-resident group substitutes rental car for the private car. Reagan National is unusual in its reliance on taxis. Figure 3-3 shows that taxi use in the Non-resident market varies sharply by trip purpose: the Non-resident Business traveler chooses taxis at a rate twice that of the Non-resident Non-business traveler.

Focusing more narrowly on the public transportation modes at Reagan National, variations by market segment can be observed in Figure 3-4. For public transportation as a whole, the Non-resident Non-business segment has the highest share, with the shared-ride van capturing a considerably higher share than the rail. For Metrorail, the strongest segment is the Resident Non-business segment, with about 16% market share. In terms of rail usage, the resident business traveler has



SOURCE: Washington Council of Governments (WASHCOG) 1998 Baltimore-Washington Regional Air Passenger Survey.

Figure 3-3. Variation by segment for Reagan National: total airport market.



SOURCE: WASHCOG, 1998.

Figure 3-4. Variation in public transportation by segment for Reagan National Airport.

a higher propensity to select rail than does the non-resident business traveler.

Variations among mode-choice patterns by market segment for the total airport market have been examined at several major U.S. airports. In most airports where variation was found, Non-business segments had a higher public mode share than did business travelers, with resident business travelers usually having the lowest. In several areas such as New York City, analysis of patterns for the airport as a whole revealed little variation in public mode shares. The following section of Chapter 3 examines the influence of geography on the variation by demographic segmentation. In order to better understand the variation by segments attributable to demographic factors, it is worthwhile to examine for variation within a specifically defined geographic market, not for the airport as a whole.

Influence of Geography and Market Segment

In the analysis of factors that encourage the use of or discourage the use of public modes in airport access, it is desirable to isolate those factors that stem from inherent differences in demographic makeup from those factors that reflect the service availability by geographic area. In this section of Chapter 3, the variation in market share by demographic segment will first be examined in terms of the total airport market and then will be examined within the prime geographic market area for rail services. That prime geographic market area is shown in the darkest gray in the center of the map included in Figure 3-5. That figure also shows the generalized location of the three airports.

Looking at Total Airport Markets: London

The three London airports can be used to illustrate the importance of understanding the influence of geographic con-

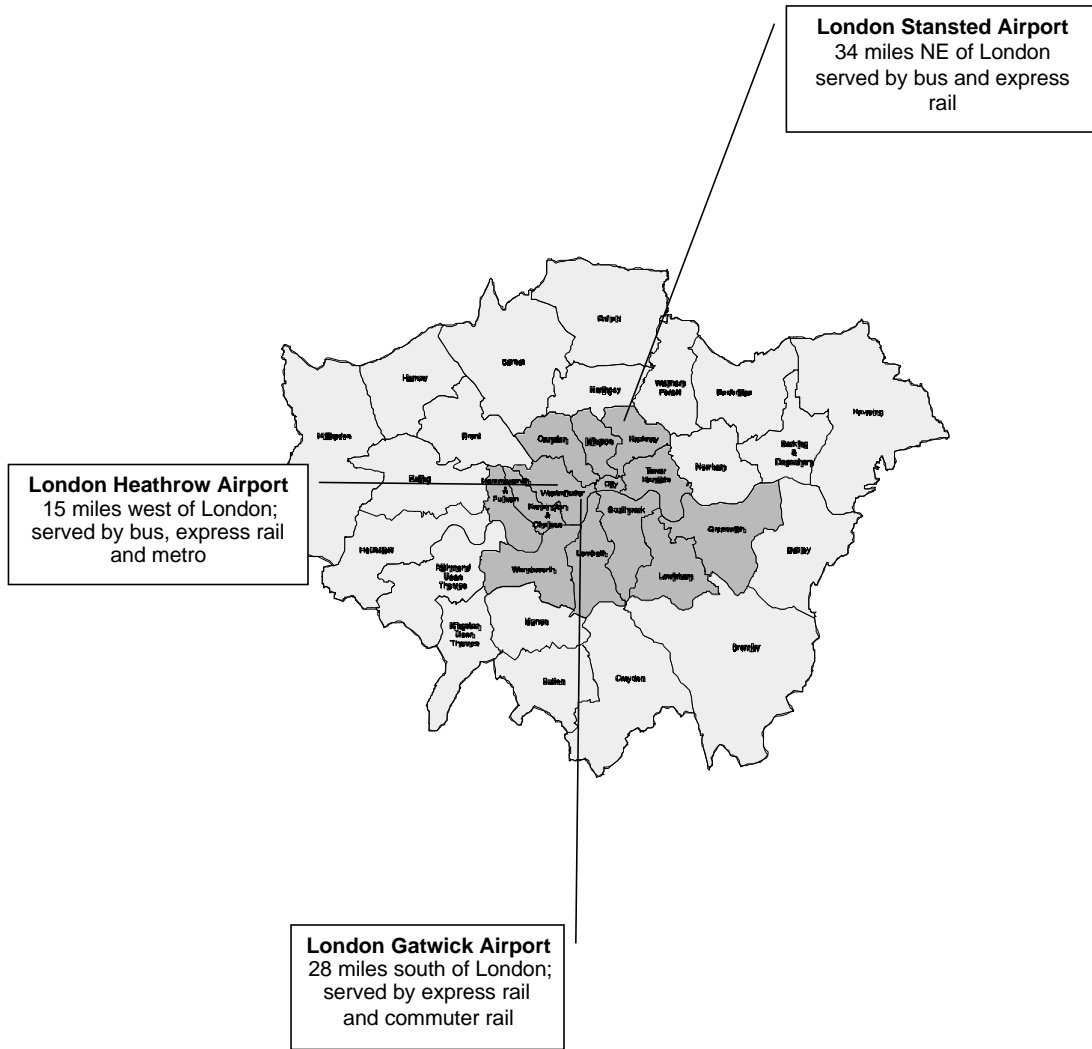
siderations when observing the differing market patterns of the four demographic segments. All data describing market share in London is based on the ongoing data collections of the Civil Aviation Authority (CAA). Figures 3-6, 3-7, and 3-8 illustrate the extent of variation of mode share to public transportation by the four market segments. It might be concluded from observing these three graphs that the individual member of each demographic segment has a fundamentally different propensity to select public transportation services, based on the demographic differences among segments. Looking first at the mode share patterns for the total market areas of each airport, the three London airports can be used as a case study in interpretation of the available data. Later, the same three airports will be reviewed in terms of variation by segment in their performance in their prime market areas.

Stansted: Total Airport

Figure 3-6 shows that Stansted Airport (which is the farthest airport from Inner London) has a public transportation rate for the Non-resident Non-business segment that is nearly four times that of the Resident Business segment, revealing a range between 17% and 65%. Non-business is stronger than Business; Non-resident is stronger than Resident. Taken as a whole, about 50% of the foreign leisure travelers using Stansted choose the train, a rate about twice as high as the rate of UK resident leisure travelers. Bus or coach use by the visiting tourists is also higher than by any other segment.

Gatwick: Total Airport

At Gatwick, a similar pattern to that at Stansted emerges, as is shown in Figure 3-7. Overall public mode use is twice as high for the Non-residents as it is for the Residents using



SOURCE: BAA.

Figure 3-5. The “Inner-London” market area and the “Outer-London” market area for three airports.

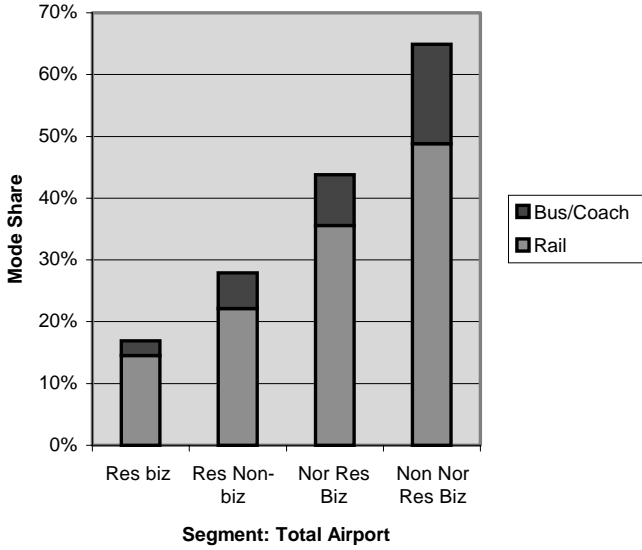
Gatwick. Rail services at Gatwick capture nearly 40% of the Non-resident airline passengers while capturing only about 20% of the Resident market. Looking at the entire ground access market, Residents traveling for leisure have low rates of rail use compared with other segments, particularly in terms of the higher-priced Gatwick Express service, with about a 5% market share. As in other airports, bus and coach are selected more by the Non-residents than by the Residents.

Heathrow: Total Airport

Examination of the variation by market segmentation for the airport as a whole reveals similar marked differences by segment for Heathrow. From the data presented in Figure 3-8, it is clear that, for the airport as whole, the non-resident has a greater market share to public transportation services than

does the resident, with the Non-resident Non-business segment using public transportation at twice the rate of the Resident Business segment. Non-business is stronger than Business; Non-resident is stronger than Resident. Buses are used more by the Non-resident Non-business market than by any other segment.

From the observation of these three London airports, one might conclude that the non-resident air traveler in London has a greater propensity to select the public modes than does the resident. Before any conclusions are drawn about the impact of demographic characteristics of modal choice, it is worthwhile to review the impact of geographic distribution of airport trips on these calculations. All three London airports provide a good basis for the examination of market pattern through a two-step process: first, applying segmentation by geography and second, applying segmentation by demographic category. Significantly more meaningful results are



SOURCE: CAA, 2000.

Figure 3-6. Variation by segment at Stansted.

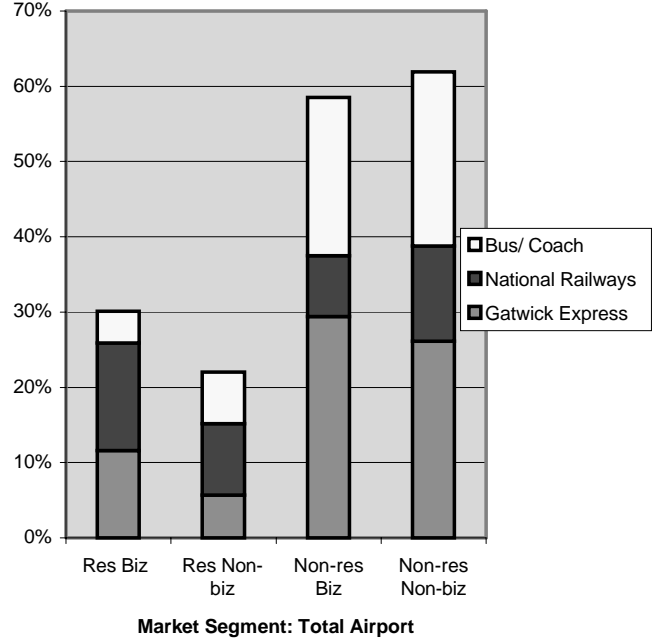
generated when the variation by demographic segment is examined for a limited geographic area.

Controlling for Variance Based on Geographic Area of Origin

Stansted and Gatwick Airports can be used to illustrate the influence of geographic distribution of origins on the modal choice decisions by each market segment. Figure 3-9 has been created to show the relationship between the origin patterns of each segment, and each segment’s propensity to choose rail. Figure 3-9 describes the access patterns at London Stansted. Stansted is an airport that primarily serves a market area other than London: of the UK Resident air passengers using Stansted, only about 17% are coming from Inner London.

From the data presented in Figure 3-9, it becomes clear that the variation by segment in rail mode share is almost entirely attributable to the propensity of that segment coming from Inner London. Of the leisure visitors, 53% are coming from Inner London, gaining a 57% mode share to rail. By contrast, only 20% of the Resident Business flyers are coming from Inner London, which is reflected in a 22% mode share to rail. In short, the rail mode variation by segment is best explained by the travelers’ propensity to be coming from the prime market area, Inner London.

The results of the analysis of Figure 3-9 are extremely important to the concept of a two-level process of market analysis. Figure 3-9 shows the powerful correlation between the propensity of each of the four demographic segments to originate their outbound air trip from Inner London, and their propensity to choose rail.



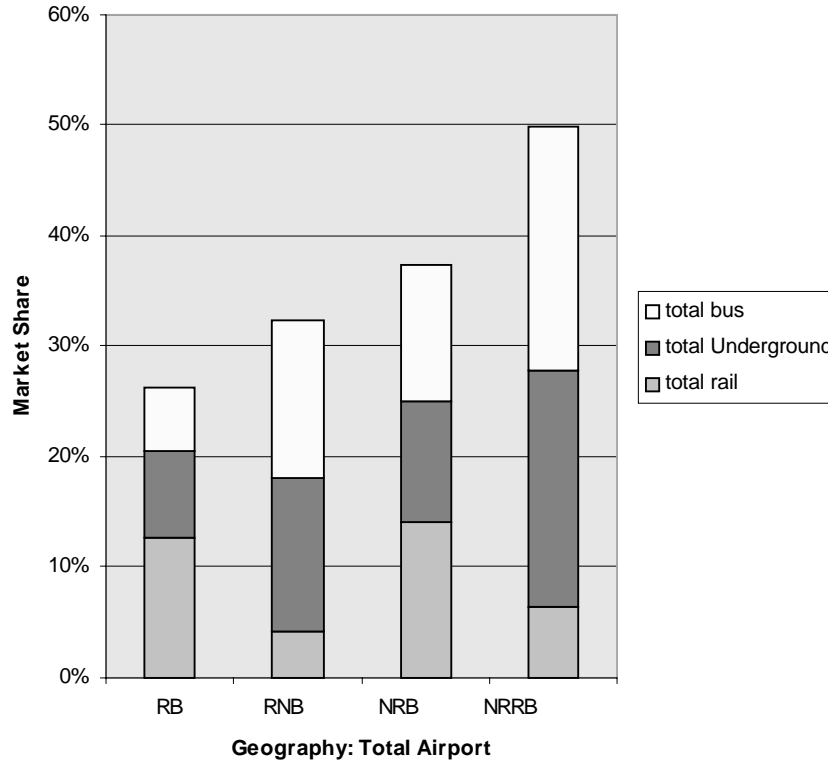
SOURCE: CAA, 2000.

Figure 3-7. Variation by segment at Gatwick.

Of those foreign tourists going to London, rail captures a very high share of the submarket. By contrast, the leisure UK traveler at Stansted overwhelmingly comes from areas other than Inner London, and the rail market share for this group correlates directly with the low proportion coming from Inner London. The two Business segments compose the middle ranks of both orientation to downtown and rail mode share. The data presented in Figure 3-9 is summarized as a bar chart in Figure 3-10. In that graph, the vertical bars show rail mode share while the connected points show the percent of the segment that come from Inner London. The power of the correlation between the two factors is immediately visible in Figure 3-10.

Gatwick Airport can also be used as a case study in the importance of controlling for geography while examining variation by the four demographic segments. Gatwick Airport is primarily used by UK leisure travelers who do not live in London. Of the largest segment (Resident Non-business), only 15% are beginning their journey in Inner London, as shown in Figure 3-11. This low market orientation to downtown correlates directly into a very low mode share for rail (11%) when seen in the context of the total airport ground transportation market.

By contrast, Gatwick’s foreign visitors to London have a much higher orientation to downtown, and their overall rail share reflects this directly. Of the foreign visiting tourists flying from Gatwick, nearly half (46%) are coming from Inner London, resulting in a relatively high (39%) mode share to rail for this group. Of the foreign business travelers, 38% are coming from Inner London, which is reflected in the 36% share to rail. Figure 3-11 shows the mode share (expressed as



SOURCE: CAA, 2000.

Figure 3-8. Variation by segment at Heathrow.

bars) and the percent of origins from Inner London (expressed as linked points).

This examination of the role of differences in origin locations in influencing public mode choice supports the conclusion of this chapter that the analysis of the impact of demographic factors on market decisions should be undertaken for specific geographic markets of concern. Phrased differently, geographic variables *should be held as a constant* in the examination of the influence of demographic variables. The rest of this chapter will examine variations in public transportation mode share for strong geographic market areas. In each case, the task of defining the strong market area has been done by the local analysts; this allows the examination of variation attributable to differences in the demographic makeup of the four market segments. In the British and U.S. cases, this will involve the examination of the four demographic segments of the four-cell matrix. Scandinavian data will be examined in terms of an eight-cell matrix.

VARIATION BY DEMOGRAPHIC SEGMENT: PRIME GEOGRAPHIC MARKETS

This section of Chapter 3 will examine the public shares in three cities, each of which has a prime market area served by three separate airports. It will examine the modal share patterns by market segment for travel from Inner London to London’s three largest airports: Heathrow, Gatwick, and Stansted.

It will examine the same mode share patterns from central Washington, D.C., to BWI, Dulles, and Reagan National Airports. It will examine the mode share patterns from Manhattan to LaGuardia, JFK, and Newark Airports. In each case, a common “prime market area” has been defined that has significant traffic from all three regional airports. This stratification will allow comparison among public mode share patterns for services from a constant origin area to regional airports. Within a given airport, it will allow for the observation of differences in mode choice stemming from differences in the four demographic segments for a fixed set of geographic assumptions.

London: A Prime Market Served by Three Airports

Revisiting each of the London airports, we can see how the market responds to services in specific geographic areas.

Inner London to Stansted

As shown in Figure 3-12, transportation services capture 79% of the air passenger travelers between Stansted and Inner London. Stansted is the farthest distance from Inner London and has the highest mode share to rail recorded in TCRP Project B-18A. Looking at the submarkets, it is revealed that the

Relationship between Zone of Origin and Rail Mode Share: Stansted Airport		
	Resident	Non-Resident
Cell Definitions	% from inner London	% from inner London
	% Rail Share	% Rail Share
Business	20%	33%
	22%	35%
Non-Business	15%	53%
	16%	57%

SOURCE: CAA, 2000.

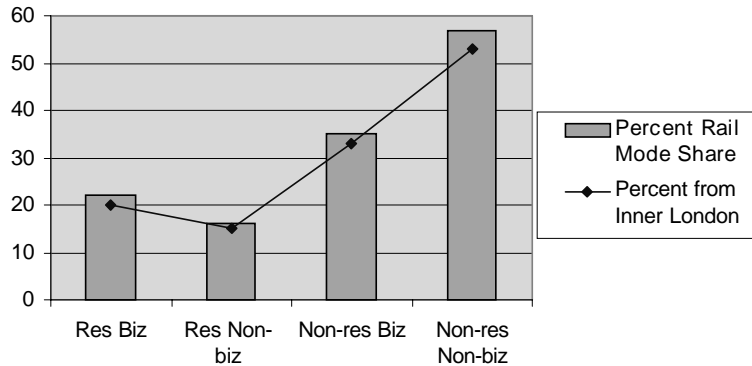
Figure 3-9. Influence of trip origin on mode share by segment for Stansted Airport.

Stansted rail service attracts robust mode shares from each of the four segments. In general, Non-resident segments have higher public transportation usage than do the Resident segments, but not to the extent implied by the data summarizing the mode share pattern of the airport as a whole.

As noted earlier in this chapter, the Non-resident segments have lower personal automobile availability and begin their trips in more central portions of Inner London (a zone of about 90 square miles). Most importantly, rail captures a high market share for all four cells of the matrix, with Non-resident showing the highest propensity to choose the rail services. More than 85% of the foreign business travelers going to Inner London choose the rail, making this one of the highest market segment capture rates revealed in the Project B-18A process.

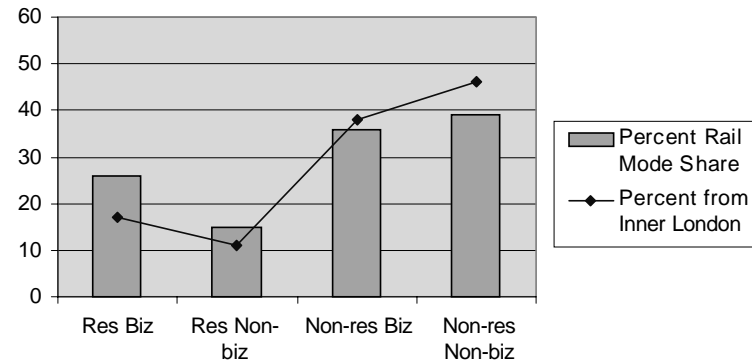
Inner London to Gatwick

For the market between Gatwick and Inner London, public transportation services capture 77% of the air passenger trips, as is shown in Figure 3-13. Gatwick is located closer to London than is Stansted, but farther than is Heathrow. Similar to Stansted, rail services at Gatwick capture excep-



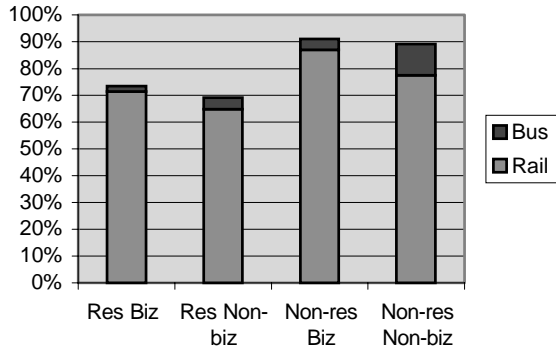
SOURCE: CAA, 2000.

Figure 3-10. Origins from Inner London and rail mode share to London Stansted Airport.



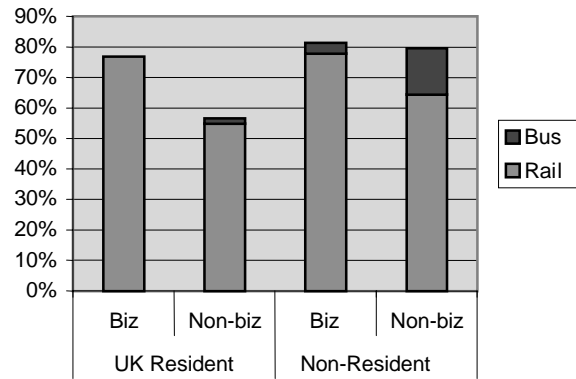
SOURCE: CAA, 2000.

Figure 3-11. Origins from Inner London and rail mode share.



SOURCE: CAA, 2000.

Figure 3-12. Variation by market segment: Stansted and Inner London.



SOURCE: CAA, 2000.

Figure 3-13. Variation by market segment Gatwick and Inner London.

tionally strong portions of the market. To Gatwick, the business traveler has a higher propensity to choose rail services than does the leisure traveler. The resident of the United Kingdom on leisure travel has the lowest propensity to choose rail, with a market share of about 50% to rail. Of the business travelers, the UK resident and the foreign visitor alike select rail services for more that 75% of trips from Inner London.

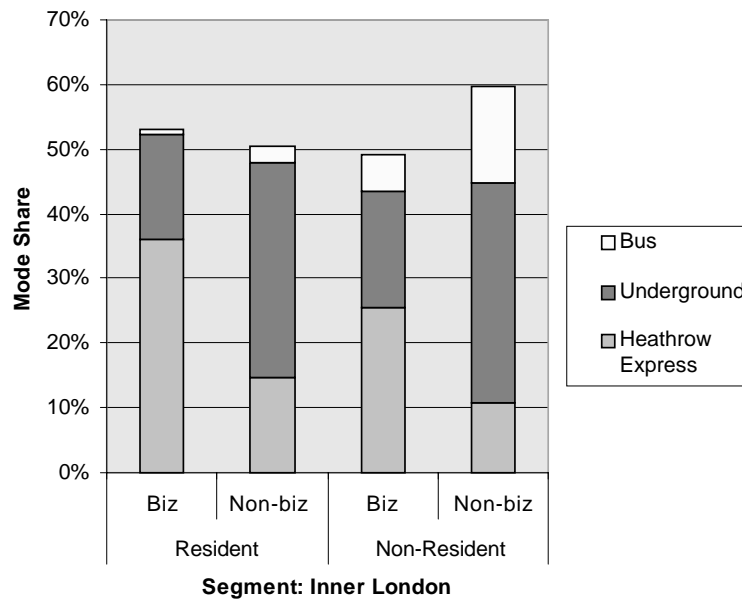
At Gatwick, the overall market shares revealed for all business travelers are exceptionally high. The business traveler from the United Kingdom acts in a manner very similar to the foreign business traveler. The leisure traveler from the United Kingdom makes market choices in a manner very similar to the leisure traveler from abroad. Like Heathrow, Gatwick offers two major rail modes between Inner London and the airport; the market choices between separate categories

of high-quality rail services are discussed for both airports later in this section.

In the cases of both Stansted and Gatwick, the superior good is obvious, and the more affluent business traveler consumes the superior good at a rate higher than does the leisure traveler at both airports. The rail is faster, cheaper, and more dependable than the taxi.

Inner London to Heathrow

For the closer-in Heathrow Airport, public transportation services capture 54% of the air passenger market. From the densely settled prime geographic area (approximately 90 square miles), private automobiles are used for fewer than 15% of the trips to the airport. Figure 3-14 shows that, in



SOURCE: CAA, 2000.

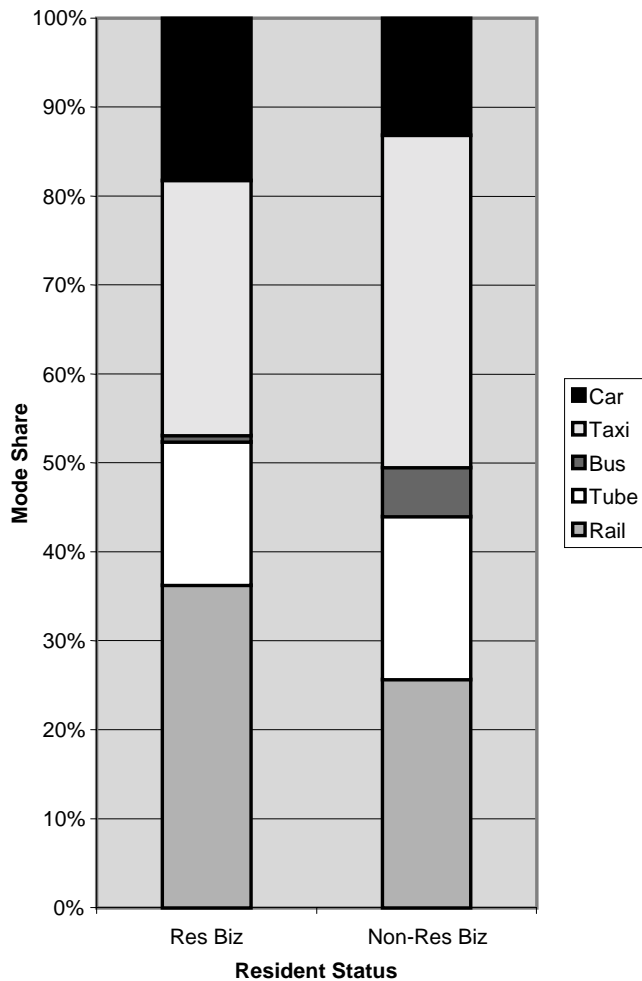
Figure 3-14. Variation by market segment Heathrow and Inner London.

terms of *total public transportation* use to Heathrow from Inner London, there is not much variation over the four market segments, generally around 50% of the market share. The major market variations occur among the separate public transportation modes to Heathrow. The Airbus, a service that connects to hotel areas downtown, plays a very minor role for the UK residents market, but captures a solid 15% of the foreign tourist market.

Heathrow Airport is within a 50-min taxi ride to Inner London, so the determination of the superior market choice is more complicated than it is for Gatwick and Stansted. In the Heathrow-to-Inner London market, the Non-resident segments are not playing their expected role as the stronger consumer of public transportation. In fact, when the two markets are compared with all modes it becomes clear that the Non-resident segments at Heathrow have significantly greater propensity to choose taxis than do the Resident segments. Figure 3-15 shows that the foreign business visitor chooses

the premium Heathrow Express less often than does the UK business traveler, with significantly higher use of the taxi. Given that both groups have financial capability to choose the superior good, it is interesting that the visitor, with less familiarity about the details of the transportation options available, chooses the taxi more than the resident. It is a challenge for those marketing the Heathrow Express to make the behavior of the visitor more like the behavior of the resident.

For the trip from Heathrow to Inner London, there is little variation by segment in the total share to public transportation, but significant differences by segment in the selection of modes within the overall category of public transportation. The choices between very similar public modes can be analyzed using the four demographic segments, as is shown in the following analyses for both Heathrow and Gatwick. At Heathrow, the fast rail competes with the slower subway service. At Gatwick a fast dedicated airport train competes with a fast commuter train.



SOURCE: CAA, 2000.

Figure 3-15. Resident versus Non-resident: Heathrow to Inner London.

Conclusions from the London Case Study

Inner London is a strong market area for ground access services from three airports. The definition of this common market area allows for meaningful comparisons between the services and their market characteristics.

The examination of how one geographic area—Inner London—is served by three airports has revealed some of the highest public market shares documented in this project. Similarly, there are geographic areas in the United States in which use of public transportation services to airports is significantly higher than the national norm. The following section examines strong markets in Washington, D.C., and Manhattan, each of which is served by three major airports. Then, strong market areas are observed for airports in Boston and San Francisco.

VARIATION BY DEMOGRAPHIC SEGMENT: PRIME U.S. MARKETS

This chapter is examining a two-phase process of market segmentation, which includes a screening for both geographic characteristics and demographic characteristics. Previous sections of this chapter have dealt with demographic segmentation as applied to the total market of the airport. As shown in the case study of the three London airports, very often market behavior is best explained by the examination of geographic factors first and then by the application of demographic segmentation on specially defined geographic areas.

This section of the chapter will examine ground access service to major market areas, in which trip-end densities are supportive of public transportation services. First, airport ground access patterns to Washington, D.C., and to Manhattan will be examined. In each case, the market area is the

common origin zone for three separate airports. The analysis will examine the extent to which demographic segmentation does and does not reveal differences among the subgroups for a specific market area. In all cases, good public transportation services do exist. Using the definition established in the *TCRP Report 62*, “public transportation” includes rail, scheduled bus, and limo/van services operated for the purpose of shared-ride service (1). Specifically excluded are charter buses and hotel courtesy buses. (In the Washington data, private limousine services were included in the original data collection under the category of “limo/van.”)

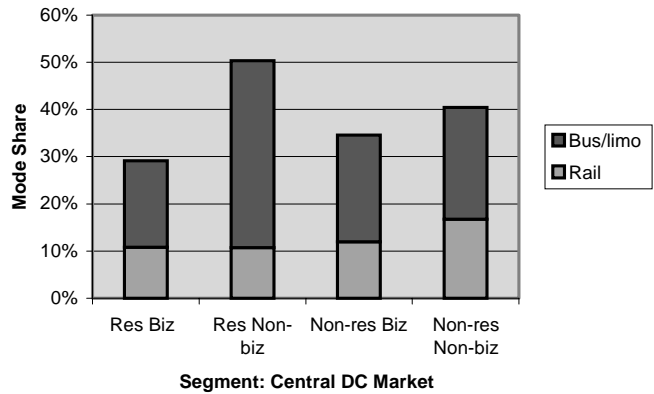
Washington, D.C.: A Prime Market Served by Three Airports

Many U.S. airports are offering services that perform strongly in the markets they are designed to serve. Examining the ground access patterns from three Washington-area airports shows a variety of strategies for dealing with the specific geographic and market challenges addressed. For this process, the research team defined a 39-square mile area around Washington that had significant concentrations of trip-end clusters for all three airports. The area describes major activity centers in Washington, D.C., and Northern Virginia.

The total public transportation market share attained in each of the airports seems to reflect the factor of distance as much as any other factor, including service quality. Airports close to the central business district offer low taxi fares, which compete favorably with public transportation options. Thus, from a constant zone of origin for central Washington, the farthest airport—BWI—has the highest mode share to public transportation for air passengers, followed by the second farthest—Dulles—with the closest airport—Reagan National—having the lowest mode share. From this high-density central Washington market area, 39% of those bound for BWI take public transportation, 28% of those going to Dulles take public transportation, and 19% of those going to Reagan National take public transportation.

Central Washington to BWI

Between BWI and central Washington, 39% of air passengers choose public transportation services. As shown in Figure 3-16, air passengers between BWI and downtown Washington, D.C. select the bus and van services over the rail option for this 30-mile journey. Most variation among the segments occurs in the selection of the bus and van modes, with the train capturing about 10% of the market for most segments. The resident leisure travelers select the bus or van service over the trains by a factor of about 4 : 1; for the resident business traveler, it is about 2 : 1 in favor of the bus or van option. Consistent with most of the patterns examined



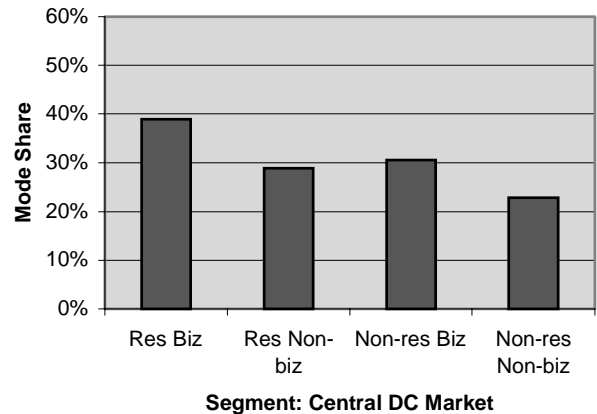
SOURCE: WASHCOG, 1998.

Figure 3-16. Variation by market segment: central Washington to BWI.

in this chapter, the highest overall market to public transportation comes from the resident non-business traveler.

Central Washington to Dulles Airport

For the 26-mile journey from Dulles to central Washington, the system of buses and vans in the Washington Flyer program captures about 28% of the air passenger trips, as is shown in Figure 3-17. In the survey data, the option of Metro-rail to West Falls Church with a connecting bus to Dulles does not manage to achieve a full percent for any segment. The meaning of the variation by market segment is unclear because Resident Business appears in the data with a higher mode share than does Resident Non-business, which is a pattern only seen with the use of high-cost options such as the Heathrow Express. (Further phases of this research effort will attempt to separate out single-party limousines from the broader “bus/limo” category to isolate that market more effectively.)



SOURCE: WASHCOG, 1998.

Figure 3-17. Variation by market segment: central Washington to Dulles.

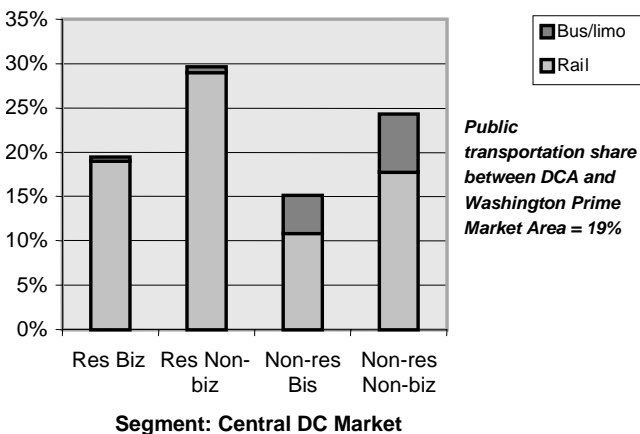
Central Washington to Reagan National Airport

With powerful competition from taxis, which capture 53% of the market to immediately adjacent central Washington, public transportation gets about 19% of the market from central Washington to Reagan National. As is shown in Figure 3-18, the market is made up of rail passengers, with the non-resident non-business travelers the most likely to select bus/van services from Reagan National Airport. Consistent with the most common pattern revealed in this chapter, the strongest demographic segment for rail and public transportation is the Resident Non-business traveler. As noted earlier in the observation of the patterns of the airport as a whole, the non-resident business traveler is the least likely to choose the public options, with a remarkable 61% market share to taxi.

Manhattan: A Prime Market Served by Three Airports

The three New York City–region airports are characterized by low use of public transportation services and unusually high use of private limousine services, a local alternative to taxicabs. For this analysis, a portion of Manhattan, generally south of the northern edge of Central Park, was determined to be a geographic zone with high trip densities for all three airports.

No New York–area airport has particularly high mode share to public transportation from the high-density market area of Manhattan, but the effect of distance noted in observations of the London and Washington markets is again repeated here. The airport with the farthest distance from Manhattan—Newark—has the highest public share; the closest airport—LaGuardia—has the lowest.



SOURCE: WASHCOG, 1998.

Figure 3-18. Variation by market segment: central Washington to Reagan National.

Manhattan to Newark Airport

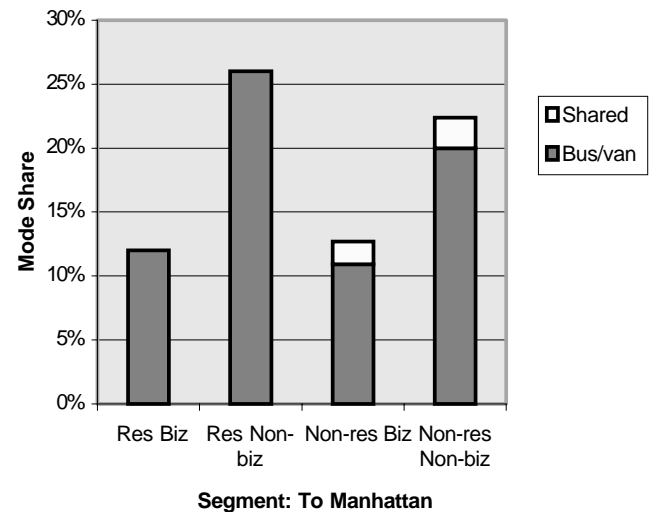
Buses, vans, and a small amount of shared-ride vans capture 18% of the market between Manhattan and Newark International Airport. The strongest pattern over the four segments is that the Non-business market is stronger than the Business market, with the Resident Non-business share twice that of the Resident Business share, as is shown in Figure 3-19. In the New York–area, the business market is selecting the private limousine over all other modes, including taxis. The business versus non-business differences are far stronger than the differences between resident and non-resident.

Manhattan to JFK Airport

In the market to serve Manhattan, JFK Airport has less reliance on public transportation services than does Newark, with about 13% to bus, rail, and shared ride vans. Although the non-business traveler has a higher rate of transit use than does the business traveler (as expected), the non-residents have the highest overall propensity to take the bus to JFK, as is shown in Figure 3-20.

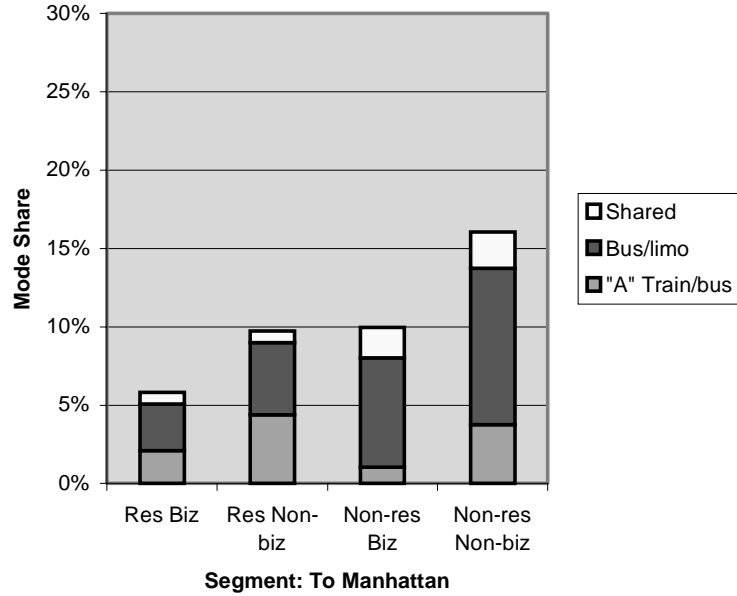
Manhattan to LaGuardia Airport

In one of the largest origin-destination markets in the United States with one of the highest levels of airport trip-end densities, Manhattan’s public transportation services achieve a mere 8% of the market share, as is shown in Figure 3-21. In terms of variation by demographic segment, the most important dimension is trip purpose, in which the non-business travelers have about twice the propensity to select public mode services than do the business travelers.



SOURCE: Port Authority of New York and New Jersey (PANYNJ), 1997.

Figure 3-19. Variation by market segment: Newark to Manhattan.



SOURCE: PANYNJ, 1997.

Figure 3-20. Variation by market segment: JFK to Manhattan.

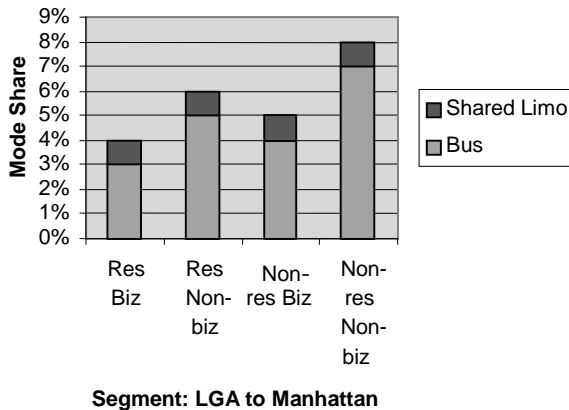
Other Examples of Strong U.S. Market Areas

Central Boston to Boston-Logan Airport

Between Boston-Logan Airport and the core area of Boston, 19% of air passengers choose either bus or other scheduled services (including the bus or water-shuttle service). In this transit-rich area, the variation among market patterns by the separate demographic categories becomes more pronounced than for the airport as a whole. To this core area, in which MBTA rail services are centered, the Resident Non-business market has a share to public transportation of about 25%. The Resident Non-business market selects rail at a rate more than

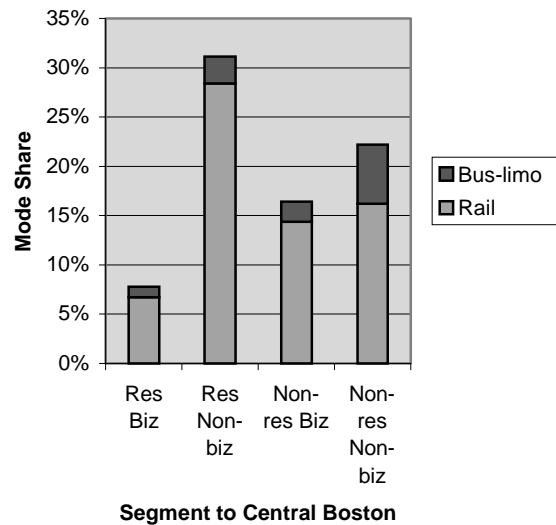
four times that selected by the Resident Business market, as is shown in Figure 3-22.

The performance of the Resident Non-business segment in Boston's prime geographic market is very similar to the performance of the same segment from Washington's Reagan National Airport. In both cases, the rail attracts nearly 30% of the market, with a sharp differential between the Resident Business and Resident Non-business market patterns. In the inner geographic area of Boston, students are



SOURCE: PANYNJ, 1997.

Figure 3-21. Variation by market segment: LaGuardia Airport to Manhattan.



SOURCE: Massport, 1997.

Figure 3-22. Variation by market segment: Boston-Logan Airport to central Boston.

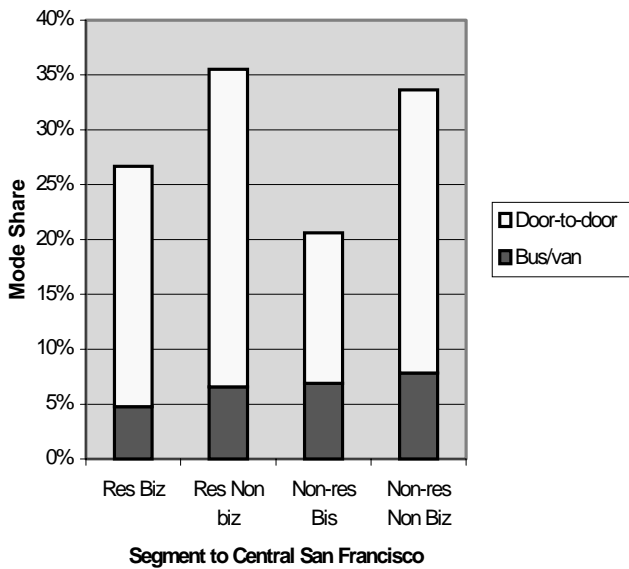
highly represented in the Resident Non-business category and have high rates of transit usage. The low numbers of buses and vans reflect the fact that most of these services are aimed at markets farther from the airport.

Central San Francisco to San Francisco Airport

Public transportation services capture 29% of the market between San Francisco International Airport and central San Francisco. Figure 3-23 shows that these trips are primarily by door-to-door van rather than by the scheduled bus services to downtown. The Non-business market selects public transportation services at a rate near 35% market share. There is less variation in the use of scheduled service, which captures about 5% of share for every market segment. The non-business travelers have a significantly higher propensity to choose the door-to-door vans than do the business travelers who chose taxis.

ADDITIONAL SEGMENTATION IN SCANDINAVIA

In the analysis of market segmentation in Stockholm and Oslo, market researchers have found it worthwhile to examine the international trip separately from the domestic trip. What results is better ability to make comparisons among the travel behavior of separate submarkets for airport ground access services.



SOURCE: San Francisco Airport, 1998.

Figure 3-23. Variation by market segment: San Francisco Airport to central San Francisco.

Prime Market Area in Stockholm

Between Stockholm’s Arlanda Airport and Stockholm’s prime market area, greater than 45% of the air passengers use public transportation—in this case, bus and rail services. The method of analysis of market behavior for this market, however, is different than that applied in other cities described in this chapter. In those other cities, market analysts are using the four-cell segmentation to better understand how different demographic segments respond to candidate service and marketing strategies. Analysts working for the Arlanda Express airport rail project have determined that one more dimension should be added to the matrix, resulting in the creation of an eight-cell matrix. (In fact, the Stockholm market research program separates charter flights as a ninth market segment. The analysis in this chapter will not deal with charter passengers.) The market analysts at the Arlanda Express apply these eight segments to the “prime catchment area” and not to the airport as a whole.

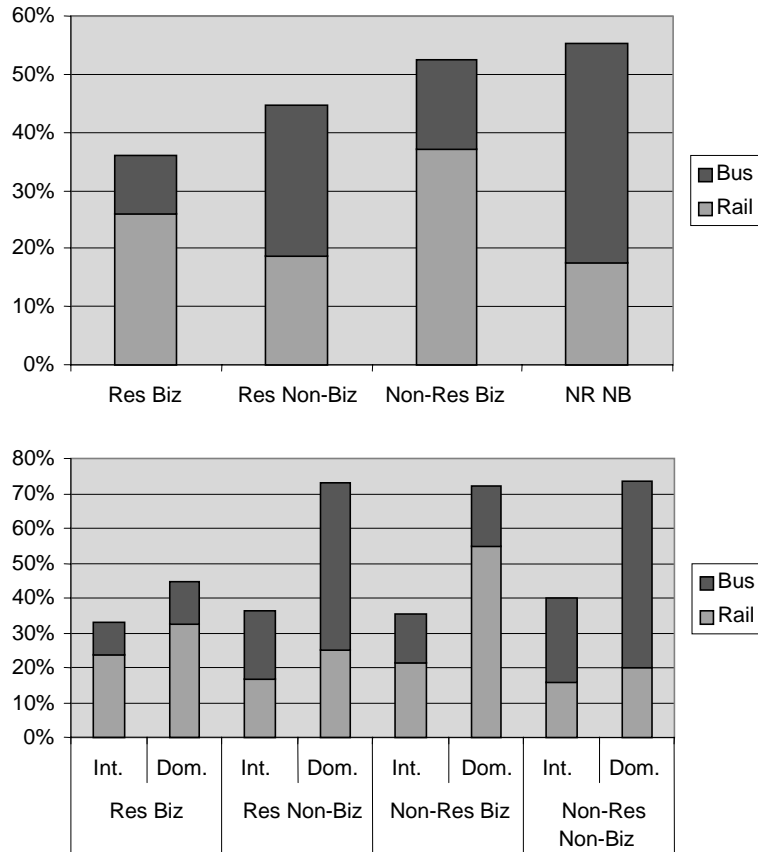
In the first step of the two-phase process, the Swedish market analysts established a prime catchment area based entirely on geography. The analysts of the market for the express train defined a geographic zone in which there was a logical possibility of taking the train. The express rail service operates between the airport, which is to the north of the city, and the downtown main railway station. Thus, the catchment area begins at the rail station and works southwards. Any zone that would require “backtracking” is excluded from the prime catchment area.

In the second phase, the four initial market segments were applied for the catchment area. The top half of Figure 3-24 shows that, in terms of total public transportation ridership, Non-Resident is stronger than Resident and Non-business is stronger than Business. Looking at the market patterns for the higher-priced Arlanda Express, business travelers choose the superior good (the train) more often than they choose the bus. Non-business travelers choose the bus more often than the rail.

The market research program of the Arlanda Express rail service then further disaggregated the four market segments. Each of the four market segments has been divided into international and domestic flights. Arlanda Express market analysts in Stockholm have established business plan goals for improving the market share of the rail service, a program that is based on separate business strategies to reach the separate market segments. Over the past 3 years, this market research program has resulted in significant increases in market share for the rail service.

A key issue in the development of a marketing program is the location of the intended customer. Getting the message to the potential user who lives outside of the country has been a major challenge for large international airports.

The eight-cell market segmentation system allows the refinement of market research in two separate areas. First, it allows the analysis of the market behavior of the non-resident

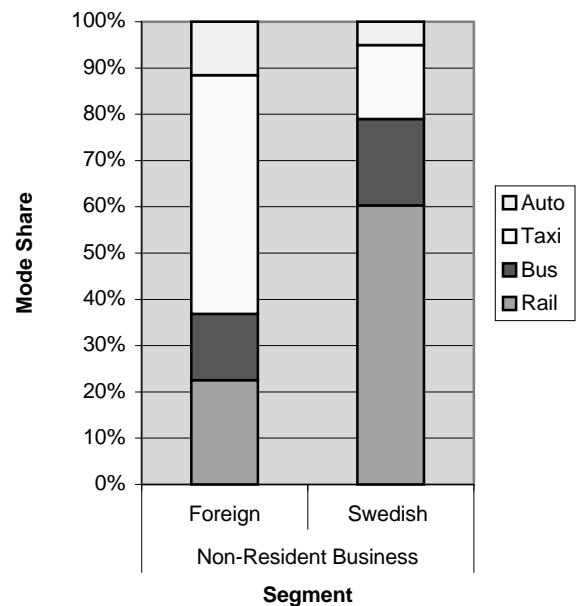


SOURCE: Arlanda Express, 1999.

Figure 3-24. Derivation of the eight-cell matrix in Stockholm.

of Stockholm who comes from a foreign country to be separated from the non-resident of Stockholm who comes from within the country. Second, it allows the comparison of the resident of Stockholm who is on a domestic trip with the resident of Stockholm who is on an international trip. The international trip is often characterized by longer trip duration and a greater amount of baggage when compared with the domestic air trip.

As shown in Figure 3-25, the additional level of segmentation reveals some major differences in mode choice patterns. In each of the original four segments, the passenger on the international flight has a significantly lower propensity to choose a public transportation service than does the passenger of the domestic flight. As expected, the difference is most pronounced for the non-resident of Stockholm. Figure 3-25 shows, for example, that within the Non-Resident Business segment, the air traveler with a domestic (i.e., Swedish) origin has twice the propensity to take public transportation for ground access as the air traveler with a foreign (i.e., international) origin. For the Non-resident Non-business segment, the effect of the domestic versus international dimension is similar in scale.



SOURCE: Arlanda Express, 1999.

Figure 3-25. Comparing mode shares of foreign and Swedish visitors to Stockholm's Arlanda Airport.

Because of the precision available through the eight-segment process, this analysis has controlled for ground access destination (both groups are going to the prime catchment area), has controlled for residential status (both groups do not live in this area), and has controlled for trip purpose (both groups are traveling for business). The remaining factors to explain the difference in mode choice are trip duration and general familiarity with the system options. A marketing program aimed at the international business visitor would attempt to increase familiarity about the service offered.

From this set of observations, the market researchers in Stockholm have determined that the international Non-residential Business market is underperforming and that a marketing program should be created to bring this segment up to the goals established in the business plan. Figure 3-25 shows a detailed breakdown of the difference between the two groups within the Non-residential Business cell. From Figure 3-25, it can be observed that there is little difference between the two groups in the use of bus and that automobile is not a major mode for either group. Overwhelmingly, the visitor from abroad is choosing the taxi at a rate (49%) that is more than three times the rate (15%) of the visitor from elsewhere in Sweden. This is a market pattern quite similar to that of the business traveler's choice between the Heathrow Express and the taxi.

The market segmentation process applied can influence the design of the business strategy to improve market share for the targeted group. A program to increase the market share for this group would not include a lower fare because this group already is overwhelmingly choosing the higher-priced taxi. An advertising campaign would emphasize the time advantage of the rail over the taxi rather than the cost advantage. By contrast, an advertising campaign to improve the Resident Non-business market might be largely based on lower pricing to better compete with the airport bus, which dominates that market in Stockholm.

Prime Market Area in Oslo

Between the new Oslo International Airport and the City of Oslo, 63% of all air passengers are selecting public transportation services—in this case, bus and rail. As in Stockholm, market researchers have chosen to focus attention on the differences in ground transportation market behavior between passengers on international versus passengers on domestic flights. For this reason, market analysts for the Oslo Airport Express commonly use a four-cell matrix that is based on trip purpose (business versus non-business) and the destination of the flight (domestic versus international). The reader should be aware that the graphics showing the four segments used in Oslo do not correlate directly with the four-cell approach taken in the rest of this chapter.

Looking at total share to public transportation services, it is seen that passengers traveling to domestic destinations have

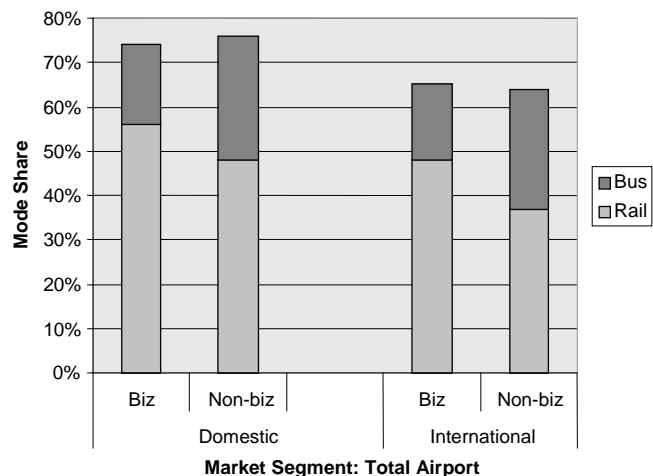
greater than a 70% mode share while those traveling outside the country have greater than a 60% mode share. Within each of these categories, there is almost no differentiation between Business and Non-business segments in their propensity to choose some form of public transportation services.

The robust performance of the Oslo rail system is seen in all the market segments examined by the managers of the Oslo Airport Express. Figure 3-26 shows that, in general, business travelers choose the train at a higher rate than did non-business travelers; conversely, the Non-business market has a higher propensity to choose the bus than does the Business market. In addition, travelers with domestic destinations (i.e., other cities in Norway) have a higher propensity to choose rail than do those with foreign destinations. The strongest market is for business travelers going to Norwegian cities; the weakest market is for non-business travelers making an international trip.

The eight-cell segmentation approach used in Stockholm made possible the comparison of the market behavior of the visitors from within the country with the market behavior of visitors from outside the country. In Stockholm, it was found that the Non-resident from within the country had, by far, the highest mode share to rail of any segment examined. Similar analysis has been prepared in Oslo to further examine the characteristics of the Non-resident market.

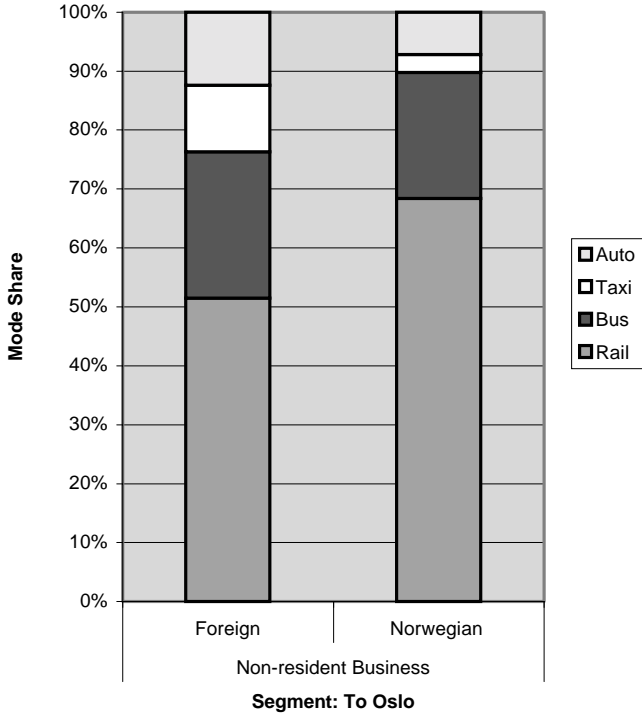
At Oslo Airport, which has the highest market share to rail of any European airport, 67% of the travelers arriving from Norwegian origins choose the rail; 50% of those from international origins choose the rail. Figure 3-27 shows that only 3% of all Norwegian visitors take the very expensive taxi service while 11% of the foreigners chose the taxi to downtown. There is little difference between the two groups in their propensity to select the bus services.

Managers of the Oslo system are now examining business strategies to increase the market share of the international



SOURCE: Flytoget, 1999.

Figure 3-26. Domestic and foreign travelers at Oslo's airport—variation by trip purpose and destination.



SOURCE: Flytoget, 1999.

Figure 3-27. Comparing mode shares of foreign and Norwegian visitors to Oslo's airport.

visitor, with the intention of increasing the foreign visitor market share to become more similar to the domestic visitor market share.

**MODE SHIFT TO NEW SERVICES:
VARIATION BY MARKET SEGMENT**

When a major new service is implemented, a major policy question concerns the source of the riders on the new service. The riders were diverted from some mode; at present there is very little "before and after" data to help the analyst understand the real impact of the new service or facility. Demographic market segmentation can be applied to the question of how mode shift was actually accomplished. Demographic segmentation helps the analyst understand why the given group was using the original mode and why that group was susceptible to diversion to the newly implemented mode.

A limited amount of data is currently available on the subject of actual mode shift in response to new services. This section of Chapter 3 reviews the known data on the modal source of the new riders on the Heathrow Express in London and on the Arlanda Express in Stockholm.

Source of New Riders: Heathrow Express

A major theme of this project has been the strategy of offering the public an array of public transportation services

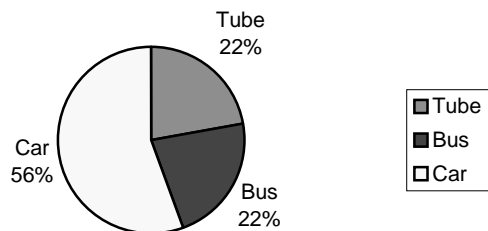
to meet an array of needs of the separate submarkets. The decision by the managers of Heathrow Airport to build the Heathrow Express to augment the rail service already provided by the London Underground's Piccadilly Line is a good example of a commitment to provide a variety of services aimed at a variety of markets.

As discussed in *TCRP Report 62*, the Heathrow Express was designed to appeal to a market willing to pay a premium price for a premium service. The Heathrow Express offers a 15-min running time to downtown London, versus a 45-min running time by the existing Underground. For this service, a relatively high price is charged—£12—versus about £5 for the Underground.

From the inception of the project, there has been much speculation about the impact of the new service on the mode shares of other services, particularly other public transportation modes. At the time of the last comprehensive survey, the Heathrow Express was attracting about 9% of the total market at Heathrow. Where had the rail riders been diverted from? What market segments were affected most?

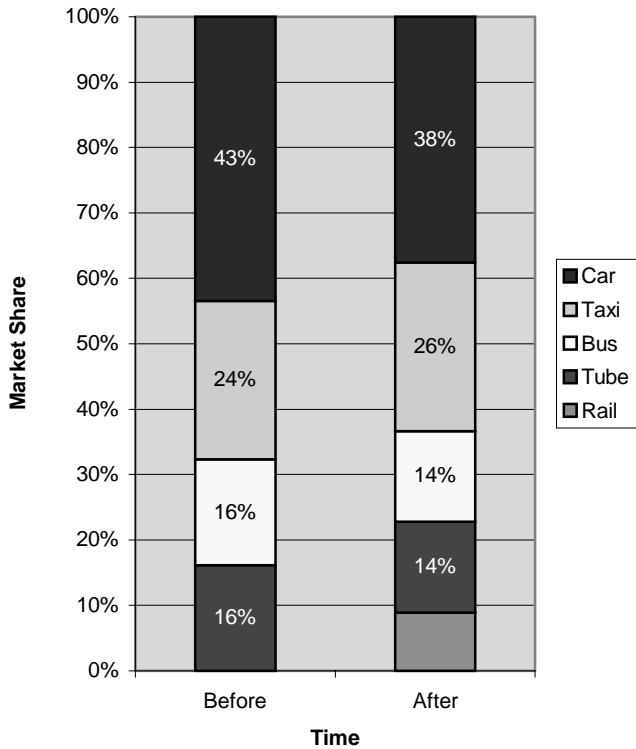
An early theory was that the high-cost service would divert riders from the taxis, but this has not happened. Comparing before and after surveys, the use of taxis has actually increased slightly over this period. Surprisingly, the greatest change in market share over this period has been the decline in the use of the private car (parked, kiss-and-ride, and rentals). No great change in ridership was noted for either the Underground or the Airbus services. Figure 3-28 shows the evident source of the Heathrow Express riders for all market segments aggregated together. Figure 3-29 shows that there has been more change in the automobile market than in the public modes.

In order to understand how the separate market segments were affected by the implementation of the Heathrow Express project, before and after market descriptions were created for three markets: UK residents traveling on business, UK residents traveling on leisure, and all air travelers coming from beyond the United Kingdom. Figure 3-30 shows that the clear majority of the UK residents were diverted from automobile use while the international travelers lowered their use of the Airbus.



SOURCE: Derived from CAA Surveys.

Figure 3-28. Previous modes of Heathrow Express riders.

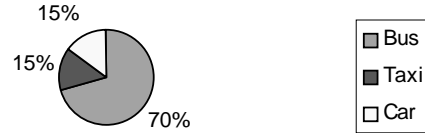


SOURCE: Derived from CAA Surveys.

Figure 3-29. Before and after: the change in market shares resulting from the opening of the Heathrow Express.

Source of New Riders on the Stockholm Arlanda Express

Before the opening of the Arlanda Express, the airport had a high mode share to public transportation, with about 38% of air passengers choosing the bus. In the fourth quarter of 2000, about 19% of passengers from the catchment area took the bus. The introduction of the Arlanda Express served to increase the total market share to public transportation from



SOURCE: Arlanda Express.

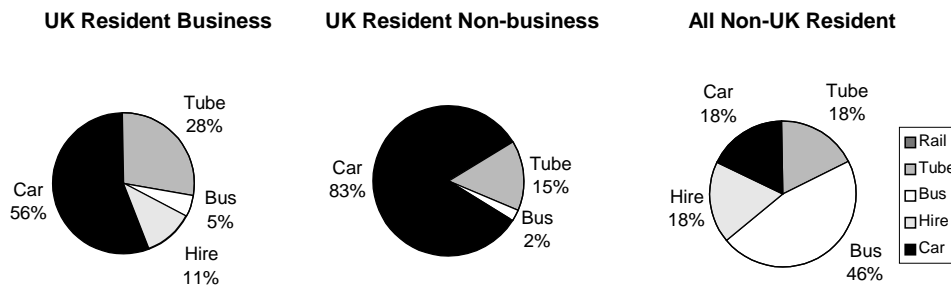
Figure 3-31. Previous modes of Arlanda Express users.

the catchment area to 45%, with decreases in the market share for kiss-and-ride, park-and-ride, and taxi.

Figure 3-31 shows that of the riders on the Arlanda Express, about 70% were diverted from the bus and 30% were diverted from automobiles (private, rented, and taxis). The source of previous mode was calculated for the four market segments under discussion in this chapter. Figure 3-32 shows a summary of the results of that analysis. In three of the four segments, the private car accounted for roughly one-fourth of the previous mode; for the Non-residential market segment, however, the private automobile has a higher mode share in 2000, after the inauguration of the rail, than it did in 1999, before the rail's inauguration. In general, all the Swedish market segments showed some diversion from the automobile while the international visitor segments did not.

CONCLUSIONS

Market segmentation by geographic area and by demographic characteristics is a powerful tool that allows the analyst to understand market conditions on a more disaggregate basis. It allows the comparison of "apples with apples," which in turn can reveal pronounced differences in market behavior by parallel market groups in different cities and on different continents. It allows many variables to be held constant while highlight legitimate differences among target groups. The ability of the Scandinavian market researchers to compare the travel behavior of out-of-town business visitors arriving from within the country with the behavior of out-of-town vis-



SOURCE: Derived from CAA Surveys.

Figure 3-30. Previous modes of users of the Heathrow Express by market segment: Where did they come from?

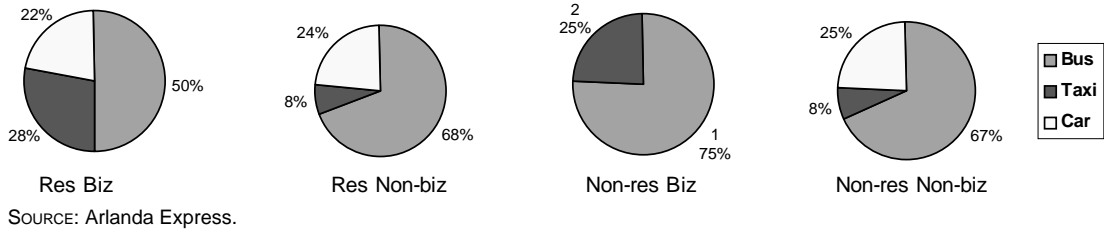


Figure 3-32. Previous modes of Arlanda Express users by market segment.

itors arriving from outside the country reveals the importance of familiarity with the system and calls for a specific marketing solution aimed at the unfamiliar traveler.

Most importantly, the application of the two levels of market segmentation allows the transportation manager to carefully design services that will attract more people into

efficient, higher-occupancy modes for airport ground access. Although there are profound differences in the level of public transportation use between the United States and Europe, the tools of market research can be profitably used in both situations. Managers from both continents can use these tools to improve their market strategies.

CHAPTER 4

IMPROVING PUBLIC MODE SHARE FOR EMPLOYEES

CONTEXT OF CHAPTER 4

Chapter 4 describes ways to improve the public transportation mode share for employees who work at an airport. The chapter begins with hypotheses of factors that influence employee use of public transportation. The results of a survey of the current situations at representative airports are then summarized. The findings from an examination of the summary are then used to discuss the key considerations for improving employee public transportation mode share at airports.

Objective and Challenge

Adequate public transportation for employees at airports is good for the environment. As shown in Table 4-1, airports have large concentrations of employees. This concentration can provide a potential market for cost-effective public transportation. Effective public transportation can help to reduce regional traffic congestion by providing employees with alternatives to the automobile for their journey to work.

Adequate public transportation at airports is also good for business because it can increase the size of the potential labor pool. Airports offer a full range of job opportunities. A large number of both skilled and non-skilled labor is required by the airport operator, airlines, and other tenants. Because airports are frequently located in suburban locations, the lower-paying non-skilled positions can sometimes be more difficult to fill. Public transportation that is linked to populations with low rates of automobile ownership can make the airport a possible work location for those who rely on transit.

There are a number of challenges, however, to implementing successful public transportation services for employees at an airport. First, airports are usually located in suburban locations, which can be difficult to serve with transit because of nearby lower population densities. Second, airports represent a unique operating environment. An airport is a 24 h-a-day operation with many work shift times differing from typical work shift times. Third, there are multiple employers working under a variety of constraints and regulations. Individual airports can have other unique challenges as well.

An understanding of the potential public transportation market is essential for implementing successful public transportation services that meet employees' needs. How many employ-

ees actually report to work each day? Where on the airport do they work? When do they work? Why should they take public transportation? The following sections provide some insights into the factors influencing employee mode choice through the experiences at a number of airports.

FACTORS INFLUENCING EMPLOYEE USE OF PUBLIC TRANSPORTATION—INITIAL HYPOTHESES

Previous research on improving public transportation access to large airports revealed that available data on employee usage of public transportation is limited. Data that was available showed a wide range for public transportation's share of employees' mode of access to the airports. An examination of the potential trends indicated by the limited data and consideration of basic transit planning principles led to hypotheses that included the following four factors:

1. *The availability of transit service at employee residences*—Is transit service to the airport reasonably accessible in areas in which employees live? In many communities, available public transportation links the airport with the regional core or major activity centers. Employee residences, however, may not be concentrated in the corridors served by this link—for example, many employees that work at an airport live in the direction away from the regional core because housing is less expensive and travel corridors are less congested. Public transportation may not offer connections from these areas to the airport.
2. *The accessibility of the employee's worksite to transit service*—Does the transit service provide a convenient connection to the employee's final destination on the airport? An airport has many employees working in areas beyond the passenger terminal—for example, ramp areas, cargo centers, aircraft maintenance facilities, and other employment sites scattered around the airport property.
3. *The extent to which employees work non-traditional work hours*—Does the transit service offer convenient frequencies of service when employees need to travel to work? Many employees who work at airports have working hours dictated by aircraft operational patterns

TABLE 4-1 Number of employees at selected airports

Airport	FAA Hub Size	Estimated 1998 Average Daily Employees
John F. Kennedy	Large	41,000 (1987)*
Dallas/Fort Worth	Large	40,000 (2000)*
O'Hare (Chicago)	Large	40,000
Los Angeles	Large	40,000
San Francisco	Large	31,000
Phoenix Sky Harbor	Large	23,665
Lambert-St. Louis	Large	19,000
Denver	Large	17,400
Boston-Logan	Large	14,600 (2000)*
Bush Intercontinental/Houston	Large	14,406
Salt Lake City	Large	13,026
Seattle-Tacoma	Large	11,375
Metropolitan Oakland	Medium	10,500
Tampa	Large	8,219
McCarran (Las Vegas)	Large	8,000 (2000)*
Portland	Medium	5,000
San Jose	Medium	3,500
San Diego	Large	3,000
Omaha	Medium	2,500 (2000)*
Sacramento	Medium	1,500 (2000)*
John Wayne (Orange County, CA)	Medium	1,000 (2000)*

*NOTE: Data was provided for 1998 unless otherwise noted.

SOURCE: Leigh Fisher Associates, based on data provided by individual airport operators.

that are outside of the typical 6 to 9 A.M. and 4 to 7 P.M. commuter hours.

4. *The availability and cost of parking for employees—* What is the cost the employee must pay for parking? Although some airports are providing subsidized car pools or transit passes, few employees pay “market-rate parking fees.”

These factors were used as a starting point to expand the available knowledge for identifying ways to improve employee use of public transportation at airports.

AIRPORT EMPLOYEE SURVEY RESULTS

This section describes the results of an Employee Public Transportation Usage Survey that was sent to a variety of airports. These airports were surveyed to help to provide insights into the factors affecting employee use of public transportation.

The survey was sent to selected airports to supplement the data gathered in the previous research. Surveys were targeted to airports located in air quality non-attainment areas. These airports were selected because major employers in non-attainment areas may be required to conduct and submit surveys of employee travel patterns, which were expected to provide the desired data on employment and employee travel patterns. However, in some communities, the surveys and trip reduction programs are the responsibility of the airlines or other major airport tenants, not necessarily of the airport operator, and thus data may not be readily available.

Surveys were distributed to the operators of 34 airports, including 19 large hub airports and 15 medium-to-small hub airports. The responses received equally represented the large and medium-to-small hub airports. Approximately one-third of the surveys was returned from both the large and

medium-to-small airports. One reason for the limited response is that there appears to be little available data concerning the number, characteristics, mode of access, or travel patterns of employees at most airports. The information obtained, however, does provide useful insights. The information requested can be categorized into three areas: (1) characteristics of existing public transportation service and use at the airport; (2) characteristics of employees working at the airport; and (3) operator's opinions regarding the key factors affecting the use of public transportation by the employees of the airport, airlines, and other tenants.

Transit Service Characteristics

Information from the survey responses concerning the existing transit service at the airport—such as type, frequency, stop locations, and employee transit mode shares—is summarized in Table 4-2.

Transit Service

As shown in Table 42, transit service to airports is typically limited in terms of the number of routes and the frequency of service. Only O'Hare (Chicago), Reagan National (Washington, D.C.), and Boston-Logan have relatively robust service with the presence of a rapid rail station on each airport.

Los Angeles International Airport has a significant amount of service nearby, but the service is provided to a transit center and rail station that is remote from the terminal. The route frequencies of the bus service are typically limited to two per hour for most routes. In addition, only two bus routes serve the west end of the airport, a major employment center where airline maintenance facilities and air cargo hubs are located. Of the other airports that responded, only McCarran International (Las Vegas) and John Wayne (Orange County, California) Airports have bus service frequencies greater than two buses per hour.

Transit Mode Share

The data in Table 4-3 shows that for airports with bus service only, typical employee transit mode shares range from approximately 2 to 5%. Most airports with bus service only are toward the lower end of the range. The exception is Denver International Airport, which has a successful airport-oriented bus system named “skyRide.” The skyRide service route map is shown in Figure 4-1. The service is a “semiexpress” bus service with service directly from numerous free park-and-ride lots to the Denver International Airport.

Airports with rail service on the airport that responded to the survey have significantly higher employee transit mode shares. Chicago-O'Hare International Airport has the highest reported employee transit use, with greater than 23% of employees commuting to work on a typical day using rail or

TABLE 4-2 Airport transit service characteristics summary

Airport	FAA Hub Size (a)	No. of Transit Routes		Bus Frequency per Route		Rail Frequency per Route		Number of Stops		Other On- airport Shuttle?
		Bus	Rail	Peak (trips per hour)	Off- peak (trips per hour)	Peak (trips per hour)	Off- peak (trips per hour)	Terminal	Non- terminal	
Birmingham (AL)	S	0	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	No
Boston-Logan	L	2	1	1-3	0-2	15	5-6	4	1	Yes
O'Hare (Chicago)	L	3	1	1-2	1	8-10	6-8	1	1	Yes
Dallas /Fort Worth	L	2	1 (b)	1-2	1-2	2 (c)	1 (c)	2	4	Yes
Denver (d)	L	8	0	1-2	0-2	n.a.	n.a.	2	0	Yes
John Wayne (Orange Co., CA)	M	2	0	2	1	n.a.	n.a.	1	0	No
McCarran (Las Vegas)	L	2	0	2-5	2-3	n.a.	n.a.	1	2	No
Los Angeles (d)	L	12 (e)	1 (b)	1-4 (f)	1-4 (f)	9 (f)	4 (f)	9	?	Yes
Louisville	M	3	0	2	1-2	n.a.	n.a.	1	1	No
Omaha	M	0	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	No
Phoenix Sky Harbor (d)	L	2	0	4	2	n.a.	n.a.	3	0	No
Reagan Washington National	L	1	2	4	6-8	12-20	6-8	1	0	Yes
Sacramento	M	1	0	1	0-1	n.a.	n.a.	2	0	Yes
Salt Lake City	L	3	0	1-2	0-1	n.a.	n.a.	1	3	No
Seattle-Tacoma (d)	L	6	0	1-3	1-2	n.a.	n.a.	1	0	Yes
San Diego	L	1	0	6	4-6	n.a.	n.a.	3	0	No

NOTES:

(a) FAA hub size: S = small; M = medium; L = large.

(b) Remote rail station.

(c) Frequency based on shuttle bus to terminal from remote rail station.

(d) Information from prior research.

(e) Remote bus station.

(f) Linked to terminals with shuttle bus; frequency based on Metropolitan Transit Authority bus schedule.

SOURCE: Leigh Fisher Associates based on data provided by individual airport operators.

bus (this information is based on the results of a 1990 survey). Most of these employees (20.7% of the 23.5%) use rail. Most of the rail use was reported by airport employees as opposed to by airline employees. Of airport employees, 34% reported that they used rail; 7% of airline employees reported that they used rail. Non-crew airline employees reported the lowest transit usage of the three employee groups. At Boston-Logan International Airport, Massport reports greater than 16% of the employees used transit, including 11% using rail.

Employee Characteristics

Information concerning the characteristics of employees at the airport—such as the number of employees, work locations, commute times, and employee parking cost—is summarized in this section.

Number of Employees

As indicated by the missing data points for the number of employees in Table 4-4, good information about the num-

ber of employees working at an airport or where they work is not always available. An airport has numerous tenants, with employees often working in dispersed locations on a variety of shifts each day. Typically, the primary means for airport operators to track the number of employees is through security badges or parking permits. However, the number of badges or permits issued does not necessarily relate to the number of employees working on site over the course of a day.

This difference is especially true when based and non-based flight crew use the airport. Based flight crew may “commute” to work on an airplane from another city. Based flight crew often travel to the airport only once per week although, if they drove, their cars will be parked in a space for several days. Non-based flight crew may hold employee badges or permits that allow them to use the airport to begin their “commute” to their base airport. Data in the O’Hare employee survey provide some quantitative insights into the issue. Of the employees that responded to the survey, only 50% reported to work sometime on a given Wednesday. Flight crew members were the lowest percentage, with fewer than 20% reporting to work on a given day.

TABLE 4-3 Airport employee public transportation mode shares

AIRPORT	EMPLOYEE MODE OF ACCESS							
	Public Transportation					Subtotal— transit	Non- transit	Total
	FAA Hub Size	Local bus	Express bus	Private bus/van	Rail			
Birmingham (AL)	Small	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100%
Boston-Logan	Large	1.0%	4.5%	0.1%	11.0%	16.6%	83.4%	100%
O'Hare (Chicago)	Large	0.4%	2.4%	N/A	20.7%	23.5%	71.5%	100%
Dallas /Fort Worth	Large	1.0%	1.0%	1.0%	1.0%	4.0%	96.0%	100%
Denver	Large	0.0%	14.2%	0.0%	0.0%	14.2%	85.8%	100%
John Wayne (Orange Co., CA)	Med.	1.0%	0.0%	1.0%	0.0%	2.0%	98.0%	100%
McCarran (Las Vegas)	Large	2.0% to 5.0%	0.0%	0.0%	0.0%	2.0% to 5.0%	95% to 98%	100%
Los Angeles	Large	0.0%	2.5%	0.0%	0.0%	2.5%	97.5%	100%
Louisville	Med.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Omaha	Med.	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100%
Phoenix Sky Harbor	Large	1.7%	0.0%	0.0%	0.0%	1.7%	98.3%	100%
Sacramento	Med.	1.0%	0.0%	0.0%	0.0%	1.0%	99.0%	100%
Salt Lake City	Large	1.0%	1.0%	0.0%	0.0%	2.0%	98.0%	100%
Seattle-Tacoma	Large	2.0%	0.0%	0.0%	0.0%	2.0%	98.0%	100%
San Diego	Large	2.0%	0.0%	0.0%	0.0%	2.0%	98.0%	100%

SOURCE: Leigh Fisher Associates, based on data provided by individual airport operators.

Percentage of Employees Working in Terminal Area

Based on typical data from the survey responses, 20 to 55% of employees at an airport do not work in the terminal area. This information is important because it illustrates the extent of dispersal of the employees across an airport. For those employees not working at the terminal, they will either have to transfer to a circulator shuttle bus or have a transit service that has a stop at their workplace.

As shown in Table 4-4, estimates for percentage of employees working in the terminal area ranged from 5 to 97%. Most of the estimates were grouped between 45 and 80% if data from the Louisville airport, where the United Parcel Service has a major hub facility, is excluded. It is difficult to obtain reliable data for the percentage of employees working in the terminal area. The reported data was primarily based on estimates by the airport operators.

Data for Chicago-O'Hare was obtained from a survey that asked for the location the employee checked in. For a typical day, 56% of all employees working on the airport reported to the terminal. Of the non-airline employees, 51% did not report to work in the terminal and yet, 34% of those employees arriving by rail used the station at the terminal (the only station on the airport).

Employee Commute Times

A significant percentage of employees at an airport do not travel during peak commuting times when transit service fre-

quencies are the highest. The reported range is 10 to 90%, with most responses being 70% or below. Airline crew employees typically have the highest percentage of commute times outside normal commute hours.

Transit Service to Major Employers

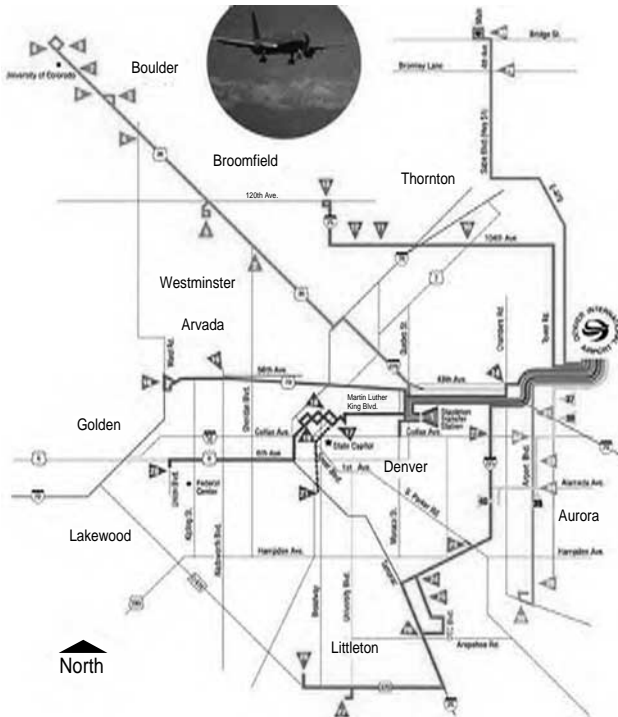
The survey responses indicate that when major employers are present at an airport, scheduled public transit service is typically provided. The frequency of the transit service may not be high, but it is usually provided by the local transit operator because of the concentration of employees.

Cost of Employee Parking

The survey responses confirm that the cost of employee parking is low at airports (see Table 4-5). This parking cost is especially low when the cost to the employee is considered. In the majority of cases, the employer pays for parking. The net cost to the employee is typically less than \$1.00 per day and often is provided free or at no charge to the employee because the cost is subsidized by the employer.

Transit Subsidies

A number of airports do partially subsidize the cost of transit for their employees. These include Boston-Logan, Sacramento, Salt Lake City, and San Diego. Salt Lake City provides



SOURCE: Denver Regional Transportation District.

Figure 4-1. Denver Regional Transportation District skyRide route map.

transit passes that cover 50% of the cost to the employee. Sacramento subsidizes \$35.00 of the \$55.00 cost of a bus pass for county employees only.

Comments on Key Factors

The survey solicited open-ended comments regarding factors the respondents felt affected employee use of public transportation. These comments were summarized and then classified into seven categories. The categories were developed based on an analysis of the relationships between survey results and characteristics of the public transportation systems that exist at the airports.

The key factors affecting employee use of public transportation, in order of the frequency of mention, can be classified into the following seven categories.

1. The comparative travel time of transit with automobile;
2. The comparative comfort of transit with automobile;
3. The extent and adequacy of the transit service area;
4. The proximity and accessibility of transit service at both trip ends;
5. The availability, cost, and convenience of parking at the work site;
6. The extent and adequacy of transit service hours; and
7. The perceived safety of transit, particularly at night.

Numbers 1, 2, and 7 were not directly represented in the initial factors hypothesized, but are similar to the characteristics affecting airport passenger use of public transportation.

KEY CONSIDERATIONS FOR IMPROVING EMPLOYEE PUBLIC TRANSPORTATION MODE SHARE

Based on the seven categories discussed in the previous section, this section describes the key considerations for improving employee transit mode share at airports.

Category 1: Comparative Travel Time of Transit with Automobile

For the large majority of employees, public transportation must compete with the convenience provided by the automobile mode of travel. Travel times on transit need to be *comparable* with, not necessarily equal or less than, those by automobile.

As demonstrated in places such as Denver and San Francisco, express or semi-express service oriented to the airport is an important aspect of improving employee public transportation mode share. The Denver skyRide system provides semi-express service for most routes. The long-standing subscription bus program in San Francisco, operated by United Airlines for employees at its Maintenance and Operations Center, provides an express service that allows employees to be free of the driving task while still having a relatively comparable travel time. Currently, there are approximately 8,000 employees working at the facility.

The buses are privately owned and operate similarly to large vanpools. In fact, the buses are part of a vanpool program at the United facility that currently includes 130 vanpools transporting about 2,000 employees. In 2001, there were two buses in operation. The number of buses declined significantly when staggered work hours were introduced a few years ago. The vanpools and buses are provided with a convenient parking location, as is shown in Figure 4-2.

The frequency of service is also an important consideration in travel times. Service that is more frequent not only reduces wait times for passengers, but also increases an employee's flexibility in terms of the timing of the trip to work. Current experience with the light-rail line that terminates at the Baltimore-Washington International Airport terminal provides a case in point regarding frequency of service. Anecdotal information for employee mode share indicates that only about 1 to 2% of employees use the rail to access the airport. It is likely that the 17-min headway for the service contributes to this limited mode share.

Category 2: Comparative Comfort of Transit with Automobile

Public transportation is competing with automobiles not only in terms of travel time, but also in terms of comfort. The

TABLE 4-4 Airport employment characteristics

Airport	FAA Hub Size	Estimated Number of Employees On-site, Typical Day	Estimated Percentage of Employees Working in Terminal Area	Estimated Percentage of Employees Traveling During Commute Peaks	Estimated Percentage of Employee Residences Served by Transit	Other Major Employment Centers	
						Number of Centers	Number of Centers with Transit
Birmingham (AL)	Small	n.a.	50%	70%	0%	3	3
Boston-Logan	Large	14,600	68%	78%	n.a.	2	2
O'Hare (Chicago)	Large	n.a.	56%	48%	n.a.	3	1
Dallas/Fort Worth	Large	40,000	n.a.	90%	70%	2	2
John Wayne (Orange Co., CA)	Med.	1,000	50%	70%	80%	0	n.a.
McCarran (Las Vegas)	Large	8,000	85%	30%	90%	0	n.a.
Louisville	Med.	n.a.	5%	10%	n.a.	1	1
Omaha	Med.	2,500	45%	33%	0%	0	n.a.
Sacramento	Med.	1,500	80%	25%	50%	0	n.a.
Salt Lake City	Large	n.a.	75 80%	60%	75%	3	3
San Diego	Large	3,000	97%	15%	n.a.	0	n.a.

SOURCE: Leigh Fisher Associates, based on data provided by individual airport operators.

experience at San Diego International Airport helps to illustrate this point. Despite having relatively frequent bus service (four to six buses per hour throughout the day), the employee transit mode share is 2%. The automobile-oriented culture of the region is likely a contributing factor.

Although it is difficult for transit to compete with the comfort that automobiles provide, the comfort and amenities for the transit vehicle should be considered, where possible. Pas-

sengers also perceive the need to transfer and wait as a significant “discomfort.” Thus, the closer a service is to door-to-door service, the higher the comfort level that will be perceived. Boston-Logan International Airport’s successful Logan Express bus service provides an over-the-road-coach vehicle that travels from a park-and-ride lot directly to the airport. Employees are currently entitled to free parking and a significant discount on the fare.

TABLE 4-5 Airport employee parking costs

Airport	FAA Hub Size	Employee Parking		Transit Subsidy and/or Incentives?
		Cost per Month	Who Pays?	
Birmingham (AL)	Small	\$0	n.a.	No
Boston-Logan	Large	\$0 to \$70	Employer	Yes
O'Hare (Chicago)	Large	n.a.	n.a.	n.a.
Dallas/Fort Worth	Large	\$0	n.a.	No (a)
John Wayne (Orange Co., CA)	Med.	\$35	Varies by company	No
McCarran (Las Vegas)	Large	\$0 to \$25	n.a.	No
Louisville	Med.	\$0 to \$12	Employer	No (b)
Omaha	Med.	\$12	Employer	No
Sacramento	Med.	\$0 to \$35	Varies	Yes
Salt Lake City	Large	\$0	n.a.	Yes
San Diego	Large	\$8 to \$50	50% employer, 50% employee	Yes

(a) County employee rideshare program is available.

(b) Local MPO sponsors a vanpool program.

SOURCE: Leigh Fisher Associates, based on data provided by individual airport operators.



Photo: Leigh Fisher Associates

Figure 4-2. Approximately 130 vanpools and 2 subscription buses transport greater than 25% of employees at the United Airlines Maintenance and Operation Center in San Francisco.

Category 3: Extent and Adequacy of the Transit Service Area

All things being equal, the ultimate success of public transportation for employee mode of access will be dependent upon the extent and adequacy of the transit service area. The significant transit mode shares at Boston-Logan and Chicago-O'Hare are largely due to the maturity and robustness of the regional transit system to which the airport station is linked. The maturity of the system provides good frequencies and expansive regional coverage. Conversely, another reason for the lower usage at Baltimore-Washington International Airport is the limited service area of the regional rail network. Currently, the network is limited to a single light-rail line and a single heavy-rail line.

The Boston-Logan employee transit mode share is suppressed because areas north of the airport are home to many employees, but these areas are not well served by transit. This latter point illustrates the importance of the *adequacy* of the transit service area for airport employees. Service to the airport should be placed where employees who work at the airport reside. Two of the routes of the skyRide system in Denver are oriented to locations near the former site of the regional airport, Denver Stapleton International Airport. Ostensibly, this is due to the concentration of employees who had located near the old airport.

In Los Angeles, LAVA provides a convenient transportation link for airline passengers and employees working at Los Angeles International Airport who live or have destinations in the San Fernando Valley. The Van Nuys FlyAway bus service operates scheduled express buses between the Van Nuys Airport, located in the San Fernando Valley, and Los Angeles International Airport. Employees are provided with free

parking in a dedicated lot at the Van Nuys FlyAway terminal. The buses operate 24 h per day with schedules designed to better meet the needs of employees. For example, buses to Los Angeles International Airport operate at 15-min headways during employee peak hours (4:45 A.M. to 8:00 A.M.). Employees pay \$1.75 each way, which is approximately one-half of the regular fare, but can receive a larger discount by purchasing a book of tickets. Employees can purchase a book of 42 one-way bus tickets for \$47.00. In 1999, employee ridership represented 20% of the total ridership on the FlyAway service.

In addition to providing service to areas in which employees are known to reside, transit providers should consider targeting service to areas with potential employees who are likely to use transit to travel to the airport. These would be areas such as those with lower rates of automobile ownership.

Category 4: Proximity and Accessibility of Transit Service at Both Trip Ends

Convenient connections between the transit-vehicle door and the work-site or home door are important for two primary reasons. First, for employees to use the service, the service must be easy to use and accessible. Second, a convenient connection will improve travel time. On the home end of the trip, experience at the airports in Denver and Boston illustrates how suburban areas can be well served with free park-and-ride lots. The work end of the trip is just as important. Most employees report to work in or near a terminal building; however, there are many who do not. An airport is a large development with numerous employers scattered around the site. The transit service should address the needs of both groups of employees. Where there are significant concentrations of employees, transit service should be provided directly to locations near the concentrations. To minimize the travel time and transfer discomfort, it is best if the final transfer can be eliminated. This elimination will not always be possible or desirable. In the latter case, on-airport shuttle bus service should be provided to link the public transportation system with the work sites for employees.

Category 5: Availability, Cost, and Convenience of Parking at the Work Site

The availability, cost, and convenience of parking play a significant role in the choice or consideration between transit and automobile modes of access. Owing to conflicting land uses, an increasing number of airport operators have located employee parking lots to less-convenient remote sites; however, most operators provide space for ample employee parking somewhere on the airport.

A few airports such as Boston-Logan, LaGuardia, and San Francisco have severely constrained sites where parking eco-

nomics begin to approach that of downtown areas, where land is scarce and expensive. In these communities, despite aggressive programs to encourage the use of public transportation, large employee parking facilities are provided to accommodate the needs of airport, airline, and other tenants. For example, the available parking supply for employees working at the United Airlines Maintenance and Operations Center at San Francisco International Airport significantly exceeds the demand. United is bound by employee labor agreements that require parking for each employee. Some incentive for using public transportation or ridesharing is provided by reserving the closest, most-convenient spaces for vanpools and buses. Much of the single-occupant automobile parking is located a significant distance from the work site.

The typically low cost of parking for employees is also a significant barrier to improving employee public transportation mode share. With free or low-cost parking, it is difficult for transit to be competitive given the longer travel times and lower-comfort levels compared with travel in a private vehicle. It is difficult to increase the cost of parking paid by individual employees at airports. The ability of the airport operator to control this cost varies from airport to airport. Some airports have employee parking costs defined in their airline use-and-lease agreements. Often, the airlines are bound by employee labor agreements that specify availability, proximity (or travel time), and cost of parking. At San Francisco International Airport, United Airlines pays the airport \$20 to \$30 per month for each employee parking space.

Consequently, increased costs that the airport operator may wish to impose either are often unallowable or would need to be paid by the employer and could not be passed onto the employees. Thus, the net cost of parking that the employees pay is low and is often free. The lack of this disincentive to the automobile is a major challenge. For example, at Washington-Dulles International Airport, employee parking cost is limited in the airline use-and-lease agreement to a “cost-recovery basis.” The amount permitted to be charged for parking is limited to cover such expenses as the cost of the shuttle bus operations and the parking permit program. As at other airports, these costs usually are paid by the employer.

Transit subsidies are offered by some airport operators to selected groups of employees, such as airport employees. Although this can help provide comparable costs, subsidies can become expensive and require continuous monitoring to prevent abuse. As an alternative to direct subsidies, the federally sponsored Commuter Check Program is available to eligible employers, that is, those with more than 100 employees. Commuter checks, up to a maximum of \$100 per month (as of an increase made in 2002), permit employees to save paying taxes on the amount and save the employer payroll taxes. The program does require the employers to incur administrative costs either to operate the program or to hire a third-party administrator. United Airlines operates a commuter check program in Denver. Employees are required to turn in their parking permit to receive \$30 commuter checks each month.

In some communities, employee discount programs are offered by the private and public operators of scheduled bus services. For example, in San Francisco, the Marin Airporter offers 30-ticket discount commuter books that result in a savings of greater than 50% when compared with full-fare tickets. Similarly, as noted above, employees riding the Van Nuys FlyAway service can purchase a book of 42 one-way tickets for \$47 or approximately \$1.12 for one way as compared with the standard adult one-way fare of \$3.50.

Another challenge to effectively using these types of incentives on a large scale is the fact that an airport has multiple employers with a full range of employee types. Because subsidies are frequently provided through employers, a comprehensive program requires significant coordination and commitment by all parties.

Category 6: Extent and Adequacy of Transit Service Hours

To be a viable option for a significant percentage of employees, the hours of operation for the transit service need to consider the operating conditions at an airport. It is not unusual for employee shift times to begin at 4:00 A.M. or 5:00 A.M. and for other shift times to end at 10:00 P.M. For transit to be an option for employees, the service needs to be operating at those times. In addition, the service needs to be operating at a convenient frequency. In Boston, early morning shuttle service is provided from nearby communities to supplement the regional transit service that opens later than early morning shifts. As noted previously, the Van Nuys FlyAway service operates reduced headways beginning at 4:45 A.M.

Category 7: Perceived Safety of Transit, Particularly at Night

Given the other challenges of comparable cost and convenience, employees need to perceive the transit service and waiting areas as safe throughout the operating hours. The provision of well-lit waiting areas, an obvious security presence, and a late-night on-demand escort service are features that can be used to help mitigate this concern.

CONCLUSION: THE IMPORTANCE OF THE AIRPORT EMPLOYEE MARKET

The volume of workers at major U.S. airports varies from 1,000 workers in Orange County (California) to more than 40,000 in Chicago, Dallas, and New York. Similarly, the mode shares to public transportation range from insignificantly low at many airports to greater than 23% at Chicago-O’Hare. The range of solutions includes services designed exclusively for employees—such as those at Boston-Logan—to use of

traditional rapid transit—such as that at Chicago-O’Hare, where the majority of the rail riders are workers rather than air passengers.

Chapter 4 has documented many of the unique characteristics of this airport ground access market, noting problems with the time of work and with the dispersion of job locations over airport property. In addition, the subsidization of parking costs is a common benefit offered to airport workers. The content of the chapter emphasizes the need to design highly

specialized services to deal with the needs of airport workers, as exemplified by the combination of vanpools and subscription buses in operation at the United Airlines Maintenance and Operations Center at San Francisco International Airport. As noted throughout this report, the market for airport ground access services is composed of a series of highly definable submarkets. The San Francisco airport’s employee services represent an excellent example of such a highly targeted program to deal with an important market segment.

CHAPTER 5

STRATEGIES FOR IMPROVING THE MANAGEMENT OF AIRPORT GROUND ACCESS SERVICES

CONTEXT OF CHAPTER 5

Chapter 5 describes the management strategies frequently used by airport management to ensure the safety and convenience of the traveling public at the airport and to encourage the use of public transportation. The measures and business strategies used by airport management to enhance public transportation service and operations and the hurdles that are typically encountered are also addressed.

As defined in *TCRP Report 62: Improving Public Transportation Access to Large Airports*, public transportation at airports includes publicly operated buses and rail transit services, privately operated scheduled buses and vans, and shared-ride vans (1). Commercial ground transportation services include all of these public transportation services plus courtesy vans serving hotel and motels, rental car companies, and parking lots; taxicabs; prearranged and on-demand limousine or luxury car services; charter buses and vans; and air-crew vehicles.

The Need to Manage Services

The goals of most airport operators include providing the traveling public with safe, convenient, and efficient access to all airport facilities and encouraging the use of public transportation by airline passengers and employees in a manner that it is consistent with other goals of the airport and the community it serves. To accomplish these goals, airport managers seek to manage and control public transportation and commercial ground transportation services operating at the airport to the extent permitted by local, state, and federal laws. It is necessary for airport managers to manage and control these services because

- In most communities, no single state or local agency is responsible for enforcing the operations of all these commercial ground transportation services.
- The state and local agencies responsible for enforcing ground transportation services typically have (1) responsibilities for multiple industries (e.g., public utilities, towing services and bus and limousine services) and (2) insufficient staff resources to inspect vehicles and enforce the established rules.

- The providers of airport ground transportation services are typically a mixture of public agencies and large and small private businesses having a wide range of capabilities, financial resources, and interest in attracting business by providing high levels of customer service.
- Often, the owners of the ground transportation services have little direct control over the behavior or actions of the drivers or operators who lease (or sublease) vehicles and who have direct contact with airline passengers.
- In the absence of regulations (because there are few institutional, legal, or financial barriers), airport ground transportation services can be readily initiated at U.S. airports by individuals lacking sufficient financial resources (to maintain their vehicles or market their services) or without sufficient experience in operations, customer service, or other skills. If these operators are unable to attract sufficient customers legitimately, they may attempt to solicit business illegally, defer vehicle maintenance, or engage in other improper activities that result in diverting customers and revenues from other operators.
- It can be difficult to introduce or promote new services that do not easily come within the jurisdiction of existing regulating agencies or that can be challenged by existing operators on the basis of need and necessity.

The following sections of Chapter 5 describe the following:

- Strategies used to manage ground transportation services on and off an airport,
- The use of business arrangements to improve service and to balance demand with supply, and
- Constraints to the introduction of new public transportation services.

AIRPORT GROUND TRANSPORTATION MANAGEMENT STRATEGIES

The fundamental strategy used by most airport managers to control ground transportation services is to require that all operators of commercial ground transportation services doing business (i.e., picking up customers) at the airport enter into a formal business relationship with the airport authority or operating agency. (In most communities, any vehicle is allowed to

drop off passengers at the airport, but only authorized or permitted vehicles are allowed to pick up customers.) Typically, commercial vehicle operators are required to obtain an airport permit in order to do business at the airport. By obtaining and signing the airport permit, the commercial vehicle operator indicates its willingness to abide by the rules and regulations established by airport management and to pay certain specified fees. Airport rules typically regulate (1) the use of airport roadways and other facilities; (2) the age, condition, and minimum insurance coverage for the vehicles used to transport customers; and (3) the behavior and appearance of the drivers or representatives of the commercial vehicle operators.

Airport Fees

Airport fees are typically imposed to recover the airport management's costs of administering the permits and providing and maintaining the airport facilities used by the commercial vehicle operators. Commercial vehicle fees can also be established to achieve other goals, such as the following:

- Encourage the use of public transportation by reducing or not charging fees—for example, most airport managers do not charge any fees to scheduled public bus and rail services picking up airport passengers and employees. In fact, airport managers can use such fees to contribute to the cost of constructing facilities that serve public transportation operators are located on the airport and used exclusively to transport airport passengers and employees.
- Achieve air-quality goals by encouraging the use of low-emission vehicles or vehicles powered by alternative fuels—for example, several airport managers waive permit fees for compressed natural gas–powered, door-to-door shuttle vans.
- Promote efficient operations by restricting the number of trips made by individual operators or by promoting consolidated operations by courtesy vehicles—for example, at Los Angeles International Airport, the number of courtesy-vehicle trips made by rental car companies is restricted, and at San Francisco International Airport, the number of hotel and motel courtesy-vehicle trips is restricted.
- Encourage the efficient use of airport facilities by limiting curbside dwell times or the number of circuits made around airport roadways—for example, at Pittsburgh International Airport, the length of time limousines are allowed to remain parked along the curbside is restricted, and a fine is levied on any vehicle exceeding these limits.

Curbside Allocation and Prioritization

Demand for curbside space at terminal buildings exceeds the area available at most airports, particularly the space

available at the most active doorway entrances and at other locations such as skycap podiums, where motorists prefer to stop. It is necessary for airport managers to assign or allocate the available curbside space to specific classes of ground transportation services to avoid chaos and congestion. When allocating the available space, airport managers typically consider the following key factors:

- *Curbside requirements*—The length of curbside space required by each class of service, which is a function of level of activity and operational needs.
- *Customer service expectations*—The expectations of limousine customers. For example, limousine customer expectations with respect to waiting times, walking distances, and the availability of baggage-handling assistance typically differ from those of passengers riding scheduled buses.
- *Level of passenger and traffic activity*—The volume of passengers transported by each class of service and the traffic volumes generated by each class of service.
- *Operational needs*—The amount of space required by each class of vehicle to maneuver into and out of the curbside area or the amount of space required for taxicab queues or stacking areas—for example, shuttle vans can typically maneuver into and out of smaller spaces more easily than can public transit buses or over-the-road coaches such as those for charter services.
- *Traffic operations and safety*—For example, when evaluating which classes of service should be assigned to the outer island at airports with both an inner curbside and a (raised-island) outer curbside, consideration should be given to the number of pedestrians who will be crossing the active roadways and to the implications on pedestrian safety and traffic delays.
- *Management goals*—These goals may include, for example, encouraging the use of public transportation or providing preferential passenger pickup areas for operators providing a specific class of service on an exclusive basis.
- *Competition among operators*—There is extensive competition, both perceived and actual, among the providers of different ground transportation services, with certain operators preferring or demanding curbside space adjacent to their competitor(s). For example, door-to-door, shared-ride van service operators prefer to be located near the taxicab pickup areas because of the perception that they are competing for the same on-demand customers.

Table 5-1 presents a typical prioritization of curbside space developed using the above priorities. As shown, private vehicles are frequently assigned the highest priority, followed by shuttle buses serving airport-operated parking lots. Scheduled buses, shared-ride vans, and public transit vehicles are assigned the highest priority at some airports to encourage the use of public transportation. Often there is a debate regarding the appropriate allocation of the available curbside space.

TABLE 5-1 Typical curbside space allocation priorities

Priority for Curbside Space Allocation*	Class of Service
1	Private vehicles
2	Shuttle buses to airport-operated parking lots and terminal connectors
3	Shuttle bus to rail station
4	Door-to-door, shared-ride vans (multi-occupant vehicles)
5	Prearranged limousines
6	Taxicabs
7	Courtesy vehicles operated by on-airport rental car companies
8	Courtesy vehicles operated by hotels/motels
9	Scheduled vans and buses
10	Public transit buses
11	Courtesy vehicles operated by (private) parking lots
12	Charter buses and vans
13	Airline-crew vehicles
14	Shuttle buses to employee parking lots
15	Courtesy vehicles operated by off-airport rental car companies
16	Service vehicles
17	Small-package delivery/courier service vehicles

*The recommended priorities were established considering (1) customer convenience, (2) desire to encourage public transportation services, (3) necessity, and (4) the traveling public's expectations of the service provided by each class of vehicle.

SOURCE: Leigh Fisher Associates, June 2001.

MEASURES TO ENCOURAGE USE OF PUBLIC TRANSPORTATION

In addition to prioritizing available curb space, it is possible to encourage the use of public transportation by (1) providing a separate roadway for commercial ground transportation (e.g., commercial lanes or drives), (2) prioritizing or reserving other portions of the terminal buildings, (3) developing transit hubs on the airport, or (4) a combination thereof. These measures are described below.

Commercial Lanes

Separate roadways or commercial lanes and the adjacent curbside areas are reserved for commercial vehicles at several airport terminals (e.g., at the airports serving Albuquerque, Atlanta, Denver, Orlando, and Portland). Access to these commercial roadways is typically gate-controlled so that only authorized vehicles can enter and pick up passengers. Drivers of authorized vehicles must have proximity cards or radio frequency identification system transponders (e.g., automated vehicle identification system tags) to activate the gates and access the passenger pickup areas.

Prioritized Building Facilities

Providing staffed counters in baggage-claim areas and passenger waiting areas or shelters can enhance the level of

service for public transportation customers. The operations of public transportation services can be improved by providing direct connections between airport roadways and HOV lanes or by reserving space to serve the needs of the transit providers.

Transportation Counters in Baggage-Claim Areas. Access to transportation or ticket counters, typically found in the baggage-claim area, can benefit both potential customers and the ground transportation providers. Counters can help passengers (1) identify available public transportation services; (2) readily determine the optimum route, schedule, and fares; and (3) purchase a ticket before boarding the vehicle. Operators have found that staffed counters in the terminal can assist in increasing their market recognition, round-trip ticket sales, and volume of walk-up business. Several airport operators limit the ground transportation providers that are allowed to staff counters in the baggage-claim area, generally preferring those with concession contracts or operating scheduled services.

Passenger Waiting Areas. To improve customer service, several airport managers provide heated and air-conditioned waiting areas with seating and other customer amenities located either adjacent to the transportation counters (e.g., Minneapolis-St. Paul, Newark, and Philadelphia International Airports) or adjacent to the curbside pickup areas (e.g., Seattle-Tacoma International Airport). Several airports provide ground transportation centers (GTCs) or intermodal centers in which

the waiting and seating areas are located remotely from the terminal building (e.g., Chicago-O’Hare, New Orleans, and Indianapolis International Airports). GTCs are described in more detail later in this chapter.

HOV Lane Access. Public transportation operations, particularly travel speeds and travel-time reliability, are enhanced by the availability of HOV or bus-only lanes linking the airport with the city center or other major destinations. In some communities, all commercial passenger vehicles are allowed to use the HOV lane, including deadheading taxicabs and limousines, while in others, the roadways are reserved for bus use only. Two examples of such facilities are as follows:

1. In Pittsburgh, the West Busway—a 5-mile-long, exclusive bus roadway linking downtown Pittsburgh and the Borough of Carnegie—is used by scheduled airport buses, including the express bus operated by Port Authority Transit (a public agency). As of May 2001, about one-half of the 2,400 bus riders using the Busway were traveling to and from Pittsburgh International Airport. A typical bus shelter along the West Busway is shown in Figure 5-1.
2. In Connecticut, HOV lanes on I-91 link Bradley International Airport with downtown Hartford, allowing commercial ground transportation vehicles to bypass congestion on I-91.

Transit Hubs and Layover Points. Public bus schedules at several airports are designed so that the airport curbside operates as a transit hub where bus riders can transfer to buses on other routes stopping at the airport. Such schedules improve public transit access to the airport, but the large number of non-airline passengers may add congestion at the terminal building curbside area. Often, bus routes terminating at an airport are scheduled to provide layover time (or recovery time) so that drivers can take their scheduled break inside the terminal while the unattended bus remains parked at the



Photo: Matthew A. Coogan.

Figure 5-1. Pittsburgh’s extensive network of busways now serves the airport.

curbside. Airport managers can help enhance transit operations and service by working with public transit operators to allocate the required space at a mutually convenient location, while recognizing the trade-offs between encouraging the use of public transportation and promoting the efficient use of curb space.

Customer Service Enhancements

GTCs or intermodal centers—in addition to transportation or ticket counters and passenger waiting areas described above—represent another example of a customer service enhancement that has been or could be implemented by airport managers. A GTC is similar to a bus terminal or rail station located near an airport terminal facility. Customer services provided at a GTC may include covered boarding areas for buses and vans; heated and air-conditioned waiting areas; restrooms; ground transportation ticket sales and information counters; kiosks, magazine stands, food and beverage amenities, and other passenger amenities; access to rental car ready areas; prior to September 11, 2001, airline ticketing and baggage-check areas; and baggage-claim facilities.

When located near the passenger terminal (to minimize walking distances and level changes), a GTC can benefit the traveling public and encourage the use of public transportation because it

- Allows commercial ground transportation passengers (and vehicles) to make fewer stops, especially at airports with multiple terminals or multiple passenger pickup/drop-off areas, thereby reducing passenger travel times;
- Reduces curbside requirements at the terminal buildings;
- Reduces traffic volumes and vehicle-miles of travel on terminal-area roads;
- Makes it easier for passengers to recognize the entire array of transportation choices and thereby compare available service, fares, and travel times;
- Facilitates the provision of staffed transportation and ticket sale counters and supports kiosks or small news and food-and-beverage concessions;
- Provides a central location for commercial vehicle staging and holding;
- Reduces the operating costs of the public transportation providers, especially at airports with multiple terminals or multiple commercial vehicle stops; and
- Can support or be combined with a consolidated rental car customer service center.

At some airports, a GTC is simply a surface parking lot or a portion of a parking structure reserved for certain commercial ground transportation services (e.g., scheduled vans or buses or courtesy vehicles). For example, at Indianapolis and New Orleans International Airports, the waiting area—with seating, counters, and other amenities—is provided within the parking structure. At Newark International Airport, a similar

facility is provided at a people-mover station that connects with the three passenger terminals and extends onto an Amtrak station. At Chicago-O'Hare and Minneapolis-St. Paul International Airports, the GTC provides additional amenities, including concessions.

At Miami International Airport, planning and design are under way for the Miami Intermodal Center, an ambitious GTC that will allow airline passengers to transfer to and from various regional rail systems (e.g., platforms serving Amtrak and Tri-Rail and connections to Metrorail); scheduled buses (including a bus depot serving Greyhound and Trailways intercity routes); taxicabs; bicycles; and pedestrian ways. The Miami Intermodal Center, illustrated in Figure 5-2, is being planned to provide airline ticketing and baggage-handling facilities, public parking, and a consolidated rental car customer service center (containing space for 6,500 cars). An automated people mover will link the Miami Intermodal Center and the airport passenger terminal buildings, with potential connections to the Miami cruise-ship berths. The Miami Intermodal Center is being funded, in part, through loans advanced through the Transportation Infrastructure Finance Act. Long-range plans for the center include a mixed-use development encompassing office, hotel, retail, and entertainment space.

Among the key factors required to encourage use of the public transportation services at a GTC are short walking distances to and from the aircraft boarding gate areas (or the availability of a reliable and comfortable link, such as an automated people mover that provides single vehicle service to and from the GTC) and passenger service equivalent to that provided at the airline terminal. This level of passenger service implies that passengers have the ability to check and claim baggage at the GTC and do not need to carry their bags long distances or on and off a people mover or shuttle bus.



Photo: Matthew A. Coogan.

Figure 5-2. The Miami Intermodal Center will be built on the site of this transfer point between Tri-Rail, car rental services, and airport shuttle bus services.

As will be discussed more fully in Chapter 6, prior to the terrorist attacks on September 11, 2001, there were several challenges associated with the remote handling of airline passenger baggage, including (1) the federal security requirements then in place (i.e., the need for positive control by approved airline representatives); (2) questions regarding the responsibility and liability for lost or damaged baggage; and (3) the ability to check baggage at the trip origin destinations off the airport (which implies the need for available additional three-letter airport identifiers) such as BOS-Downtown, BOS-Framingham, and so forth. Several of these challenges could be addressed by

1. Advances in technology—for example, inexpensive, disposable bag tags using radio-frequency identification systems or other technologies to enhance airline and user baggage tracking;
2. Operational programs—for example, the baggage check-in services offered at more than 20 Las Vegas hotels by Certified Airline Passenger Services, a federally certified baggage-handling agent who allowed passengers, paying a \$6.00 fee, to check bags to their final destination 2 to 12 h in advance of their flight; and
3. Programs to allow the screening or inspection of all checked and carry-on passenger baggage at the remote site by airline representatives.

Among the security measures implemented by the FAA in response to the events of September 11, 2001, was the prohibition of all remote baggage check-in facilities. Prior to September 11, 2001, in addition to the Las Vegas example, there were numerous sites in the United States such as GTCs, hotels, off-airport rental car facilities, parking lots, railroad stations, and cruise-ship terminals where the airlines (or airline representatives) accepted or checked in passenger baggage. However, these remote baggage check-in services have been closed, and it is uncertain whether they will be permitted to reopen.

The Aviation and Transportation Security Act, enacted in November 2001, establishes national requirements for the screening of airline passengers and their baggage. At the time this report is being completed, remote baggage check-in programs continue to be prohibited. At some future date, the FAA could allow the remote check-in of passenger baggage, particularly if the mandated baggage-screening procedures and equipment were used at the remote site or if procedures were established for the rechecking and screening of remotely checked baggage.

Automated Traffic Monitoring and Management Programs

Automated vehicle identification (AVI) systems are used at more than 25 U.S. airports to improve the management of commercial vehicle activity. AVI systems provide reliable

data on the volume of vehicle trips by location, date, and operator. Common AVI system applications at airports include monitoring commercial vehicle activity, controlling access to restricted areas, dispatching and controlling shuttle bus operations, and providing shuttle bus passengers with arrival time and stop location information.

As noted in previous paragraphs, airport management frequently seeks to promote the efficient use of airport facilities (1) by restricting the number of trips made by individual operators or promoting consolidated courtesy-vehicle operations, and (2) by limiting curbside dwell times or the number of circuits made around airport roadways. AVI systems facilitate these and other actions by allowing airport management to establish policies.

Restrictions on the Number of Trips

Airport management can restrict the number of hourly, daily, or monthly trips made by an individual ground transportation operator. These restrictions are enforced by using the AVI system to record the number of vehicle trips each operator makes and then to fine or penalize operators who exceed the prescribed limits. As noted above, such restrictions have been established at Los Angeles and San Francisco International Airports.

Measures to Encourage Consolidated Operations

Management can promote consolidated courtesy-vehicle operations by charging participating ground transportation operators access fees (calculated on a per-trip basis) that are substantially less (e.g., 25% to 50%) than the fees paid by operators who are not participating. AVI systems can record the number of trips made by each operator and identify those that are not participating. Access fees promoting the use of consolidated hotel or motel courtesy vehicles have been established at San Francisco International Airport.

Dwell-Time Restrictions

Limitations on the time a commercial vehicle is permitted to remain parked at the curbside or remain on airport roadways (i.e., dwell times) can be established to encourage efficient use of the curbside areas. AVI systems can be used to measure when a vehicle enters and exits a curbside area (or airport property) and to identify vehicles that exceed prescribed limits, which are frequently established service class and vehicle size. The resulting data can be used to fine or penalize operators of vehicles that exceed the prescribed limits. Dwell-time or overtime charges have been implemented at several airports including Orlando and Pittsburgh International Airports.

Restrictions on the Number of Circuits

Restrictions can be established on the maximum number of permitted circuits that a commercial vehicle can make around the airport roadway system within an established period. These restrictions are intended to discourage drivers of empty (or partially empty) vehicles from circling continuously to advertise their service or seek additional passengers. At Los Angeles International Airport, for example, door-to-door vans are prohibited from making more than three consecutive circuits. The AVI system automatically detects any van exceeding this limit and provides documentation supporting penalties and fines.

Restricted Access to Commercial Lanes

As noted above, at several airports, access to commercial lanes or commercial vehicle passenger pickup areas is restricted to vehicles (or drivers) with airport-issued AVI transponders. The use of AVI systems allows airport management to deactivate the transponders belonging to providers who are, for example, in violation of airport rules, have not paid airport fees, or have not maintained the required insurance coverage.

Schedule Adherence

The AVI system can monitor the headways or trips per hour or day made by each scheduled ground transportation operator. This data can be used to confirm adherence to posted schedules or maintenance of established maximum passenger wait times.

More Efficient Vehicle Dispatching

At airports at which AVI transponders have been installed on taxicabs and limousines, the AVI systems can be used to dispatch taxicabs and prearranged limousines from a holding area (or stack) to the appropriate curbside area and to ensure the correct sequencing of these vehicles.

Traveler Information Systems

Chapter 7 will review the development of many new technologies in the field of intermodal passenger information systems. The development of new technologies to provide passenger information across modal and jurisdictional boundaries is presented in that chapter, with a strong emphasis on systems currently under development, for later application to immediate airport access services.

This section of Chapter 5 reviews a series of steps that practitioners can take now to improve the overall quality of information given to the airport users. Traveler information

systems are currently used by airline passengers, visitors, employees, and others to plan and conduct their trips to and from an airport efficiently, safely, and comfortably. For airline passengers, the airport is just an intermodal transfer point, not a final destination. Therefore, airline passengers often require information that will be of assistance in completing their entire journey from point of origin (e.g., place of residence or work) to their final destination.

Traveler information is intended to assist passengers in

- Selecting from the available travel modes, travel paths, and parking options at various points along the way;
- Recognizing potential en route delays or congestion points and identifying alternative paths or times of departure to the airport;
- Deciding on the most reliable travel alternative; and
- Determining whether their arriving or departing flight is on time.

Traveler information should be available to passengers at the time of trip planning, at the time of trip commencement, and while they are en route in the various stages of the longer-distance trip.

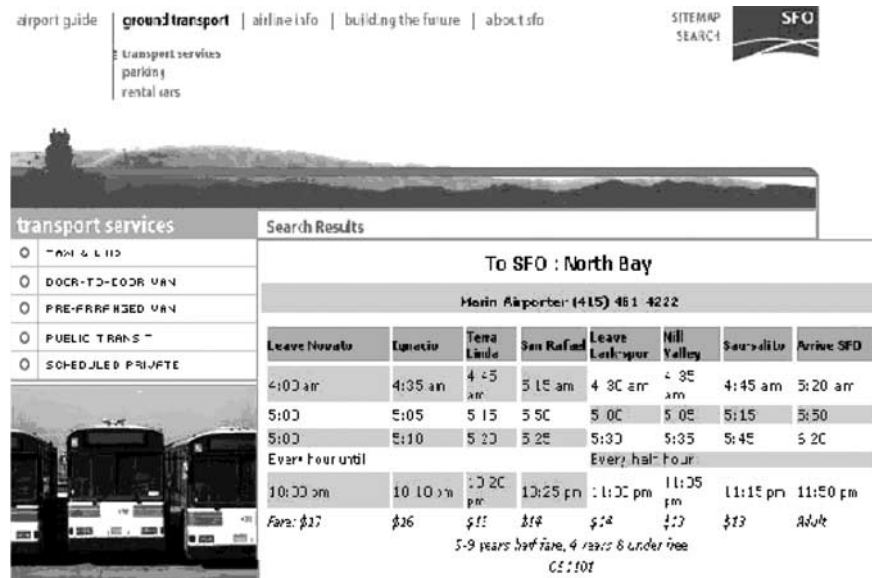
Primary Categories of Traveler Information and Data Sources

The primary categories of traveler information relevant to airport passengers and visitors are discussed below. The traveler information needs of employees working at an airport

are not addressed in this section because their needs are comparable with those of other employees working in the region. The primary categories and available sources for traveler information are as follows.

Flight Status. Passengers and visitors are typically advised to confirm the status of their flights prior to leaving home to avoid unnecessary delays at the airport. All scheduled carriers provide real-time arrival and departure times and often the arrival or departure gates via their toll-free telephone numbers and websites. Flight arrival and departure times and gate assignments are also available through automated telephone lines at some airports and on airport websites (e.g., www.flysfo.com) that provide both the toll-free telephone number and hot-links for all airlines.

Ground Transportation Services. Prior to leaving home, passengers select one of the available transportation modes to access the airport as part of their initial trip planning. Passengers are more likely to use public transportation if they are aware of the potential options and can make informed decisions based on accurate data on routes, fares, and schedules or waiting times for the available transportation services (see Figure 5-3). Often airport websites provide links to websites maintained by regional transit agencies, which frequently contain trip planner software that, for any origin-destination pair in the metropolitan area, describes the available bus and rail routes, schedules, travel time, and fares and allows the passenger to select a preferred itinerary. However, few airport websites provide equivalent data for the privately operated public transportation services.



SOURCE: San Francisco Airport Commission, June 2001.

Figure 5-3. Bus schedules are presented on the San Francisco International Airport website.

Parking Availability and Rates (by Facility). Passengers who decide to drive to and park at an airport use available airport-operated or privately-operated parking facilities. Typically, parking patrons select from the available options based on information about space availability, costs, and convenience (e.g., waiting time for courtesy shuttle, walking distances, or availability of covered spaces). Much of this information is available through the Internet (e.g., parking rates, general description of the parking garage, and lots). At several airports, current (or real-time) data describing space availability, parking rates, and directions to the lots are also available through automated telephone lines.

Driving Directions. Passengers unfamiliar with an airport may require driving directions to the terminal, parking or rental car facilities, or other areas (e.g., the air cargo or small package delivery sites). Driving directions are available from multiple sources, including the Internet, maps and directions provided by travel agencies and rental car companies, and automated telephone lines.

Travel Conditions. Motorists can benefit from access to current or real-time information on traffic conditions, including delays caused by incidents or construction, and advice on alternative routes to avoid congestion points. Transit riders can benefit from access to real-time information concerning expected travel times or waiting times, actual arrival times of scheduled vehicles, and information about system delays or service interruptions. This information helps the traveler assess the reliability of the travel alternatives. In most communities, this information is now available (or will be available soon) from websites maintained by local or state transportation and transit agencies and from commercial radio and television stations that also broadcast real-time traffic data. Data for certain road segments are available through toll-phone numbers.

Ground Transportation Services at the Destination Airport. As mentioned above, an airport is not usually a passenger's final destination. Most passengers decide how to travel from their destination airport to a local destination prior to boarding an aircraft (or leaving home). Ideally, passengers would have access to such travel information for their entire trip via a trip planner comparable with the trip planner provided by local public transit agencies. Alternatively, passengers can review data through websites provided by other airport managers.

Traveler Information Required During a Trip

The following paragraphs summarize the types of traveler information required or desired by airport passengers and visitors at various points along their trips to and from the airport. The general types of information are relevant for all travelers, but the specific information required may vary by

the passenger's familiarity with the airport environs (i.e., resident versus non-resident passengers) and trip purpose (i.e., business versus non-business). The primary sources of this data are described in the previous section.

- Prior to leaving home or office:
 - Flight status (or delays) and gate number;
 - Ground transportation services for travel to the airport (and from the destination airport to a final destination), including communities served, routes, schedules, fares, and reservation number (if required);
 - Parking information by facility, including availability of spaces, fees or rates, and directions;
 - Driving directions to the airport; and
 - Travel conditions, including expected travel time and schedule delays and real-time information regarding delays caused by congestion, construction, or incidents.
- En route to the airport:
 - Real-time information about delays caused by congestion, construction, or incidents and advisories as to alternative routes available; and
 - Flight status confirmation.
- At the airport—enplaning passengers (or well-wishers):
 - Terminal and airline information and directions;
 - Parking facility and space availability;
 - Flight status and gate number (see Figure 5.4); and
 - Ground transportation services at destination airport.
- At the airport—deplaning passengers (or meeters and greeters):
 - Flight status and gate number (for meeters and greeters);
 - Ground transportation services (e.g., communities served, fares and schedules, route information, travel time, and directions to stop or station);

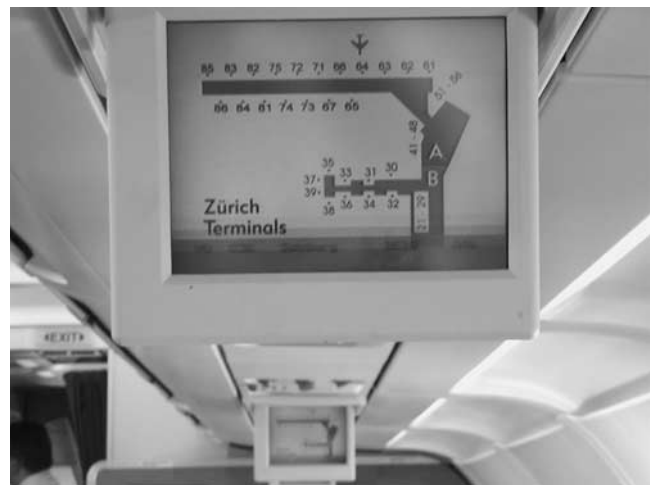


Photo: Matthew A. Coogan.

Figure 5-4. Real-time information on flight connections is now provided by many airlines.

- Driving directions to off-airport destination; and
- Travel conditions, including expected travel times and roadway congestion.

After leaving the airport, the traveler information needs of passengers and visitors are similar to those of other motorists and transit passengers in a community.

BUSINESS ARRANGEMENTS AT AIRPORTS TO IMPROVE SERVICE TO THE TRAVELING PUBLIC

A variety of types of business arrangements with ground transportation operators are used by airport management to ensure that the traveling public is provided a high level of customer service and to encourage the use of public transportation. The most common types of business arrangements are open access, exclusive or semi-exclusive concession agreements, and third-party management contracts. Increasingly, airport managers are establishing exclusive or semi-exclusive agreements because with these arrangements, the airport operator has a better ability to ensure service quality and performance, and the operator has a greater financial incentive to maintain the desired standards.

Open Access

With open-access systems, any ground transportation operator, properly licensed by the local regulatory authority, can pick up passengers at an airport. The primary benefit of this system is that any business, large or small, can serve the airport, thereby providing customers with options and promoting competitive fares and services. As such, the open-access system is often favored by small ground transportation operators who lobby local politicians to implement or maintain such arrangements. Open-access systems function well in communities with multiple, well-operated transportation providers (e.g., multiple taxicab companies) and effective enforcement. Key concerns with an open-access system include the following:

- *Lack of control over service levels*—Airport management has little ability to control the level of service standards for vehicle maintenance or driver appearance and knowledge because other agencies are responsible for specifying and enforcing the minimum standards for vehicles and drivers.
- *Inability to balance supply and demand*—In communities in which the number of providers exceeds passenger demands (e.g., an excessive number of shared-ride van operators), operators will experience long waits and earn less revenue. If drivers are unable to receive sufficient revenues, they may be tempted to improperly solicit passengers or engage in other illegal activities. Con-

versely, in a community with little commercial ground transportation service (e.g., few taxicabs), there may be a lack of service during late-night hours or when there are requests for service at other locations (e.g., downtown or a convention center).

Exclusive and Semi-exclusive Concessions Agreements

Most airport managers have agreements with concessionaires to provide certain services on an exclusive (e.g., a hotel or food-and-beverage operator) or semi-exclusive (e.g., rental car companies) basis. These agreements specify the services that the companies are allowed to offer at the airport, the manner in which they are to be offered, the prices or markup permitted, and the airport fees and charges. The fees are normally calculated on the basis of some measure of activity (e.g., as a percentage of gross revenues or per deplaning passenger) and include a required minimum annual guarantee. Concession agreements are typically awarded through a bid or proposal process that allows airport management to consider the experience of the operator, the quality of service to be provided, and the fees to be paid.

Exclusive or semi-exclusive concession agreements are used to provide taxicab, limousine, shared-ride van, and scheduled bus or van service at numerous airports. (Examples of airports using these forms of business arrangements are presented in *TCRP Report 62*.)

Service Standards

As part of a concession agreement, airport management typically specifies the minimum required service standards. Examples of these service standards that the provider awarded the contract (i.e., the concessionaire) is required to maintain include the following:

- *Minimum hours of operation*—For example, a concessionaire may be required to ensure that vehicles are waiting at the airport from the time of the first arriving flight until an hour after the last scheduled arriving flight.
- *Adequate supply of vehicles*—A concessionaire may be required to ensure sufficient vehicles to serve the expected volume of deplaning customers at all times, particularly at airports with a small market for public transportation.
- *Level of customer service*—For example, the concession agreement may specify the maximum waiting times, the maximum number of en route stops, requirements for transporting disabled passengers, acceptance of credit cards, and requirements for schedule adherence.
- *Fares or surcharges*—The proposal or bid may require that the concessionaire specify the fares to be charged and any surcharges (e.g., for baggage).

- *Geographic areas to be served*—The original request for proposals or bids would typically specify the geographic area(s) that a concessionaire would be required to serve, the area the concessionaire would be granted the exclusive right to serve, or both.
- *Vehicle standards*—The agreements typically specify the required standards for vehicle safety (e.g., properly functioning brakes, lights, and emissions controls); cleanliness (e.g., prohibition of dents, rust, or torn or soiled seats); convenience (e.g., air conditioning); two-way radio; exterior signage or lettering; and a maximum age of vehicle. The agreement may specify vehicle size or capacity (e.g., number of seats) if these standards are not specified by local regulatory authorities.
- *Driver standards*—Agreements typically establish or support airport standards for expected driver behavior (e.g., no solicitation); appearance (e.g., types of shirts, shoes, and caps); personal hygiene; local knowledge; or customer skills.

Balancing Supply and Demand

Concession agreements allow airport management to ensure the appropriate balance between supply and demand because the concessionaire can direct company-employed drivers to serve or not to serve the airport as warranted. The concessionaire is responsible for ensuring that the drivers or employees are assigned an appropriate number of trips and an opportunity to earn a fair salary. In absence of a concession agreement, a limited number of options are available to airport management to balance supply and demand. These include the following:

- *Limiting the number of vehicles serving the airport each day*—Such limitations can be achieved by using odd-even license plate programs that allow only half of the authorized taxicabs to serve the airport or other measures.
- *Closing the entrance to the hold lot*—This action effectively closes the airport and prevents additional vehicles (e.g., taxicabs) from entering the airport.
- *Increasing the minimum standards*—By establishing higher standards for ground transportation providers (e.g., a minimum fleet size or insurance requirements), vehicles (e.g., a maximum age of vehicles), or driver qualifications, airport management can discourage less-qualified companies from serving the airport.

With a concession agreement, airport management typically grants the concessionaire certain privileges, including access to preferential curbside space and ticket and information counters in the terminal building, and the exclusive right to provide service to certain geographic areas (e.g., downtown). If the service is considered to be sufficiently lucrative, it is possible to require that the concessionaire support services that

are less lucrative or are not self-supporting. For example, airport management can require the concessionaire awarded a shared-ride van or taxicab contract also to operate or to provide a scheduled bus service to downtown or other destination. Such arrangements are particularly feasible in communities in which a major corporation both owns a major taxicab service and provides scheduled airport bus service or, alternatively, in communities that have established goals for disadvantaged business participation in airport services.

Third-Party Management Contracts

In addition to entering into contracts that require concessionaires to provide certain ground transportation services, airport management may also enter into contracts that require a third-party contractor to manage and enforce ground transportation operations at the airport. For example, at San Francisco International Airport, a third-party contractor is responsible for dispatching shared-ride vans and taxicabs and for controlling and monitoring charter buses and limousine operations. At Portland International Airport, a third-party contractor is responsible for providing information, directing passengers to ground transportation services, dispatching taxicabs, and monitoring operations along the commercial roadway. Although management of both airports retains the responsibility for establishing policies, fees, and regulations, the third-party contractor can significantly influence the level of service provided to the traveling public.

REGULATORY CONSTRAINTS TO THE INTRODUCTION OF NEW SERVICES

The regulatory constraints encountered when introducing new airport ground transportation services and the ability of airport managers to regulate and promote public transportation services are described below.

Competition and Enforcement

One constraint to introducing new public transportation services is the perceived and actual competition among differing classes of ground transportation services, the need to be able to enforce regulations restricting and controlling ground transportation services, and the overlap among the services provided by each class of service. For example, consider the implications when airport management evaluates which ground transportation services should be allowed (or required) to pick up and drop off passengers at a planned GTC.

Private Vehicles

The primary purpose of a GTC is to serve commercial ground transportation services. Therefore, it is likely that air-

line passengers traveling in private vehicles would be directed to space at the terminal building curbsides—the GTC is reserved for commercial ground transportation services.

Private Vehicles Versus Privately Owned Limousines

Airline passengers traveling in privately owned or corporate-provided limousines would normally expect to receive a level of service similar to that available to passengers traveling in private vehicles. Therefore, it is likely that privately owned limousines would be directed to curb space at the terminal building.

Privately Owned Versus Prearranged Limousines

If customers perceive that being picked up and dropped off at the terminal provides a higher level of service and convenience than being picked up and dropped off at the GTC, they will request that privately owned limousine services stop at the terminal building rather than at the GTC. As it would be difficult for police to readily distinguish between a privately owned limousine and a prearranged limousine or town-car service, it would be difficult for police to prevent privately owned limousines or town-car services from stopping at the terminal building curbsides. If police are unable to prevent, or enforce regulations prohibiting, use of the terminal curbside by prearranged limousines, it is likely that these limousines would be permitted to use the curbsides.

Prearranged Limousines Versus Taxicabs

Taxicab operators perceive limousines as competitors. If prearranged limousines are permitted to use the terminal building curbsides, taxicab operators would likely pressure airport management (or perhaps city or county government leaders) to allow taxicabs to use the curbsides. The taxicab operators would claim that they would lose customers to their competitors (i.e., limousines), that customers would not accept being dropped off or having to be picked up at the GTC, or both. At airports that have planned GTCs, management has agreed to allow taxicabs to drop off and pick up customers at the terminal building curbside.

Taxicabs Versus Shared-Ride Vans

The operators of shared-ride vans perceive that they are competing with taxicabs for on-demand customers. If taxicab owners are permitted to drop off and pick up customers at the terminals, the operators of shared-ride van services would likely demand the right to provide equivalent services, especially if the operators perceive that customers value access

to the terminal building over access to the GTC. Again, as with the taxicab operators, it is likely that the decision would involve others besides airport management.

Shared-Ride Vans Versus Scheduled Vans and Buses

The operators of scheduled vans and buses, particularly at downtown locations, perceive that they compete with the operators of shared-ride van services. The scheduled van operators will likely resist picking up passengers at a location that they perceive provides an advantage to their competitors.

Courtesy Vehicles

Local rental cars, hotel and motels, and other operators of courtesy vehicles would also likely demand that they be permitted to drop off and pick up customers at the terminal buildings rather than at a GTC.

Impacts

As a result of the enforcement challenges and competitive factors described above, management at several airports at which GTCs are planned have determined that the only users of the GTC would be public transit services and scheduled buses and vans. All other transportation services were directed to pick up and drop off customers at the terminal building. Such allocation decisions could discourage the use of public transportation by airline passengers or employees, particularly if bag-check or baggage-claim services are not available at the GTC.

Federal Regulation of Interstate Service

Within U.S. DOT, two agencies have particular responsibility for the regulation of public transportation services at airports: the Surface Transportation Board (STB), established in 1996 when Congress terminated the Interstate Commerce Commission (ICC), and the Federal Motor Carrier Safety Administration (FMCSA), established in January 2000.

STB is responsible for the economic regulation of interstate surface transportation within the United States. Its mission is to ensure that competitive, efficient, and safe surface transportation services are provided in a manner meeting the needs of consumers, shippers, and receivers. STB has oversight of certain operational and financial matters for intercity passenger bus companies including the companies' structure, registration, rates, and insurance coverage. When the ICC was terminated, certain functions or responsibilities were eliminated (rather than being transferred to another agency), including regulation of interstate airport bus service. Under the

terminated responsibilities, ICC regulated such airport bus services and determined that they were exempt from regulations established by airport operators.

FMCSA is responsible for preventing commercial motor vehicle–related fatalities and injuries. FMCSA’s responsibilities include enforcing safety regulations, improving safety information systems and commercial motor-vehicle technologies, and strengthening commercial motor vehicle equipment and operating standards. Most vehicles used to provide public transportation at airports are within the purview of FMCSA, including vehicles capable of transporting 8 passengers (including the driver) for compensation (e.g., shared-ride vans) or transporting more than 15 passengers (including the driver) for no compensation (e.g., courtesy vehicles).

Public transportation to airports is also affected by the requirements of the Americans with Disabilities Act (ADA) and the guidelines established by U.S. DOT for public buses, over-the-road buses, and other buses and vans used for fixed-route or for-hire service at airports. In effect, these regulations specify that one-half of the major bus fleets must be lift-equipped by 2006 and that the entire fleet must be fully ADA accessible by 2012.

Challenges of Introducing New Service

In most communities, it is necessary to obtain state authority to introduce a new door-to-door, shared-ride, or scheduled transportation service. Typically, the operator of the new ground transportation service must

1. Describe where and how it will serve the public, including the proposed fares or tariffs;
2. Demonstrate that the new service will serve the public convenience, need and necessity (i.e., there is sufficient demand for such service);
3. List all other routes that operate partially or wholly within the proposed service area;
4. Present a business plan indicating the expected revenues and costs of operation; and
5. Provide a financial statement and evidence of insurance.

In some instances, the operator must demonstrate that the local public transit operator is unable to meet the transportation needs of the public that will be served by the proposed service or must describe the impact on existing public transit services. The operator must typically provide letters from the public (e.g., local communities) and evidence to demonstrate a need and necessity for the proposed service. Existing operators are permitted to file objections to the statements of need to introduce new services and to challenge the new operator’s ability to sustain a business without adversely affecting existing businesses. The operator can only apply for an airport permit after obtaining the required state or local operating permits.

These procedures may present a significant hurdle for a small operator, particularly an operator without a properly defined business plan or service plan, without prior experience in the industry, and without sufficient capital resources. Typically, airport management does not have programs to support or assist new businesses seeking to initiate transportation service.