Collaborative Funding to Facilitate Airport Ground Access

MTI Report 11-27

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REPORT 11-27

COLLABORATIVE FUNDING TO FACILITATE AIRPORT GROUND ACCESS

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16. Abstract

This report presents the findings and conclusions from a research study that has examined the challenges of funding airport ground access projects and the role of collaborative funding strategies between the different agencies that typically become involved in such projects. The report reviews the recent literature on funding airport ground access projects, as well as funding transportation projects more generally. This is followed by a detailed review of current federal transportation funding programs relevant to airport ground access projects, as well as a discussion of state and local funding programs and potential opportunities for private-sector funding.

A major component of the research described in the report consists of detailed case studies of seven selected airport ground access projects, including a major intermodal center, two automated people-mover projects, two airport access highway projects, and two airport rail links. These case studies examine the history of each project, the costs involved, and the funding programs and mechanisms used to finance the projects.

Based on the literature review, the review of current funding programs, and the case study findings, the report identifies potential funding strategies for intermodal airport ground access projects, requirements for effective implementation of these strategies, and a recommended approach to facilitate successful project development and implementation. The report also presents recommended changes to transportation funding program rules and regulations that could facilitate and simplify development of intermodal solutions to future airport ground access needs.

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EXECUTIVE SUMMARY

Airports are the principal interchange nodes in the passenger transportation system where local and regional transportation systems interface with those for national and international travel. At the same time, airports also facilitate the transfer of air cargo between the surface transportation system and the air transportation system, as well as sometimes serving as major sorting and distribution centers for freight that moves entirely by surface transportation.

However, projects to improve the connectivity between the surface transportation system and the airport circulation and terminal facilities are often hampered by the fact that program regulations limit the type and location of projects eligible for funding from the various federal and state transportation funding programs. Policies regarding the allocation and use of these funds are often so restrictive that projects are difficult to implement or are rendered much less effective at improving intermodal connectivity. These limitations and restrictions constrain the ability of both airport authorities and state and regional transportation agencies to plan and implement effective intermodal solutions to airport ground access needs.

Literature Review

There is a fairly limited literature that specifically addresses funding airport ground access projects, with a somewhat larger body of literature on airport ground access planning, some of which addresses funding issues. The latter includes guidance documents prepared for the Federal Aviation Administration (FAA) and Federal Highway Administration (FHWA) on planning airport ground access facilities and services, and recent studies by the U.S. Government Accountability Office (GAO) and the Airport Cooperative Research Program of the Transportation Research Board. In addition, there is a fairly extensive body of literature on transportation funding in general, some of which is indirectly relevant to airport ground access funding. A 2001 study for the California Department of Transportation examined a wide range of policy issues affecting ground access to California airports and developed a number of policy recommendations, some of which addressed funding issues. A subsequent study of airport intermodal transportation capabilities by the GAO presented a number of case studies of intermodal projects at selected airports and includes a review of federal, state, and local funding programs applicable to airport intermodal ground access projects, as well as potential private-sector funding opportunities.

In February 2009, the National Surface Transportation Infrastructure Financing Commission released its Final Report *Paying Our Way: A New Framework for Transportation Finance*, which includes an extensive bibliography and provides a good overview of both the issues being faced in surface transportation funding and potential solutions. Two aspects that have received considerable attention in recent literature are the equity implications of changing the way in which transportation projects are financed and funded, and issues involved in forming public-private partnerships.

Funding Programs and Sources for Airport Ground Access Projects

There is a very wide range of different federal, state and local transportation funding programs that could potentially be used to fund intermodal airport ground access projects. Federal programs include both airport development and surface transportation programs, although the airport development programs are generally limited to funding projects, or parts of projects, located within the airport perimeter. The federal Airport Improvement Program (AIP) provides grants for eligible projects, which include a broad range of airport ground access projects. The program includes both entitlement funds, distributed to airports according to a formula defined in the authorizing legislation, and discretionary funds. However, airport ground access is not a high priority for use of discretionary funds.

The second major federal airport funding program is the Passenger Facility Charge (PFC) program. This program allows airport sponsors to impose a fixed charge on all passengers using the airport, with a few exceptions. The charge is collected by the airlines through the air ticket and is currently limited to a maximum of $4.50 each time a passenger uses an airport that is imposing a PFC. Project eligibility for PFC revenue is similar to that for AIP grants, although PFC revenue can be used for some purposes that are not eligible for AIP grants. Airport sponsors must apply to the Federal Aviation Administration for approval to impose a PFC and specify the project or projects that revenue will be used for and the total amount to be collected. The PFC remains in effect until the approved amount has been collected.

In addition to these two programs, airport ground access projects will generally also be eligible for funding from a range of federal surface transportation funding programs primarily administered by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA). Many of these programs provide funds directly to states on a formula basis for projects meeting the eligibility requirements of each program. FHWA programs that could be used to fund intermodal airport ground access projects or components of such projects, depending on the nature of the project, include the Surface Transportation Program, the National Highway System Program, and the Congestion Mitigation and Air Quality Improvement Program. The FHWA also administers a revolving loan program under the Transportation Infrastructure Finance and Innovation Act (TIFIA) that has been used for a number of intermodal airport ground access projects. To qualify for a TIFIA loan, a project has to be able to generate sufficient revenue to cover the loan interest and eventual debt repayment.

The FTA administers a number of programs that provide Formula Grants to states and local jurisdictions and agencies, which can be used to fund capital projects that could include public transit elements of intermodal airport ground access projects. In addition, the FTA administers a Major Capital Investments Program, more commonly called New Starts or Small Starts (depending on the level of funding involved), which provides discretionary grants on a project basis. This program has partially funded a number of intermodal airport ground access projects.

In addition to distributing federal funds, states also have their own transportation funding programs supported by a range of state taxes and fees, commonly including state motor fuel

taxes and vehicle registration or license fees. Naturally the details of these programs vary from state to state. This report presents a description of relevant California transportation funding programs to illustrate the potential range of state programs. These include funds distributed through the State Highway Account, the Public Transportation Account, the State Transportation Improvement Program, and a number of programs financed by voter-approved general obligation bonds. Project funding decisions for some of these programs are managed at the state level while other funds are allocated to Metropolitan Planning Organizations or other local jurisdictions.

Local funding for transportation capital projects includes funds provided by a wide range of different agencies, including cities and counties, transit and other transportation agencies, and special-purpose agencies such as port or airport authorities, toll road authorities, or congestion management agencies. At a national level, local funding for transportation, including both capital and operating expenditures, accounts for about 36% of total surface transportation funding and exceeds the federal share by a wide margin. Local ballot measures that dedicate revenues from a voter-approved retail sales tax increment to a specific set of projects or specific purposes have become increasingly important sources of local funding for transportation projects. A number of intermodal airport ground access projects have been funded in part by such measures, including several that are included in the case studies presented in this report.

There is a growing interest in exploring opportunities to take advantage of private-sector funding for transportation projects, including airport ground access projects. This generally takes one of two forms: issuing bonds or creating public-private partnerships (PPPs) with private-sector firms that invest equity or other private capital. Both approaches require a revenue stream that can pay the interest on the debt or provide a return on the investment and eventually retire the debt. PPPs have been used in a number of intermodal airport ground access projects, several of which are included in the case studies presented in this report.

Case Studies of Airport Ground Access Project Funding

In order to examine how different funding sources have been used in practice for intermodal airport ground access projects, the report documents past experience on collaborative funding through a series of seven case studies of selected projects. These represent a wide range of airport ground access projects and were financed through an equally wide range of funding programs and sources. They are located in five different states on both the U.S. East and West Coasts., and include a major intermodal center located adjacent to and serving a large international airport, two automated people-mover links from airports to nearby rail stations, two airport highway projects, and two extensions of regional rail systems to airports – one a light rail system and one a heavy rail system. Specifically, the seven projects comprise:

- The Miami International Airport Intermodal Center;
- New York JFK International Airport AirTrain people-mover;

- Oakland International Airport BART Connector;
- Oakland International Airport Roadway Project;
- Richmond Airport Connector;
- Portland International Airport Light Rail Extension;
- San Francisco International Airport BART Extension.

The Miami Intermodal Center represents not only the largest airport intermodal facility in the country but perhaps the largest intermodal center of any type. When completed, the facility will serve intercity and regional rail systems, intercity and local buses, and airport rental cars in a single integrated complex linked to the airport passenger terminals with an automated people-mover. Three of the seven projects – the Miami Intermodal Center, the JFK International Airport AirTrain, and the San Francisco International Airport BART extension – can be considered megaprojects by any standard, with total costs for each exceeding $1 billion.

Funding Strategies for Intermodal Airport Ground Access Projects

Because intermodal airport ground access projects can rarely be funded from a single transportation funding program, planning such projects generally requires the development of a funding strategy that involves multiple agencies and funding sources. These sources may include a range of federal, state and local transportation funding programs and possibly private-sector involvement as well.

While the exact mix and proportion of funding sources will vary with the nature and scale of the project, the implementation of a multi-agency, multi-program funding strategy will require the development of a broad regional consensus on the importance of the project. The development of such a consensus forms a critical component of the planning for any large-scale intermodal airport access project. A key aspect to developing this consensus is a broad involvement of regional agencies in airport ground access planning. This will be facilitated by the establishment of a multi-agency airport ground access task force, consisting of senior staff from the relevant agencies. This task force should have a wider scope than just pursuing a particular project. Rather, it should take a broad perspective on regional airport ground access issues and needs and should have adequate resources to assemble the relevant data and retain consultant support. A second key aspect in developing a regional consensus on the importance of a proposed intermodal airport access project is a balanced and thorough documentation of the expected benefits of the project.

In developing funding strategies for intermodal airport ground access projects, consideration should be given to opportunities for public-private partnerships that can provide access to private-sector funding. Factors that need to be considered in identifying potential opportunities include ways to provide private-sector partners with sufficient return on their investment.

Recommendations for Changes to Program Rules and Regulations

The complexity of developing funding strategies for intermodal airport ground access projects and the current restrictions on the use of funds from many applicable funding programs suggest that some changes to existing program rules and regulations could facilitate developing more effective intermodal solutions to meet future airport ground access needs.

Perhaps the most significant restrictions from the perspective of intermodal airport ground access projects are the limitations on the use of federal Airport Improvement Program (AIP) and Passenger Facility Charge (PFC) funds for ground access projects located off the airport and the so-called revenue diversion rules that restrict the ability of airport authorities to use airport revenue to fund projects located off the airport. While the Federal Aviation Administration (FAA) has shown greater flexibility in recent years in allowing the use of AIP and PFC funds for airport ground access projects, the current provisions in the authorizing legislation and associated regulations are unnecessarily restrictive, particularly in the distinction between on-airport and off-airport components of airport access projects. The ability to develop effective intermodal solutions to future airport access needs would be enhanced if the FAA were to work with Congress to ensure that future reauthorization of these programs provides greater flexibility in the use of these funds. Similarly, current revenue diversion rules unduly limit the ability of airports to use airport revenues to finance improvements to airport ground access, particularly intermodal access projects. Revisions to the rules to provide greater flexibility, which may require Congressional action, could help facilitate such projects.

Many states have taken a strong policy position on developing improved intermodal connections within the state's transportation system, although the majority of state transportation funding programs still operate within a funding structure that is organized on a modal basis. It may be helpful to create a funding program specifically structured to support the development of intermodal connections and improved intermodal coordination, as some states have begun to do.

Local transportation funding programs provide a significant proportion of all transportation funding and often result from specific funding measures approved by voters. Many of these measures specify the projects to be funded by the program or the process for allocating funds. Therefore, those agencies with an interest in improving airport ground access in a region should pursue opportunities to include airport ground access projects in such programs. Although the majority of local transportation funding programs are based on revenue from sales taxes, there is a growing interest in new and innovative sources of revenue to finance transportation programs. Potential new revenue sources include automated tolling and mileage-based fees.

Conclusions

Intermodal airport ground access projects present some of the greatest opportunities to improve intermodal coordination in the transportation system. Such projects not only improve the interface between the surface and air transportation systems but also are

likely to become a critical solution to meeting future airport ground access needs at many airports. At the same time, they are some of the most challenging transportation projects to plan and fund due to the large number of different agencies that can become involved in such projects and the restrictions imposed by current funding programs. As a result, collaborative approaches to funding such projects are often essential to their successful implementation. These approaches can draw on a wide range of federal, state, and local funding sources, as well as opportunities for private-sector involvement.

While future changes to federal legislation and regulations could greatly facilitate funding such projects, there are already many existing funding programs that can be used, as illustrated by the case studies described in this report. However, in order to take full advantage of these opportunities, it is necessary to develop a regional consensus on the importance of a given project to the regional transportation system. This can be greatly facilitated by establishing a regional airport ground access task force that will work on an ongoing basis to identify and plan needed facilities to enhance airport ground access and to develop collaborative funding strategies to implement these plans.

I. INTRODUCTION

Airports are the principal interchange nodes in the passenger transportation system where local and regional transportation systems interface with those for national and international travel. Airports also play a vital role in facilitating the transfer of air cargo between the surface transportation system and the air transportation system, as well as sometimes serving as major sorting and distribution centers for freight that may be moved entirely by surface transportation. In particular, as the integrated air cargo carriers have increased their role in handling second and third-day freight shipments, an increasing proportion of their freight traffic is moved by truck, although it may be consolidated and sorted at airport facilities.

However, all too often projects to improve the connectivity between the surface transportation system (including private vehicles, buses, light and heavy rail systems, and trucks) and the airport circulation and terminal facilities are hampered by the fact that project funding regulations limit the type and location of projects eligible for funding from the various funding programs administered by the Federal Aviation Administration (FAA), Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA).

Policies regarding the use and allocation of these funds are often so restrictive that projects are difficult to implement or are rendered much less effective at improving intermodal connectivity. In particular, FAA rules on the use of airport funding sources severely limit the ability to use these funds for airport access improvements off the airport property. Similarly, restrictions on other sources of surface transportation funds may have the reverse effect and prevent their use for projects located on airport property.

These limitations and restrictions constrain the ability of both airport authorities and state and regional transportation agencies to respond to airport ground access needs by planning and implementing effective intermodal alternatives to the private vehicle or improved facilities for handling freight traffic moving to and from the airport. At the same time, the nature of such projects typically involves multiple agencies and presents opportunities to develop collaborative planning and funding strategies that can overcome many of the limitations of existing funding programs and sources.

Because of the constraints that current funding program limitations place on developing and funding solutions to airport ground access problems, there is a need to explore the potential role of collaborative strategies in addressing these limitations. However, there is currently a lack of relevant guidance material available to planners developing airport ground access projects on how to define and implement such collaborative funding strategies. As a result, sponsors of intermodal airport ground access projects often struggle to obtain adequate funding commitments and these projects can take decades to be implemented, during which time costs escalate and the benefits of the project are lost to potential users.

OBJECTIVES OF THE RESEARCH

The research documented in this report was undertaken to:

- Identify and document existing sources of funding for airport ground access projects, together with the associated constraints on how they can be used;
- Examine past experience on the use of different funding sources for intermodal airport ground access projects;
- Develop guidance material on how to implement collaborative funding arrangements for such projects within the constraints of the different funding sources.

The research examined and documented past experience on collaborative funding of airport ground access projects through a number of case studies of intermodal airport ground access projects. Based on the findings of these case studies, the research has developed guidance material targeted at planners developing airport ground access projects, as well as recommendations for changes to policies and funding allocation procedures at the federal and state levels. It is hoped that this guidance material and the recommended changes will improve the ability to make use of different funding sources to facilitate interconnectivity between transportation modes, including the development of effective intermodal solutions to improving airport ground access.

STRUCTURE OF THE REPORT

The remainder of the report consists of six sections. The next section summarizes the recent literature on funding airport ground access and intermodal projects, as well as prior work addressing the limitations and restrictions imposed by the regulations and eligibility requirements of relevant funding programs. The third section provides a summary of the various funding programs, their limitations and restrictions, and the available regulatory and guidance material.

The fourth section presents a summary of seven case studies of a range of intermodal airport ground access projects that were selected to illustrate the variety of different funding programs and sources that have been used to finance such projects, as well as the range of different types of projects and how the funding strategies vary with the type of project. The projects covered by the case studies include a light rail extension to an airport; development of automated people-mover links between airports and regional rail systems; airport access roadways; and development of a major intermodal terminal adjacent to a major airport. The latter project serves a wide range of transportation modes, including regional rail systems, buses, rental car facilities, and airport parking. Each case study is documented in more detail in a series of case study reports that are available on the Mineta Transportation Institute website.

The fifth section of the report presents guidance on the development of collaborative funding strategies for intermodal airport ground access projects. This guidance addresses identification of potential funding sources, institutional considerations in generating a

regional consensus on the need for improved airport ground access, and interagency agreement on project selection and priorities. The sixth section presents a set of recommended changes to applicable funding program rules and regulations, as well as associated legislative requirements, to better facilitate collaborative funding of airport ground access projects. These recommendations are based on the findings of the literature review, analysis of funding program regulations, and the case studies.

The seventh and final section presents a summary of the findings of the research and the conclusions regarding opportunities for innovative and collaborative funding of intermodal airport ground access projects, as well as desirable changes to current funding programs to better facilitate these opportunities.

II. LITERATURE REVIEW

Airport ground access and egress facilities and services provide an essential interface between the air transportation and surface transportation systems that is not only critical to the effective operation of the nation's airport system but also often represents an example of an intermodal transportation system involving a range of different modes. However, the issues surrounding how these facilities and services are or could be funded and financed has received relatively little attention in the literature compared to funding and financing the broader surface transportation system or funding airport development in general.

Although the airport ground transportation system serves both airport access and egress, for brevity this will generally be referred to in the remainder of this report as the airport ground access system. Projects to improve this system thus represent a key component of airport development plans as well as efforts to enhance intermodal connectivity at airports.[1,2,3] As a result, there has been growing policy interest in recent years in a more focused effort to improve intermodal connections at airports, including comprehensive studies of strategies to improve airport access in both California[4] and Texas,[5] and a U.S. Government Accountability Office (GAO) study of potential changes to the federal role in developing airport intermodal capabilities.[6] There have also been a series of research studies for the Transit Cooperative Research Program (TCRP) and Airport Cooperative Research Program (ACRP) exploring strategies to improve public transportation access to large airports.[7,8,9]

However, the intermodal nature of many airport ground access projects and the fact that airport development projects are generally funded through entirely separate funding programs from surface transportation projects has resulted in an extremely complex funding situation for airport ground access projects. A wide range of transportation funding programs exist at the federal, state and local levels, many of which potentially can be used for airport ground access projects, although at the present time there are no funding programs specifically dedicated to these types of projects. As a result, airport ground access projects have to compete with other transportation priorities and airport development needs. Even so, the growing interest in improving intermodal connectivity within the transportation system may increase the attention given to airport ground access projects by funding agencies.

AIRPORT GROUND ACCESS PLANNING

In spite of the increasing recognition of the importance of intermodal planning for airport ground access[10,11,12] and the magnitude of the investments being made in airport ground access projects around the world,[13] the development of information and techniques for airport ground access planning has only relatively recently begun to receive attention from transportation research funding agencies. In an attempt to raise the awareness of these needs among policy makers, in 1994 the Federal Aviation Administration sponsored a workshop to define a research agenda to support a national program of airport ground access development.[14] This identified some 15 studies or programs that are needed to ensure that both policy makers and planners have appropriate information and tools, including information on funding strategies.[15,16]

Subsequently, the Federal Highway Administration and the FAA sponsored the preparation of a planning guide,[17] which provided a brief discussion of funding sources, and the Transit Cooperative Research Program sponsored a two-phase study to examine strategies for improving public transportation access to large airports. The first phase of this study[18] examined the current status of public transportation services to large airports in the U.S., presented case studies of successful intermodal airport access systems (primarily rail links) in other countries, and discussed the importance of a market research-based approach to planning public transportation services to airports, the potential role of new and emerging technologies, and the institutional factors affecting the operation and funding of airport access services and facilities. The second phase of the study[19] addressed in more detail potential strategies for improving public transportation access to airports, including the identification of market conditions where improved public transportation services for airport access are likely to be successful, consideration of the needs of airport employees, improvement of the management of airport ground access services, issues involved in handling baggage, off-airport passenger processing and security, and the role of traveler information systems. However, the second report did not provide any significant information on funding strategies.

A study in 2001 for the California Department of Transportation (Caltrans) on ground access to California airports[20] addressed a wide range of issues and problems at some 47 airports in the state as well as one in Mexico adjacent to the California border, including project selection and funding, and developed a set of associated policy recommendations, four of which specifically addressed project funding issues.

- The State of California should take a leadership role in advocating greater federal involvement in funding airport ground access through the reauthorization of surface transportation legislation;

- The State should develop policy recommendations to enable more federal financing opportunities for airport ground access projects of “national significance” and advocate more flexibility in the use of Passenger Facility Charges and airport revenues;

- The State should develop a policy approach that provides funding and financing mechanisms for air cargo distribution improvements;

- Caltrans should develop specific guidelines for future consideration of airport ground access projects for funding as part of the Inter-Regional Program of the State Transportation Improvement Program.

The study also identified a set of recommendations for expanded or additional responsibilities for local, state and federal agencies in the area of airport ground access, several of which involved funding. These include development of guidelines for Caltrans District Offices on how they can and should approach regional funding programs to include airport ground access improvements where these are deemed beneficial to the state or regional transportation system, and a recommendation that Caltrans take action to make information available to regional planners on creative approaches to pursuing innovative projects, including development by regional agencies of additional funding opportunities.

More recently, a 2005 study of airport intermodal transportation capabilities by the U.S. Government Accountability Office[21] undertook a survey of existing and planned bus and rail connections at 72 U.S. airports, and presented the results of 14 case studies of intermodal projects at selected airports.

A subsequent study for the California Department of Transportation by the California Partners for Advanced Transit and Highways (PATH) program at the University of California, Berkeley, developed a combined quantitative and qualitative approach to planning for improved intermodal connectivity at California airports. An initial working paper prepared as part of this study[22] reviewed potential opportunities for improving intermodal connectivity at 13 large and medium hub California airports. Two subsequent reports[23,24] presented details of a modeling framework developed as part of the study for analyzing potential intermodal improvements.

At about the same time, a 2008 Airport Cooperative Research Program report on ground access to major airports by public transportation[25] examined a broad range of issues involved in planning for enhanced public transportation access to airports, including attributes of successful systems, application of market research, management of the airport landside system, considerations in attracting airport employees to public transportation, and effective ways to get ground access information to travelers.

AIRPORT GROUND ACCESS FUNDING

In spite of the importance of the airport ground access system to the effective development of the airport system, and the role of airport ground access in regional and statewide intermodal transportation systems, there has been relatively little attention given to potential funding sources and mechanisms for airport ground access projects in particular, compared to funding other aspects of airport development and transportation projects in general. Of course, many of the funding sources for airport development and other transportation projects may also be used for airport ground access projects, even though such projects are not explicitly addressed in the literature on those programs or funding sources.

Although earlier descriptions of specific airport ground access projects sometimes addressed funding considerations, some of the earliest work that specifically addressed airport ground access funding issues consisted of a presentation by Matthew Coogan and a paper by Annalynn Lacombe that were prepared for the two workshops on ground access to airports sponsored by the FAA and held at the University of California, Berkeley, in 1994.[26,27] The 1996 *Planning Guide* for intermodal ground access to airports prepared for the FHWA and FAA contains a section on funding sources.[28] The section reviews traditional funding sources for on-airport improvements, principally airport revenue bonds, federal grants through the Airport Improvement Program, and Passenger Facility Charges, and potential funding sources for off-airport improvements, including FHWA and Federal Transit Administration funding programs, although some of these programs have been significantly changed by subsequent legislation. There is also a useful summary of a range of innovative state and local funding sources that potentially could be used for funding

airport ground access projects, although there is no discussion of whether any of them had been used.

The 2000 TCRP report on improving public transportation access to large airports includes a chapter discussing institutional considerations and funding options for airport ground access projects.[29] This reviews the various federal and state funding programs that could be used for airport access projects and contains a fairly extensive discussion of the factors constraining the use of airport revenues for such projects, including the role of airport-airline contractual agreements. The 2001 study of ground access to airports in California identified airport ground access development needs at airports throughout the state and developed recommendations on the need for improved coordination of different funding sources.[30,31] The study did not review the different funding sources in any detail, although the study working papers include a glossary that contains a short description of each of the major funding programs that are or could be used to fund airport ground access projects.

The 2005 GAO study of the federal role in developing airport intermodal capabilities includes an appendix that provides a review of federal, state and local funding programs applicable to airport intermodal ground access projects as well as potential private-sector funding, with some discussion of airport intermodal projects that have used particular sources of funding.[32] The 2008 ACRP report on ground access to major airports by public transportation contains a discussion of factors governing airport financial operations and sources of funding for ground access projects,[33] although this largely repeats, in somewhat less detail, the discussion in the 2000 TCRP report on improving public transportation access to large airports.

TRANSPORTATION PROJECT FUNDING IN GENERAL

Financing the development and operation of the transportation system has always been an issue of major policy concern, particularly in recent years as traditional sources of revenue to support the development and operation of the transportation system have failed to keep up with both rising costs and growing needs. Therefore, not surprisingly, there is an extensive body of literature on the subject. Although much of this does not directly address the challenges of funding airport ground access projects, since many of the broader surface transportation funding programs are used to fund airport ground access projects this literature has indirect relevance to funding such projects The following discussion is intended to summarize some of the more recent studies that provide an overview of the various programs and issues and provide a more extensive bibliography for those interested in more detailed information.

An October 2006 report published by the Mineta Transportation Institute examined transportation financing opportunities for California.[34] Although primarily addressing transportation finance in California, many of the findings of the study are of course more broadly applicable to other states as well. The report analyzed a range of alternative sources of revenue and different finance options based on a review of existing literature, interviews with key stakeholders, and two statewide phone surveys that assessed public attitudes to different revenue options. Survey respondents were most supportive of raising vehicle registration fees as long as the rate varied with the vehicle fuel economy, but

they were also generally supportive of progressively raising motor fuel taxes and allowing private companies to build and operate toll facilities. The report concluded that the state needs a multi-phased approach that considers near-term, medium-term, and long-term options, with near-term measures focused on those options with relatively strong political support that can be implemented within the current administrative framework. However, longer-term solutions need to address fundamental changes that are occurring in the transportation system and vehicle fleet and will require some time to generate the necessary political support.

Changes in the sources of revenues supporting transportation funding programs are also likely to result in changes to the structure and funding levels of those programs. The way in which these changes affect funding availability for intermodal projects is likely to have significant implications for funding airport ground access projects, particularly those involving public transportation. With greater emphasis in California on reducing greenhouse gas emissions and developing more sustainable land use patterns, there is likely to be both a stronger policy focus on improving public transportation and intermodal connections, as well as greater demand on funding programs that support these types of projects. While the policy focus on improving intermodal connections may give airport ground access projects greater prominence in developing regional transportation plans, a key question is whether the available funding for intermodal and public transportation projects will be able to keep pace with the growing demand for funding for such projects.

In February 2009 the National Surface Transportation Infrastructure Financing Commission released its Final Report *Paying Our Way: A New Framework for Transportation Finance*.[35] This report analyzed the widening investment gap between surface transportation investment needs and the trend in revenues flowing into the Highway Trust Fund, and the effect of this trend on resulting spending on surface transportation programs. The report then explored options for increasing the resources available to support increased investment in surface transportation. These included changes to the structure and level of motor fuel taxes, weight-based fees for freight movements, use of tolls and mileage-based user fees, and private-sector financial participation. The report presented a set of policy recommendations for consideration by Congress. These included an immediate increase in the motor fuel tax rate and a transition to a mileage-based direct user fee system in the longer term. The recommendations also addressed federal policy actions to facilitate non-federal investment, including allowing tolling on the National Interstate System under specific circumstances, expansion of the Transportation Infrastructure Finance and Innovation Act (TIFIA) loan program, and the creation of a national infrastructure financing organization, as well as recommendations addressing research, development, and demonstration programs in support of new transportation funding approaches, and recommendations on funding allocation priorities and procedures.

Expansion of the TIFIA program and the creation of a national infrastructure financing organization could provide greater opportunities for funding intermodal airport ground access projects, particularly where these are designed to generate revenue streams that can be used to pay off loans.

Equity Considerations

Not surprisingly, proposals to change the basis on which revenues to support surface transportation programs are generated have raised concerns about the equity implications of these changes. An article in the *TR News* issue of March/April 2009[36] summarized the discussions on this topic at a Transportation Research Board (TRB) Executive Committee policy session in January 2008. A subsequent TRB Special Report explored these issues in more detail and developed a set of recommendations for public policy makers, researchers and analysts, federal agencies, and states.[37,38]

Equity considerations affect not only the source of revenues that support transportation programs but also the choice of projects that are funded by those programs and how those projects are structured. This may become an issue of concern with some airport ground access projects that may be perceived as using funds derived from broadly based revenue sources to develop facilities and services that will largely serve fairly affluent air travelers.

Public-Private Partnerships

The growing interest in public-private partnerships (PPPs) as a way to finance transportation infrastructure has also led to a growing body of literature addressing this topic. A series of articles in the May/June 2011 issue of TR News examined a number of aspects of the potential use of PPPs for transportation projects,[39] including U.S. and international experience,[40,41] obtaining value from PPPs,[42] public-sector decision making in selecting PPPs,[43] and protecting the public interest.[44] These articles summarize current experience and concerns and build on research on PPPs undertaken by the National Highway Cooperative Research Program (NCHRP) over the past 20 years.[45,46,47] While the NCHRP reports naturally focus on the application of PPPs for highway projects, many of the findings are equally applicable to transit or airport projects.

As discussed later in this report, PPPs have been used for a number of airport ground access projects, including an intermodal center at Miami International Airport, Florida, an airport access roadway at Richmond International Airport, Virginia, and a light rail extension to Portland International Airport, Oregon. Therefore PPPs are likely to receive increased consideration in developing funding strategies for future airport ground access projects and the issues involved in such partnerships will need to be well understood in developing the funding strategies for these projects.

In December 2007, the Federal Transit Administration submitted a Report to Congress on the costs, benefits and efficiencies of PPPs for fixed guideway transit capital projects.[48] This report discusses the types of PPPs used in fixed guideway capital projects and the implications of using PPPs for transit costs, benefits, efficiencies, and effectiveness. It also discusses legal and institutional issues arising in applying PPPs to transit projects and services, including federal statutory and regulatory requirements. The report considered a wide range of different types of PPP contract structures, including design-build, build-operate-transfer, design-build-operate-maintain, design-build-finance-operate, and build-own-operate.

In June 2008, a team sponsored by the Federal Highway Administration International Technology Scanning Program undertook a program of visits to Portugal, Spain, the United Kingdom, and Australia to gather information on experience with PPPs for highway infrastructure in those countries.[49] The visits addressed the origins and evolution of the highway PPP programs, PPP project programming and delivery procedures, project contract management and operations, program performance, and lessons learned. A subsequent report by the accounting firm PricewaterhouseCoopers in June 2010 provides a summary of U.S. experience with PPPs, compares enabling legislation in the 25 states that had passed such legislation at the time of the report, and provides a discussion of why PPPs are attractive, the circumstances under which they make sense, and hurdles that need to be overcome.[50] In December 2010 the National Conference of State Legislatures (NCSL) released a report that provides a toolkit for legislators.[51] The report discusses key characteristics of PPPs, related benefits, concerns and controversies, federal and state government roles in the PPP process, and principles for state legislation. The NCSL website page discussing the report also provides an extensive bibliography on PPPs with links to each of the reports.[52]

III. FUNDING PROGRAMS AND SOURCES FOR AIRPORT GROUND ACCESS PROJECTS

This section documents the principal current funding programs and sources that can be used to fund airport ground access projects, together with their associated restrictions and limitations. A wide range of transportation funding programs exist at the federal, state and local levels, many of which potentially can be used for airport ground access projects, although at the present time there are no funding programs specifically dedicated to these types of projects. As a result, airport ground access projects have to compete with other transportation priorities and airport development needs. However, the increasing interest in improving intermodal connectivity within the transportation system may increase the attention given to airport ground access projects by funding agencies. In additional to traditional public-sector surface transportation and airport development funding programs managed by government agencies, there is growing interest in private-sector involvement in funding transportation projects, typically through public-private partnerships. This section reviews some of the recent experience with such partnerships and discusses some of the issues involved.

It should be noted that at the time this report was prepared, Congress had not yet reauthorized the most recent federal surface transportation funding legislation (the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users,* passed in 2005, which originally expired on September 30, 2009). The Act has continued to be in effect through a series of short-term extensions. Congressional leaders had indicated that they intend to pass new legislation to establish a multi-year reauthorization of the federal surface transportation programs before the end of the current Congress, although as of May 2012 this appeared increasingly unlikely, as discussed further below. While new legislation may change some of the details of the current funding programs, particularly authorized funding levels and revenue sources to pay for the programs, the majority of the current programs have been in place through several reauthorization cycles, so they are likely to remain in effect, perhaps with some modification. Therefore the current funding programs provide a good indication of the structure of the programs that can be expected to be in place for at least the next reauthorization cycle.

One possible exception to this, which could have some implications for airport ground access projects, is the future federal commitment to the development of high-speed rail projects. Over the past few years the current administration has made a significant commitment to funding high-speed rail projects, largely outside the framework of the regular surface transportation funding process, primarily through the American Recovery and Reinvestment Act (ARRA) of 2009, which appropriated $8 billion for high-speed rail, with subsequent annual appropriations of an addition $2.1 billion.[53] However, in mid-November 2011 Congress eliminated any additional high-speed rail funding from the federal budget for fiscal year 2012, suggesting that any reauthorization of surface transportation funding programs during the current Congress is not likely to include additional funding for high-speed rail.

While the high-speed rail projects that are currently being planned are not generally configured in a way that would make a significant contribution to airport ground access,

there are a few exceptions where proposed stations are located adjacent to major airports and the high-speed trains stopping at those stations could serve longer-distance access trips. However, the volume of air travelers who would find such services convenient is likely to be fairly small and the overall contribution of the high-speed rail service to air passenger ground access at those airports is not likely to be significant. On the other hand, since the high-speed rail station will also need similar ground access services to the airport, depending on the proximity of the station to the airport there may be opportunities for shared access facilities and services that could benefit from the greater volume of trips to the airport and station together and thereby improve access to both. Thus while funding for high-speed rail projects may not directly contribute to airport access, there may be opportunities for cost sharing for common access facilities that could reduce the level of funding needed from other sources for improvements to airport access infrastructure.

In contrast to the status of federal surface transportation funding programs, a four-year reauthorization of federal airport development funding programs was passed by Congress in February 2012 as part of the *FAA Modernization and Reform Act* of 2012 (Public Law 112-95) and signed into law on February 14, 2012. This ended an even longer series of short-term extensions of the previous federal aviation funding legislation, the *Vision 100 – Century of Aviation Reauthorization Act* of 2003 (Public Law 108-176), which had originally expired on September 30, 2007 and had remained in effect through a record-setting sequence of 23 extensions.

FEDERAL FUNDING PROGRAMS

Federal transportation funding programs fall into two broad categories: airport development funding programs and surface transportation funding programs. This results from the fact that funding for the Federal Aviation Administration, which includes the airport development funding programs, is authorized by legislation different from that authorizing funding for the surface transportation programs of the U.S. Department of Transportation. As a result, there are limitations in the legislation authorizing the federal airport development programs that restrict how funds from these programs can be used for airport ground access projects (or indeed any projects not located on airport property). In contrast, the legislation authorizing the surface transportation funding programs does not generally restrict the use of these funds in ways that preclude their use for airport ground access projects, although of course such projects have to compete for available funds with a much broader range of other surface transportation projects.

Airport Development Funding Programs

As of May 2012 there are currently two different airport development funding programs authorized by the most recent federal aviation funding legislation: the Airport Improvement Program (AIP) and the Passenger Facility Charge (PFC) program. Both programs are administered by the FAA. The AIP is a grant program that is funded from a range of aviation-user taxes and fees, most notably a tax on airline tickets, which are deposited in the federal Airport and Airway Trust Fund. The PFC program allows individual airports to levy a charge on enplaning passengers at that airport and use the proceeds for specific airport improvement projects. The PFCs are added to the ticket price by the airlines and

paid to the federal government, along with other federal taxes and fees on each ticket. The FAA in turn pays the PFC revenue to the airport.

The 2012 reauthorization made relatively minor changes to the AIP and minimal changes to the PFC program from the previous legislation, although the authorized funding levels for the AIP were reduced slightly to $3.35 billion per year and the federal share for AIP projects at smaller airports (small hub and below) was reduced from 95% to 90%.

Airport Improvement Program

The AIP was established by the *Airport and Airway Improvement Act* of 1982 (Public Law 97-248) and has been amended and reauthorized several times since then. Funds obligated for the AIP are drawn from the Airport and Airway Trust Fund into which are deposited revenues from several aviation-user taxes, including taxes on airline fares, air freight charges, and aviation fuel. The AIP provides grants to public agencies, and in some cases to private airport owners and other entities, for planning and development of airports. In order for an airport to be eligible for an AIP grant, it must be included in the National Plan of Integrated Airport Systems (NPIAS), although as practical matter any airport proposing a major ground access improvement project would be included in the NPIAS. Grant recipients are referred to as project sponsors, and are typically the airport owner and operator.

AIP grants are intended to support airport improvements directed at enhancing airport safety, capacity, and security, or addressing environmental concerns, as well as associated planning activities and other professional services that are necessary for eligible projects. Projects related to airport operations or revenue-generating improvements are not eligible. Eligibility of ground access projects for AIP funding is quite restricted and is discussed further below. The proportion of the cost of an eligible project that can be covered by an AIP grant depends on the classification of the airport, which in turn depends on its role in the system and the number of enplaned passengers that it handles in a year. For large and medium primary hub airports, an AIP grant can cover up to 75% of the eligible costs of a project, or up to 80% of noise program implementation costs. For small primary, reliever, and general aviation airports, the grant can cover up to 95% of eligible project costs. An eligible project must involve more than $25,000 in AIP funds.

The AIP funds appropriated by Congress for a given year are divided into a number of entitlement categories, including primary, cargo service, and general aviation airports. The remaining funds are allocated to a discretionary fund, with set-asides for specific programs for airport noise compatibility planning and programs, conversion of military airports to civil use, and reliever airports. The remaining discretionary funds are allocated using a national prioritization formula. Entitlement funds are calculated according to a formula in the authorizing legislation that varies with the annual appropriation for the program. If large hub or medium hub airports elect to charge a PFC, their passenger entitlement funds are reduced and the withheld funds are divided between the discretionary fund and a “small airport fund.” The formulae for allocating funds within the AIP are fairly involved and details are provided in the FAA *Airport Improvement Program Handbook* (AIP Handbook).[54] In

general, if airports do not use their entitlement funds in a given fiscal year, the unused funds carry over for up to two or three subsequent years, depending on the airport classification.

The distribution of AIP grants by funding category for fiscal year (FY) 2003 as presented in the *AIP Handbook* is shown in Table 1. The distribution for other years would be similar, although the actual amounts vary from year to year depending on the level of appropriations. It can be seen that of the available FY 2003 appropriation of $3.29 billion, the primary airport passenger and cargo entitlement grants accounted for $1.06 billion, with a further $355 million in carryover funds (not all of which would be for primary airports). The maximum entitlement grant in FY 2003 for any one airport was limited by legislation to $26 million. In comparison, the pure discretionary funds were only $125 million, while discretionary funds restricted to capacity, safety, security or noise compatibility projects were $374 million.

Therefore the AIP funding available for larger airports, which typically have the greatest need for airport ground access projects, apart from any grants from the discretionary funds or noise set-aside, was limited to $26 million in FY 2003 for all eligible projects at a given airport. While the discretionary funds could, in principle, be awarded for eligible ground access projects, given the limited available funds in this category and the need for and priority given to other types of projects, particularly airside capacity, safety and security projects, there is very little prospect of AIP discretionary funds being available for ground access projects. Thus, even if a ground access project met the AIP eligibility criteria, the airport would need to fund this from its entitlement funds, which would both limit the available funding and reduce the funds available for other airport projects.

Table 1. Distribution of AIP Grants in FY 2003

Program	$ (million)
Urbanized Area Formula (Section 5307)	
Total available	4,151.7
Less oversight (0.75%)	(31.1)
Reapportioned funds	5.5
Total apportioned	4,126.0
Fixed Guideway Modernization (Section 5309)	
Total available	1,663.0
Less oversight (1%)	(16.6)
Reapportioned funds	0.3
Total apportioned	1,646.7
Alternatives Analysis (Section 5339)	
Total available	24.9
Funds available for allocation	24.9
New Starts and Small Starts (Section 5309)	
Total available	2,000.0
Less oversight (1%)	(20.0)
Funds available for allocation	1,980.0

Source: FAA, Airport Improvement Program Handbook (2005), Table 4.

Program Guidance

The primary reference on the administration of the AIP program is the FAA *AIP Handbook*.[55] In addition to the program guidance provided by the *AIP Handbook*, from time to time the FAA issues Program Guidance Letters (PGLs) and Program Information Memorandums (PIMs) on specific topics.[56] These are available on the FAA website. Among other topics, PGL 04-02 addresses a requirement established by Section 187 of the *Vision 100* Act that airport sponsors at large and medium hub airports must certify that projects involving the location of an airport, runway, or major runway extension, have been coordinated with the relevant intermodal planning agency, generally the Metropolitan Planning Organization (MPO). As part of the required coordination, airport sponsors must, upon request, provide the MPO with copies of the airport layout plan amendment and associated master plan documents. There are currently no PGLs or PIMs addressing airport ground access projects.

The FAA has also issued a bulletin on best practices for surface access to airports[57] that is intended to facilitate coordination between the FAA and airport sponsors and surface transportation agencies, including state departments of transportation, regional transportation planning agencies, and transit operators. This bulletin provides guidance on the use of AIP and PFC funds and airport revenues for airport ground access projects, the details of which as they pertain to AIP funds are discussed below.

Letter of Intent Program

The Letter of Intent (LOI) program[58] provides a mechanism to facilitate funding large-scale capacity projects at primary or reliever airports over several funding cycles. LOIs state that FAA intends to obligate AIP discretionary and entitlement funds from future budgetary authority in an amount to cover the Federal Government's share of allowable costs for the project. An LOI states that reimbursement will be made according to a specified schedule as funds become available from Congress each year over the term of the LOI. This allows airport sponsors to anticipate AIP funding over multiple years and allows the FAA to plan for future demands on discretionary funds.

Eligibility of Airport Ground Access Projects for AIP Grants

The FAA guidance bulletin on *Best Practices – Surface Access to Airports*[59] provides an overview of the general eligibility criteria for airport ground access projects, including references to the relevant sections of the *AIP Handbook* and a *Federal Register* notice of February 10, 2004, addressing eligibility of airport ground access projects for funding under the PFC program.[60] Although the *Federal Register* notice addresses the PFC program, the *Best Practices* bulletin notes that AIP eligibility of such projects conforms to that of PFC projects, except for provisions that are exclusive to the PFC program.

The basic principles for airport ground access project eligibility are that the project should be:

- Located on airport property or on a right-of-way owned and controlled by the airport;
- Intended for the exclusive use of airport passengers.

In addition, any elements of the project that are for purposes of operations, maintenance, or revenue generation are not eligible.

The term "airport passengers" is considered to include airport employees and airport visitors, in addition to air passengers.

Eligible projects include airport access roads (subject to the above eligibility criteria); public on-airport circulation roads; walkways and moving walkways providing access to eligible passenger terminals; light rail, monorail and automated people-mover (APM) systems to transport passengers and baggage between eligible terminals or between eligible terminals and parking lots or other areas of the airport; and airport access rail lines (subject to the above eligibility criteria). In the case of stations or stops for light rail, monorail, or APM systems or airport access rail links, only those elements that serve airport passengers

are eligible. Ticketing or fare collection areas or equipment are ineligible. Commercial and maintenance areas are ineligible, as are operations, maintenance and storage facilities, including any track to a maintenance facility. Where stations include both eligible and ineligible areas, the costs must be prorated to determine the eligible costs.

Parking facilities that generate revenue are not eligible for AIP funding because of their revenue-producing function. However, roadways, sidewalks and APM systems between eligible terminals and revenue-generating parking facilities are eligible since the authorizing legislation provides that access to and from a terminal is eligible if it is necessary for the movement of passengers and baggage. Roads exclusively intended to connect revenue-generating parking facilities to an access or circulation road are not eligible since they are considered part of the parking facility.

A special case arises with access roads or rail or APM systems that extend off the airport. For these to be eligible, the airport sponsor must own and control the right-of-way and the access facility must be for the exclusive use of airport passengers. If the facility serves other uses between its connection to the rest of the regional transportation system and the airport, only the portion between those uses and the airport would be eligible. Thus, if an access road connecting a nearby highway to an airport also serves commercial uses located along the access road, only the portion between the commercial use closest to the airport and the airport terminal would be eligible.

Two examples of how this requirement is interpreted by the FAA are provided in the February 2004 *Federal Register*:[61] the AirTrain APM at John F. Kennedy International Airport (JFK), New York, and the Portland MAX light rail extension to Portland International Airport, Oregon. In the case of the JFK AirTrain, which connects the Jamaica Station of the Long Island Railroad to the airport via a 3.1mile elevated link along the Van Wyck Expressway, the airport sponsor (the Port Authority of New York and New Jersey) acquired the right-of-way and the entire link was determined to be eligible (apart from ineligible functional components, such as ticketing areas and fare collection equipment). In the case of the Portland MAX extension, which included various commercial developments between the airport and the existing light rail system, the only portion determined to be eligible was the section on the airport property between the airport terminal and the closest commercial development. In both cases, the applications were for PFC funding, but the FAA guidance makes it clear that the same approach would be followed in in the case of an application for AIP funding.

In general, access links extending off the airport must connect to the nearest public highway or regional rail facility of sufficient capacity to accommodate the airport traffic. More than one such link may be eligible where any of the following three conditions can be demonstrated: the airport traffic is of sufficient volume to require more than one access link; an existing access link cannot be expanded to meet expected traffic due to physical, environmental or other constraints; or a single access link is poorly located to serve a significant volume of airport traffic to and from a particular geographical area served by the airport.

Although revenue-generating parking facilities are not eligible for AIP funding, rail access links for the exclusive use of airport passengers are eligible even if they charge a fare for their use. The FAA guidance does not discuss the rationale for this distinction, although typically the fare for a rail access link does not cover the full cost of the facility, while airport parking facilities generate surplus revenue over and above their cost of construction and operation.

Because of the fairly complicated eligibility rules, coordination with the FAA to determine project eligibility for AIP funding at an early stage in planning a project is strongly recommended. The FAA requires extensive justification, including a discussion of other alternatives, for airport access rail links or on-airport APM systems. Although a formal cost-benefit analysis is not required (but may be performed as part of the project justification), the project sponsor must demonstrate that the project will produce an adequate stream of congestion reduction or other access benefits.

Passenger Facility Charge Program

The Passenger Facility Charge Program was established by the *Aviation Safety and Capacity Expansion Act* of 1990 (Title IX, Subtitle B of Public Law 101-508) and the first funds were collected under the program in 1992. The program authorizes public agencies controlling an airport to establish a fixed charge per enplaned passenger to be added to each air ticket or equivalent document (with some exceptions) by airlines serving the airport, collected by the airlines, and remitted to the public agency (hereafter referred to as the airport operator or airport for brevity). The amount of the passenger facility charge (PFC) is shown on the ticket or other receipt for the airfare paid by the passenger as part of the taxes and fees paid on the ticket or fare. Initially, airports could set the PFC at $1, $2 or $3. Subsequently, the *Wendell H. Ford Aviation Investment and Reform Act for the 21st Century* (AIR-21) (Public Law 106-181) authorized PFCs of $4 or $4.50 as well, subject to some restrictions. In general, airports establishing PFCs do so at the highest allowable rate, although there have been cases where airports established a lower charge.

The authorizing legislation limited the imposition of PFCs on a given passenger itinerary to no more than two charges in each direction. The FAA regulations for administering the PFC Program[62] specify that these will be charged on the first two enplanements at airports with a PFC in effect on a one-way trip or the outbound leg of a round trip and the last two enplanements at airports with a PFC in effect on the return leg of a round trip. The legislation exempts some flights from PFCs, including those provided as part of the Essential Air Service program and certain flights in Hawaii and Alaska. In addition, airports may request that certain classes of air carriers or flights to certain destinations be excluded from PFC collection, as long as the excluded class does not account for more than 1% of the airport enplanements, or the destination does not enplane more than 2,500 passengers annually or meets other rather specialized requirements specified in the legislation.

The original legislation authorizing the PFC Program prescribes that a large hub or medium hub primary airport that imposes a PFC or $3 or less will have its AIP passenger entitlement funds reduced by 50% or by 50% of the projected revenues from the PFC in the fiscal year, whichever is less, with the reduction in funds divided between the AIP discretionary fund

and the AIP small airport fund. Under AIR21 if a large or medium hub airport establishes a PFC above $3, the reduction in AIP passenger entitlement funds is increased to the lesser of 75% of its AIP passenger entitlement funds or 75% of the projected PFC revenues in the fiscal year. The reduction in AIP entitlement funds becomes effective in the fiscal year following the start of the PFC collection, so it would generally not be in the interest of a large or medium hub airport to start charging a PFC toward the end of a fiscal year, when the PFCs for the remainder of the fiscal year would not generate enough revenue to offset the loss of AIP funds in the next fiscal year.

The FAA has established project eligibility requirements for the use of PFC revenue, as discussed in more detail below. In broad terms these follow the project eligibility criteria for AIP funding, with some significant additions, including the use of PFC revenue to pay interest on airport debt for eligible projects. Airport operators must apply to the FAA for approval to establish a PFC and describe what projects or other uses will be funded by the revenue. The FAA reviews the application to determine whether the planned uses of the PFC revenue meet the revenue use eligibility requirements of the program and other program requirements are satisfied. The great majority of airport applications to establish a PFC have been approved, but a few applications have been disapproved. An approved PFC remains in effect for a designated period with the intention of generating the desired revenue for the stated projects or other use.

In order for the FAA to approve a PFC at the $4 or $4.50 level, the provisions of AIR-21 require that the project or project to be funded by the PFC must satisfy the following criteria in addition to those for PFCs at a lower level:

- The project cannot be paid for from funds reasonably expected to be available from the AIP;

- If the project is an eligible surface transportation or terminal project, the airport operator requesting the PFC has made adequate provision for financing the airside needs of the airport, including runways, taxiways, aprons, and aircraft gates;

- In the case of a large or medium hub airport, the project will make a significant contribution to improving air safety and security, increasing competition among air carriers, reducing current or anticipated congestion, or reducing the impact of aviation noise on people living near the airport.

In addition, in the case of a large or medium hub airport at which one or two air carriers control more than 50% of the passenger boardings, an airport operator requesting a PFC at any level must have submitted a competition plan acceptable to the Secretary of Transportation.

As of September 1, 2010, PFC collections have been approved at 380 airports, with total approved collections of approximately $76.8 billion.[63] From the time collections began in 1992 through the end of calendar year (CY) 2009, over $30 billion in PFC revenue had been collected. PFC collections in CY 2009 were approximately $2.53 billion. Of the total approved collections as of August 31, 2010, some 7% were for airport ground access

projects, exclusive of any PFC revenue used for interest on airport debt, which may include debt that has been or will be used in part to fund ground access projects.[64] Of the approved ground access collections, 37.5% were for roads and 61% were for rail projects, with a little over 1% for planning and the balance for land acquisition.

Although the total amount of annual PFC collections is somewhat less than the annual amount of AIP grants, the distribution across airports of different sizes is very different, since the PFC collections at a given airport are directly related to the level of passenger enplanements. Whereas the annual AIP entitlement funds at a given airport are limited to a maximum of $26 million, a large airport with 10 million annual enplanements paying a PFC of $4.50 would receive $45 million. Thus, the PFC program is particularly useful for the largest airports, and more than offsets the reduction in their AIP entitlement funds that results from establishing a PFC.

Program Guidance

Detailed program guidance is contained in FAA Order 5500.1 *Passenger Facility Charge*.[65] Additional guidance on eligibility of airport ground access projects for PFC funding is contained the *Federal Register* notice of February 10, 2004[66] and *Bulletin 1: Best Practices-Surface Access to Airports*[67] discussed above under project eligibility for the AIP.

As noted above, project eligibility for PFC funding generally follows AIP project eligibility rules, with some additions. The first is the allowable use of PFC revenue to pay interest in airport debt incurred to finance eligible projects. The second major addition is the allowable use of PFC revenue for construction of gates and related areas at which passengers are enplaned or deplaned and other areas directly related to the movement of passengers and baggage within the airport boundary, whether or not these are revenue-producing space. The FAA has interpreted these areas to include airline ticketing areas and counters, baggage sorting and make-up areas, and baggage claim areas and devices. However, these areas do not include restaurants, car rental facilities, automobile parking facilities, or other concession space. Under some conditions, construction of airline or airport operations space, aircraft fueling facilities, and concession space immediately adjacent to or under a gate area may be eligible, although tenant finishes would not. PFC revenue may also be used for cost-sharing programs for air traffic modernization.

Eligibility of Airport Ground Access Projects for PFC Funding

Allowable uses of PFC funds for airport ground access projects is essentially the same as for AIP funds, with the addition that PFC revenue may be used to pay interest on airport debt incurred to fund eligible projects. *Bulletin 1* emphasizes that PFC funding may not be used for any portion of a project that would have both airport and general use, or is not located on airport property or on right-of-way owned or controlled by the airport, or is intended for the use of both airport and non-airport passengers.

In addition, in the case of a PFC at the $4 or $4.50 level at a large or medium hub airport, there are the additional requirements that the airport operator requesting the PFC has

made adequate provision for financing the airside needs of the airport and that the project will make a significant contribution to reducing current or anticipated congestion.

Thus the principle difference between AIP funding and PFC funding for airport ground access projects relates to the extent of potentially available funding at larger airports, rather than the type of projects that are eligible.

Use of Airport Revenue

Although not a Federal funding program as such, the FAA has established a policy and procedures for acceptable uses of airport-generated revenues that restrict the ability of airport sponsors to use such revenues for a range of purposes, including funding airport ground access projects, the details of which are contained in a *Federal Register* notice of February 16, 1999.[68] The authority for the policy and procedures derives from the Airport and Airway Improvements Act of 1982 and several subsequent Federal statutes that narrowed permitted uses of airport revenues.

Section V.A.9 of the 1999 *Federal Register* notice describes permitted uses of airport revenue for airport ground access projects. These are somewhat less restrictive than project eligibility for AIP or PFC funding and allow airport revenue to be used for "capital and operating costs of those portions of an airport ground access project that can be considered an airport capital project, or of that part of a local facility that is owned or operated by the airport owner or operator and [is] directly and substantially related to the air transportation or passengers or property, including use by airport visitors and employees." The guidance states that the FAA has approved the use of airport revenue for the costs incurred for structures and equipment associated with an airport terminal building station and a rail link between the airport station and the nearest mass transit rail line, where the structures and equipment were located entirely on airport property and designed and intended exclusively for the use of airport passengers.

In the discussion of comments received on an earlier issue of the Proposed Policy and a Supplementary Notice, the FAA makes it clear that the approved project mentioned in Section V.A.9 was the extension of the Bay Area Rapid Transit (BART) system to San Francisco International Airport, where the airport station and the line between the airport station and the BART line that ran past the airport was entirely on airport property. The discussion noted that the part of the extension financed through the use of airport revenues was intended for the exclusive use of people traveling to and from the airport and included design features to discourage use by through passengers. In fact, the link between the main line and the airport station consists of a Y-shaped spur that requires trains to stop at the airport station and reverse direction. The BART District has operated trains over the airport spur in a number of different ways since the extension was first opened, although initially trains from the direction of the City of San Francisco to the north of the airport stopped at the airport station then returned to the north, while trains from Millbrae station to the south of the airport (at the time and currently the only station to the south of the airport) were operated as a shuttle connection between the airport and Millbrae stations. This required any through passengers to change trains at the airport station.

Based on a literal interpretation of the wording of the policy, the principle differences between permitted uses of airport revenue under the policy and eligibility criteria for AIP and PFC funded projects appear to be:

- An allowable facility must be owned ***or*** operated by the airport sponsor;
- An allowable facility must be "directly and substantially related to the air transportation of passengers or property" but is not required to be intended for the exclusive use of airport passengers;
- Airport revenue can be used for operating and maintenance costs of allowable ground access facilities, including capital costs of maintenance facilities and equipment;
- Airport revenue can be used for capital, maintenance, and operating costs of ticketing areas and fare collection equipment.

Obviously, there is some room for differences in interpretation of the term "directly and substantially" related to air transportation. The policy guidance in the February 1999 *Federal Register* does not define what would constitute a "substantial" relationship to air transportation, although it uses the term frequently. In the context of an airport ground access project, it would seem reasonable to consider that a project is directly and substantially related to air transportation if the majority of users are traveling to and from the airport are air passengers, airport employees, or airport visitors (including air passenger greeters and well-wishers), or are transporting property to be moved by air.

The provision that allowable ground access facilities must be owned ***or*** operated by the airport sponsor raises the possibility that an airport sponsor might provide land and/or ground access facilities on airport property to another agency that would operate the facilities and pay the airport sponsor less than fair market rental for the use of the facilities. This is explicitly allowed under certain circumstances by Sections VII.G and VII.H of the policy guidance in the February 1999 *Federal Register*. Section VII.G allows an airport sponsor to make airport property available at less than fair market rental for public transit terminals, right-of-way, and related facilities, as long as the transit system is publicly owned and operated, or operated by contract for a public owner, and the facilities are "directly and substantially related to the air transportation of passengers or property." Section VII.H extends this to private ground transportation services in cases where publicly owned transit services are extremely limited and where a private bus, rail or ferry transit service provides the primary source of public transportation.

The policy also appears to allow an airport sponsor to use airport revenue to *operate* airport ground transportation services using facilities that it does not own, so long as they are "directly and substantially related to the air transportation of passengers or property." An example would be the operation of an express bus service between the airport and a remote terminal on land that the airport sponsor leases.

Surface Transportation Funding Programs

In addition to funding programs addressing airport development specifically, there are a large number of federal funding programs authorized by different sections of the legislation authorizing the surface transportation programs of the U.S. Department of Transportation that can be used to fund airport ground access projects. As of May 2012 the most recent revision of federal surface transportation legislation was the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users*, widely referred to by the acronym SAFETEA-LU, (Public Law 109-59) that was signed into law in August 2005. The Act expired on September 30, 2009 and has remained in effect under a series of short-term extensions since then.

In March 2010, the *Hiring Incentives to Restore Employment (HIRE) Act* extended the provisions of SAFETEA-LU through December 31, 2010 and provided $19.5 billion to the Highway Trust Fund so that it could meet program obligations through 2011. In December 2010 the *Continuing Appropriations and Surface Transportation Extensions Act, 2011* extended authorization of federal surface transportation programs through March 4, 2011, at which point Congress passed the *Surface Transportation Extension Act of 2011*, which extended authorization of the same programs to September 30, 2011. After failing to agree on a multi-year reauthorization of SAFETEA-LU, in September 2011 Congress passed the *Surface and Air Transportation Programs Extension Act of 2011* that further extended authorization of the federal surface transportation programs to March 31, 2012. As of mid-March 2012, the House of Representatives and the Senate were each attempting to pass reauthorization bills, although there were substantial differences that would need to be reconciled. This effort failed when the House Republican leadership was unable to secure enough votes to pass its version of the reauthorization bill that would have established a $260 billion program over five years. The House and Senate then passed the *Surface Transportation Extension Act of 2012*, which extended the current programs and funding levels to June 30, 2012.

As of late May 2012, a House of Representatives and Senate Conference Committee was trying to reach agreement on a bill that would extend the provisions of SAFETEA-LU yet again to September 30, 2012. However, the House version of the bill contained a number of highly controversial provisions that the Administration has strongly objected to, so it was unclear how and whether the House and Senate would be able to resolve these issues.

Many of the surface transportation funding programs contained in SAFETEA-LU continued or modified programs that had been established by prior legislation, particularly the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and the Transportation Equity Act for the 21st Century (TEA-21) of 1998. Therefore, although a new surface transportation Act to succeed SAFETEA-LU is long overdue and there have been significant pressures to get this passed in 2012, it is likely that many of the programs in SAFETEA-LU will be continued in the new legislation, perhaps in modified form.

In addition to SAFETEA-LU, some surface transportation programs have been established or funded by other legislation. The most significant recent legislation affecting surface transportation programs has been the *American Recovery and Reinvestment Act* (ARRA)

(Public Law 111-5) that was signed into law on February 17, 2009, and is commonly referred to as the Recovery Act or the Stimulus bill. Although this Act had many aspects, the majority unrelated to transportation, it included an allocation of $48.1 billion for transportation investments. Because much of this funding was dispersed through existing programs and the unique, one-time nature of this Act, it is addressed in a separate section later.

Another important federal surface transportation program, the Transportation Infrastructure Finance and Innovation Act (TIFIA), is not a separate Public Law but was originally authorized in June 1998 as part of TEA-21. It was reauthorized and amended in 2005 by SAFETEA-LU.

The various programs authorized by SAFETEA-LU and other legislation are administered by the modal agencies of the U.S. Department of Transportation. For surface transportation programs these are primarily the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and Federal Railroad Administration (FRA). Historically, FRA programs have had limited relevance to airport ground access projects. However, with the increased emphasis in ARRA on intercity passenger rail, and particularly high-speed rail, this may change if future improvements to intercity passenger rail services involve stations located at or serving airports. Nonetheless, the majority of airport ground access projects that receive funding from federal surface transportation programs will continue to do so through the programs of the FHWA and FTA. Of course, not all the funding programs of the FHWA or FTA are relevant for airport ground access projects. The following discussion focuses on those programs that are likely to be applicable to airport ground access projects.

Federal Highway Administration Programs

The FHWA administers those programs that are directly applicable to highway and bridge projects, but also administers more broadly based programs that fund transportation planning and intermodal facilities. This partly arises from the dominant role of highways in federal surface transportation funding as well as the fact that highway planning and funding form a primary focus of many of the state and local agencies that are responsible for transportation planning and developing intermodal facilities, including the state departments of transportation (DOTs) and the metropolitan planning organizations (MPOs). Indeed, much of the federal highway funding is distributed through the state DOTs and MPOs.

The principal FHWA programs under SAFETEA-LU that are or could be applicable to airport ground access projects include the following:

- Surface Transportation Program;
- National Highway System Program;
- Congestion Mitigation and Air Quality Improvement Program;
- Transportation Infrastructure Finance and Innovation Act;
- State Infrastructure Bank Program.

Unlike the other four programs mentioned, the State Infrastructure Bank (SIB) Program does not have any separate funding authorized but rather allows states to leverage federal surface transportation funds by using them to capitalize a state infrastructure revolving fund that provides non-grant assistance, such as below-market rate loans or credit guarantees, to eligible projects.

Some more specialized or geographically targeted programs could potentially be applicable to airport ground access projects in particular circumstances that happen to fit the eligibility criteria of the program. For example, the program for Construction of Ferry Boats and Ferry Terminal Facilities could apply to construction of a ferry terminal adjacent to an airport that would allow a local ferry system to provide service to the airport. Because applicable situations are so case-specific and the demand for funding under these programs often greatly exceeds the level of funding available, potential applicability of these programs for an airport ground access project would have to be explored with the local offices of the FHWA and would most likely require development of a regional consensus in support of the project involving other agencies that might have competing projects that would also be eligible for the program. Therefore, these programs are not discussed in any detail in this report. These more specialized or geographically targeted programs include:

- Appalachian Development Highway System Program;
- Construction of Ferry Boats and Ferry Terminal Facilities Program;
- Emergency Relief Program;
- Federal Lands Highway Program.

A number of programs in SAFETEA-LU provide funds for designated projects. These programs are not discussed in this report because they would not apply to new projects. However, if these programs are reauthorized in future legislation and the funding in these programs made available for new projects, they may potentially be applicable to airport ground access projects.

A summary of the highway provisions of SAFETEA-LU was prepared by the FHWA Office of Legislation and Intergovernmental Affairs in August 2005.[69] Fact sheets on the various programs administered by the FHWA together with details of the legislation, associated regulations (Title 23 of the United States Code of Federal Regulations), and funding levels for the different programs are available on the FHWA website.[70]

Surface Transportation Program

The Surface Transportation Program (STP) provides states with flexible funding that may be used by states or localities for projects on any federal-aid highway, bridge projects on any public road, transit capital projects, and intra-city and intercity bus terminals and facilities.[71]

The authorized funding level for the STP in FY 2009 was $6.577 billion, augmented by a portion of funds from the Equity Bonus Program described below. After certain set-asides, the authorized funds are distributed to states based on the following factors:

- 25% based on total lane-miles of federal-aid highways;
- 40% based on vehicle-miles traveled on lanes on federal-aid highways;
- 35% based on estimated tax payments attributable to highway users in the states into the Highway Account of the Highway Trust Fund.

However, each state will receive a minimum of 0.5% of the funds apportioned to the STP.

In FY 2005 the STP included a set-aside for safety programs, which was eliminated from FY 2006

National Highway System Program

This program provides funding for improvements to rural and urban roads that are part of the National Highway System (NHS), a designated system of some 160,000 miles of roadway considered important to the nation's economy, defense, and mobility.[72] The NHS includes the Interstate Highway System, principal arterials in rural and urban areas that provide access to major ports, airports, public transportation facilities, or other intermodal transportation hubs, and designated connectors to major intermodal terminals. NHS funds may be used to fund transit improvements in NHS corridors, provided that the transit improvement meets the eligibility requirements for federal transit capital grants specified in chapter 53 (Public Transportation) of Title 49 of the Code of Federal Regulations, and

- The transit project is in the same corridor as, and in proximity to, a fully access-controlled highway designated as part of the NHS;
- The construction or improvements will improve the level of service on the access-controlled highway and improve regional traffic flow;
- The construction or improvements are more cost-effective than an improvement to the access-controlled highway.

The authorized funding level for the NHS in FY 2009 was $6.307 billion, augmented by a portion of funds from the Equity Bonus Program described below. After set-asides for the Alaska Highway and U.S. Territories, the authorized funds are distributed to states based on the following factors:

- 25% based on total lane-miles of principal arterials;
- 35% based on total vehicle-miles of travel on lanes on principal arterials;
- 30% based on diesel fuel used on all highways;

- 10% based on total lane-miles of principal arterials per capita.

However each state will receive a minimum of 0.5% of the funds apportioned to the NHS and Interstate Maintenance programs combined. This ensures that states with fewer lane-miles of Interstate Highways receive a proportionately larger share of NHS funds. A state may transfer up to 50% of its NHS apportionment to its apportionments for the STP, Congestion Mitigation and Air Quality Improvement, Interstate Maintenance, Highway Bridge, or Recreational Trails programs. Up to 100% of the NHS apportionment may be transferred to the STP program with the approval of the U.S. Secretary of Transportation and provided that sufficient notice and opportunity for public comment has been given.

The federal share of projects funded from the NHS program is generally 80%, although the federal share for projects to add high-occupancy vehicle or auxiliary lanes to Interstate Highways may be 90%. In both cases, the federal share is subject to an upward sliding scale adjustment for states that have large amounts of Federal lands.

Congestion Mitigation and Air Quality Improvement Program

The Congestion Mitigation and Air Quality Improvement (CMAQ) Program provides funding for projects and programs that reduce transportation-related emissions in air quality nonattainment and maintenance areas for ozone, carbon monoxide, and particulate matter, as defined by the National Ambient Air Quality Standards (NAAQS) established by the 1990 Clean Air Act Amendments (CAAA).[73] Funds are apportioned using a formula based on population and severity of pollution in ozone and carbon monoxide areas. However, each state will receive a minimum apportionment of 0.5% of the CMAQ funds in any given year, even if it has no nonattainment or maintenance areas. States with no nonattainment or maintenance areas that receive the minimum apportionment must use the funds for projects and programs that are eligible for CMAQ funding. The authorized funding level in FY2009 was $1.777 billion.

CMAQ funds may be used for a wide range of potential projects or programs, including:

- Transportation control measures, such as programs for improved public transit, construction of roads or lanes for use by passenger buses or high-occupancy vehicles, employer-based transportation management plans, and establishment of fringe and transportation corridor parking facilities serving multiple-occupancy vehicle programs or transit service;

- Purchase of public-owned alternative fuel vehicles, establishing publicly owned fueling facilities and infrastructure for alternative fuels, or support for conversion of privately-owned fueling facilities to handle alternative fuels;

- Traffic flow improvements and intelligent transportation systems projects that result in improved air quality, such as regional multimodal traveler information systems, traffic signal control systems, or electronic toll-collection systems;

- Highway congestion pricing or variable parking pricing that reflects congested conditions;

- Transit improvements that result in improved air quality, including construction of new facilities, purchase of new vehicles and equipment, and operating assistance to introduce new or expanded transit service;

- Bicycle and pedestrian facilities and programs;

- Transportation demand management programs;

- Experimental pilot projects that show promise to reduce emissions through the development of new services, innovative financing arrangements, public-private partnerships, and complementary approaches that use transportation strategies to reach clean air goals.

Details of eligible projects and programs are given in the FHWA CMAQ Program Guidance document.[74] CMAQ funds can be used for both capital projects and operating assistance, although generally CMAQ funds for operating assistance are limited to the first three years of a project or program, since the intent of the program is to encourage new initiatives that produce air quality improvements rather than provide ongoing support for established activities.

However, states and MPOs are required to give priority in distributing CMAQ funds to projects and programs that support diesel retrofits and other cost-effective emission reduction activities and cost-effective congestion mitigation activities that provide air quality benefits.

The program is jointly administered by the FHWA and FTA, with transit projects being administered and funded by the FTA and all other projects, including transit projects for which the FTA does not have statutory authority to fund, being administered and funded by the FHWA.

A state may transfer CMAQ funds to its apportionments for the STP, NHS, Interstate Maintenance, Highway Bridge, Highway Safety Improvement, or Recreational Trails programs, although the amount that may be transferred may not exceed 50% of the amount by which the state's CMAQ apportionment for the fiscal year exceeds the amount that the state would have been apportioned if the program had been funded at $1.35 billion annually.

The federal share of projects and programs funded with CMAQ funds is generally 80%, with an upward sliding scale adjustment for states that have large amounts of federal lands. interstate highway projects have a federal share of 90%. Certain other activities, including carpool/vanpool projects, priority control systems for emergency and transit vehicles, and traffic control signalization, have a federal share of 100%.

Equity Bonus Program

The Equity Bonus Program increases the funding available to a state for specific programs, including the STP, NHS and CMAQ programs, in order to ensure that its overall funding level across a broader range of programs under SAFETEA-LU meets certain threshold criteria.[75]

Federal-aid highway funds for individual programs are apportioned to states by formula using factors relevant to the particular program. After those computations are made, additional funds are distributed to ensure that each state receives an amount that reflects the state's share of contributions to the Highway Account of the Highway Trust Fund and the funding that it received under TEA-21. These equity considerations include a minimum percentage rate of return on a state's contributions to the Highway Account of the Highway Trust Fund, which increased from 90.5% for FY 2005 and 2006 to 92% for FY 2008 and 2009. In addition, no state would receive less than a specified percentage of its average annual apportionments and funding for High Priority Projects under TEA-21, which increased from 117% in FY 2005 to 121% in FY 2009.

In addition, states with certain characteristics, such as a total population less than 1 million or a median household income of less than $35,000 per year, would receive a share of apportionments and High Priority Projects that is at least equal to their average annual share of total apportionments and High Priority Projects under TEA-21.

All but $2.639 billion per year of the Equity Bonus Program funding is distributed to the Interstate Maintenance, NHS, Bridge, STP, Highway Safety Improvement, and CMAQ programs and take on the eligibility requirements of those programs. The remaining $2.639 billion has the same eligibility requirements as the STP program, but is not subject to the STP safety set-aside, the transportation enhancement set-aside, or the sub-allocations to sub-state areas. In addition, $639 million of this amount is exempt from the annual obligation limitation established by SAFETEA-LU to limit highway spending each year. The remaining $2 billion does not expire if not used by the end of the fiscal year but is carried over to future years.

Transportation Infrastructure Finance and Innovation Act

The Transportation Infrastructure Finance and Innovation Act (TIFIA) of 1998 was originally authorized under TEA-21 and subsequently reauthorized and amended by SAFETEA-LU.[76,77] The TIFIA program provides federal credit assistance to nationally or regionally significant surface transportation projects, including highway, transit and rail projects. The program is designed to fill market gaps and leverage private co-investment by providing projects with supplemental or subordinate funding. The program offers three types of financial assistance, designed to address funding requirements throughout a project's life cycle:

- *Secured loans* in the form of direct federal loans to project sponsors that offer flexible repayment terms and provide combined construction financing and permanent financing of project capital costs;

- *Loan guarantees* to non-federal lenders such as pension funds that make loans for projects;

- *Standby lines of credit* that offer contingent sources of funding in the form of federal loans that may be drawn on to supplement project revenues as needed during the first 10 years of a project's operation.

In the case of loan guarantees, repayments to the non-federal lender must commence no later than five years after substantial completion of the project. Senior project obligations must receive an investment grade rating. The total amount of TIFIA credit assistance many not exceed 33% of project costs and the TIFIA credit instrument must be supported in whole or part from user charges or other dedicated non-federal funding sources that also secure the project obligations. TIFIA credit assistance must be repaid within 35 years after the project's substantial completion.

The TIFIA program was authorized at a funding level of $122 million for each fiscal year from 2005 to 2009.

Any type of highway project and transit capital project eligible for federal assistance through the surface transportation programs is eligible for the TIFIA credit program. Eligibility is extended to intercity passenger bus and rail facilities and vehicles, as well as international bridges and tunnels and certain freight facilities. To qualify for TIFIA assistance, a project must cost at least $50 million or a third of the state's annual apportionment of federal-aid highway funds, whichever is less. The cost threshold for intelligent transportation system projects is reduced to $15 million. Freight projects with a common objective of improving the flow of goods may be combined to meet the required threshold. In addition, a project must be consistent with the state's Long-Range Transportation Plan and be included in the Transportation Improvement Program.

Proceeds from TIFIA loans and loan guarantees may be used to refinance long-term project obligations or federal credit instruments if this provides additional funding capacity for the completion, enhancement, or expansion of new transportation infrastructure.

Projects meeting the eligibility requirements are evaluated and selected by the US DOT on the basis of the extent to which they generate economic benefits, leverage private capital, promote innovate technologies, and meet other program objectives.

Among the potential advantages of the TIFIA program are its ability to provide low-cost financing to private, cross-jurisdictional, and other non-traditional project sponsors and its flexible features that enable many non-traditional types of revenue to be included in a project's funding package. By providing improved access to capital markets, flexible repayment terms, and potentially more favorable interest rates than can be found in private capital markets, the TIFIA program can help advance expensive projects that might otherwise be delayed or deferred due to their size, complexity, or uncertainty over the timing of their revenues.

State Infrastructure Bank Program

SAFETEA-LU established a new program under which states, as well as the District of Columbia, Puerto Rico, American Samoa, Guam, the Virgin Islands, and the Northern Mariana Islands, are authorized to establish a State Infrastructure Bank (SIB) by entering into a cooperative agreement with the U.S. Secretary of Transportation to use federal transportation funds to capitalize a revolving fund to finance infrastructure projects.[78] The intent of this program is to allow the states to increase the efficiency of their transportation investments and leverage federal resources by attracting non-federal public and private investment. The program provides states with greater flexibility in funding projects by allowing other types of financial assistance than direct grants, such as loans that are repaid to the revolving fund.

SIBs can provide various forms of non-grant assistance to public or private entities for eligible projects, including below-market rate subordinate loans, interest rate buy-downs on third party loans, and guarantees and other forms of credit enhancement. The program regulations require that any debt issued or guaranteed by an SIB must be of investment grade quality.

Projects eligible for SIB financial assistance include all projects eligible under the various highway programs of SAFETEA-LU defined in CFR Title 23, transit capital projects defined in Section 5302 of CFR Title 49, and "any other projects related to surface transportation that the Secretary determines to be appropriate." In addition to the initial credit assistance funded with federal contributions to the SIB, including any non-federal matching funds, any project assistance funded from loan repayments and other recycled funds is subject to the eligibility requirements of CFR Title 23 and Title 49 as appropriate.

States participating in the program may capitalize the accounts in their SIB with federal surface transportation funds for each of fiscal years 2005 to 2009 from their apportionments from the following programs:

- Up to 10% of the funds apportioned from the NHS, STP, Highway Bridge, and Equity Bonus programs;
- Up to 10% of the funds made available for transit capital projects under the programs for Urbanized Area Formula Grants, Capital Investment Grants, and Formula Grants for Other Than Urbanized Areas (these programs are discussed below);
- Funds made available for rail capital projects under subtitle V (Rail Programs) of CFR Title 49.

States are required to match federal funds used to capitalize an SIB on an 80-20 federal/non-federal basis, except that the federal share for funds derived from highway programs is subject to an upward sliding scale adjustment for states that have large amounts of federal lands, corresponding to the requirements for the programs from which the funds are derived.

Federal Transit Administration Programs

The Federal Transit Administration (FTA) is responsible for managing a broad range of capital grant and operating assistance programs for public transportation providers, authorized under SAFETEA-LU. These programs fall into two broad categories: Formula Grants and Discretionary Grants.[79] As the names of the categories imply, Formula Grants are distributed to states and local jurisdictions and agencies according to a formula defined in the legislation, while Discretionary Grants are competitive and awarded based on an evaluation of applications and selection by the FTA. Many of the programs address operational aspects of transit agencies, such as replacement of buses and bus facilities, provision of transit service to specific markets such as meeting transportation needs of the elderly or those with disabilities, or research into issues related to public transportation. The principal programs that are or could be relevant to funding intermodal airport ground access projects consist of:

- Fixed Guideway Modernization Program;
- Urbanized Area Formula Program;
- Alternatives Analysis Program;
- Major Capital Investments (New Starts and Small Starts) Program.

The funds appropriated and apportioned to these four programs in FY 2010 are shown in Table 2.

The Urbanized Area Formula Program is the largest of the four programs, with about $4.1 billion apportioned by formula to local agencies. The Fixed Guideway Modernization Program had about $1.65 billion apportioned by formula to local agencies. The discretionary Major Capital Investments Program had about $2.0 billion available for allocation, while the much smaller discretionary Alternatives Analysis Program had about $25 million available for allocation.

Fixed Guideway Modernization Program

The Fixed Guideway Modernization Program provides capital grants to public agencies to modernize or improve existing fixed guideway systems, defined as any transit service that uses exclusive or controlled rights-of-way or rails, entirely or in part.[80] The term fixed guideway systems thus includes commuter rail, heavy rail transit, light rail, and automated guideway transit, as well as aerial tramways and similar systems, and bus services operating on exclusive or controlled rights-of-way and high-occupancy vehicle lanes. The Fixed Guideway Modernization Program was originally established to support renovation of the nation's older rail transit systems and has been continued to ensure that new systems funded with federal capital grants can be modernized as they age.

Table 2. Revised FY2010 Appropriations and Apportionments for Selected FTA Grant Programs

Program	$ (million)
Urbanized Area Formula (Section 5307)	
Total available	4,151.7
Less oversight (0.75%)	(31.1)
Reapportioned funds	5.5
Total apportioned	4,126.0
Fixed Guideway Modernization (Section 5309)	
Total available	1,663.0
Less oversight (1%)	(16.6)
Reapportioned funds	0.3
Total apportioned	1,646.7
Alternatives Analysis (Section 5339)	
Total available	24.9
Funds available for allocation	24.9
New Starts and Small Starts (Section 5309)	
Total available	2,000.0
Less oversight (1%)	(20.0)
Funds available for allocation	1,980.0

Note: Section numbers refer to section in U.S. Code of Federal Regulations Title 49.

Source: FTA, "FY 2010 Apportionments, Allocations, and Program Information --Supplemental" (Table 1). www.fta.dot.gov/funding/apportionments/grants_financing_11647.html (accessed Sept. 22, 2010).

Federal grant funds can be used to purchase or rehabilitate rolling stock, track, line equipment, signals, communications and power equipment, structures, stations and terminals, maintenance facilities and equipment, and operational support equipment, as well as for system extensions and preventive maintenance. Funds are allocated by a statutory formula to urbanized areas that have rail systems that have been in operation for at least seven years. The available funding is divided into seven tiers, with specified amounts in each tier. The allocation formula for the first four tiers are based on the system data used to apportion the funding in FY 1997, while the formula for the other three tiers are based on the latest system data for available route miles and revenue vehicle-miles on segments that are at least seven years old. Federal funds have to be matched on an 80-20 federal/local basis.

Urbanized Area Formula Program

The Urbanized Area Formula Program provides federal funds to urbanized areas, defined as an incorporated area with a population of 50,000 or more and designated as such by the U.S. Bureau of the Census, for transit capital and operating assistance and transportation-related planning.[81] UAFP funds can be used only for operating assistance by urbanized areas with populations of less than 200,000. For urbanized areas with populations of 200,000 or more, funds are apportioned and distributed to a designated recipient agency selected locally that manages the local distribution of the funds. Funds for urbanized areas with populations less than 50,000 are distributed through each state.

Urbanized Area Formula Program funds are apportioned on the basis of legislatively established formulae that are based on population and population density, and for urbanized areas with populations of 200,000 or more that also consider a combination of bus revenue vehicle-miles, bus passenger-miles, fixed guideway revenue vehicle-miles and fixed guideway route miles. Funds can be used for a wide range of capital investments, including investments in new and existing fixed guideway systems, purchase or overhaul of buses or other rolling stock, and preventive maintenance.

Generally, federal funds have to be matched on an 80-20 federal/non-federal basis for capital costs and a 50-50 basis for operating assistance. However, the federal share can be 90% for vehicle-related equipment required for compliance with the Americans with Disabilities Act and the Clean Air Act and for projects or project costs related to bicycles.

Alternatives Analysis Program

This discretionary grant program provides federal funds to assist states and other public agencies undertake alternatives analysis for transportation projects when at least one of the alternatives under consideration is a new fixed guideway transit system or an extension to an existing fixed guideway transit system.[82] The objective of the program is to assist in funding the evaluation of all reasonable modal and multimodal alternatives and alignment options to meet identified transportation needs in a broadly defined travel corridor.

The transportation planning process funded by the Alternatives Analysis Program should:

- Include an assessment of a wide range of public transportation or multimodal alternatives;
- Provide ample information to enable the U.S. Secretary of Transportation to make findings of project justification and local financial commitment;
- Support the selection of a locally preferred alternative;
- Enable the local MPO to adopt the locally preferred alternative as part of the region's Long-Range Transportation Plan.

Applicants for funds from the Alternatives Analysis Program must have the legal, financial, and technical capacity to carry out the proposed project being considered in the alternatives analysis and maintain any facilities and equipment for the proposed project that are purchased with federal assistance. Federal funds from the Alternative Analysis Program have to be matched on an 80-20 federal/local basis.

Generally, an alternatives analysis study funded through the Alternatives Analysis Program will be undertaken as part of a planning process that will lead to an application for federal assistance through the Major Capital Investments Programs described below.

Major Capital Investments (New Starts and Small Starts) Programs

The discretionary New Starts and Small Starts programs provide federal funding assistance for capital investment in new fixed guideway systems or extensions of existing fixed guideway systems, including commuter rail, heavy rail transit, light rail, automated guideway transit, and busways.[83] Eligible projects also include systems that use a fixed catenary system and a right-of-way shared with other modes of transportation (i.e. trolley-bus systems).[84] The Small Starts program is limited to projects that have a total capital cost of $250 million or less, with a limit on the federal contribution of $75 million. Small Starts projects must either (a) meet the definition of a fixed guideway for at least 50% of the project length in the peak period or (b) be corridor-based bus projects with 10-minute peak and 15-minute off-peak headways, or better, and operating at least 14 hours per weekday.[85] Each year, $200 million of the available funding for the New Starts program is allocated to the Small Starts program.[86]

The statutory match requirement for New Starts funding is an 80-20 federal/local split. However, for projects funded under a Full Funding Grant Agreement (FFGA), discussed further below, the FTA encourages project sponsors to request a New Starts funding share as low as possible. The Congressional Conference Report on the FY 2002 Department of Transportation Appropriations Act instructed FTA not to sign any FFGAs after September 30, 2002 that have a maximum federal share higher than 60%.[87]

Due to the discretionary nature of the funding decisions for the New Starts program, SAFETEA-LU directs the FTA to evaluate and rate candidate New Starts projects as an input to decisions on federal funding and at specific milestones during each project's planning and development. The FTA has defined a New Starts planning and project development process that all New Starts projects must follow. This process is designed to assist project sponsors, local agencies and decision-makers evaluate alternative strategies for meeting transportation needs in a defined corridor and select the most appropriate project to carry forward to construction and operation.[88] This process is broadly divided into five phases, three of which are specified in the legislative requirements:

- System planning;
- Alternatives analysis;
- Preliminary engineering;

- Final design;
- Construction.

The systems planning phase identifies the need for the project and defines it in sufficient detail to develop the scope of an alternatives analysis study. This phase will typically be undertaken as part of ongoing transportation planning activities in the region. The alternatives analysis phase is intended to enable local decision makers to select the locally preferred alternative and provide the FTA with sufficiently detailed information to evaluate the project for potential federal funding under the New Starts program. These two phases are not eligible for funding from the New Starts program, but can be funded through other federal grant programs, such as the Alternatives Analysis Program or the Urban Area Formula Program discussed above.

If the FTA selects a project for New Starts funding, it can then progress to the preliminary engineering phase. This phase defines the project in sufficient detail to prepare the required environmental impact documentation under the National Environmental Policy Act (NEPA) and complete the NEPA process, which culminates with the FTA issuing a Record of Decision (ROD) or Finding of No Significant Impact (FONSI) for the project. The FTA then evaluates whether the project sponsor has the technical capability to advance the project into the final design phase. This is the last phase of project development and includes right-of-way acquisition, utility relocation, and preparation of final construction plans, construction management plans, detailed specifications, construction cost estimates, and bid documents, and finalization of the project financial plan. If the project is to be funded through an FFGA, this phase will also include the preparation of a plan for the collection and analysis of the necessary data to perform the “Before and After Study” required for all projects funded with a FFGA.

Finally, during the final design phase, the FTA will evaluate whether the project is sufficiently well defined to issue an FFGA or Project Construction Grant Agreement (PCGA) so that the construction phase can commence. Since construction of major capital investment projects typically extends over several years, an FFGA commits federal funding to a specific project over a multi-year period in order that the project sponsor can begin construction with the assurance that federal funding will be available for subsequent years.[89] An FFGA is issued for projects requiring $75 million or more of New Starts funding while a PCGA is generally issued for projects requiring less than $75 million and funded through the Small Starts program.

The FFGA or PCGA defines the project, including the cost, scope, and schedule, establishes the terms and conditions of federal financial assistance, and commits a maximum amount of New Starts or Small Starts funding. If project costs exceed the projected costs in the FFGA or PCGA, the project sponsor is responsible for making up any shortfall with local funds. Federal funding commitments are subject to Congress appropriating sufficient funds for the New Starts program in each year but take priority over funding for new projects. This project planning and development process is illustrated in Figure 1.

Applications for New Starts or Small Starts funding are evaluated against two criteria: project justification and local financial commitment. Project justification assesses whether the anticipated benefits of a project justify the costs involved, irrespective of the level of federal funding of the project, while local financial commitment addresses the proposed share of total project costs from sources other than the New Starts or Small Starts programs, the strength of the proposed capital financing plan, and the ability of the sponsoring agency to fund the operations and maintenance of the entire transit system, including both the existing service and the planned project, once the project is built. This evaluation is used not only to determine whether a planned project qualifies for federal funding from the New Starts program, but also to prioritize and select projects to fund. This evaluation is not a one-time decision, but continues during the planning and project development process as more detailed analysis results become available and the project sponsor addresses FTA concerns.

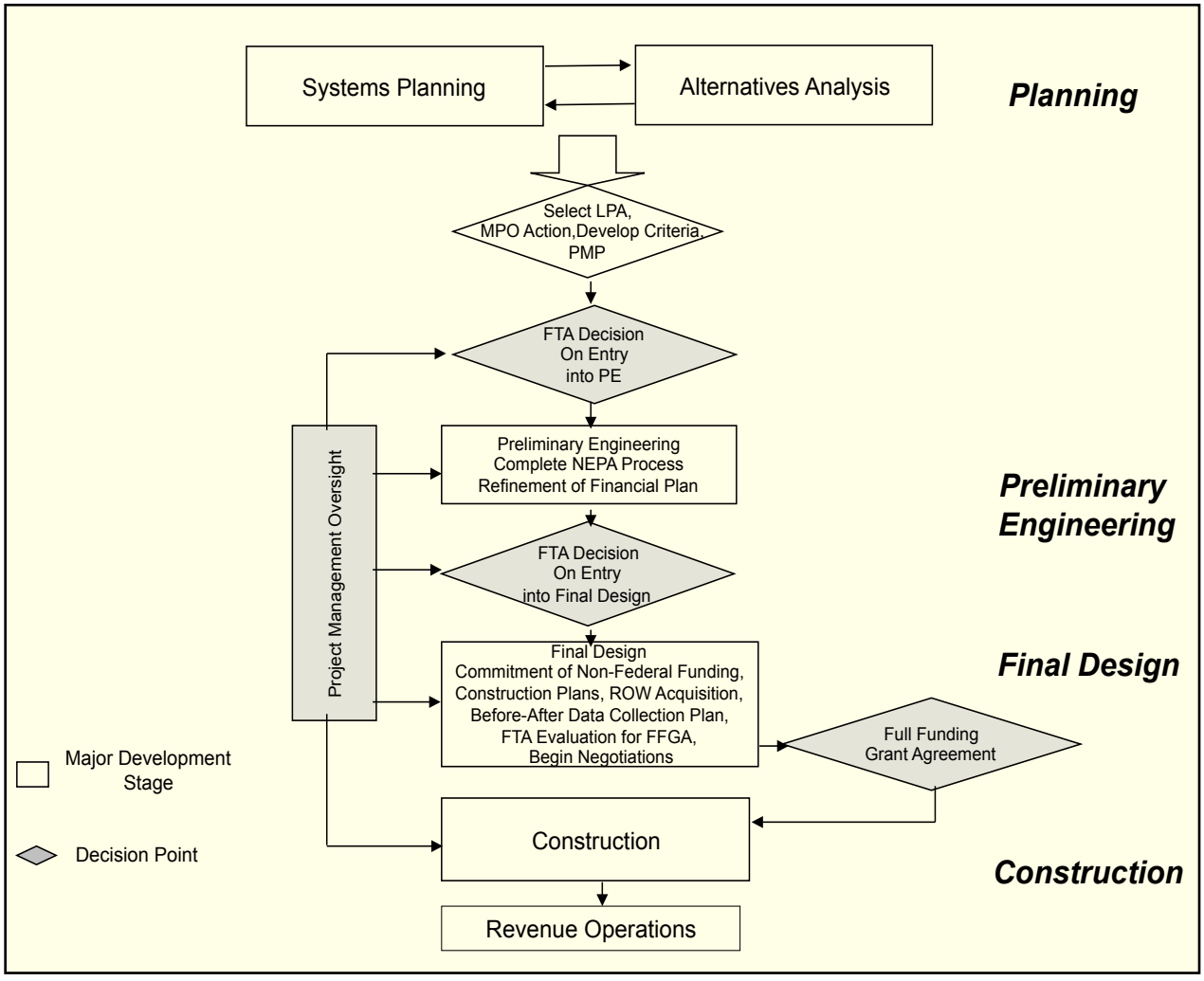

Figure 1. New Starts Planning and Project Development Process

Source: FTA, "New Starts Planning and Project Development Process" http://www.fta.dot.gov/documents/FTA_New_Starts_Project_Development_Process.ppt

The project evaluation process has evolved over time, within the constraints established by the most recent authorizing legislation and Congressional directives. The most recent description of the evaluation process was published in July 2010.[90] This defined the following seven criteria to evaluate project justification:

- Mobility improvements;
- Environmental benefits;
- Operating efficiencies;
- Cost effectiveness;
- Transit supportive land use;
- Economic development effects;
- Other factors.

Specific measures were defined for each criterion that vary considerably in complexity and the effort required to determine appropriate numerical values. Based on the value of the measure for each criterion, the FTA assigns a rating to the project against that criterion using a five-tier scale: High, Medium-High, Medium, Medium-Low, and Low. The overall project justification rating is then obtained by taking a weighted average of the ratings for each criterion. Ratings for mobility improvements, cost effectiveness, transit supportive land use, and economic development are weighted twice those for environmental benefits and operating efficiencies.

"Other factors" are not formally included in the project justification rating, but are considered by the FTA if the project sponsor provides compelling justification for their inclusion in the evaluation. In this case, the FTA may raise the overall rating by one step, or report the other factors in its evaluation of the project but not change the overall rating.

A similar approach is followed for local financial commitment, with the rating for the strength of the capital financial plan weighted two and a half times that of the share of project costs from local and other funding sources, and the ability of the project sponsor to fund future operation and maintenance of the entire system weighted one and a half times that of the share of project costs from local and other funding sources.

An overall project rating is then determined by averaging the project justification rating and the local financial commitment rating. Once a project has been evaluated and recommended by the FTA to progress to the Preliminary Engineering, Final Design, or FFGA or PCGA phases, the project is included in the *Annual Report on Funding Recommendations* from the U.S. Secretary of Transportation to Congress and the President's annual budget request to Congress. Final funding decisions for the projects are then made by Congress in determining the appropriations for the fiscal year.

A somewhat simplified approach is followed for the evaluation of Small Starts projects and an even simpler approach for "Very Small Starts" projects (a subclass of Small Starts projects that have a total capital cost less than $50 million and that meet a number of other criteria).

In June 2010, the FTA initiated a process to revise the way that New Starts and Small Starts projects are evaluated. An Advanced Notice of Proposed Rulemaking (ANPRM) solicited comments on three of the criteria used to evaluate project justification: cost effectiveness, environmental benefits, and economic development benefits.[91] Following receipt of comments and analysis by FTA, a Notice of Proposed Rulemaking (NPRM) was issued on January 25, 2012 that proposed changes in the evaluation and rating process, with comments due by March 26, 2012.[92]

The more significant proposed changes in the evaluation criteria include:

- Mobility improvement measures would continue to be based on the number of trips using the proposed project, but would no longer consider the user benefits per passenger-mile;

- Environmental benefit measures would assess the annualized capital and operating cost of the project compared to the monetized value of the anticipated direct and indirect benefits to human health, safety, energy, and air quality that are expected to result from the project instead of the current practice of simply considering whether the project is a non-attainment area under the Clean Air Act or not;

- Operating efficiency would be measured in terms of the change in operating and maintenance cost per "place-mile" (vehicle capacity multiplied by annual revenue miles of service) instead of the change in operating cost per passenger-mile;

- Cost-effectiveness measures would be based on the annualized cost per trip on the project, including capital, operating and maintenance costs, compared to the existing system, instead of the current practice of measuring the incremental annualized capital and operating costs (over a "baseline" system in the "base year") per hour of transportation system user benefits in the forecast year;

- Transit supportive land use measures have been reworded to refer to public transportation supportive land use policies and future patterns and add consideration of publicly supported housing in the corridor;

- Economic development measures have been restructured and reworded and add consideration of the share of affordable housing in the project corridor.

While some of these proposed changes simplify the analysis needed to support the evaluation, the proposed change in measuring environmental benefits would impose a significantly increased analysis requirement. Also, changing the measures to only consider trips rather than passenger-miles or user travel time benefits will tend to favor projects with a shorter overall length for a given level of total ridership.

American Recovery and Reinvestment Act

The American Recovery and Reinvestment Act (ARRA) was signed into law on February 17, 2009 and was initially authorized to provide $787 billion in a wide range of programs to help stimulate the economy to overcome the effects of the recession that began in late 2007. The estimated expenditure levels were subsequently revised to $840 billion for consistency with the President's fiscal year 2012 budget and scoring changes made by the Congressional Budget Office.[93] One component of these expenditures was an allocation of $47.5 billion to the U.S. Department of Transportation for additional contracts, grants, and loans for transportation projects.[94] The majority of these funds were distributed through existing programs by the modal agencies by increasing the funding levels available for those programs and encouraging project sponsors to submit applications for additional funds for projects for which the funds could be spent within the time limits specified in ARRA. The largest budget allocation was $26.8 billion to the FHWA that funded more than 12,000 road, highway, and bridge projects.[95] The second largest budget allocation was $8.4 billion to the FTA for transit capital improvements.[96]

TIGER Discretionary Grant Program

As part of the ARRA transportation funding, $1.5 billion was allocated to the U.S. DOT for discretionary grants for road, rail, transit and port projects that promise to achieve critical national objectives, through a program termed the Transportation Investment Generating Economic Recover (TIGER) Discretionary Grant program.[97] Congress subsequently allocated $600 million in FY 2010 for a second round of grants, termed TIGER II, and a further $527 million for a third round of grants in FY 2011. The TIGER II round included a new Planning Grant category. An announcement of the availability of a fourth round of TIGER grants for FY 2012 was published on January 31, 2012.[98] Unlike the initial round of TIGER grants, which was authorized by ARRA, subsequent rounds were authorized by successive Congressional Appropriations Acts. The fourth round was authorized by the *Consolidated and Further Continuing Appropriations Act, 2012* (Public Law 112-055), which was signed by the President on November 18, 2011 and authorized the DOT to award up to $500 million in TIGER grants.

The TIGER program is designed to fund projects that are multimodal, multi-jurisdictional, or otherwise challenging to fund through existing programs and will have a significant impact on the nation, a metropolitan area, or a region. The first three rounds of the TIGER program awarded 139 capital grants and 33 planning grants under TIGER II. Grant awards included the following airport ground access projects:

- Crenshaw/LAX Light Rail Connection – a new light rail line linking the Los Angeles Metro Exposition Line and Green Line, with a stop serving Los Angeles International Airport (LAX);
- San Bernardino Airport Access – road and bridge infrastructure;
- Dallas Area Rapid Transit (DART) Orange Line Extension – light rail extension to Dallas/Fort Worth International Airport;

- South Link: Sea-Tac Airport to S. 200th Street – light rail extension.

Although ARRA funding for transportation projects was a one-time allocation of funds (which could be spread over several fiscal years), and not intended or structured as an ongoing program, the subsequent funding of additional rounds of TIGER grants suggests that this program may continue, possibly in modified form, in the future. Because of the flexibility offered by the program, this may present an important potential future funding source for intermodal airport ground access projects.

STATE FUNDING PROGRAMS

In addition to administering the use and distribution of certain federal transportation funds as discussed above, states generally have established their own transportation funding programs that are funded by various state revenue sources, including state motor fuel taxes that are imposed in addition to federal motor fuel taxes that flow into the Highway Trust Fund. The nature of the funding sources and the state transportation programs naturally vary from state to state.

The American Association of State Highway and Transportation Officials (AASHTO) Center for Excellence in Project Finance,[99] a joint effort of AASHTO and the U.S. DOT established by SAFETEA-LU, provides information on different sources of state funding and maintains a database of state transportation revenues and spending in broadly defined categories by fiscal year for each state.[100] As of March 2012, this covered the period 1992 to 2008. However, the spending categories do not identify specific programs or separate spending by the source of the funds.

State revenues to support transportation programs derive from a wide range of sources, including:

- State motor fuel taxes and fees;
- Motor vehicle registration fees;
- Motor vehicle sales taxes;
- Tolls;
- Bond proceeds;
- General sales taxes;
- State General Fund appropriations.

The composition and sources of funding varies from state to state but motor fuel taxes and fees and vehicle registration taxes and fees typically account for the largest share, although some states do not levy a state motor fuel tax.

An analysis of surface transportation funding revenue sources for FY 2004 by the FHWA shown in Table 3 shows that on a national basis state revenue sources contributed 44% of total expenditures, while local revenues contributed 36% and federal revenues and reductions in the Highway Trust Fund balance only contributed 21%. State motor fuel taxes and vehicle taxes and fees together accounted for 58% of total state revenues for surface transportation funding. Bond proceeds were the next largest revenue source, accounting for 13% of state transportation revenues. Of course, interest has to be paid on bonds and the bonds eventually have to be repaid, so counting bond proceeds as revenue is a little misleading, since in the long run the associated expenses involved more than offset the revenue from the bond proceeds.

A more detailed breakdown of state funding for public transportation programs is available from an annual survey performed by the AASHTO Standing Committee on Public Transportation in association with the American Public Transportation Association. As of May 2012, the most recent survey was published in July 2011 using FY 2009 data reported by the states.[101] For each state and the District of Columbia, the survey results show each state program, the state revenue sources and amounts used to fund that program, the eligible uses and amounts funded, and the methods of distributing the funds and the amounts distributed by each method, as well as remarks and additional information on each program. However, a number of states funded their programs through allocations from a state Transportation Trust Fund or similar fund and did not break out the revenues flowing into that fund by revenue source.

Table 3. Revenue Sources for Surface Transportation Funding Fiscal Year 2004 ($ billion)

	Federal		State		Local		Total	
Revenue Type	**$ (b)**	**Share**	**$ (b)**	**Share**	**$ (b)**	**Share**	**$ (b)**	**Share**
User charges								
Motor fuel taxes	31.1	82.1%	29.7	36.9%	1.2	1.8%	62.0	33.5%
Vehicle taxes and fees	3.1	8.2%	16.8	20.9%	0.9	1.4%	20.8	11.3%
Fares	0.0	0.0%	0.0	0.0%	9.1	13.7%	9.1	4.9%
Tolls	0.0	0.0%	5.6	7.0%	0.9	1.4%	6.5	3.5%
Total user charges	34.2	90.2%	62.1	64.7%	12.1	18.2%	98.4	53.2%
Other revenue								
Sales tax	0.0	0.0%	2.1	2.6%	4.8	7.2%	6.9	3.7%
Property taxes	0.0	0.0%	0.1	0.1%	8.0	12.0%	8.1	4.4%
Other taxes and fees	0.3	0.8%	4.6	5.7%	5.0	7.5%	9.9	5.4%
Bond proceeds	0.0	0.0%	10.4	12.9%	5.4	8.1%	15.8	8.5%
Investment income	0.0	0.0%	2.6	3.2%	4.9	7.4%	7.5	4.1%
Other income	0.0	0.0%	0.0	0.0%	2.0	3.0%	2.0	1.1%
General fund appropriations	3.4	9.0%	6.8	8.4%	19.5	29.4%	29.7	16.1%
Other public funds	0.0	0.0%	1.8	2.2%	4.7	7.1%	6.5	3.5%
Total other revenue	3.7	9.8%	28.4	35.3%	54.3	81.8%	86.4	46.8%
Total revenues	37.9	100%	80.5	100%	66.4	100%	184.8	100%
Reserves withdrawn	2.2						2.2	
Total expenditures	40.1	21.4%	80.5	43.0%	66.4	35.5%	187.0	100%

Source: AASHTO Center for Excellence in Project Finance, "Transportation Funding & Financing -- Funding" www.transportation-finance.org/funding_financing/funding/ (accessed Mar. 18, 2012).

The survey report provides summary information that shows changes in the total amount of state funding for public transportation for each state for selected years since 1995 compared to the level of federal funding for public transportation for each state for each of those years. Among the seven larger states with total funding for public transportation over $1 billion in FY 2009, the share of funding from state revenues compared to federal funds varied from just over 80% for Maryland to a little over 50% for Illinois. The share of public transportation funding from state revenues for states with total funding for public transportation of less than $1 billion varied from over 80% for Delaware to zero for five states (Alabama, Arizona, Hawaii, Nevada, and Utah). Eight of these 43 states and the District of Columbia (DC) had a share of total public transportation funding from state revenues over 50%, while another ten had a share between 20% and 50%.

The total funding for public transportation naturally varied widely from state to state reflecting not only funding from state revenues and state population, but also the size and nature of the state's urban areas. New York State had by far the largest level of public transportation funding at $6.15 billion, followed by California at $2.85 billion and Massachusetts at $1.64 billion. When expressed in terms of state funding per person, DC had the highest level at $503 per capita, followed by New York State at $225 per capita and Massachusetts at $194 per capita. In spite of having the second highest level of state funding for public transportation after New York State, California ranked only 13th on the basis of state funding per person at $41 per capita, less than several states with much smaller populations, including Alaska ($115 per capita), Delaware ($103 per capita) and Rhode Island ($46 per capita). However, the high per capita funding for public transportation by DC is misleading on several counts. While DC is counted as a state in the survey, it also functions as a local jurisdiction. Of the $302 million in funding for public transportation reported by DC, $230 million consisted of an operating subsidy from DC General Funds for the Washington Metropolitan Area Transportation Authority (WMATA), which serves a much larger area in the Washington region than just DC. Furthermore, an additional $65.5 million consisted of capital funding for WMATA from bond proceeds, which eventually have to be repaid but increase the levels of reported funding in the years when the bond proceeds are generated.

Eligible uses for state public transportation funds vary by state, with most states providing funding for both operating costs and capital projects. Of the 45 states and DC that had state funding programs in FY 2009, 40 had programs that provided capital funding and 43 had programs that provided funding for operating costs. Across all states and DC, 15% of state funding was committed to capital projects while 55% was dedicated to covering operating costs and 30% could be used for either. Overall, almost $2 billion was dedicated to capital costs, with another $4 billion eligible for either capital costs or operating costs. However, the balance between state funding eligible for capital and operating costs varied widely between states, with 95% of the state funding in New Mexico dedicated to capital projects while only 3% of the state funding in Ohio was eligible for capital projects.

In summary, state funding programs for public transportation are more important than federal funding in 14 states and DC, which account for over 43% of the population of all 50 states and DC In total across all states and DC state funding for public transportation exceeds federal funding by 35%. State funding programs primarily cover operating costs, but also provide a significant amount of capital funding in most states.

In order to provide a more detailed example of representative state transportation funding programs, the following subsection describes the programs in California funded by state revenues.

California State Transportation Funding

California has a number of transportation funding programs financed from a variety of state revenues.[102] These programs cover the State Highway System, and provide assistance to local streets and roads, public transportation, including three intercity rail routes,

airports, seaports, ferries, and bicycle and pedestrian facilities. State revenue sources for transportation programs include:

- A state fuel excise tax of 18 cents per gallon on gasoline and 13 cents per gallon on diesel fuel as of July 1, 2011. These revenues are divided between the State Highway Account and cities and counties by a statutory formula, with 64% allocated to the State Highway Account and 36% allocated among cities and counties.

- Fuel Tax Swap legislation, originally enacted in 2010, that eliminated the state sales tax on gasoline and replaced it with an additional excise tax of 17.3 cents per gallon, which was intended to generate revenues equivalent to what would have been collected from the sales tax. These revenues are allocated to local streets and roads and the State Highway Account as discussed below.

- Truck weight fees levied on commercial vehicles and that are intended to compensate for wear and tear on state roadways. Starting in 2011, these revenues are deposited in a Transportation Debt Service Fund within the state General Fund to cover payments on general obligation bond debt service for specified voter-approved transportation bonds.

- A portion of state sales taxes. Since 1971, 0.25% of the state retail sales tax has been earmarked for transit and is deposited into a Local Transportation Fund in each county. In addition, 4.75% of the state sales tax on diesel fuel is deposited into the Public Transportation Account and split equally between state and local transit programs.

- An additional sales tax on diesel fuel that was established by the Fuel Tax Swap legislation to offset the loss of revenue resulting from reducing the diesel fuel excise tax from 18 cents to 13 cents per gallon. As of July 1, 2011, this tax was 1.87%, with the rate varying in subsequent years. The revenues from this tax are dedicated to the State Transit Assistance (STA) program.

- Proceeds from voter-approved general obligation bonds for transportation programs. Proposition 1B in 2006 authorized the state to issue $19.9 billion in general obligation bonds with the proceeds to be distributed among a variety of programs. Proposition 1A in 2008 authorized the state to issue $9.95 billion in general obligation bonds to support construction of a high-speed train system in the state, of which $950 million is to be used for capital improvements to intercity rail lines, commuter rail lines, and urban rail systems that provide connectivity to the high-speed train system.

The California Board of Equalization is required to adjust both the gasoline and diesel state excise tax rates annually so that they are consistent with the estimated revenue loss from the sales tax changes on gasoline and diesel fuel.[103]

The revenues from the Fuel Tax Swap excise tax on gasoline are allocated 44% to local streets and roads, 44% to the State Transportation Improvement Program (STIP), and

12% to the State Highway Operation and Protection Plan (SHOPP). The allocation of STIP funds is discussed further below. SHOPP funding is used for pavement rehabilitation and operational and safety improvements of state highways and bridges.

The state levies vehicle registration and driver license fees, which largely are used to fund the California Highway Patrol (CHP) and Department of Motor Vehicles (DMV), as well as providing smaller amounts to the California Air Resources Board (CARB) and other agencies. Any balance is deposited in the State Highway Account. In FY 2009/10 the revenue from vehicle registration and driver license fees was about $2.8 billion, of which about $1.8 billion was allocated to the CHP, $908 million to the DMV, 119 million to the CARB, and $44 million to other agencies. Only $3.1 million was deposited in the State Highway Account from these fees.[104]

In addition to vehicle registration fees, a vehicle license fee of 0.65% of the vehicle value is levied in lieu of property tax. This generated $545 million in FY 2009/10 and is returned to city and county general funds.

State transportation funds from these various sources of state revenues are allocated and distributed through a number of different accounts and programs, the more important of which are discussed in the following sub-sections.

State Highway Account

The State Highway Account (SHA) receives revenues from the state fuel excise tax, revenues from the fuel tax swap, various other state revenues, including interest, rents, and sale of property, and state apportionments from the federal Highway Trust Fund. These funds are in turn used to support a variety of activities and programs, including highway system maintenance and operations and other non-capital outlays, SHOPP, the Local Assistance Program, the Interregional Transportation Improvement Program, and the Regional Transportation Improvement Program (RTIP).[105]

The SHA Loan Program uses unallocated funds in the SHA to make short-term loans of up to four years to local agencies for capital improvements projects that are eligible for STIP funding and included in an adopted Regional Transportation Plan. Eligible projects must have a total cost greater than $10 million and meet various other conditions.[106]

Public Transportation Account

The Public Transportation Account (PTA) is funded from state sales tax on diesel fuel and provides funds to state transit programs managed by the California Department of Transportation and the State Transit Assistance (STA) Program that provides funding to local agencies and transit operators through the state's Regional Transportation Planning Agencies (RTPAs). Funds are currently divided 25% to Caltrans and 75% to the STA Program. The STA funds are split 50:50 between local jurisdictions and transit operators.[107]

Aeronautics Account

Revenues from an eighteen-cents-per-gallon state excise tax on aviation gasoline and a two-cents-per-gallon state excise tax on jet fuel are deposited in the Aeronautics Account. These funds are used to fund the operations of the Caltrans Division of Aeronautics, provide funds for aeronautical planning through the PTA, and provide assistance to local airports operated by cities, counties and other public agencies.[108] This local assistance can be used for local matching funds for federal AIP grants. Each airport also receives an annual grant of $10,000.

State Transportation Improvement Program

The State Transportation Improvement Program (STIP) is an ongoing multi-year capital investment program that funds transportation projects on and off the State Highway System.[109] STIP funds derive primarily from state fuel tax swap revenues and federal Highway Trust Fund allocations to the SHA. For FY 2009/10 STIP expenditures were approximately $0.9 billion.[110] STIP funds are split 25% to Caltrans to fund the Interregional Transportation Improvement Program (ITIP) and 75% to MPOs, Regional Transportation Planning Agencies, or County Transportation Commissions, as appropriate, to fund projects in their Regional Transportation Improvement Programs (RTIPs). Funds are divided between northern counties and southern counties on a 40:60 split and then allocated to counties on the basis of population and state highway mileage.[111] Airport ground access projects become eligible for STIP funding by being included in the local RTIP.

Proposition 116 Rail Bond Account

In 1990, state voters passed Proposition 116 that enacted the Clean Air and Transportation Improvement Act (CATIA) and authorized the state to issue bonds for $1.99 billion to be used for designated transportation projects and purposes, primarily passenger rail capital projects, with about $130 million allocated for other purposes including purchase of paratransit vehicles and a ferry program.[112] As of June 30, 2010 all but about $14 million of the $1.99 billion had been allocated to projects or other purposes.[113]

Traffic Congestion Relief Fund

The Traffic Congestion Relief Fund (TCRF) was created by the Traffic Congestion Relief Act of 2000 and committed $4.909 billion to 141 designated projects.[114] The TCRF was to be funded with a transfer from the state General Fund, gasoline sales tax revenues, and transfers from the Transportation Investment Fund (TIF). Subsequent legislation delayed the transfers from the TIF and authorized a series of loans to the General Fund from the TCRF. Transfers to the TCRF from state motor fuel taxes were reestablished by state ballot Proposition 42 in 2002 but subsequently suspended by the legislature. State ballot Proposition 1A in November 2006 required the balance of the funds loaned to the General Fund to be repaid by June 30, 2016.[115]

Proposition 1B Bond Funds

In November 2006 voters approved state ballot Proposition 1B, the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006, which authorized the state to issue $19.925 billion in general obligation bonds to fund a number of specific transportation programs.[116] The funds are programmed and allocated by the CTC through these programs, including the Corridor Mobility Improvement Account, the Public Transportation, Modernization, Improvement and Service Enhancement Account, and funding augmentation for the STIP.[117]

Proposition 1A Bond Funds

In November 2008 voters approved state ballot Proposition 1A, the High Speed Passenger Train Bond Act for the 21st Century, which authorized the state to issue $9.95 billion in general obligation bonds to finance the development of a high-speed train system in the state.[118,119] While $9 billion of the funding was to partially fund the planned high-speed train system, $950 million was to be made available for capital project on other passenger rail lines, including intercity rail lines, commuter rail lines, and urban rail systems, that provide connectivity to the planned high-speed train system and its facilities or that provide capacity enhancements and safety improvements.[120] Although the $950 million is primarily intended to improve connectivity to the planned high-speed train system, some of this funding could potentially be used for capital projects that enhance airport ground access, particularly if they also improve connectivity to planned high-speed rail stations. Indeed, some Proposition 1A funds have been allocated to a planned automated people-mover connection between Oakland International Airport and the BART system, as discussed in Section IV of this report.

Several of the planned stations on the high-speed train system are located adjacent to airports, including San Francisco International Airport, Bob Hope Airport in Burbank, Ontario International Airport, and potentially San Diego International Airport, so projects to improve connectivity to those stations will also enhance airport ground access.

City and County Road Funds

Local city and county road funds are used for street and road maintenance, new construction and reconstruction, engineering and administration, right-of-way acquisition and other street and road expenditures. While the majority of the revenues deposited in these funds come from local sources, including General Funds and county sales tax measures, state funding is provided from the state fuel excise tax, fuel tax swap revenue, and federal and state aid. In fiscal year 2008/09, state contributions to city and county road funds totaled $2.9 billion, while federal aid provided $0.7 million.[121]

These funds can potentially be used for local street and arterial improvements as part of airport ground access projects.

Local Transportation Funds

Local Transportation Funds are established by each county to receive revenues from a portion of state retail sales taxes designated for transit through the Transportation Development Act (TDA). These funds are then allocated to areas within each county based on population, taxable sales and transit performance.[122]

Bay Area Toll Account

The San Francisco Bay Area includes seven state-owned toll bridges that are owned and operated by Caltrans, with the toll revenues administered by the Bay Area Toll Authority (BATA), an agency under the Metropolitan Transportation Commission (MTC), the MPO for the region.[123,124] The toll revenues fund the day-to-day operations, facilities maintenance, and administration of the bridges, as well as long-term capital improvement and seismic retrofit programs.[125] In addition, a $1 toll increase that became effective in July 2004 is used to fund a wide range of transit and highway projects in the Bay Area under the Regional Measure 2 Traffic Relief Plan, which was passed by Bay Area voters in March 2004. Projects to improve airport ground access to Bay Area airports, particularly projects to improve transit access and thereby reduce highway traffic in the corridors served by the bridges, could be eligible for Regional Measure 2 funds.

Bicycle Transportation Account

The Bicycle Transportation Account provides funding to cities and counties for projects that improve the safety and convenience of bicycle commuters.[126] In recent years, it has been funded at an annual level of about $7 million. Funds are obtained from the Highway Users Tax Account in the Transportation Tax Fund. To be eligible to receive funds from the program, local agencies must first prepare and adopt a Bicycle Transportation Plan and have it approved by the relevant Regional Transportation Planning Agency. State funds must be matched by local funds covering at least 10% of total project costs.

While this program will not generally be applicable for airport ground access projects, situations may arise in which provision of bikeways or bicycle parking serving airport employees may be part of larger intermodal airport ground access project and could be eligible for funding under this program.

Summary

As perhaps befits a state of the size and geographic diversity of California, the state transportation funding programs comprise a complex and diverse set of interrelated funding sources and programs that are constantly evolving in response to legislative and voter initiatives. While none of these programs are specifically designed to address airport ground access needs, many of them could potentially provide financial support for such projects.

LOCAL FUNDING SOURCES

Local funding for transportation capital projects includes funds provided by a wide range of different agencies, including cities and counties, transit and other transportation agencies, and special-purpose agencies, such as port or airport authorities, toll road authorities, or congestion management agencies. Airport authority funding of capital projects is considered local funding when it derives from operating revenues or bonds financed with operating revenues, rather than federal or state funding.

Because local government institutional structures and associated taxation policies and practices vary widely from state to state, and even within states, the availability and scale of local funding for transportation investments also varies widely, as do the revenue sources that support that funding. The AASHTO Center for Excellence in Project Finance has identified the following sources of local funding for transportation, in addition to general fund appropriations and travel-related taxes such as hotel occupancy taxes or rental car taxes:[127]

- Local motor fuel taxes;
- Local motor vehicle registration fees;
- Local option sales taxes;
- Local income, payroll or employer taxes;
- Local severance taxes;
- Value capture;
- Tolls and fares.

As shown in Table 3 above, at a national level local funding for transportation, including both capital and operating expenditures, accounts for about 36% of total surface transportation funding. The local share exceeds the federal share by a wide margin.

Cities and Counties

Sources of funding for transportation capital improvements by cities and counties fall into two broad categories: General Fund revenues and special-purpose tax measures. General Fund revenues typically include property taxes, local portions of retail sales taxes, special assessment fees, and a range of other revenue sources. Local jurisdictions can decide to fund part or all of a transportation capital project from their General Fund. Typically, local street and road improvements are at least partly funded in this way.

However, because there are many competing demands for General Fund expenditure and many local jurisdictions have been struggling to balance their budgets in recent years, increasingly many cities and counties have been turning to special-purpose tax measures

to fund specific transportation capital projects. One common approach is a retail sales tax increment with revenues dedicated to a specific set of projects or specific purposes through existing or new transportation funding programs.[128,129] Establishing such a tax or tax increment typically requires voter approval in a ballot measure that limits the duration of the tax and defines the use to which the tax revenue will be put. Although sales taxes are generally regarded by economists as highly regressive (poorer people pay a higher share of their disposable income on sales taxes than wealthier people), the electorate has generally shown a greater willingness to increase sales taxes for transportation purposes than to support other taxation approaches, particularly raising the excise tax on motor fuel.

Transit and Transportation Agencies

Transit agencies and other transportation providers typically fund their operating and capital budgets from a variety of sources, including farebox revenue, sales or other local taxes, and grants from federal and state programs that provide funds to meet general operating and capital needs rather than being awarded for a specific project.

Special-Purpose Agencies

The range of special-purpose agencies includes toll road authorities, port and airport authorities, congestion management agencies, and agencies established specifically to distribute and manage revenues from special tax measures. The nature of the revenues funding such agencies and the restrictions on what those revenues can be used for will vary from agency to agency, but most of these agencies will have some ability to fund capital projects from their revenues.

PRIVATE-SECTOR FUNDING SOURCES

There are two broad ways in which private-sector funding can be made available to finance the development of transportation infrastructure. The first and more traditional way is through issuing bonds, the interest on which is paid from operating revenues, tax revenues, or other revenue sources. These can allow projects to proceed earlier than they would otherwise by generating an immediate source of capital funds in return for committing future revenue streams to debt service and the eventual repayment of the bonds. In the long run, the total cost of the project will be higher, but the benefits will be obtained earlier, potentially justifying the higher costs. Since the interest paid on the bonds may be exempt from state or federal taxation depending on the specific nature of the bonds and the current taxation regulations, such bonds can often be issued at a favorable interest rate compared to privately issued bonds. Even so, the interest rate will generally be higher than inflation (or there would be no reason for investors to buy the bonds), so the debt service costs will increase the total cost of a project compared to funding it out of current revenues on a pay-as-you-go basis. However, the “lumpy” nature of major projects often makes it difficult to fund these on a pay-as-you-go basis.

Large airport development projects, such as a new runway or passenger terminal, are typically funded, at least in part, by airport revenue bonds, whose interest, and possibly eventual repayment, is paid from airport operating revenues. Repayment of bonds may

also be financed in part from federal airport development grants or by issuing new bonds, thereby in effect extending the life of the bonds. A similar approach is less common with surface transportation projects, which generally do not generate a surplus revenue stream from ongoing operations that can be used for debt service and bond repayment. However, there is a growing interest in applying a similar approach to financing certain types of surface transportation project.

In the case of airport ground access projects, development of a revenue stream that can be used to cover debt service and bond repayment will require the projects to include elements that can generate surplus revenues beyond their operating and maintenance costs, such as car parking, rental car facilities, or commercial development.

Public-Private Partnerships

The second broad way in which private-sector funding sources can be used to finance transportation infrastructure is through the direct involvement of private entities in the construction and operation of transportation facilities under a contractual agreement with a public agency responsible for the facilities. These arrangements are commonly referred to as public-private partnerships (PPPs).[130]

There has been a growing interest in recent years in using PPPs to attract private-sector funding to help finance transportation infrastructure or operate transportation facilities. The details of these arrangements vary from project to project and can involve only the design and construction, referred to as design-build (DB), or extend to operation and maintenance of the project for a defined period, referred to as design-build-operate-maintain (DBOM).

The case studies described later in this report provide several examples of the use of PPPs to help fund airport ground access projects, including the extension of a light rail system to Portland International Airport in Oregon and the development of a privately operated toll road serving Richmond International Airport in Virginia. As with the use of revenue bonds, the viability of the use of a PPP to help fund an airport ground access project will depend on being able to identify a revenue stream or development opportunity that can give the private-sector party an adequate return on their investment.

IV. CASE STUDIES OF AIRPORT GROUND ACCESS PROJECT FUNDING

A major focus of the research described in this report comprises a number of case studies that were undertaken to document how collaborative funding arrangements were developed for selected intermodal transportation and airport ground access projects. The case studies were selected to illustrate successful collaborative funding initiatives by multiple agencies, as well as provide guidance on how the limitations of specific funding programs were overcome. It was initially envisaged that these case studies would focus on California airport access projects, but also include significant projects elsewhere that offer particularly useful experience. However, given the limitation on the number of case studies that could be included in the project, it turned out that only three of the seven case studies that were finally selected are located in California.

Preliminary information on potential case studies was available from the California Ground Access to Airport study,[131] the 2005 GAO study on intermodal transportation at airports,[132] and a research study by the California Partners for Advanced Transit and Highways (PATH) program on strategies for improving intermodal connectivity at California airports.[133] This information was supplemented by case-specific information gathered in the course of the current project from a review of relevant literature, an Internet search, and discussions with planning staff at relevant federal, state and local transportation agencies.

On the basis of this information, a list of potential case study projects was developed and evaluated using the following criteria:

1. Extent of collaborative funding (multiple funding sources);

2. Type of project (bus or rail access versus highway improvement; focus on air passenger access or air freight access or both);

3. Nature of the ground access problem being addressed (capacity versus improved service alternatives; air quality issues);

4. Size of airport and urban environment (large metropolitan area versus smaller community);

5. Number and type of agencies involved in the project;

6. Whether the project had been completed or was still in progress.

Given the limitations of the project funding, it was recognized that it would not be possible to undertake a large enough number of case studies to cover all possible combinations of the above criteria, and some combinations may have yet to occur. Rather, the approach was to ensure a reasonably wide range of projects that include at least some elements of each of the above criteria, since the purpose of the case studies is to illustrate ways in which collaborative project funding has been undertaken in a range of different contexts and to identify issues and problems that have arisen in the course of those projects. While

this does not guarantee that a particular approach will be successful in ensuring that funding for a project will be forthcoming in other, similar, situations, it does provide a basis for guidance on potential approaches to pursue.

SELECTION OF CASE STUDIES

The foregoing process identified 23 potential case studies, as follows:

- Boston Logan International Airport Logan Express bus service;
- Houston Bush Intercontinental Airport Connector toll road;
- Huntsville International Airport Intermodal Center;
- Lambert-St. Louis International Airport Metrolink extension;
- Los Angeles International Airport Flyway Service;
- Miami International Airport Intermodal Center;
- Minneapolis-St. Paul International Airport light rail line;
- New York John F. Kennedy International Airport AirTrain people-mover;
- Newark International Airport AirTrain people-mover;
- Northwest Arkansas Regional Airport highway connector road;
- Oakland International Airport Bay Area Rapid Transit (BART) people-mover link;
- Orange County John Wayne Airport bus rapid transit link;
- Pittsburgh International Airport busway;
- Pocahontas Parkway Airport Connector, Richmond, Virginia;
- Portland International Airport MAX light rail extension;
- Sacramento International Airport light rail line;
- San Francisco International Airport BART extension;
- San Francisco International Airport bicycle trail;
- San José Mineta International Airport people-mover link to light rail;
- Seattle-Tacoma International Airport light rail line;

- Warwick Intermodal Station, Rhode Island;
- Washington Dulles International Airport Metro rail extension;
- Washington Dulles International Airport toll road.

Preliminary information on each of the potential case studies was assembled and a working paper prepared documenting this information. The list of potential case studies together with the working paper descriptions of each were reviewed with staff at the Caltrans Division of Aeronautics, and six case studies were selected for inclusion in the research. In addition to the six case studies selected from the initial list, Division of Aeronautics staff suggested including the Oakland International Airport Roadway Project in the case study for the BART people-mover link, since the roadway project made extensive use of local funding and served a major air cargo facility. However, since the two projects are very different, with quite different funding sources, it was decided to include the Airport Roadway Project as a separate case study, rather than try to combine it with the case study of the BART people-mover link.

This resulted in the following seven case studies being included in the research:

1. Miami International Airport Intermodal Center;
2. New York John F. Kennedy International Airport AirTrain;
3. Oakland International Airport BART Connector;
4. Oakland International Airport Roadway Project;
5. Richmond Airport Connector;
6. Portland International Airport MAX extension;
7. San Francisco International Airport BART extension.

The seven case studies include one heavy rail rapid transit airport link, one light rail airport link, two people-mover connections to regional rail systems, two highway projects, and a major intermodal center. Six of the seven projects are located in large metropolitan areas.

CASE STUDY APPROACH

Once agreement had been reached on the final list of selected case studies, more detailed documentation of each of these was assembled, including technical reports, newspaper and professional journal articles, conference presentations and papers, descriptive material posted on agency websites, and minutes of relevant agency meetings. The case study analysis paid particular attention to the time required to complete the process from initial planning to implementation, as well as interagency and funding eligibility issues that arose in the course of the project and the factors that appear to have contributed to the successful

conclusion of a project (or successful progress in the case of projects that were still under way), where success is defined in terms of meeting the initial project objectives within the projected budget and anticipated time frame. While criteria for success of an airport ground access project should also involve cost-effectiveness considerations, determining this was considered to be beyond the scope of the current project unless it happened to have been already addressed as part of the project planning and implementation. However, in practice there has been very little effort in the past to do post-implementation evaluation of project effectiveness.

The analysis of the case studies also attempted to identify factors that could influence the transferability of the findings of a particular case study to other similar situations. These include such aspects as the institutional relationships between the agencies involved, the extent and level of development of existing regional transportation infrastructure, the composition of the air passenger or airfreight market, and the scale of the proposed project.

CASE STUDY FINDINGS

The following sections present the principal findings for each of the seven case studies. More detailed discussion of each of the case studies is contained in case study reports that are available on the MTI website at http://transweb.sjsu.edu and cited in the following sections on each case study.

Miami Intermodal Center

The Miami Intermodal Center (MIC) is a major intermodal facility located adjacent to the Miami International Airport (MIA), as shown in Figure 2. The airport is located about five miles northwest of downtown Miami and is the largest airport in Florida and a major international gateway for flights between the U.S. and the Caribbean and Central and South America. In 2010, it handled 35.7 million passengers.

The MIC is being developed by the Florida Department of Transportation (FDOT) in cooperation with the Miami-Dade Aviation Department (MDAD), Miami-Dade Transit, and a number of other stakeholders. The MIC project includes a Rental Car Center (RCC) that accommodates the operations of all on-airport rental car companies, as well as serving as the pickup and drop-off location for all off-airport rental car companies, an automated people-mover to transport passengers and their baggage between the MIC and the airport terminals, and an intermodal facility termed the Miami Central Station (MCS). The MCS will provide a major regional intermodal hub for rail and bus services, including the regional Metrorail transit system, commuter trains operated by the South Florida Regional Transportation Authority (SFRTA), and Amtrak.

Figure 2. Miami Intermodal Center

Source: FDOT, Miami Intermodal Center – Project Overview, April 2011.

The MIC and associated infrastructure, including roadway and highway improvements and an extension of the Metrorail system to the MIC, is projected to cost over $2 billion when completed. Funding for the project includes federal, state and local grants, mostly programmed through the regional Transportation Improvement Plan and Long Range Transportation Plan process, and federal and state loans through the federal Transportation Infrastructure Finance and Innovation Act (TIFIA) program, the Florida State Transportation Trust Fund (STTF), and the Florida State Infrastructure Bank (SIB). The extension of the Metrorail system from the existing Earlington Heights station to the MIC is being primarily funded with revenues from a half-percent local sales tax approved by Miami-Dade County voters under a measure termed the People's Transportation Plan. Revenue provided by a Customer Facility Charge levied on all rental car transactions within the RCC is used to

cover the interest and repayment of principal on the $270 million TIFIA loan, some of land acquisition and construction costs for the RCC, operating and maintenance expenses for the RCC, and contribute toward the operating and maintenance costs of the automated people-mover.

In addition to the following description, a more detailed discussion of the MIC Program is provided in a case study report on the MTI website.[134]

Project Description

The Miami Intermodal Center has been developed to provide a transportation hub that will improve access to and from MIA for travelers with trip origins and destinations in Miami-Dade County and the larger South Florida region, including Palm Beaches, Fort Lauderdale, and the Florida Keys. When completed, the MIC will be served by several regional rail systems and long-distance buses, as well as provide rental car and parking facilities to expand landside capacity at MIA.[135] In addition, the MIC project includes access roads and a number of major highway improvements that will provide access to the MIC and improve access to MIA.[136]

The MIC project involves four major elements: the Rental Car Center, the Miami Central Station, the automated people-mover between the MIC and Miami International Airport, termed the MIA Mover, and major roadway and highway improvements.[137]

The RCC provides a consolidated facility to serve all the rental car companies formerly operating inside MIA and many of those located near the airport. It is intended to significantly reduce congestion on the airport curbside and terminal roadways. It provides 3.4 million square feet of vehicle parking and support facilities on four levels, each covering twenty acres, with space to accommodate up to sixteen rental car companies. It includes customer service facilities for rental car transactions, 6,500 vehicle parking spaces for fleet storage and staging, a ready/return car area, and a Quick Turnaround Area (QTA) for washing and refueling cars, with 120 vehicle fueling positions and 42 wash bays. Vehicle storage and maintenance operations are located on the first three levels of the RCC while the fourth level includes a spacious customer service lobby and the ready/return area. Between the opening date of the RCC on July 13, 2010, and the completion of the MIA Mover in September 2011, customers were transported between the MIA terminals and the RCC by a consolidated shuttle bus system.[138]

The Miami Central Station is designed to provide the primary intermodal ground transportation hub for Miami-Dade County and wider South Florida region, bringing together long-distance, commuter, and urban transit rail services, as well as intercity and urban bus services and ground access services for MIA.[139] The MCS will include tracks serving Amtrak, SFRTA (formerly Tri-Rail) commuter trains, and Metrorail upon completion of the Earlington Heights to MIC Metrorail extension, renamed AirportLink in June 2010.[140] Provision has also been made for future high-speed rail trains, if such a system is eventually developed to serve the Miami region.

East of the tracks will be a public esplanade, linked with the MCS station of the MIA Mover by an elevated pedestrian walkway above the rail tracks and around which will be located private vehicle parking and bus depots for Greyhound, Miami-Dade Metrobus, intercity buses, courtesy buses and shuttles currently serving MIA, and taxis. The MCS is envisaged as a major transfer point for users of rail and bus services in Miami-Dade County and the wider South Florida region that will improve connectivity not only for trips to and from Miami International Airport but also for travel by public transportation throughout the region.

The third major component of the MIC project is the MIA Mover automated people-mover link between the airport and the MIC, as shown in Figure 3. The link has two stations, one in the airport and one in the MIC, and a dual track guideway 1.25 miles long.[141] The airport station is located on the third level of the airport terminal complex and connects with the airport's third-level moving walkways. The MIC station is located on the fourth level of the RCC between the RCC Customer Service Lobby and the MCS. Construction and operation of the MIA Mover is primarily the responsibility of the Miami-Dade Aviation Department (MDAD) and forms the contribution of Miami-Dade County to the MIC project. FDOT contributed $100 million toward the cost of the link, including construction of the guideway foundations and the MIA Mover station within the MIC, for which it had responsibility. Construction of the MIC station began in February 2008, with construction of the MIA station starting in March of 2009. Construction of the guideway foundations commenced in June 2009 and was completed at the end of December 2009. The MIC station was completed in January 2011 and the MIA Mover became operational on September 9, 2011 with the completion of the MIA station. The MIA Mover is capable of transporting over 3,000 passengers per hour, along with their luggage. Passengers ride the system free of charge.

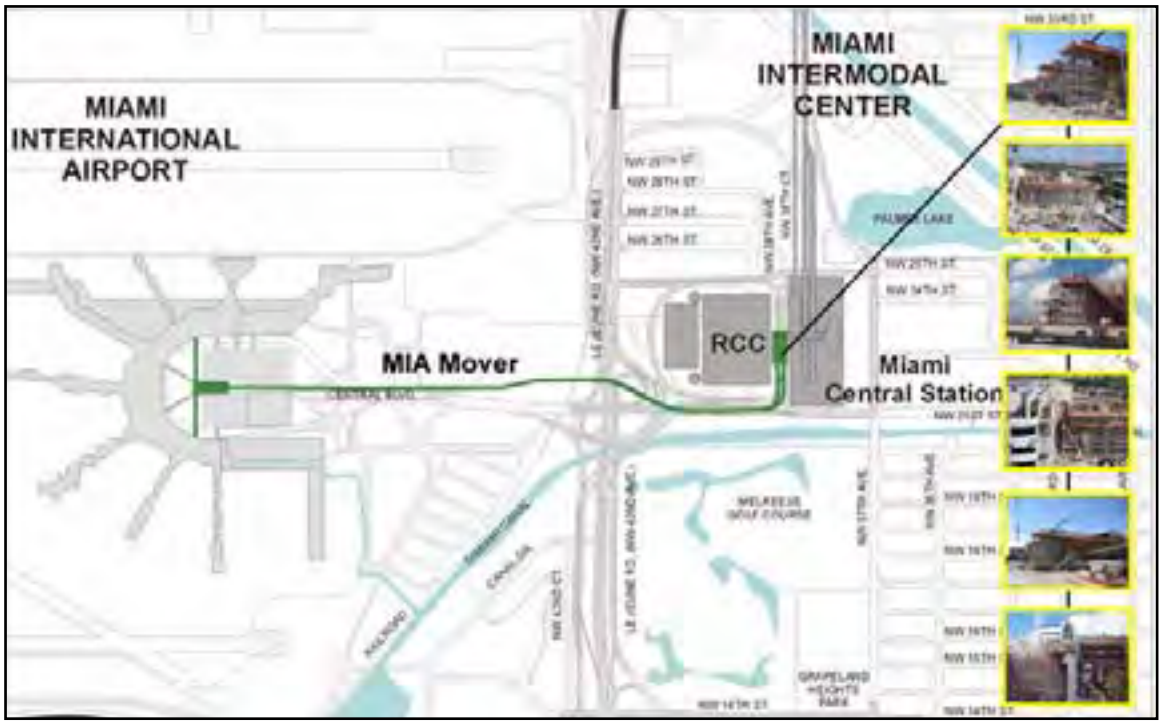

Figure 3. MIA Mover Route

Source: FDOT, *Miami Intermodal Center – MIA Mover Fact Sheet*, September 2011.

In addition to serving the transportation needs of the airport, an important component of the MIC program.is a Joint Development strategy that has been established to stimulate the economic development potential of the area and generate revenues that can be used to partially offset the capital costs of developing the MIC and support the long-term operating costs of the facility. This strategy includes public and private ground lease opportunities for up to 1.4 million square feet of mixed-use development that may be built in conjunction with the MCS. Potential uses include offices, hotel and meeting space, additional parking, ancillary retail and restaurants.[142]

Although initially not part of the MIC Program, the 2.4-mile AirportLink Metrorail extension from the existing Earlington Heights Station to the MIC forms a key element of the overall project. This extension will terminate at the MCS, from where passengers can access the airport via the MIA Mover. Miami-Dade County broke ground on the extension in May 2009 and as of December 2011, the extension was scheduled to open in the spring of 2012,[143] although the MCS is currently not expected to be completed until sometime in 2013. By June 2012, the planned opening of the extension had slipped to later in the summer. The majority of the funding for the $506 million project is coming from a regional transportation funding program called the People's Transportation Plan, which is funded from a local half-percent sales tax, with FDOT contributing $101.3 million.

Planning for the Intermodal Center started in the early 1980's, although development was postponed due to environmental reasons. In 1989, after the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA), local planners decided to continue to pursue the idea of an intermodal center for the airport. The main thought at the time was to link two major rail systems, Tri-Rail and Metrorail, with the airport.[144] In 1993, the local agencies involved in planning the intermodal center joined with FDOT, six federal agencies, and the U.S. Department of Transportation (USDOT) to undertake the planning and design of the facility. In 1995, the Federal Highway Administration (FHWA) approved FDOT's Major Investment Study/Draft Environmental Impact Statement. In May 1998, FDOT issued Kaiser Engineers a contract to serve as consultant program manager for the MIC Program. The following month the U.S. Congress passed the Transportation Equity Act for the 21st Century (TEA-21) and the Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA) that created a federal credit program to invest in national and regional transportation programs. FDOT applied for a TIFIA loan for the MIC Program and was awarded $439 million in two separate loans. Recognizing the need for broader inter-agency cooperation and coordination, in 2000 FDOT entered into strategic partnerships with Tri-Rail (now the SFRTA), Miami-Dade County, and the Miami-Dade Expressway Authority, and in 2001 formed a MIC Steering Committee with representatives of twelve participating stakeholders and associated agencies, including the Miami-Dade County Metropolitan Planning Organization, the greater Miami Chamber of Commerce, and the Greater Miami Convention and Visitor Bureau.[145]

Construction of the MIC began in 2001 with initial work by FDOT on the MIC roadway improvements. Utility and foundation work for the RCC commencing in June 2003 following award of a Construction Manager at Risk (CM@Risk) contract to Tuner Construction Company. The improvements to Le Jeune Road and the MIC-MIA interchange were completed in May 2008, marking the first component of the project to be completed. The

RCC was completed in July 2010, with the MIA Mover becoming operational in September 2011. As of May 2012, work is continuing on the MCS with a planned opening in 2013.

Project Costs

Detailed information on the evolution of project costs for the various elements of the MIC development program is available from the Annual Financial Plan Updates prepared by FDOT. As of the date of this case study, the most recent Annual Financial Plan Update was dated May 31, 2011 and included cost estimates (actual costs in the case of completed elements) as of the April 2011 work program.[146] The estimated project costs for the various elements of the overall program as of the April 2011 work program are shown in Table 4, together with changes from the April 2010 work program and an earlier cost estimate prepared in July 1999 in support of an application for a federal TIFIA loan.

Table 4. Miami Intermodal Connector Estimated Project Costs

	Amount ($000)		
Program Element	**July 1999 TIFIA Loan Application**	**April 2010 Work Program**	**April 2011 Work Program**
Right-of-way acquisition and environmental remediation	379,072	338,330	339,282
Initial MIC Core (Miami Central Station)	80,696	760,254	739,214
Road improvements	143,424	187,834	186,950
MIC/MIA connector (people-mover)	399,680	270,116	270,071
Rental car facility	161,554	386,910	395,084
Capitalized interest	61,390	53,964	33,017
Rental car facility reserves and costs	5,715	0	0
Other	118,203	85,929	79,598
Total	1,349,734	2,083,337	2,043,216

Source: FDOT, *MIC 2011 Annual Financial Plan Update*, May 2011.

Overall, the estimated project costs increased by a little over 54% from 1999 to 2010. The largest contribution to this increase was the Miami Central Station, the estimated cost for which increased to more than nine times the original estimate, followed by the rental car facility, the estimated cost for which increased by about 145%. However, the apparent increase in cost for the Miami Central Station is misleading because the 2010 and 2011 estimates include the AirportLink extension of the Miami-Dade County Metrorail system, which was considered a separate project in 1999 and not included in the 1999 MIC cost estimate. The current estimated cost for the AirportLink extension is $540.2 million, with the other components of the MCS projected to cost $199.0 million, an increase of 147% over the July 1999 estimate, reflecting a significant change in the design of the MIC since

the July 1999 estimates were prepared. The details of these changes are described in the case study report.[147]

The total estimated project cost reduced slightly from 2010 to 2011, due primarily to reductions in the estimated costs to complete the MCS ($21 million), estimated capitalized interest ($20 million), and estimates of other costs including the cost of roadway improvements ($7 million), partly offset by an increase of $8 million in the cost of the RCC.

While the project costs shown in Table 4 include separate program elements for right-of-way acquisition and environmental remediation, and capitalized interest, these costs result from the various physical elements of the MIC project. The breakdown of the total project cost into the different types of activity is documented in the case study report. As could be expected, the largest component of the estimated costs was for construction, which by April 2011 accounted for about 70% of total project costs. The second largest component was right-of-way acquisition, which accounted for about 15% of total project costs. Estimated financing costs accounted for only 1.6% of total project costs, the largest part of which was the estimated capitalized interest on a TIFIA loan for the rental car facility.

Funding Sources

In addition to details on project costs, the Annual Financial Plan Updates also provide details on funding sources. The MIC Financial Plan draws on a range of federal, state and local funding sources, as well as private-sector contributions.[148] By April 2010, the majority of the funding comprised a combination of federal, state, and local funding programmed through the Miami-Dade County Transportation Improvement Program (TIP) and Long Range Transportation Program (LRTP). In addition, the financing plan includes local funding contributions from the MIA Airport Capital Improvement Plan, Miami-Dade Expressway Authority toll revenue and revenues from the rental car companies using the RCC.

In addition to grants and other direct revenues, the financing plan for the project relies on a number of major loans. As a project designated by the federal government as a Project of National Significance, the MIC Program was eligible for a federal TIFIA loan. FDOT applied for and received two TIFIA loans for the project, as discussed in more detail below. Additional loans have been made or committed by the Florida STTF and the Florida SIB.

As could be expected in a complex project of this scale and duration, the financing plan has evolved over time, in part to reflect changing estimates of the total cost to complete the project and in part due to changes in the sources of funds planned to finance the project. The planned amounts and sources of funding as of the April 2010 and April 2011 work programs and the initial funding plan in the July 1999 TIFIA loan application are shown in Table 5.

Table 5. Miami Intermodal Connector Funding Plan

Source of Funds	Amount ($000)		
	July 1999 TIFIA Loan Application	April 2010 Work Program	April 2011 Work Program
Federal contributions			
TIP/LRTP and prior	106,718	23,058	6,353
State and local contributions			
TIP/LRTP and prior plus other state	157,033	1,072,043	1,047,548
Airport Capital Improvement Plan	399,680	159,343	155,196
Dedicated revenues from RCC	25,000	110,697	113,496
Miami-Dade Expressway tolls	86,568	86,169	86,157
MDTA non-federal contributions	15,000		
Ancillary revenues	37,000	4,704	3,881
Subtotal	***720,281***	***1,432,956***	***1,406,278***
Financing			
TIFIA loans plus capitalized interest	497,735	338,416	315,458
State Transportation Trust Fund loan		246,051	245,242
SIB loan plus capitalized interest	25,000	42,856	69,885
Subtotal	**522,735**	**627,323**	**630,585**
Total	**1,349,734**	**2,083,337**	**2,043,216**

Source: FDOT, *MIC 2011 Annual Financial Plan Update*, May 2011.

By April 2011, state and local funds were planned to account for about 69% of total project funding, of which by far the largest share (75% of state and local funds) consists of state and local funds programmed through the TIP/LRTP and other state funds. The share of project funding planned to be contributed from the MIA Airport Capital Improvement Program dropped significantly over the course of the project, until by April 2011 it accounted for less than 8% of total funding (11% of state and local funds). TIFIA and state loans, which of course have eventually to be repaid, accounted for about 31% of the planned project funding.

The majority of the funding for the AirportLink extension of the Metrorail system from Earlington Heights Station to the MCS, some $405 million, is being funded from a half-cent local sales tax under the People's Transportation Plan (PTP) and programmed through the Miami-Dade LRTP.[149]

In addition to federal, state and local government funding sources, somewhat less than 6% of the total project funds are projected to be provided from fee revenues from the rental car companies using the RCC. These fee revenues are derived from a Customer Facility

Charge (CFC) fee charged to customers renting vehicles for each day of the rental. This fee revenue is planned to serve three purposes: a direct contribution to the construction and land acquisition costs for the RCC facility, a contribution to future operating and maintenance costs of the RCC and MIA Mover, and to pay off the loans used to finance the RCC facility. Assuming that the current projections of future CFC revenues actually materialize, by the end of fiscal year 2044 the CFCs will have generated an additional $1.66 billion beyond the funds contributed through the end of FY 2011.

As can be seen from Table 5, federal contributions to the project apart from the TIFIA loans have been relatively small, with the bulk of the funding coming from state and local sources. Figure 4 shows the proportions of the total funding plan derived from federal, state, and local funding programs, including loans, as well as from rental car revenues.

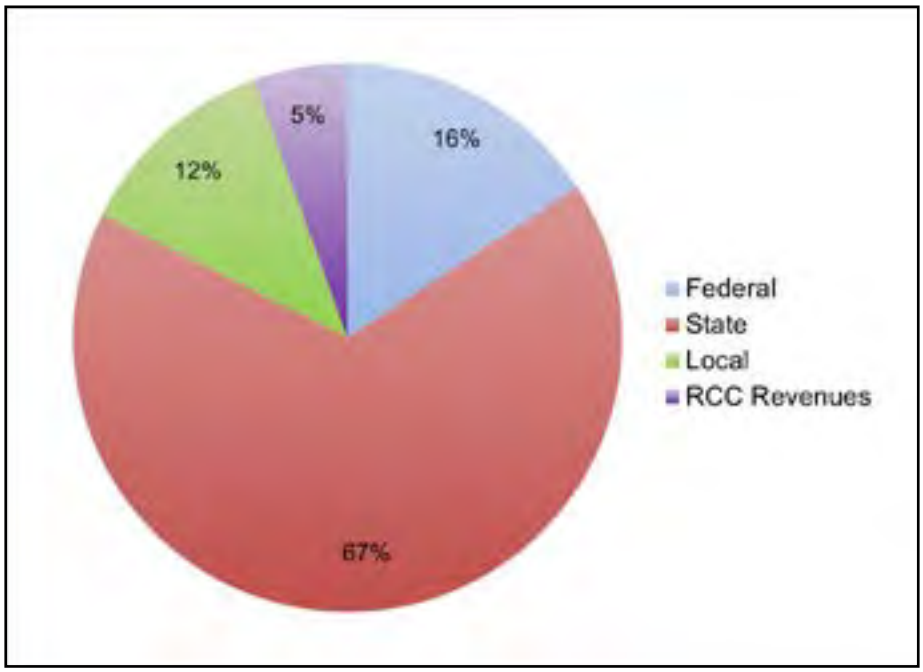

Figure 4. Miami Intermodal Center Funding

Source: FDOT, *MIC 2011 Annual Financial Plan Update*, May 2011.

However, the division of funding sources into federal, state, and local categories is somewhat arbitrary due to comingling of funds from different sources within a funding program. For example, the Florida SIB derives some of its funds from the federal government and some from state tax revenues. For the purposes of Figure 4, the SIB loans were considered state funding. Similarly, the state and local TIP and LRTP funds were considered state funds, since the majority of the funds in these programs are administered by the state. Funding contributions from the MIA Airport Capital Improvement Program and the Miami-Dade Expressway tolls were considered local funds.

In July 1999 FDOT applied to the then recently established federal TIFIA program for financial assistance and in September 1999 the USDOT selected the project for two TIFIA loans for a total of $433 million. The first loan allocated $259 million towards overall project costs including more rapid land acquisition and was to be repaid from state motor fuel

tax revenue or other state funds. The second loan allocated $164 million to finance the rental car facility, to be repaid by rental car fees.[150] The first loan closed on June 9, 2000. Negotiation on the second loan continued for several years and it closed on April 29, 2005 at the amended level of $170 million. By July 2006, FDOT had drawn $15 million of the first loan, and on July 3, 2006, FDOT repaid the full amount of the loan, plus $2.1 million in interest because it had been able to replace the loan with a more competitive internal loan from the STTF.[151] In July 2007 an additional $100 million was requested for the second loan to help cover increased construction costs for the RCC, which the FHWA approved in an amended loan agreement dated August 1, 2007 and signed on August 28, 2007.

Summary and Discussion

The MIC is not only a major transportation project in its own right, with total project costs of a little over $2 billion, it also represents what is easily the most ambitious attempt to-date to create a major regional intermodal hub adjacent to a large U.S. airport. Not surprisingly for a project of this scale and scope, by the time development of the MIC and associated infrastructure is completed, construction will have been underway for at least twelve years. As might be expected, the details of the project have evolved over time and the funding plans have also had to evolve to accommodate changes both in the cost and scope of the project, as well as to take advantage of new funding opportunities that have emerged over the course of the project. Fundamental to the successful completion of the project has been the unwavering commitment and financial support of FDOT, as well as consistent support from the Miami-Dade Board of County Commissioners and other regional stakeholders.

By far, the largest component of the funding for the project has been a series of capital project grants from state and local transportation funding programs, mostly programmed through the regional TIP and LRTP process A key component of the funding plan for the MIC project has been a $270 million loan from the federal TIFIA program. This loan has been supplemented with additional loans from the Florida STTF, and the Florida SIB. The extension of the Metrorail system from the existing Earlington Heights station to the MIC is being primarily funded with revenues from a half-percent local sales tax approved by Miami-Dade County voters to fund the People's Transportation Plan.

A second major component of the funding plan is the revenue from a Customer Facility Charge (CFC) that is levied on all rental car transactions by the rental car companies operating in the RCC. This revenue has been used to cover some of the construction costs on a pay-as-you-go basis, and will be used in the future to cover the interest and pay off the principal on the $270 million TIFIA loan, as well as cover some of the land acquisition costs for the RCC, the operating and maintenance expenses for the RCC, and contribute toward the operating and maintenance costs of the MIA Mover.

Perhaps the most striking aspect of the MIC Program from the perspective of intermodal airport access is how little MDAD has contributed to the entire project from its own Airport Capital Improvement Plan. In the July 1999 application for a TIFIA loan for the RCC, it was envisaged that MDAD would contribute $400 million toward the construction of the MIA Mover and a planned landside facility at the MIC that would allow air passengers to check in and check baggage. By the April 2011 Work Program, this had reduced to $155

million, partly by eliminating the planned landside facility from the MIC Program, partly from shifting responsibility for constructing the MIC station for the MIA Mover to FDOT, and partly from negotiating a design-build-operate-maintain contract for the MIA Mover at a lower cost than originally budgeted. Thus for a fairly modest capital investment of $155 million (compared to typical airport terminal improvement programs for a major hub airport) MDAD has not only obtained a world-class intermodal facility at its front door linked to the airport terminals by an automated people-mover, but has been able to reduce the amount of vehicular traffic on the terminal roadways and curbfront by consolidating all the on-airport rental car companies in the MIC, requiring all the off-airport rental car companies to pick up and drop off their customers at the RCC, and replacing the rental car courtesy buses with an automated people-mover.

In summary, the MIC provides a promising model for the development of a major airport as a regional intermodal hub that leverages required investments in airport landside facilities and airport access services to both enhance airport access and serve a broader range of regional surface travel. Key to the implementation of this model is the participation of a wide range of regional stakeholder agencies in the planning and funding of the facility, as well as the use of a broad range of different funding sources, some typically associated with airport infrastructure development and others generally used for surface transportation projects. In the case of the MIC, these funding sources include a mix of direct funding, loans, and fees from commercial operations and eventually joint land use development opportunities.

JFK International Airport AirTrain

John F. Kennedy International Airport (JFK), New York, is one of three major airports serving the New York/New Jersey metropolitan area and is the primary international airport for the region. The airport is operated by the Port Authority of New York and New Jersey (PANYNJ) and handled 46.5 million passengers in 2010. In addition to serving as the principal international gateway airport for the northeastern United States, the airport is the primary hub for JetBlue Airways. The airport is located in the borough of Queens on Long Island about 15 miles southeast of midtown Manhattan.

The airport was one of the first airports to adopt the unit terminal concept, and the central terminal area (CTA) formerly comprised eight separate passenger terminals, seven of which are still in use, as shown in Figure 5. The eighth terminal (Terminal 6) was demolished in October 2011 to accommodate a future expansion of Terminal 5.[152]

For many years inter-terminal transfers, as well as connections to the nearby Howard Beach station of the New York subway system and long-term parking lots adjacent to the Howard Beach station, were provided by shuttle buses. However, in order to reduce congestion on the CTA roadways and improve service to passengers, in 1995 the PANYNJ decided to construct an automated people-mover system which they termed AirTrain and sometimes refer to as a light rail system, although it is not a light rail system in the usual sense of the term and this case study will refer to it as a people-mover. The AirTrain would replace the inter-terminal shuttle buses and connect the CTA with the long-term parking

lots, Howard Beach station, and the Jamaica station of the Long Island Rail Road (LIRR) in Queens.

In addition to the following description, a more detailed discussion of the JFK Airtrain project is provided in a case study report on the MTI website.[153]

Project Description

The AirTrain system comprises an 8.1-mile guideway that includes a 1.8-mile loop within the CTA connecting the passenger terminals and two routes linking the passenger terminals with the New York subway system, airport long-term parking lots, and LIRR commuter trains at Jamaica station, as shown in Figure 6.[154]

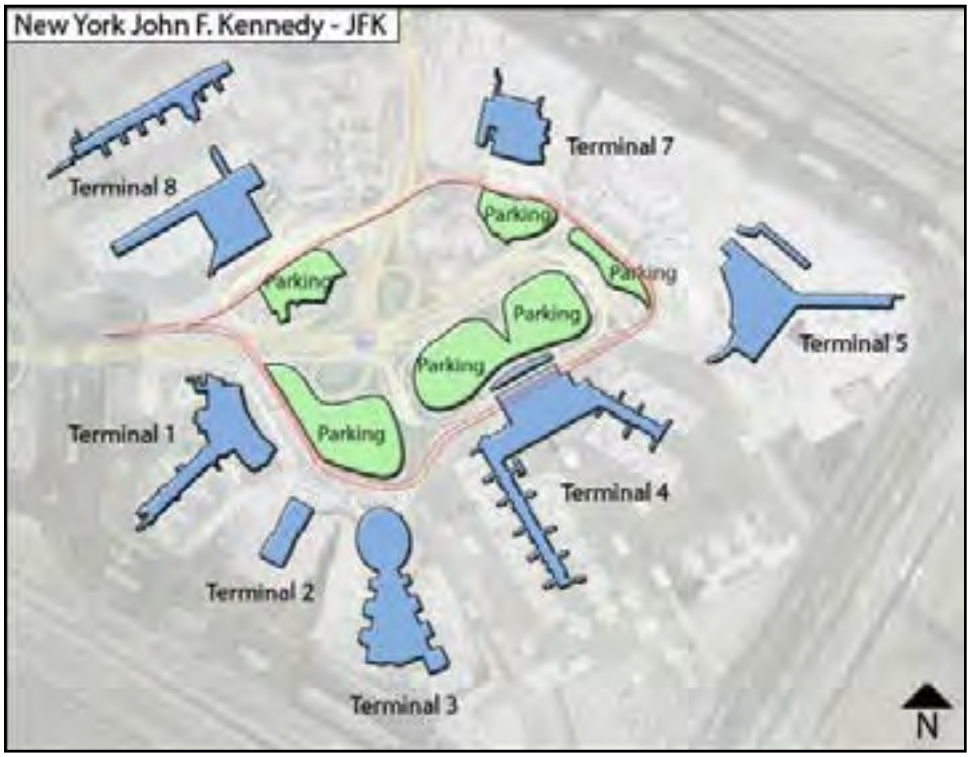

Figure 5. JFK Central Terminal Area

Source: iFly.com, "New York Kennedy Airport (JFK) Terminal Map" www.ifly.com/john-f-kennedy-international-airport/terminal-map

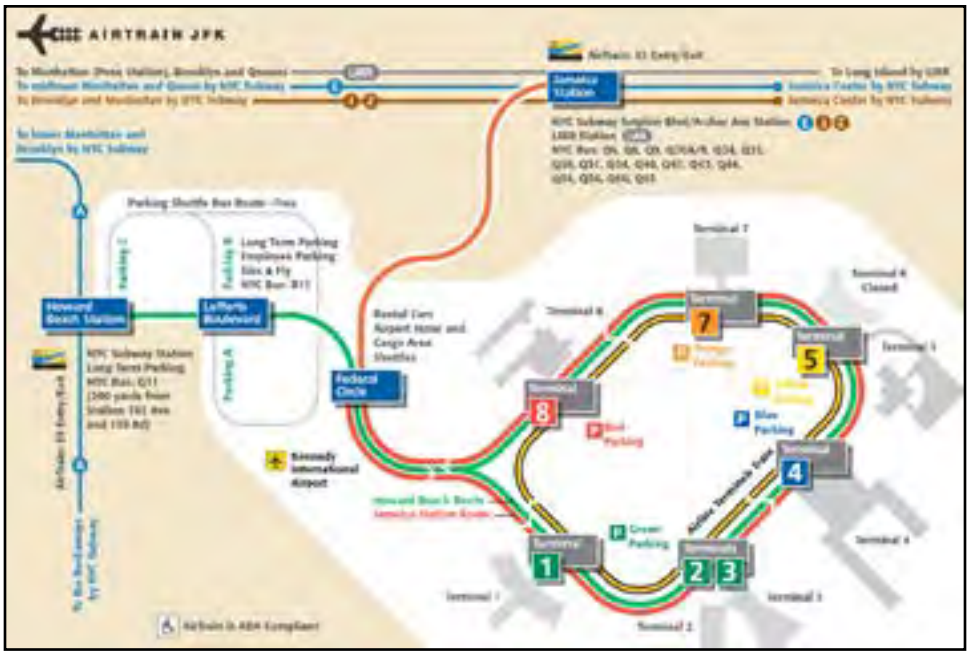

Figure 6. JFK AirTrain System Map

Source: PANYNJ, "To & From JFK," www.panynj.gov/airports/jfk-to-from.html (accessed June 6, 2012). © 2010 PANYNJ.

Six stations within the CTA serve the passenger terminals and four stations outside the CTA serve the LIRR and subway stations, long-term parking, rental car facilities, and an airport hotel at Federal Circle. AirTrain is free for trips within the airport but, as of March 2012, costs $5.00 to enter or exit at the Howard Beach or Jamaica stations. Children under the age of five ride free. The system operates 24 hours a day.

Regional Transit Connections

The AirTrain system links JFK with a wide range of regional rail connections, as shown in Figure 7. The Howard Beach station serves the New York City Transit (NYCT) subway A line between Manhattan and Rockaway. The Jamaica LIRR station serves commuter trains between New York Penn Station and points in Long Island, as well as LIRR trains to Flatbush Avenue station in Brooklyn.

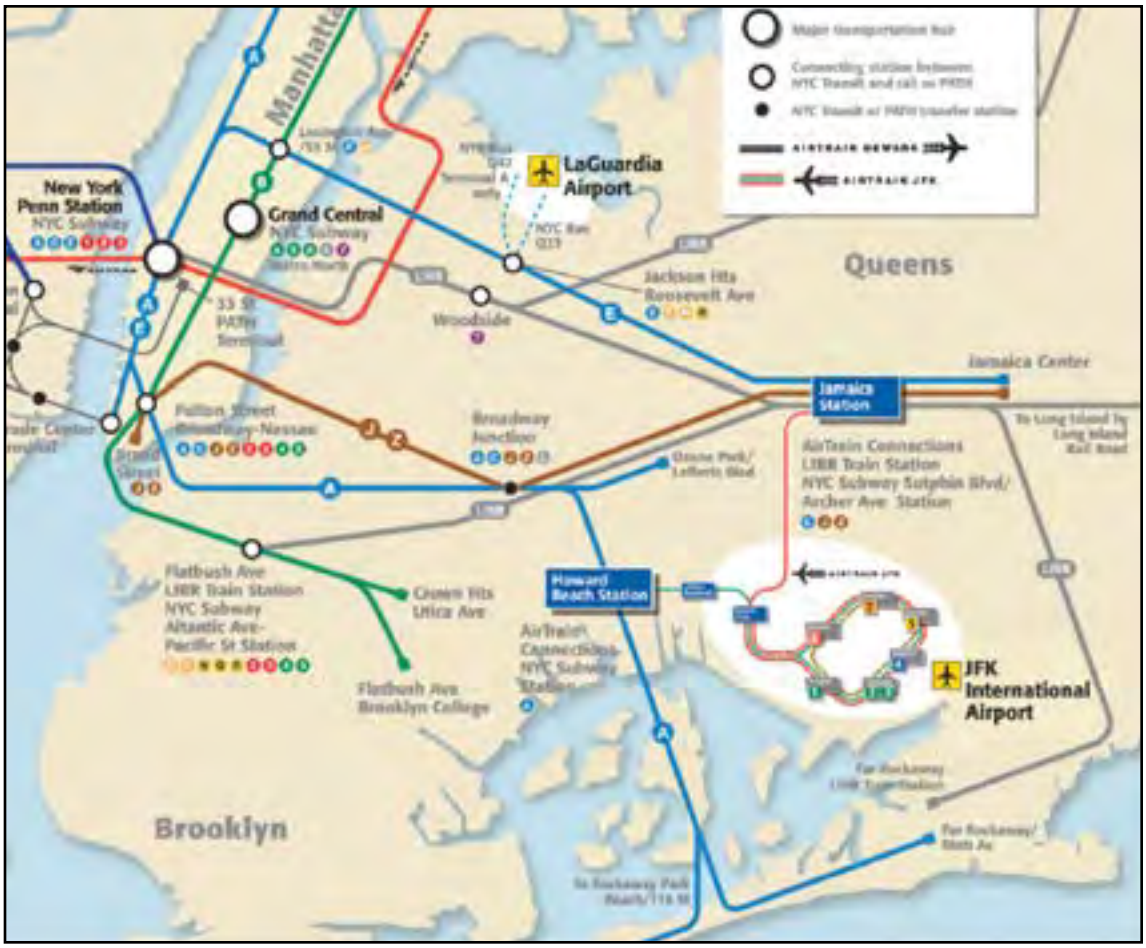

Figure 7. JFK Regional Rail Connections

Source: PANYNJ, "To & From JFK," www.panynj.gov/airports/jfk-to-from.html (accessed June 6, 2012).

The Jamaica station also provides connections to the NYCT subway E, J, and Z lines at the adjacent Sutphin Boulevard/Archer Avenue station. Jamaica station also provides connections to a large number of NYCT and Long Island bus routes. From Jamaica station, the AirTrain ride to the CTA stations takes approximately 15 minutes. From most parts of New York City, using public transportation to access the AirTrain and riding to the CTA stations takes between 45 minutes and an hour and a half.

One particularly interesting aspect of the project was the consideration given in the design of the system to future interoperability with LIRR or NYCT trains, or use of LIRR tracks by AirTrain vehicles to provide a one-seat ride to Manhattan. The AirTrain cars were sized and designed to be compatible with LIRR operation, while the AirTrain guideway and stations were sized and designed to accommodate LIRR or NYCT subway trains in the future, if such operations were to be found desirable. Aside from the issues that this would raise with the use of PFC revenues to construct the system, it is unclear whether the benefits of operating LIRR or NYCT trains into the CTA would justify the costs and operational complexities involved. Operating AirTrain car sets into Manhattan may make more sense, particularly in terms of serving visitors to the New York region who may not be familiar with the LIRR service. However, this may be a situation where improved passenger information

provides almost as much benefit as a one-seat ride at considerably less cost. While a one-seat ride would eliminate the transfer at Jamaica station, most AirTrain users would have to make further transfers in Manhattan anyway, so the benefit of eliminating one transfer is likely to be fairly modest, as long as travelers have good information about the LIRR service from Jamaica station to Manhattan.

History of the Project

Starting in the late 1960's, the PANYNJ and the New York Metropolitan Transportation Authority (MTA) undertook a series of studies on ways to improve rail access to JFK from Manhattan. In 1978, the MTA began operating the Train-to-the-Plane, a limited stop service with special-purpose subway cars between Manhattan and the Howard Beach subway station using existing subway tracks.[155] However, this service attracted limited ridership and was discontinued in 1990.

In May 1995, the PANYNJ abandoned an ambitious plan for a rail link between Mnahattan, LaGuardia Airport, and JFK and began pursuing a plan for an automated guideway transit system (variously described as a light rail system or monorail system) that would provide inter-terminal transport and a connection to Howard Beach station.[156] On August 1, 1995, the FAA approved a PANYNJ request to use PFC revenues to fund part of the project.[157] The 5.1-mile project was projected to cost $825 million, of which the section between Howard Beach station and the CTA would cost $325 million and be funded with PFCs to be collected from October 1995 over a five-year period. The remainder of the project would connect the terminals in the CTA and would cost $500 million. This part would be funded with about $114 million of the $282 million in PFC revenues that had been collected since 1992, with the balance funded from the PANYNJ capital budget. It was anticipated that construction of the system would commence in 1997 and the system would be opened in 2002.

Community leaders in Queens began pressing to have the system expanded to include a link to Jamaica Station.[158] On May 9, 1996 the PANYNJ approved $25 million for engineering and planning for an expanded 8.4-mile project that included a link to Jamaica Station and was projected to cost $1.1 billion, $700 million of which would come from PFC revenues.[159,160] However, the planned use of PFC revenues to fund the segment of the project from the airport to Jamaica Station introduced a complicating issue because the regulations for the use of PFC revenues do not allow them to be used for projects located off an airport. The PANYNJ planned to circumvent this restriction by acquiring a strip of land in the median of Van Wyck Expressway (VWE), which runs from JFK to Jamaica, from New York State, the owner and operator of the VWE, and some additional land near Jamaica station from the City of New York, thereby making the land to be used for the AirTrain guideway part of the airport.

A Final Environmental Impact Statement for the project was issued in May 1997 and the FAA issued a Record of Decision in July 1997 determining that the proposed project had satisfied the requirements of NEPA.[161,162] In February 1998 the FAA approved partial funding of the project from PFC revenues with some restrictions[163] and in May 1998 the PANYNJ awarded a design-build-operate-maintain (DOBM) contract to a consortium of

four firms: Slattery Skanska, Inc., Koch Skanska, Inc., Perini Corporation, and Bombardier Transit Corporation, operating as the Air Rail Transit Consortium (ARTC).[164] The contract made ARTC responsible for the project's preliminary engineering, design completion, construction, installation, testing, demonstration, and operation and maintenance for a 5-year period, with optional 1-year contract extensions for up to 10 years. As part of an early action program, final design contract documents for a twin-cell tunnel under two airport taxiways that would allow the AirTrain guideway to access the CTA were prepared by a consultant to the PANYNJ and included in the work required by the ARTC. [165]

During the detailed design phase of the project, the length of the project was reduced to 8.1 miles, with a 1.8-mile loop in the CTA, a 3.3-mile segment from the CTA to Howard Beach station, and a 3-mile segment to Jamaica Station. It is unclear how much of the reduction was due to an actual change of alignment and how much was due to a more accurate measurement of the lengths of each segment as the design was refined.

Following the FAA decision on PFC funding in February 1998, the Air Transportation Association of America (ATA), representing many of the U.S. airlines using JFK, filed a lawsuit against the FAA challenging the FAA's approval to use PFC revenues for the project, particularly for the section of the project along the VWE, and the FAA's use of information provided by the PANYNJ as part of the project justification that had not been made publicly available.[166] In March 1999 the court upheld the right of the FAA to approve use of PFC revenues for construction of the VWE section of the AirTrain guideway but agreed with the ATA that the FAA should not have made use of information submitted by the PANYNJ after the close of the public comment period on the project, vacated the approval and remanded the PFC application to the FAA to correct the procedural flaw. Following a second public review and comment period, on August 16, 1999 the FAA reaffirmed its approval of the use of PFC revenues for the project.[167]

Construction of the AirTrain system began in 1998 following award of the DOBM contract and was largely completed in 2002. Following extensive testing, in the course of which a serious accident occurred when a test train crashed, killing the operator, the system opened for service on December 17, 2003.

Project Costs

As the project evolved, the costs increased from the initial 1995 estimate of $825 million to a final cost of $1.9 billion. Part of the cost escalation resulted from the decision to add the segment between the airport and Jamaica station, which increased the contract award for the DOBM contract to $1.134 billion, as shown in Table 6. In addition, the PANYNJ established a contingency fund of $129 million to cover uncertain or unanticipated costs arising during construction and reduce the provision for contingencies in the negotiated contract amount.[168] The project budget also included $400 million for direct PANYNJ expenses, including land acquisition, some mitigation expenses, and a part of the design work.[169] By the end of the construction phase of the project, some $99 million of the contingency fund had been used.[170]

In early 2001 the PANYNJ increased the budget for the project to $1.9 billion reflecting an agreement with the MTA to provide $325 million to finance improvements at the Jamaica LIRR station and to enhance the AirTrain station and the link between the two stations in order to create a "gateway" to JFK and facilitate intermodal connections.[171] The resulting Jamaica Intermodal Terminal was designed by the PANYNJ and construction was procured under a separate contract with a joint venture of Perini Corporation and Tutor-Saliba Corporation. The MTA provided $172 million toward the project, which included an eight-story office tower for the LIRR and provision for future air rights development.

Table 6. Estimated JFK AirTrain Project Costs at Contract Award

	Project Cost $ (million)
Contract Award	
Early Action (Cut and Cover Tunnels)	99
Design-Build Components	930
Operation and Maintenance (5 years)	105
Subtotal	***1,134***
Contingency Fund	129
Direct PANYNJ Expenses	400
Total	**1,663**

Source: Songer et al., 2012; Brecher & Nobbe, 2010.

Funding Sources

The principal source of funding for the project was PFC revenue collected at all three New York Airports. In its August 1999 decision, the FAA approved the use of $1.148 billion in PFC revenue for the Light Rail System.[172] The approved amount was unchanged from the Record of Decision issued on February 9, 1998, which approved collection of $823 million in new PFC revenue from a $3.00 PFC from January 1, 2001 until January 1, 2009 (or the approved amount had been collected), together with $325 million in previously approved PFC collections.[173]

In its approval, the FAA excluded certain costs as ineligible for the use of PFC revenues due to regulatory restrictions. These included fare collection equipment and the planned AirTrain operations, maintenance and storage facility, with the exception of equipment needed for operational control of the planned system as of its opening day. Furthermore, any additional costs involved in making provision to accommodate LIRR or NYCT subway cars on the system and any tracks to link the system to the LIRR or NYCT subway would not be eligible.[174]

The majority of the remainder of the project funding came from PANYNJ capital funds, with some funding from the MTA for related improvements to Jamaica and Howard Beach stations.

Although not formally part of the AirTrain project, the New York State DOT decided to widen a number of bridges over the Van Wyck Expressway while the AirTrain guideway was under construction and provided $72 million to the ARTC under a separate contract for this work to avoid having to undertake a separate procurement.

Summary and Discussion

The JFK AirTrain project is notable for a number of characteristics:

- The use of PFC revenues to cover a large share of the project costs, including connections to Jamaica Station, located some distance away from the airport;
- The use of PANYNJ capital funds for the majority of the remainder of the project funding, with no use of Federal or state funding for the project itself;
- The development of an integrated system that provides on-airport inter-terminal transportation as well as links to two nearby rail stations, rental car facilities, an on-airport hotel, and long-term parking;
- The use of a DBOM contract to construct the project and subsequently operate and maintain it for a period of up to 15 years;
- Design of the project to facilitate future inter-operability with existing regional rail systems.

The project served as an important test case to establish the ground rules governing the use of PFC revenues for intermodal links to regional rail systems located off the airport. Legislation establishing the PFC program requires projects to be located on land owned or controlled by the airport sponsor. Therefore, the PANYNJ acquired a strip of land in the median of the Van Wyck Expressway and additional property adjacent to the Jamaica station of the LIRR to construct the link between the airport and the station. The cost of the AirTrain terminal at Jamaica station and associated improvements to the station were funded by PANYNJ capital funds, not PFC revenues. The ATA filed a lawsuit in federal court challenging the FAA approval of the use of PFC revenues for the link to Jamaica station, but the court upheld FAA's interpretation of the regulations governing the use of PFC revenues, thereby establishing a precedent for similar projects in the future.

The use of PANYNJ capital funds for the majority of the elements of the project not funded by PFC revenues demonstrates the importance assigned to improved intermodal connections to regional rail systems by the PANYNJ in planning to meet future airport access needs at JFK. The development of an integrated system serving inter-terminal connections and providing links to car rental facilities, long-term parking and other on-airport facilities, as well as regional rail systems significantly reduced the amount of shuttle

bus traffic on airport roadways and allowed the costs of developing and operating the AirTrain system to be spread across the greatest number of riders.

The use of a DBOM contract to construct and operate the system was intended to reduce costs by shifting the responsibility for managing risk to the contractor and improving coordination between the various firms involved in constructing and delivering the system, as well as reducing the staffing requirements on the part of the PANYNJ, particularly for operating the system once it was constructed. Assessment of the success of this strategy by those involved suggests that only some of these objectives were met or partially met. In particular, the scale and complexity of the project, together with its interaction with airport operations and other construction activity on the VWE and at Jamaica station required extensive involvement by PANYNJ staff and consultants.

Oakland International Airport BART Connector

Oakland International Airport (OAK) is one of three primary air carrier airports in the San Francisco Bay Area located on the east side of San Francisco Bay about 8 miles southeast of downtown Oakland. The airport is owned and operated by the Port of Oakland and served 11.5 million passengers in 2008.[175] In an effort to reduce automobile congestion in the Bay Area and provide an improved connection between the airport and the regional Bay Area Rapid Transit (BART) system, an automated guideway transit (AGT) link between OAK and the nearby Coliseum/Oakland Airport BART station has been planned since the early 1970's. The Coliseum/Oakland Airport station is located about 3 miles northeast of the airport adjacent to the Oakland Coliseum stadium where the Oakland Athletics Major League Baseball team and Oakland Raiders National Football League team play their home games and on the far side of the Interstate 880 freeway from the airport.

As of the date of this report, the BART system serves the four central counties in the Bay Area (Alameda, Contra Costa, San Francisco, and the north part of San Mateo). The system has 43 stations and had an average weekday ridership of 327,629 in 2010[176] To access OAK by public transportation, air passengers and airport employees currently ride the AirBART shuttle bus from the Coliseum BART station or take Alameda Contra Costa Transit District (AC Transit) bus lines 73 or 805. The AirBART shuttle is operated by Oakland International Airport and transported 85,000 passengers per month in 2008. The one-way travel time varies between 12 and 30 minutes and there is a $3 fare.

In February 1970, BART, the City of Oakland, the County of Alameda, and the Oakland Coliseum conducted a study to determine the viability of connecting BART to OAK with some type of automated people-mover. Although the study found the project to be viable and planning for the project continued intermittently for almost 30 years, no action was taken to implement the project during this period. In October 1999, BART and the FTA held a public meeting to discuss environmental issues and project details.[177] Over the following decade, planning continued to implement what has come to be called the Oakland Airport Connector (OAC) that will replace the current AirBART shuttle bus.

In addition to the following description, a more detailed discussion of the OAC project is provided in a case study report on the MTI website.[178]

Project Description

The OAC is an AGT system that is intended to provide reliable and frequent service to the airport.[179] Travel time from the Coliseum station to the OAK station is estimated to be 15 minutes. Trains will depart for the airport every 4 minutes. By 2020, the OAC is projected to transport 10,000 passengers daily.[180]

The OAC alignment from the Coliseum BART station follows the median of Hegenberger Road, one of the two major access arterials between Interstate 880 (I-880) and the airport, south past I-880 to just before the intersection with Airport Drive. The route then swings to the east, crosses under 98th Avenue and the intersection of Doolittle Drive and Airport Drive, to emerge between Airport Drive and an adjacent municipal golf course. The OAC alignment then continues southwest between Airport Drive and the golf course, crosses the airport parking lot, and ends at the airport passenger terminal. For the segment on Hegenberger Road, the AGT would transport passengers on an elevated guideway, allowing the system to operate free of ground traffic and signals.[181] The OAC will have two stations, one located at OAK and one at the Coliseum BART Station. The current project does not include intermediate stations, but the design allows for future stations to be developed at a later time.[182] Figure 8 below shows the general area of the OAC alignment together with the current AirBART route and AC Transit Route 58 bus route.

History of the Project

The cost of the Oakland Airport BART connector has steadily increased over the history of the project. In 1998, the AGT BART connector had an estimated cost of $130 million. The 1998 design was a smaller, narrower, and lighter system than subsequent designs. By 2001, the estimated cost of the AGT had increased to $204 million and by 2009 the project cost had increased to $522 million. BART assembled a complex funding package of $452 million and was hoping to get $70 million in federal ARRA funds to complete the funding and start construction.

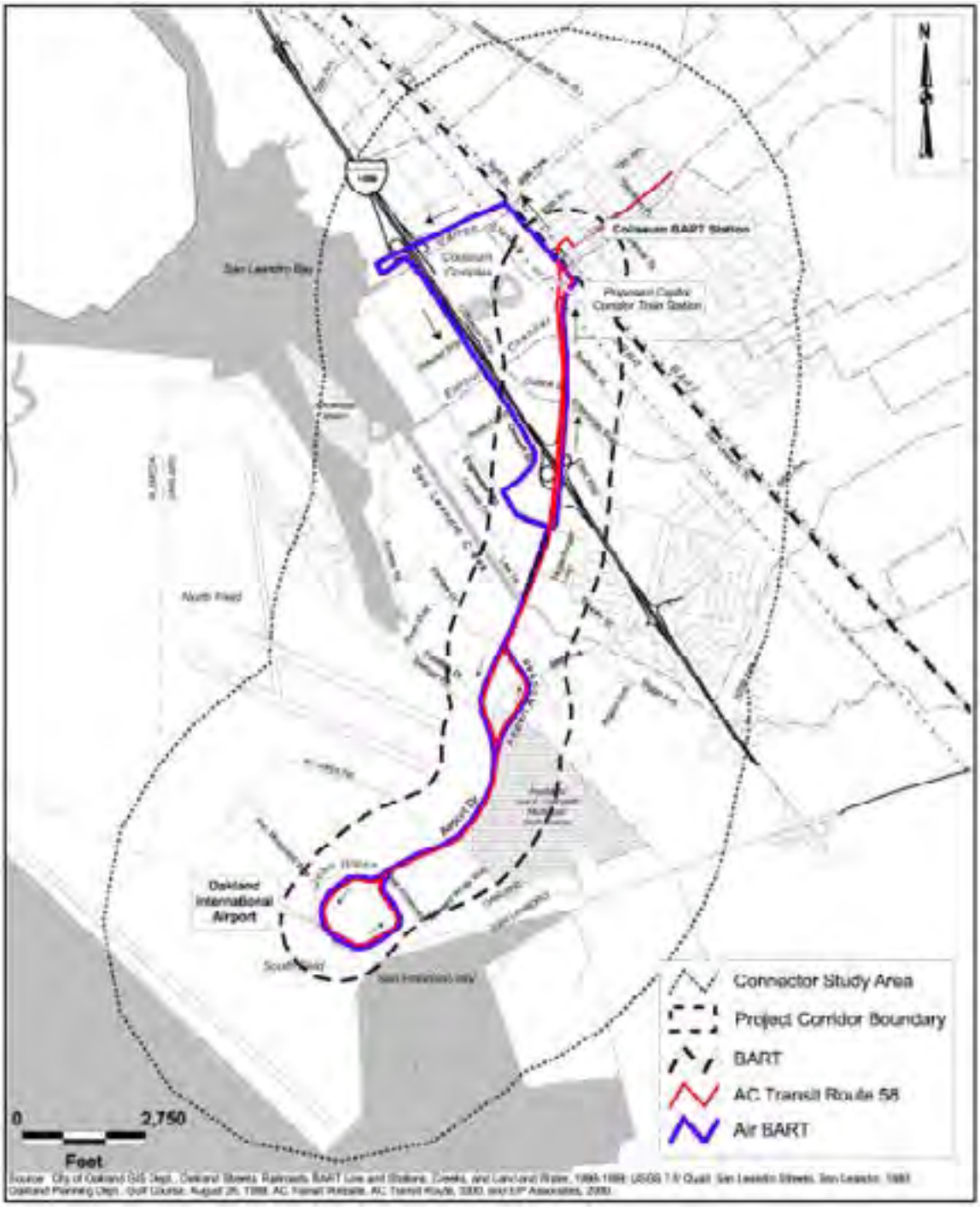

Figure 8. Proposed Oakland Airport Connector Corridor

Source: BART, BART-Oakland International Airport Connector: FEIR/FEIS, 2002, Figure S-2.

However, local residents and organizations that opposed the project filed a formal complaint with the FTA claiming that the increased fares that would be charged for using the OAC would adversely affect minority and low-income passengers. In early 2009 FTA found BART had not prepared a service equity study and would only grant ARRA funds if BART conducted a service equity study and implemented a public participation plan by September 2009. BART did not have sufficient time to produce the requested documents

and the ARRA funds were dispersed to other regional transit agencies and projects. In response to the loss of ARRA funds, BART modified the project and developed a revised OAC funding package.

In September 2010 BART's Board of Directors awarded a design-build contract to construct the project and a contract to operate and maintain the OAC project to a consortium of Flat Iron Construction Corporation, Parsons Corporation, JV Construction, and Dopplemayr Cable Car.[183, 184]. The maintenance and operation award will last 20 years. As of May 2012, construction was under way with revenue operation expected to commence in spring 2014.

Project Costs

The latest projected total cost for the OAC project is $484 million. The total projected construction and financing costs are presented in Tables 7 and 8.

Table 7. OAC Updated Project Construction Costs

Development and Construction Costs	$ (millions)
BART costs spent and reimbursed to date	39.2
Capital construction and civil cost	363.9
Delivery and construction contingency	73.0
Total development and construction costs	***476.1***

Source: Table adapted from BART, 2010a.

Table 8. OAC Updated Financing Cost

Financing Costs	$ (millions)
TIFIA Interest expense	0.9
Upfront financing costs and fees	5.4
Annual rating agency fees	0.1
Reserves for other financing costs	1.5
Total financing costs	8.0

Source: Table adapted from BART, 2010a.

Funding Sources

BART has assembled a complex funding package from a variety of local, regional, state, and federal sources. The original funding package included funding from Alameda County Transportation Improvement Act (ACTIA) Measure B, the Port of Oakland, the California

Transportation Commission (CTC), the State Transportation Improvement Plan (STIP), regional bridge tolls, and federal ARRA funds.[185] By 2009, BART had identified funding of $452 million and was waiting to receive an ARRA grant of $70 million to cover the balance of the projected cost of $522 million.

In response to the loss of ARRA funding, BART's Board of Directors approved a revision of the project scope and funding plan and applied for federal New Starts funding [186] and a $20 million STIP grant by the CTC. The FTA sent a letter to BART on September 15, 2010 stating that they had reserved $24.99 million in New Starts funding for the OAC project, subject to approval of BART's service equity report addressing concerns raised by the Title VI complaint filed by local environmental justice advocates.[187] The CTC STIP grant was approved unanimously on September 22, 2010. [188]

BART's new funding plan for the OAC project includes a total of 12 different funding sources: five local, six state, and one federal source. Table 9 presents the local, regional, state, and federal funding sources, the amount funded, and the status of the funds as of late 2010.

Discussion

The Oakland Airport Connector project illustrates the challenges that can arise in developing an automated people-mover link between an airport and an off-airport station on a regional rail transit system. The project has been under consideration for several decades and over this time the estimated costs have steadily increased. This led to a challenge to the project on grounds that the higher fares required to cover the increased operating costs would impose an undue burden on lower income travelers, particularly lower income airport workers.

Beyond these concerns, the escalating costs of the project raise questions over whether the travel time benefits provided by the project, which are likely to be fairly small compared to continued use of the current AirBART bus service that links the airport to the Coliseum BART station, justify this level of capital investment.

Technically the project is fairly straightforward, using a well-established people-mover technology procured under a design-build-operate-maintain contract, with the majority of the guideway between the station and the airport on an elevated structure in the median of Hegengerger Road. For many years it was planned that the system would include two intermediate stations serving the area between I-880 and the airport, thereby taking advantage of the investment in the project to improve transit accessibility to anticipated development in the Hegenberger corridor. However, these have since been dropped from the final design to save cost. While this avoids the cost and visual intrusion of locating stations in the median of Hegenberger Road, as well as reducing travel times between the BART station and the airport, it also sacrifices the synergies that could have been obtained by supporting transit oriented development in the corridor.

Table 9. Updated OAC Funding Plan

OAC Funding Sources -- Status and Use $ (millions)					
Source	**Local**	**State**	**Federal**	**Debt Draws**	**Status**
Alameda County Transportation Improvement Agency (ACTIA) Measure B	89.1				Committed
Port of Oakland PFC	29.3				Pending
Regional Measure 1 (1988) Bridge Toll	31.0				Committed
Regional Measure 2 (2004) Bridge Toll	115.2				Committed
BART SFO Reserve Account	10.0				Pending
State Transportation Improvement Program (STIP)		20.7			Committed
Corridor Movement Improvement Account (CMIA)/ Regional Transportation Improvement Plan (RTIP) Funding Exchange		10.0			Programmed
State Highway Operation and Protection Program (SHOPP)/ (RTIP) Funding Exchange		10.0			Programmed
Metropolitan Transportation Commission (MTC) - State-Local Partnership Program (SLPP) Proposition 1B		20.0			Committed
PTMISEA Proposition 18		12.8			Committed
High-speed Passenger Train Bond		5.4			Pending
Federal Transit Administration (FTA) Small Starts			25.0		Pending
TIFIA Debt Draws				105.7	Requested
Total Funding = $484.2	**274.6**	**78.9**	**25.0**	**105.7**	

Source: Table adapted from BART, 2010a

Oakland International Airport Roadway Project

During the 1990s, Oakland International Airport (OAK) had been steadily handling more passengers and cargo annually. The airport was originally designed to accommodate only 8 million passengers, but by 2000 the airport was handling over 10 million passengers and over 700,000 metric tons of air cargo, ranking it in the top 30 airports in the world for cargo traffic. The growth in passenger and cargo traffic required the development of an improved access road system to better connect the airport with Interstate 880 to the northeast and with Bay Farm Island, a community immediately to the west of the airport, and to link the airport passenger terminals and cargo center with the nearby Harbor Bay Business Park.

The Oakland International Airport Roadway Project (ARP) widened Airport Drive from two lanes to six lanes, widened 98th Avenue, and constructed a new road that linked Bay Farm Island to Airport Drive, improving commutes for City of Alameda residents working at the airport and access for businesses located between the airport and I-880. The ARP

was seen as a major contribution to enhancing the movement of passengers, airport employees, and cargo to and from the airport, as well as alleviating future congestion due to increased airport traffic and regional population growth.[189]

The ARP was developed as part of a larger Airport Development Program (ADP) that was intended to increase airport capacity, provide improved airport ground access, and enhance the airport's flight reliability.[190]

As it turned out, passenger traffic continued to increase after 2000 to reach a peak of 14.6 million passengers in 2008, although it subsequently declined to 9.5 million passengers in 2010 due to the combination of the general decline in air travel as a result of the recession that began in late 2007 and an expansion of service by low-cost airlines at San Francisco International Airport (SFO). This resulted in lower fares at SFO in several key markets, which attracted some of the traffic that had previously been served by OAK. The growth in air cargo traffic ended after 1998, with annual air cargo traffic levels fluctuating around a slowly declining trend. By 2007, annual air cargo traffic had dropped to about 667,000 metric tons and declined sharply after 2008 to about 511,000 metric tons in 2010.

In addition to the following description, a more detailed discussion of the OAK ARP project is provided in a case study report on the MTI website.[191]

Project Description

The Airport Roadway Project extended from the 98th Avenue Interchange on I-880 along 98th Avenue and Airport Drive and included a new road between Airport Drive and Bay Farm Island in the City of Alameda.[192] The new road was originally called the Cross-Airport Roadway and later renamed Ron Cowan Parkway. Figure 9 shows the principal access roads serving OAK from I-880 and the surrounding communities.

Figure 9. Oakland International Airport Environs and Access Roads

Source: Google Maps, maps.google.com (accessed July 30, 2011). Imagery © 2011 Digital Globe, GeoEye, U.S. Geological Survey, USDA Farm Service Agency; Map data © 2011 Google.

In addition to providing improved access between Bay Farm Island and Airport Drive, the Ron Cowan Parkway serves the FedEx air cargo complex located to the west of Taxiway B that links the air carrier runway on the south side of the airport with the general aviation runways to the north of the passenger terminal complex. Prior to the construction of an underpass under Taxiway B as part of the project, vehicles accessing the FedEx complex had to enter the aircraft movement area and cross Taxiway B at a controlled crossing.

The project was structured as a partnership between the Port of Oakland, the City of Alameda, the City of Oakland, and the Alameda County Transportation Authority

(ACTA), which changed its name during the course of the project to the Alameda County Transportation Improvement Authority (ACTIA). The Port of Oakland owns and operates Ron Cowan Parkway and Airport Drive up to the interchange between 98th Avenue and Doolittle Drive. The stretch of 98th Avenue between Doolittle Drive and I-880 is part of the street system of the City of Oakland.

The project was divided into three contracts:

- Contract A: Widened Airport Drive between a new grade-separated interchange at Doolittle Drive and the passenger terminal complex, developed a new link between Harbor Bay Parkway and Airport Drive, and constructed an underpass under Taxiway B. The project included relocating utilities, installing new duct banks, and constructing the new road between the existing Air Cargo Road that served the FedEx complex and Harbor Bay Parkway. The facilities developed under Contract A became operational in March 2004. Construction under this contract was delayed by two years due to litigation over the environmental impacts of the ADP, of which the new road was part.

- Contract B: Constructed the new grade-separated interchange at Doolittle Drive and Airport Drive that allowed traffic on Airport Drive to access 98th Avenue by passing underneath Doolittle Drive. This work was completed on September 13, 2002.

- Contract C: Widened 98th Avenue between I-880 and Airport Drive and was completed on December 31, 2001.

Project Costs

The ARP had an original project cost estimate of $81.6 million in 1986 with the majority of the funding coming from the Alameda County Transportation Authority, as it was called at the time.

By 1996, the estimated project cost had increased to $97.5 million because of safety and engineering issues, and mitigation concerns from the environmental review process.[193] Estimated project costs increased again in June 1999 to $104.1 million. Project cost estimates increased for the third time in August 2000 to $114.7 million due to the delay in the FAA issuing a Record of Decision (ROD) for the EIS for the ADP, which included part of Contract A of the ARP, while litigation against the ADP was resolved. The final cost projection for the ARP as of September 2000 was $121.25 million.

Funding Sources

The allocation of project costs among the partners changed with the evolving cost estimates. The final cost allocation of projected costs to the project partners as of September 2000 is shown in Table 10.

Table 10. Final Estimate of OAK ARP Cost and Funding Contributions

Agency	Amount	Project Share	Local Share
ACTIA with SLTPP	$78,100,000	64.4%	
City of Alameda	$8,835,000	7.3%	20.48%
City of Oakland	$418,000	0.3%	0.97%
Port of Oakland	$33,895,506	28.0%	78.56%
Total	**$121,248,506**	**100.0%**	**100.0%**
Local Total	***$43,148,506***		

Source: Port of Oakland, 2000.

The State and Local Transportation Partnership Program (SLTPP) was created in 1989 to encourage local agencies to fund transportation projects both on and off the State Highway System. The program contributed funds from the State Highway Account to eligible locally funded transportation projects that were ready to be constructed with little state oversight and planning.[194] Originally, the total SLTPP funding allocated to the project was $8.8 million, but the delays in approving the EIS for the ADP caused Caltrans to reduce the SLTPP funding contributions to half, which Caltrans provided to ACTIA to help fund the ARP. ACTIA added an additional $4.4 million in funding to make up for the SLTPP funding shortfall.[195] The funding contributions of the City of Alameda included property worth $400,000 for project roadway right-of-way.

Summary

The OAK ARP improved and expanded the system of access roads serving the airport, allowing air passenger, employee and cargo trips to access the airport more efficiently and providing an alternate path for travelers from the City of Alameda and Bay Farm Island to reach I-880 and businesses located between the airport and the freeway.

The initial cost estimate for the ARP was $81.6 million in 1986, with the total estimated cost increasing four times over the course of 14 years. The final cost of the project was $121.25 million. One of the main reasons for the project cost increase was a delay in issuing the Record of Decision for the FEIS for the Airport Development Program, which included a portion of the ARP. The ROD was eventually approved and construction was finally completed in March 2004. The components of the ARP constructed under Contracts B and C were finished earlier than the work included in Contract A because the construction work under those contracts was not affected by the delays in issuing the ROD for the ADP.

A total of five entities funded the ARP:

- Alameda County Transportation Improvement Authority;
- Port of Oakland;

- City of Oakland;
- City of Alameda;
- Caltrans through the SLTPP.

The Port of Oakland and ACTIA provided the majority of the funding for the ARP. The ARP was funded without any direct federal aid and with only a small amount of state funding. The SLTPP contributed $4.4 million in state funding to the project. The ARP is a good example of a project sponsor persevering through multiple increases in estimated costs and a contested EIS process. As Oakland International Airport attracts more air passengers and air cargo in the future, the road improvements provided by the ARP will make an important contribution to meeting the future ground access needs of the airport.

Richmond Airport Connector

The Richmond Airport Connector (RAC) serving Richmond International Airport, Richmond, Virginia, provides one of the first examples of a public-private partnership in the development of an airport access highway. The RAC is a divided four-lane highway that connects the existing Pocahontas Parkway Route 895 toll road in Henrico County, Virginia, to Richmond International Airport and has been developed to improve airport access and reduce congestion on access roadways serving the airport.

Richmond International Airport (RIC) is located southeast of the downtown area of Richmond, Virginia, as shown in Figure 10, and in 2010 was served by eight air carriers with flights to both domestic and international destinations. By 2010, RIC was handling over 3.5 million passengers and 115 million pounds of cargo annually, with the number of annual passengers projected to increase to 5.2 million passengers by 2015.[196]

Figure 10. General Location of the Richmond Airport Connector

Source: Rich Prezioso, *Richmond Airport Connector Project*, June 2009.

In an effort to decrease congestion and automobile travel times in the region, the 8.8 mile Pocahontas Parkway and 1.6mile RAC have been included in state and regional transportation plans since 1989, although funding constraints prevented any action on either facility for several years. In 1997, the Pocahontas Parkway Association (PPA) was established as a nonprofit organization. Its purpose was to issue tax-exempt bonds to fund the construction of the Pocahontas Parkway as a toll road under a public-private partnership (PPP) with the Virginia Department of Transportation (VDOT). The Pocahontas Parkway opened in 2002. After the Parkway opened, the Richmond Regional Planning District Commission continued to include the RAC in their regional plans, including the 2026 Constrained Long-Range Transportation Plan and the Richmond Area Metropolitan Planning Organization Transportation Improvement Program and Congestion Management System road network.[197] The RAC was expected to decrease travel times to the airport by ten minutes and reduce traffic congestion on local roads.

In June 2006, Transurban (USA) Development, Inc., a $7.3 billion Australian toll road developer and operator, entered into an agreement with the PPA and VDOT to buy the rights to operate and maintain the Parkway and develop the RAC under a new PPP with VDOT.[198] The PPP agreement stated that Transurban would develop and maintain the Parkway and RAC for 99 years after purchasing the toll road from the state. The initial toll rate for the connector was set at $1.25[199] for vehicles with two axles traveling from or to the east. Vehicles using the connector and traveling from or to the west pay a higher toll at

the Main Toll Plaza. Toll rates would remain constant for two years then could be increased annually at rates specified in the agreement between Transurban and VDOT.

In addition to the following description, a more detailed discussion of the RAC project is provided in a case study report on the MTI website.[200]

Figure 11. Richmond Airport Connector

Source: Rich Prezioso, Richmond Airport Connector Project, June 2009 (labels added).

Project Description

The RAC has been designed as a four-lane divided highway and extends from the Pocahontas Parkway to an intersection with Charles City Road and Airport Drive, at

the southwest boundary of RIC, as shown in Figure 11. The road was constructed on mostly undeveloped land. Because it provides an extension of Airport Drive south to the Pocahontas Parkway, it is also sometimes referred to as Airport Drive. The road includes a grade-separated overpass at Sprouse Road and a bridge over the CSX railroad. There is an at-grade intersection at Seven Hills Blvd. and at the location of a new road between Seven Hills Blvd. and the Parkway. Development of the connector required the construction of three new bridges, carrying the new road over the Parkway, Sprouse Road and the railroad, and the widening of an existing bridge over Monahan Road to accommodate a ramp connecting the Parkway to the RAC.[201]

Toll Collecting System

An important part of Transurban's agreement with VDOT was to upgrade the toll collecting system on the Parkway and extend this to the RAC when it was constructed. In November 2009, the Spanish company Telvent was awarded a $7 million contract by Transurban to upgrade the toll system on the Parkway and develop the toll system for the RAC.[202]

The upgrades to the toll system for the Parkway included replacement of roadside equipment, upgrade of office equipment, and installation of a video tolling system and violations processing center. The main toll plaza is located at the west end of the Parkway and accepts cash along with credit or debit cards and payment by EZ Pass transponder. There are electronic tollbooths on the two Laburnum Avenue and two RAC ramps that serve traffic to and from the east on the Parkway that does not pass through the main toll plaza. These booths only accept credit/debit cards or EZ Pass. The Laburnum Avenue ramps on the Parkway went cashless in July 2010 to provide an easier experience for drivers.[203,204] The RAC had cashless tollbooths when it opened.[205]

History of the Project

Originally, the Pocahontas Parkway and the RAC were planned to be developed as one project. However, sufficient funding was not available at the time and the project was subsequently split into two, and priority was given to the Parkway. In 1995, Virginia's General Assembly had passed the Public-Private Transportation Act, which allows private companies to generate funds to develop transportation projects in the State. The Pocahontas Parkway, Route 895, became the first project developed under that Act. In 1997, the Pocahontas Parkway Association was created as a non-profit, non-stock company to develop the parkway. To fund the Parkway, the PPA issued tax-exempt bonds that generated $354 million, received an $18 million Virginia State Infrastructure Bank loan, and was the recipient of an $9 million federal grant for roadway design. The Pocahontas Parkway was opened to the public in October 2002.

Over the next few years, traffic on the toll road did not match earlier projections and by 2005, the PPA was in danger of defaulting on its loan payments.[206] In response to the shortfall in revenue generation, the PPA and VDOT sought to enter into a financial arrangement with Transurban (USA) Development Inc. to take over the operation of the Parkway. Although Transurban had experience with privately funded highway projects in Australia, this was its first such venture in the U.S.

In June 2006, Transurban, the PPA, and VDOT entered into an Amended and Restated Comprehensive Agreement (ARCA) under which Transurban purchased the right to lease the Parkway and agreed to provide the PPA with sufficient funds to repay the outstanding bonds.[207] Under the purchase agreement, Transurban had the rights to maintain, operate, manage, enhance, and collect tolls from the Parkway for 99 years.[208] The agreement stated that VDOT would enter into a development contract with Transurban covering the development of the RAC, would process and approve design-build contracts for the RAC, and would take responsibility for any pre-existing hazardous waste.[209]

Transurban agreed to develop, maintain, and operate the RAC in conjunction with the Parkway, provided the FHWA approved a TIFIA loan for a $150 million line of credit, which was approved on June 19, 2006.[210] The ARCA stated that VDOT and Transurban would share future net revenues if they exceed a level that provides Transurban with a return on its investment of 6.5%.[211] It has been claimed that the PPP agreement will save taxpayers $240 million in road maintenance over the life of the agreement and will encourage more PPP joint development projects.[212]

Project Costs

In 2010, the RAC was projected by Transurban to have a total cost of $49.75 million. Construction costs were projected to be $39.5 million, with land acquisition and right-of-way costs of $10.25 million.[213]

Funding Sources

The Pocahontas Parkway was originally constructed with a funding package of $381 million comprised of a Virginia SIB Loan, federal roadway design funds, and Pocahontas Parkway Association bonds.

In 1996, Transurban entered into a $611 million agreement to lease the Pocahontas Parkway for 99 years. A large portion of the costs identified in the agreement was dedicated to repaying the bond debt from the PPA and Virginia Department of Transportation (VDOT), as shown in Table 11.

Table 11. Transurban's Lease Agreement Costs

Cost Element	Amount
PPA and VDOT debt	$487,000,000
Reserves and contingency	$90,000,000
Operational improvements	$8,000,000
Development Costs and Fees	$13,000,000
Finance and arranging Fees	$11,000,000
Maintenance reserves	$2,000,000
Total	$611,000,000

Source: Table adapted from Samuel, 2009.

Transurban financed the lease agreement with two loan packages from a consortium of banks, a $150 million loan from the TIFIA program, and $141 million in equity. The consortium of banks comprising DEPFA Bank in Ireland, BancoEspirito Santo de Investimento in Spain, and the Bayerische Hypo-und Vereinsbank in Germany provided $420 million in senior bank debt and $55 million in subordinate bank loans.[214]

The TIFIA loan provided a $150 million line of credit to be used to upgrade the electronic toll collection system, refinance part of the long-term senior debt, and construct the RAC, as shown in Table 12.[215]

Table 12. Transurban TIFIA Loan Components

Cost Element	Amount
Refinance senior bank debt	$95,000,000
Upgrade electronic toll collection system	$7,000,000
Construct the Richmond Airport Connector	$48,000,000
Total	**$150,000,000**

Source: Table adapted from USDOT, 2010.

TIFIA loan repayments will begin in 2029 and finish in 2043.[216] The interest rate for the TIFIA loan was equal to the local and state government average interest rate of 5.16% plus one basis point with interest capitalized for five years on a 35 year term.[217] Transurban will repay the TIFIA loan through toll revenues.

Summary and Discussion

The RAC project demonstrates the potential for public-private partnerships in funding improvements to airport access highways. The RAC represents one of the first highway projects in the U.S. to be constructed and operated through a public-private partnership and probably the first airport access highway funded in this way. The private-sector partner that took over operation of the Pocahontas Parkway from the previous public toll authority undertook to construct and operate the RAC as an extension of the Parkway.

In addition to the use of private-sector financing for the construction of the RAC, a major feature of the project is a TIFIA loan to supplement the investment of private capital, with the interest payments and eventual repayment of the loan to be covered from toll revenues on the Parkway and RAC. Since the TIFIA loan provided most of the funding to construct the RAC, the motivation for constructing the project under the PPP with Transurban arose more from it being developed as an integrated component of the larger Pocahontas Parkway project than because private-sector investment was used to fund part of the RAC.

It remains to be seen whether future toll revenues will prove sufficient to provide an adequate return to Transurban on its investment in the overall project or whether the toll revenue generated by traffic using the RAC will be sufficient to cover the costs of constructing and operating the Connector.

Portland MAX Airport Extension

MAX (Metropolitan Area Express) is a light rail system serving the metropolitan area of Portland, Oregon. It is operated by TriMet, a municipal corporation providing bus, light rail and commuter rail services in the three-county metropolitan area.[218] The MAX system began service in 1986 and by September 2010 comprised four lines covering 52 miles of route.[219]

Portland International Airport (PDX) had experienced considerable growth during the 1990s, with air passenger traffic at the airport increasing from 6 million passengers in 1990 to 14 million in 2000.[220] Air passenger traffic grew to a peak of 14.7 million passengers in 2007 before declining to 12.9 million in 2009.[221] Traffic recovered slightly to 13.2 million passengers in 2010 and was forecast to increase to about 27 million by 2035.[222]

TriMet opened the MAX Red Line serving PDX in September 2001. This project was constructed through a public-private partnership with Bechtel Enterprises, which allowed the project to be completed many years earlier than had been planned.[223] As part of the PPP agreement, Bechtel Enterprises contributed about a quarter of the project's funding and contracted to construct the 5.5-mile extension from the Gateway Transit Center in northeast Portland to the airport. In return, Bechtel Enterprises received development rights to a 120-acre site near the entrance to the airport that was owned by the Port of Portland, the operator of PDX, with approval to construct a mixed-use development.[224]

In addition to the following description, a more detailed discussion of the Portland MAX airport extension is provided in a case study report on the MTI website.[225]

Project Description

The airport station is located adjacent to the terminal building on the arrival level about 200 feet from baggage claim. There are three intermediate stations between the airport station and the Gateway Transit Center, as shown on Figure 12. Between Cascades station and the Gateway Transit Center the line runs in the median of the Interstate 205 (I-205) freeway. From the Gateway Transit Center, Red Line trains share tracks with the Blue Line trains to downtown Portland and the City of Beaverton on the west side of the metropolitan area.

Figure 12. Portland MAX Red Line Route and Airport Extension

Source: TriMet, MAX Red Line -- Light Rail to the Airport, 2009.

Red Line trains run every 15 minutes during peak hours and every 30 minutes during early morning and evening hours[226] The first train arrives at the airport around 5 am and the last train departs the airport at 11:59 pm.[227] Travel time from downtown Portland to the airport is approximately 38 minutes,[228] and the adult all-zone fare as of January 2011 was $2.35.[229] The adult all-zone fare increased by 5 cents in September 2011.

In 2009 the Red Line airport station handled 1.1 million passengers boarding and alighting,[230] comprising air passengers, airport employees, and airport visitors.

History of the Project

In 1997, Bechtel Enterprises approached regional officials with a proposal to construct a 5.5-mile extension of the MAX system to PDX as a public-private partnership. This extension was already included in regional transportation plans, but it was not expected that funding to construct the extension would be available until the 2010 time frame. Bechtel proposed to provide private-sector funding for about a quarter of the project's cost in return for a

sole-source contract to design and build the extension and development rights to a 120-acre site located near the airport on the planned alignment of the MAX airport extension.[231]

This site, which came to be called Cascade Station, was owned by the Port of Portland, the operator of the airport, and lay within the Airport Way Urban Renewal Area (URA) established by the Portland Development Commission (PDC) of the City of Portland in May 1986. The URA covered 2,726 acres along the shore of the Columbia River immediately to the east of the airport as shown in Figure 13.

Figure 13. Airport Way Urban Renewal Area

Source: PDC, "Airport Way Urban Renewal Map," May 2008.

The Airport Way URA is unique among the urban renewal areas in the city in that it does not have a significant housing element. Instead, its primary goal is to create a major employment center on the east side of the city, taking advantage of its proximity to major transportation infrastructure, including the airport.[232] Figure 13 shows the Red line route (in yellow) and the location of Cascade Station at the western end of the URA.

Project Costs

The MAX Red Line Airport extension cost $129 million, with funding provided by TriMet, the Port of Portland, the City of Portland, and Bechtel Enterprises. Preliminary engineering cost $3 million and construction cost $126 million.

Funding Sources

In April 2009 a detailed case study of the development and financing of the Red Line Airport extension was undertaken by PBConsult for the American Association of State Highway and Transportation Officials (AASHTO) Center for Excellence in Project Finance.[233]

The Red Line Airport extension was funded by a combination of local funds and the contribution from Bechtel Enterprises, as shown in Table 13. No federal funds were used in the project, which simplified approvals and allowed more rapid decision making.

Table 13. Funding Sources for Portland MAX Red Line Extension

	Amount $(m)			
Funding Source	**Preliminary Engineering**	**Construction**	**Total**	**Percent**
City of Portland	0.5	23.8	24.3	18.9%
TriMet	0.5	45.5	46.0	35.7%
Port of Portland	0.5	28.3	28.8	22.4%
Bechtel	1.5	28.2	29.7	23.1%
Total	**3.0**	**125.8**	**128.8**	**100.0%**

Source: PB Consult, Airport Max: A Case Study, April 2009.

The City of Portland agreed to contribute $23.8 million toward the construction cost of the 2.9-mile segment from the Gateway Transit Center along the I-205 right-of-way. Since the segment is within the Airport Way URA, the City was able to use tax increment financing to finance its contribution. It issued bonds to generate the funds, with future tax revenues from increases in the land values of parcels within the URA to be used to pay the interest on the bonds and eventually retire the debt. TriMet provided $45.5 million to cover the balance of the construction cost of the 2.9mile segment from the Gateway Transit Center along the I-205 median.

Summary and Discussion

The Portland MAX Airport extension represents an innovative approach that made use of a public-private partnership to allow a major airport ground access project to be implemented many years earlier than it would have been otherwise. By providing Bechtel Enterprises with development rights to land adjacent to the airport in return for covering some of the costs of constructing the light rail extension, the public costs involved in developing the airport link were reduced by about 23%. There is no doubt that the MAX Airport extension has significantly improved transit access to PDX and encouraged greater use of transit for airport trips, which supports regional policies to reduce private vehicle use. Furthermore, by configuring the Cascade Station development around a station on the MAX Airport extension, the operating costs of the extension are partly offset by the fare revenue from transit trips generated by the development.

Whether the Cascade Station development has proved a good deal for Bechtel Enterprises is less clear. One aspect of PPP developments is that the financial transactions of the private-sector entity following completion of the project are often not public information, as in this case. Another unknown aspect is how much a private developer might have been willing to pay for the development rights to the area of Cascade Station if this had been available as separate transaction unrelated to the construction of the airport extension. It is possible that development fees under such an arrangement might have been greater than the contribution of Bechtel Enterprises to the costs of constructing the airport extension, particularly given the possibility of federal grants to support the construction of the line.

A larger question that is rarely addressed during consideration of specific proposals for private-sector funding of public infrastructure is whether the overall costs to society of using private funding sources to develop public infrastructure are reduced or increased in comparison to funding these projects entirely from public sources. While private-sector funding may be viewed as “free money” by the sponsoring agencies, which do not have to meet these costs from constrained budgets, these funding contributions are most certainly not free from the perspective of society as a whole but have to repaid one way or another.

These questions point out the difficulty of determining whether a particular PPP is really in the long-term public interest or simply a way to allow a private-sector entity to make money off the provision of needed public infrastructure. However, with growing public interest in making greater use of private-sector funding for transportation infrastructure development, these questions become increasingly important.

The MAX Airport extension provides an excellent example of both the opportunities that may exist to take advantage of private-sector funding for airport ground access project and the difficulty of knowing whether this is really such a good idea, from the perspective of the larger public interest.

San Francisco International Airport BART Extension

San Francisco International Airport (SFO) is the primary commercial service airport in the San Francisco Bay Area and the principal West Coast hub for United Airlines. The airport has extensive long-haul and international air services and recently has attracted a number of low-cost airlines. In 2010 the airport handled 39.1 million air passengers.

The Bay Area Rapid Transit system currently connects SFO with many municipalities in the San Francisco Bay Area. Prior to opening the first stage of the BART extension into San Mateo County in 1996, the system operated within three Bay Area counties: Alameda, Contra Costa and San Francisco, with the line through San Francisco terminating at Daly City on the southwest boundary of San Francisco. An extension of the system to the town of Colma in San Mateo County was opened in July 1996, and a longer extension further south into San Mateo County was opened in June 2003, with a station at SFO and a terminating station just south of SFO in the city of Millbrae. In addition to the stations in Colma, Millbrae and the airport, the extension includes stations in the cities of South San Francisco and San Bruno. The Millbrae station is an intermodal facility that provides a connection with the Caltrain commuter rail service that connects San Francisco to San Jose and other communities in San Mateo and Santa Clara Counties.

Between the San Bruno and Millbrae stations the BART line separates into a Y-shaped spur that serves the station at SFO, which is located adjacent to the departure level of the International Terminal.[234] BART service to SFO is currently provided by trains that also serve the Pittsburg/Bay Point line in the East Bay. On average, trains serve the airport every 15 minutes and the travel time to SFO from downtown San Francisco about 30 minutes. The current BART system map is shown in Figure 14.

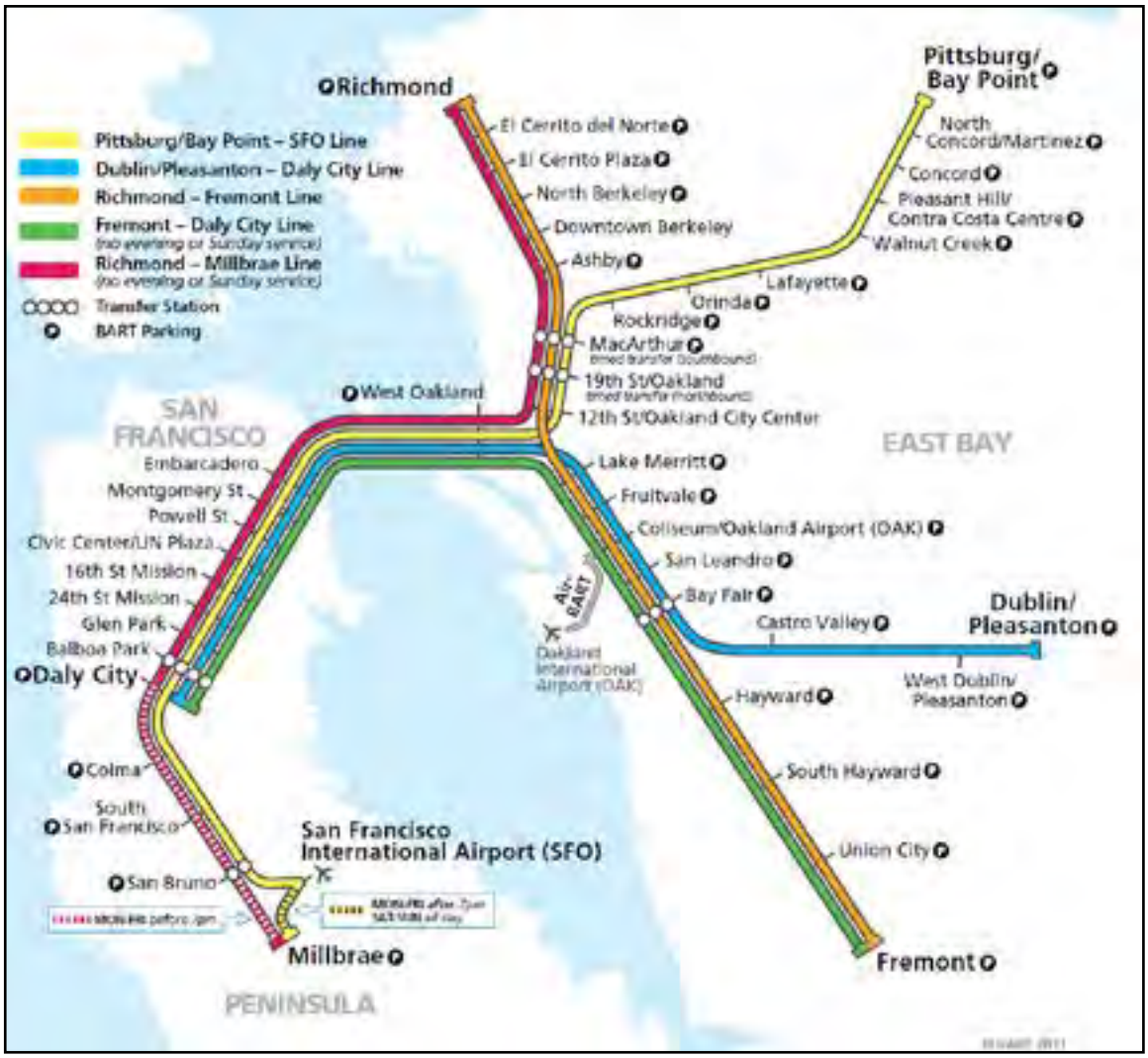

Figure 14. BART System Map

Source: BART, *BART Fares and Schedules*, February 2011.

When BART passengers reach SFO, they can either walk to their terminal or ride the AirTrain people-mover system that links the BART station with the four airport terminals as shown in Figure 15. The AirTrain trains operate on two different routes. Red Line trains serve all the passenger terminals, parking garages, and the BART station. Blue Line trains also serve all the terminals, parking garages, and the BART station, as well as the rental car center. The BART line to SFO and Millbrae is shown in purple in Figure 15, with the Caltrain line and interchange at the Millbrae station shown in yellow. It should be noted that Figure 15 is diagrammatic and not to scale. In reality, the Millbrae station is much further from SFO than suggested by the figure, and the SFO BART station extends from the AirTrain station at Garage G to the International Terminal.

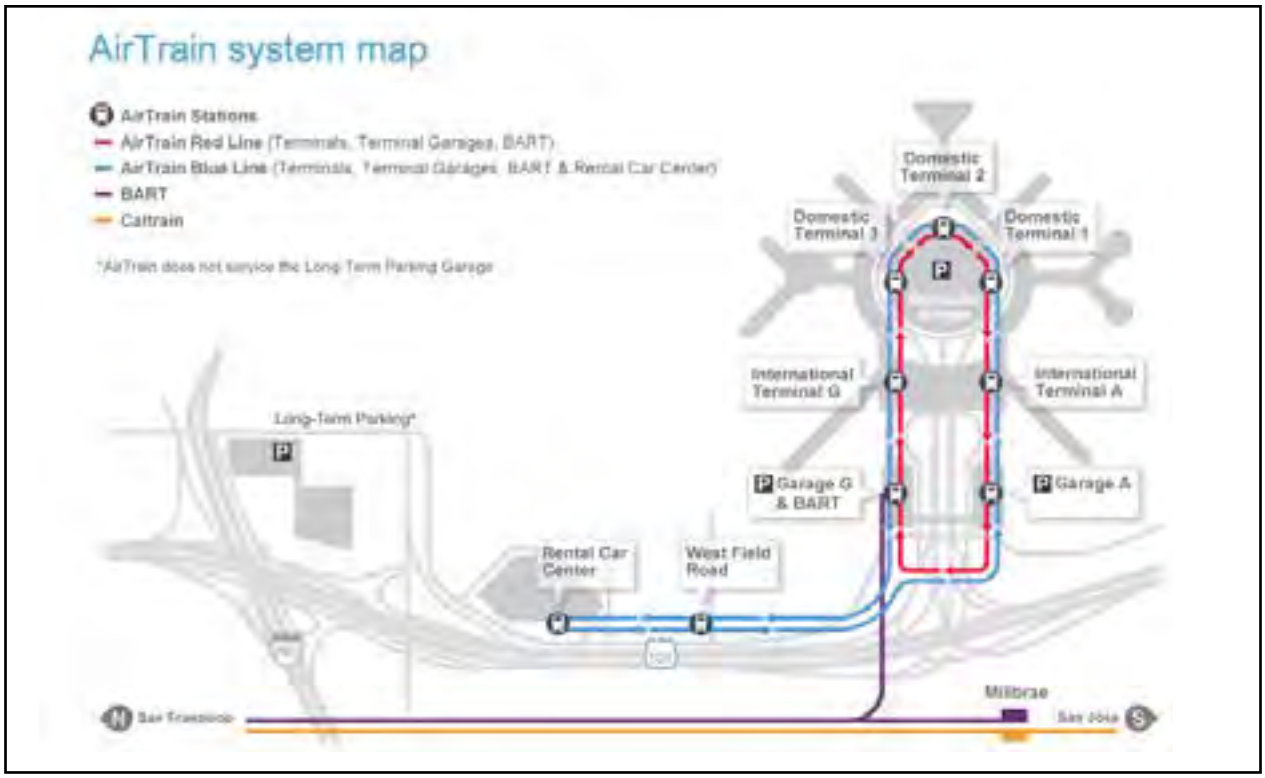

Figure 15. SFO AirTrain System

Source: SFO, *AirTrain System Map*, www.flysfo.com/web/page/atsfo/airtrain/map/ (accessed July 4, 2009).

In addition to the following description, a more detailed discussion of the SFO BART extension is provided in a case study report on the MTI website.[235]

Project Description

The BART extension from Daly City to SFO and Millbrae was constructed in two stages. Originally envisaged as a single project, in October 1991 it was decided to construct the 1.6-mile section to Colma in advance of the rest of the extension.[236] Work on the extension to Colma began in February 1993 and the Colma station was opened on February 24, 1996.[237,238] The Colma station is located a short distance to the east of Interstate 280, one of the two freeways running the length of San Mateo County. It includes a 1,400-space parking garage, which provides parking for travelers from San Mateo County who can then take BART to destinations in San Francisco or the East Bay.

The extension from Daly City to Colma cost $170 million to construct, including the Colma station and parking structure.[239] The San Mateo County Transit District provided about 25% of the capital costs to develop the Colma station.[240] The majority of the balance of the costs was funded with grants from the Federal Transit Administration as part of the overall funding authorized for the BART extension to SFO.[241]

While construction of the extension to Colma was underway, planning continued for the 8-mile section of the extension from Colma to SFO and Millbrae, which forms the focus of this case study. In addition to the airport and Millbrae stations, this section includes

stations at Hickey Blvd. in South San Francisco and on Huntington Avenue adjacent to the Tanforan shopping mall in San Bruno. The Millbrae station is located less than a mile south of the airport passenger terminal complex at East Millbrae Avenue just off El Camino Real and a few blocks west of U.S. Highway 101, the principal north-south freeway serving the developed area of San Mateo County. It is a major intermodal terminal connecting BART and Caltrain with local buses, and it provides cross-platform connections between BART and Caltrain.

As mentioned above, the airport station is served by a spur off the main line between San Bruno and Millbrae and is served by direct trains from San Francisco and the East Bay. The station has three tracks and two platforms, with the middle track served by both platforms. The Y-shaped spur allows trains from the airport station to proceed north toward San Francisco or south to Millbrae.

Early History of the Project

The BART extension to SFO was first proposed in 1970, and BART received a $371,334 federal grant in July 1970 to study the extension.[242] In 1992, the Metropolitan Transportation Commission (MTC) developed the first plan to extend BART to SFO, which had an estimated cost of $960 million. The 1992 design met with local opposition over the environmental impacts of removing wetlands and the loss of habitat for the San Francisco garter snake and the California red-legged frog (the former was classified as endangered and the latter as threatened), as well as over concerns about the ridership forecasts.[243] BART subsequently took the lead on the project, acknowledged the environmental concerns and agreed to enhance an offsite location several miles away to provide replacement habitat for both species.

In 1995, BART produced a Draft Environmental Impact Report (DEIR) for the extension project that identified six build alternatives and two no-build alternatives.[244] Several of the alternatives took advantage of a planned Airport Light Rail System (ALRS) people-mover, eventually designated the AirTrain, to connect an airport station to the passenger terminals. At the time, the airport was also planning to construct an Airport Ground Transportation Center (AGTC) between the International Terminal and U.S. 101, and some of the alternatives included a BART station as part of the AGTC, which the airport subsequently decided not to build.

The locally preferred alternative identified in the DEIR proposed to extend BART from Colma through South San Francisco and San Bruno to an intermodal station on the west side of U.S. 101 adjacent to the airport. The latter station would provide connections to Caltrain and the ALRS. However, this proved controversial on several counts, one of which was the fact that BART passengers would have to transfer to the ALRS to access the airport.

The San Francisco Ballot Measures

In 1994, while the DEIR was being prepared, the alternatives under consideration were contested by two politicians: San Francisco Supervisor Tom Hsieh and California State

Senator Quentin Kopp, a former San Francisco Supervisor. In the June 1994 primary election, two ballot measures were put to the voters of San Francisco to determine which project alternative they believed should be implemented. Proposition H, supported by Supervisor Hsieh, several other supervisors, and a number of civic and political leaders, directed the City to select a site for the airport BART station that would be the most cost-effective, convenient and safe. In the public discussion of the measure it was recognized that this was intended to favor a multimodal transit hub on the west side of U.S. Highway 101 about a half-mile from the airport (although opponents of the measure claimed the distance was greater). Passengers and employees would transfer to a light rail shuttle to the airport terminals.[245] Proposition I, supported by Senator Kopp, favored a BART station inside the airport terminal.

According to a San Francisco Chronicle article at the time, the alternative favored by Proposition I would have cost $300 million more than the alternative favored by Proposition H.[246] The extra cost of this alternative came from the need to tunnel under the airport and Highway 101. The article stated that, according to Measure I, the extra cost would be funded from airport passenger facility charges (PFCs). However, the article noted that the use of PFCs for any project is restricted by federal regulations that state that the funds can only be used to expand, create, and maintain airport facilities to transport airport passengers and employees.[247] A later article reported that the majority of San Francisco voters supported Senator Kopp's Proposition I to develop a more expensive BART station inside the airport.[248] However, the vote was only advisory, since the final decision on the station location would be made by the BART Board of Directors, not the City of San Francisco.

Public Concerns and Opposition

In June 1995, an article in the San Francisco Tomorrow newsletter suggested that BART had downplayed the bus alternative to the BART extension to SFO.[249] The article suggested that a free bus service would be more cost-effective and cheaper than a BART extension. The article said that the DEIR for the SFO extension in 1995 stated that the extension would only attract 6,900 new transit riders to the airport per day. According to the article, at that time 15 San Francisco Municipal Railway (Muni) bus routes carried more than 6,900 riders per day.

Instead of extending BART to the airport, the article suggested that Caltrain be extended north into downtown San Francisco with a free bus service connecting the existing BART station in Colma to the airport. The article claimed that for 2% of the cost of extending BART, a free bus service could transport 6,900 passengers daily from the Colma BART station to all four SFO terminals.[250] The article suggested that the Caltrain extension would be cheaper to build and the Bay Area did not have enough funding to both extend Caltrain to downtown San Francisco and extend BART to SFO. The article claimed that extending BART would drain the region of funds for the next 30 years, exhaust funds from SamTrans operating budget, reducing bus service and increasing fares, divert BART funding from existing projects, decrease Caltrain ridership, and divert all monies from a bridge toll that was partially dedicated to Muni.[251]

The Project Design Evolves

Despite the opposition, BART continued with its plans to develop the extension. In April 1995 it adopted Alternative VI in the DEIR as the planned route.[252] This provided a station at the International Terminal in the airport and corresponded to the station option that had gained the most support in the 1994 San Francisco ballot propositions, demonstrating that the majority of public wanted BART to develop a station in the airport. This alternative involved tunneling under Highway 101 south of San Bruno, then tunneling under the airport passenger terminal complex with a station under or adjacent to the International Terminal, and then continuing south to tunnel back under Highway 101 to a station at Millbrae that would provide an interchange with Caltrain.

However, it was becoming clear that this design would not only be very expensive, it would also be technically challenging and very disruptive to airport operations. In addition, having the line through the airport serve both airport passengers and other riders would preclude the use of federal airport funds for the project. In June 1996, the BART Board of Directors certified the Final Environmental Impact Report for the project and adopted a modified version of Alternative VI with a Y-shaped spur from the main line crossing Highway 101 on an aerial structure into a station next to the International Terminal. The main line would continue south on the west side of Highway 101 to Millbrae.[253]

This design was essentially what was constructed. However, the change from a through station under the International Terminal to a stub-end station on a branch off the main line has had, and continues to have, significant operational implications. Southbound trains from San Francisco either go to SFO or Millbrae, which reduces service frequency to both stations. For several years after the extension opened, a shuttle train ran between the airport station and Millbrae. However, ridership was very low and this was eventually discontinued. During this phase, trains to the airport continued on to Millbrae, returning to San Francisco via the airport. The stub-end station requires trains to reverse direction at the airport station, so the train operator has to go to the other end of the train at the airport station, which adds to station dwell time. This, too, was eventually discontinued. Currently, there is no direct service to Millbrae on weekdays after 7 pm and on weekends, and trains to the airport station continue on to Millbrae, returning via the airport. On weekdays, there is direct service to both SFO and Millbrae until 7 pm but no service between SFO and Millbrae. Travelers to the airport using Caltrain before 7 pm on weekdays have to change to BART at Millbrae, take a San Francisco train to San Bruno, then reverse direction and take an airport train.

Role of Design-Build Contracts

Construction of the BART to SFO extension formally started in November 1997 with a groundbreaking ceremony.[254] The project was selected by the FTA to be one of the “turnkey” projects under the Intermodal Surface Transportation Efficiency Act (ISTEA) that would potentially save time and cost on construction and development through the use of fewer contractors. The “turnkey” style of development was expected to minimize construction time to just 18 months.[255]

On February 10, 1998 BART granted two design-build contracts, one to a joint venture of Sverdrup Corporation and Conco (Sverdup/Conco), and the other to a joint venture of Tutor-Saliba Corporation and Slattery Construction (Tutor/Saliba/Slattery), to construct 90% of the BART to SFO extension. Swerdup/Conco was awarded a $70.5 million contract to construct the Millbrae Intermodal Station and Tutor/Saliba/Slattery was awarded a $526.5 million contract to construct the BART line from Colma to Millbrae.[256]

The two design-build contracts allowed the project to be built at a faster rate, but also meant that BART needed to obtain funding more quickly to pay for the faster construction pace. Along with the requirement for a larger cash flow earlier than originally planned, the cost of the project also increased throughout the life of the project. As a result BART experienced cash flow shortfalls during the course of the project.

Project Costs

The cost for the extension from Colma to SFO and Millbrae increased throughout the life of the project for a variety of reasons, including higher construction contract costs, increased costs for right-of-way acquisition and utility relocation, unanticipated mitigation costs, and third party contracts for engineering and construction purposes.[257] The estimated project cost in June 1997, when the FTA committed $750 million toward the project under a New Starts Full Funding Grant Agreement, was $1,167 million to connect BART directly to the airport with a tunnel under Highway 101. This plan subsequently evolved to include the Millbrae station and the Y-spur into the airport with elevated guideways across Highway 101. By early 2000 the estimated construction cost of the project had increased by $316 million to $1,484 million, an increase of 27% over the June 1997 estimate.[258]

The 27% increase in cost presented a serious problem to BART. The higher costs would exacerbate the problem of cash flow shortfalls and require more money overall. In addition, the faster pace of construction due to the design-build method required BART to finance the project over a shorter period than anticipated. In March 2000 BART was anticipating a maximum cash deficit of $295 million in fiscal year 2002. [259] However, as it turned out BART only experienced a $240 million funding shortfall from the fast pace of construction.

Funding Sources

To finance a major capital project costing almost $1.5 billion, BART assembled a complex funding package involving federal, state and local sources.

Federal Funding

The major funding component that helped BART begin, sustain, and complete the project was the FTA Full Funding Grant Agreement (FFGA). The FFGA provided $750 million through the Section 5309 New Starts program. As part of the agreement to receive FFGA funding, the project sponsor must undertake to complete the project on time, within budget and abide by federal regulations. Once FFGA funding has been approved for a project, the funding levels are fixed and any increase in cost must be paid by local sources without further federal assistance.[260]

State and Local Funding

San Francisco International Airport contributed $200 million for civil works on airport property. Airport funds came in the form of Airport Improvement Plan funding and from Passenger Facility Charges. At the time, the regulations for AIP grants and use of PFC revenues did not allow airports to use these funds to develop transit lines that would be used by non-airport users. Originally, the FAA denied the airport's use of PFC or AIP funds for the extension because the original plan provided a through tunnel connecting the BART line to the airport and continuing on to Millbrae that would be used by non-airport riders. The revised design created an aerial Y-shaped spur line to the airport that would only be used by airport patrons.[261]

The SFO extension was constructed mostly in San Mateo County, but San Mateo County was not part of the BART District at the time. In 1996, the San Mateo County Transit District (SamTrans) agreed to contribute $171 million to BART to allow the system to operate in San Mateo County.[262]

Other sources of funding comprised: [263,264,265]

- $152 million from the California Transportation Commission;
- $26.5 million from the Metropolitan Transportation Commission;
- $183.7 million from BART's own funds.

The total funding package is summarized in Table 14.

Table 14. BART SFO Extension Funding Allocation

Agency	Total Amount	Funding Share	Government Level	Government Type
Federal Transit Administration	$750,000,000	51%	Federal	Federal Transportation Agency
San Francisco International Airport	$200,000,000	13%	Federal (AIP) Local (PFC)	Airport
California Transportation Commission	$152,000,000	10%	State	State Transportation Agency
San Mateo County Transportation District	$171,000,000	12%	Local	Local Transit Agency
Metropolitan Transportation Commission	$26,500,000	2%	Local	Metropolitan Planning Organization
Bay Area Rapid Transit District	$183,700,000	12%	Local	Regional Transit Agency
Total	**$1,483,200,000**			

Source: Author analysis.

A little over half of the cost of the SFO extension (51%) was funded by the FTA through the FFGA. If the project cost had stayed at $1.167 billion, the FTA funding would have covered 64% of the cost. When the project cost increased by $316 million local and state sources had to fund the gap.

Cash Flow Shortfalls

To ensure enough funding to complete the project, BART requested and received a line of credit backed by future federal funds. To do this, BART had to first obtain a change in California law to allow the agency to create a borrowing program to cover cash shortfalls.[266] After California law was changed, BART received a $300 million line of credit.[267] To finance the line of credit, MTC loaned BART $60 million. With increased annual Congressional appropriations, more funding commitment from local, state, and regional agencies, and its $300 million line of credit, BART was able to proceed with construction and complete the project. BART repaid the MTC loan after it received the final Congressional appropriations for the project.

Summary and Discussion

The BART extension to SFO provides a good example of airport, regional and state commitment to leveraging federal New Starts capital investment grants to fund an extension of a regional rapid transit system to a major airport. At the same time, the project illustrates the technical challenges and compromises that are often involved in bringing rail service into an airport terminal area. The solution that was ultimately adopted – constructing a Y-shaped spur from the main line between San Bruno and Millbrae – has resulted in a situation where trains serving the airport have to stop and reverse direction in the airport station. On the one hand, this allows the airport station to be located within a short walking distance of the International Terminal facilities, with a longer but still-feasible walk to the other passenger terminals. On the other hand, this added significantly to the cost of the BART extension and creates a costly and inefficient operating situation that BART will have to live with indefinitely.

While many BART riders walk between the BART station and the domestic passenger terminals, the station is also served by the AirTrain automated people-mover system that connects the passenger terminals, and many BART riders use this to access the domestic passenger terminals (or reach the BART station from those terminals). Had the BART station been located on the west side of U.S. 101 and connected to the passenger terminals by the AirTrain people-mover, the capital cost of the extension would have been significantly less and the operational inefficiencies of the stub-end operation would have been avoided. Although this would have required all airport travelers using BART to transfer to the AirTrain, many do so anyway, and the additional travel time would have been minimal. Indeed, for many passengers having all trains on the line serve the airport station would have saved time, since they could take the first train and not have to wait for one going to the airport.

Apart from the need to transfer to the AirTrain, another potential drawback of locating the airport station on the main line west of U.S. 101 was that, under the prevailing rules for use

of AIP and PFC revenues at the time, the airport could not have contributed to the cost of the airport station. Of course, the reduced capital costs from avoiding the need for the spur track may well have more than offset the loss of the airport contribution.

As things turned out, the decision to adopt the configuration that was eventually built was decided by a ballot measure promoted by an influential local politician who firmly believed that the airport station should be located in the airport terminal complex. This experience demonstrates that developing strategies to fund large intermodal airport ground access projects is not the only challenge in implementing such projects. Addressing the complex trade-offs that commonly arise in selecting the preferred alternative from among those considered for the project, and even deciding which alternatives should be included in the evaluation, can be equally challenging and fraught with political considerations. Yet, these are not just design and operational issues; they can also significantly affect the cost of a project, so they become intrinsically interwoven with the funding issues.

CASE STUDIES: SUMMARY AND CONCLUSIONS

The seven case studies cover a wide range of different types of project, including a major intermodal facility, automated people-mover links between airports and nearby rail stations, extensions of rail transit systems to airports, and airport access roadways, as well as a range of different funding strategies and mechanisms. Federal funding played a major role in four of the case studies and a less significant role in two others. The level of state funding varied across the case studies, from the Miami Intermodal Center where several SIB loans were used as a major element of the project funding, to the JFK AirTrain and Portland MAX Airport extension, which did not use any state funding. All the case study projects except the Richmond Airport Connector made use of a variety of local funding sources, while private-sector funding played a major role in the Richmond Airport Connector and the Portland MAX Airport extension.

The Miami Intermodal Center is a major transportation hub located adjacent to Miami International Airport and linked to the airport passenger terminals by an automated people-mover. The MIC brings together urban, regional and intercity rail services, as well as local and intercity bus services, and facilitates intermodal connections between those services as well as improving airport access by users of those services. In addition, a consolidated airport rental car facility forms a major element of the MIC, allowing the people-mover to serve both the rental car patrons and users of the public transportation services at the MIC who are making trips to and from the airport. The project provides a major expansion of landside capacity at Miami International Airport and well as offering the prospect of greatly improved airport access by a wide range of public transportation services. It also provides a good illustration of the potential role of state Departments of Transportation in working with local agencies to develop major intermodal facilities and enhancing airport access by public transportation.

In contrast, the JFK AirTrain system is a project that was conceived, planned, and developed entirely within the airport authority and largely funded through traditional sources for airport capital development: However, this project represented the first use of PFC revenue by an airport to fund an automated people-mover link to nearby rail stations. To

meet the requirement that PFC revenue be used only for projects on airport property, the airport acquired the right-of-way for the people-mover along the median of the Van Wyck Expressway, a state highway running between the airport and the Jamaica commuter railroad and subway station. This acquisition technically made the right-of-way part of the airport. Although this approach was challenged by the airlines in a lawsuit against the FAA, the court upheld the FAA decision to approve the use of PFC revenue for that aspect of the project.

The Oakland Airport Connector is a more recent project involving the construction of an automated people-mover to link Oakland International Airport to a nearby station of the Bay Area Rapid Transit system. The project sponsor is the BART District, working in collaboration with the Port of Oakland (the airport operator) and other local and regional agencies. The largest proportion of the project funding comes from funds generated by regional transportation measures that allocated bridge toll revenues to supporting investments in public transportation, followed by a federal loan under the Transportation Infrastructure Finance and Innovation Act and smaller amounts from a number of state funding programs. The Port of Oakland is contributing a fairly small amount of funding from PFC revenues toward the construction of the airport station.

The Oakland Airport Roadway project expanded existing access roads serving the Oakland International Airport as well as constructing an entirely new road that improved road access to a major cargo area on the airport and an adjacent community on the northwest boundary of the airport. The project was funded almost entirely by local funds, with a small amount of state funding. The largest component of the local funds derived from revenues from a local sales tax measure that provided funding for transportation projects within Alameda County.

Another airport access roadway project, the Richmond Airport Connector serving Richmond International Airport in Virginia, was developed through a public-private partnership between the Virginia Department of Transportation and a private operator of a toll road located to the south of the airport. The RAC links the toll road with the airport and was primarily funded with a federal TIFIA loan, although the Pocahontas Parkway toll road to which it is connected was funded with a combination of private loans from a consortium of banks, equity investment by the toll road operator, and part of the TIFIA loan. The project provides a completely different funding model from the Oakland Airport Roadway project, which was possible because of the presence of the toll road to which the RAC is linked. This allows all traffic using the RAC to be charged a toll, which in turn provides the revenue stream to service the loans and provide the toll road operator with a return on its equity investment in the project.

A public-private partnership was also a major aspect of the extension of the Portland MAX light rail system to Portland International Airport. The Bechtel Corporation agreed to construct the airport extension in return for development rights to an area of land adjacent to the airport and served by the airport extension. However, unlike the funding for the Richmond Airport Connector, local and regional agencies also contributed a significant share of the project funding. It has been claimed that this arrangement allowed the project to proceed many years earlier than it otherwise would have.

The final case study, the extension of the BART system to San Francisco International Airport, illustrates some of the technical and cost challenges involved in bringing a rail transit system into a densely developed passenger terminal complex of a major airport. A proposal to locate the airport station on the far side of a major freeway from the passenger terminal complex and connect it to the passenger terminals with an automated people-mover ran into strong public opposition from those who wanted a station located within walking distance of the passenger terminals. The BART District, the project sponsor, then pursued a plan to tunnel under the freeway and part of the passenger terminal complex, with an underground station located adjacent to the SFO International Terminal, then tunnel back under the freeway to the south of the passenger terminal complex to continue the line further south to terminate at an intermodal station beyond the airport. It was quickly recognized that this plan would not only be extremely costly but very disruptive to airport operations and the plan was modified to provide a spur line into the airport, crossing the freeway on an aerial structure and ending at a stub-end station next to the International Terminal. While this design reduced the cost and allowed the airport to provide funding for the airport station from PFC revenues, it created operational problems for the BART system that will continue until such time as the system is reconfigured, if this ever occurs.

Resolving these challenges drove the cost of the extension up to nearly $1.5 billion. About half of this cost was funded from a federal grant under the New Starts program for major transit capital investments. The balance came from a combination of local and state funds, including $200 million contributed by San Francisco International Airport from PFC revenues.

In discussing the sources of funding for each of the foregoing case studies it should be noted that the question of whether a particular funding source should be considered federal, state, or local may be unclear or ambiguous due to flows of funds between different levels of government at the program level or definitional issues. For example, PFCs are established by an airport sponsor and collected by airlines through an addition to the relevant air tickets, but they require approval by the FAA for compliance with the federal legislation authorizing the program. So it is unclear whether PFC revenues should be considered federal or local funding. Similarly, local agencies may obtain funding to support capital investment programs from a variety of state and federal programs that are not restricted to specific projects, but can be combined with local funding and allocated to the various projects in the agency's capital investment plan. Reported funding for a specific project may not identify the sources of those funds beyond the agency providing them.

Conclusions

The projects documented in the seven case studies show that funding sources for major intermodal airport ground access projects vary widely with the nature and location of the project. All the projects involved some collaboration between several local, state and federal agencies in developing the funding plan for each project, although the number of agencies involved varied across the projects. In general, the larger projects tended to have more agencies involved in providing funding.

Therefore, developing a funding package for such a project requires the involvement of a broad range of stakeholder agencies as well as a detailed knowledge of potential funding sources. The use of TIFIA or other loans featured in the funding plan for several of the case study projects. While this reduced the level of funding required from other sources, potentially allowing the project to proceed earlier than it otherwise would have, these loans eventually have to be repaid. In cases where a project will generate a net revenue stream once it is completed, consideration can be given to the use of loans or other debt as part of the funding package, along with opportunities for a public-private partnership. In some cases, private-sector participants may be able to obtain a return on their investments in a project through the award of development rights that are tied in some way to the project, such as the use of air rights over the planned transportation facility.

The extent to which the case study projects were able to take advantage of synergies between different transportation services and between airport and non-airport trips also varied widely across the projects. The Miami Intermodal Center represents the most integrated approach, combining a consolidated rental car facility for Miami International Airport with the primary station in the Miami region for long-distance rail and bus services. Regional rail lines and bus routes that also serve the station provide access to both the airport and the long-distance rail and bus services. Thus, the MIC will serve a much broader function than just improving airport ground access and will enable the airport to evolve into the primary intermodal hub for the region.

While the ability to replicate this type of synergy elsewhere will be constrained by local conditions, the SFO BART extension represents an example of a missed opportunity to create a similar synergy between the airport BART station, Caltrain service, and the proposed future high-speed train services that will also use the same corridor. Key to being able to take advantage of similar opportunities at other airports is the ability to combine airport development funds with funding sources for surface transportation intermodal facilities in a way that benefits both airport users and those using the facilities for other types of trips. This is not to suggest that airport development funds should be used for non-airport purposes, but that using airport development funds to share in the cost of facilities used by both airport and non-airport travelers can lead to more efficient solutions that reduce the costs to both groups of users while greatly enhancing airport access and intermodal connectivity for other users.

None of the other case study projects offer similar synergies, although they all result in enhanced access to the respective airports. Of the five other projects, the Oakland Airport Connector appears likely to provide the least benefit in terms of enhanced airport access. While the travel time on the automated people-mover is planned to be several minutes faster than the current shuttle bus service, the proposed fare is significantly higher. Whether airport travelers will view this as a net benefit remains to be seen. In contrast, the AirTrain connection between JFK International Airport and Jamaica Station has provided a significant improvement in the connectivity between the airport passenger terminals and the rail services into Manhattan from Jamaica station. The AirTrain project also served as a useful stimulus to the modernization of Jamaica Station. The Portland MAX airport extension also provided a significant improvement in airport access by providing a one-

seat ride between the airport and central Portland and communities on the Red Line, with easy connections to the other MAX lines.

The two airport roadway projects provide enhanced highway access to Oakland International and Richmond International airports, although with very different funding arrangements. The Oakland Airport Roadway project improvements have provided a greater increment in roadway capacity and more direct routes for the majority of vehicle trips to and from the airport. In contrast, while the Richmond Airport Connector is reported to have reduced highway travel times to Richmond International Airport, it is located on the south side of the airport while a large part of the region, including downtown Richmond, is located to the north and west of the airport. Thus using the Connector involves a greater driving distance for most airport trips compared to a more direct route. It also requires airport travelers to use the Pocahontas Parkway toll road to access the Connector.

Underlying several of the case study projects is the dilemma that, in many cases, the approach to improving airport accessibility that offers the most benefit in travel time and convenience is also the most expensive. Although the case studies have focused on the way the various projects were funded and have not attempted to assess whether the costs were justified by the project benefits, this is not a question that should be ignored, since changes in project scope would have changed the amount of funding required to implement the project.

V. FUNDING STRATEGIES FOR INTERMODAL AIRPORT GROUND ACCESS PROJECTS

It is clear from the summary of funding programs and sources that may be applicable to intermodal airport ground access projects in Section III and from the wide range of different funding mechanisms used in the various intermodal airport ground access projects described in Section IV that identifying an appropriate package of funding for any given project is generally far from straightforward and typically involves combining funds from multiple sources, usually under the control of different agencies. This arises in part from the restrictions on the use of funds from different modal programs and in part from the inherent nature of most intermodal airport ground access projects that span across the jurisdictions of different agencies. In particular, while airport authorities have an obvious interest in improvements to the airport ground access system serving the airport or airports for which they have responsibility, they generally have no authority over planning and development of the surface transportation system off the airport property and have significantly restrictions on their ability to use airport funds on projects off the airport property.

Beyond these limitations on the ability of airport authorities to fund airport ground access projects off the airport, in the case of many intermodal airport ground access projects there is also an inherent conflict between the goals of projects that are designed to facilitate the use of public transit or other high-occupancy public transportation modes for airport access trips and the significant revenue that airports derive from private vehicle parking, rental car concessions, and to a lesser extent other low-occupancy public transportation services, such as taxis and limousines. While many airport authorities profess to encourage the use of high-occupancy ground access services for airport access trips, particularly in the context of mitigating highway and surface street congestion resulting from increases in surface traffic generated by airport expansion projects, in many cases these stated goals are not pursued particularly vigorously, if at all, unless some other agency is willing to foot the bill. Of course, it is completely understandable why an airport authority trying to finance an expensive passenger terminal expansion or modernization program, for example, would be reluctant to take actions that not only would divert ground transportation revenues that would otherwise be available to help finance the terminal development but, to make matters worse, would use the diverted revenues for a project that would reduce its overall revenue stream.

In some cases, even if the airport authority recognizes the value of improved intermodal ground access and is willing in principle to contribute to the costs of such projects, its capital improvement program requires approval by the airlines using the airport (under a so-called Majority-in-Interest provision of its rates and charges agreement with the airlines). In general, airlines do not view improved airport ground access as contributing to their profitability or competitive position, and are thus typically reluctant to see airport revenues that could be used to reduce their rates and charges used for other purposes or to fund projects that reduce airport revenues from non-airline sources.

In contrast, while regional planning and transportation agencies, as well as the communities in the immediate airport environs, may well appreciate the value of improved intermodal access to major airports, they also have many competing priorities and concerns, and are

often reluctant to devote scarce resources to projects that primarily benefit air passengers, who are often perceived as being more than able to pay for any improvements to the airport ground access system that are required. After all, many of these passengers are already paying amounts that may easily exceed $100 for their travel to and from the airport, particularly if they rent a car for several days or park one at the airport for a similar period, and most intermodal ground access projects reduce the access costs of those who use them compared to continued use of more established modes. Reluctance to use local or regional transportation funds to enhance airport ground access is likely to be reinforced if the airport authority appears to have little interest in providing financial support for such projects.

There are obviously exceptions to this situation, where fortuitously there is a confluence of interests in a given project on the parts of both the airport authority and local or regional agencies. The case study of the Miami Intermodal Center in the previous section provides such an example. Miami International Airport perceived that it was running out of roadway and terminal curb capacity in the passenger terminal area and wanted to move the rental car companies to a consolidated rental car facility outside the passenger terminal area linked to the terminals by a people-mover with the goal of eliminating a large number of rental car shuttle bus trips. The Florida Department of Transportation and regional transportation agencies wanted to improve the connections between several regional rail and bus services and the airport, as well as create a regional intermodal hub. The resulting project meets the needs of both the airport and the state and regional agencies exceptionally well, while providing the airport with a consolidated rental car facility at far less cost than it would have had to incur if it had constructed such a facility as a stand-alone project.

The Airport Roadway Project at Oakland International Airport provides another example of a synergy of interests between the airport and local and regional agencies. The Ron Cowan Parkway cross-airport road component of the project provides improved access to a FedEx sorting hub located on the airport that previously required vehicles traveling to and from the facility to cross an active taxiway and also provides a new highway link between the residential community of Bay Farm Island located immediately to the west of the airport and Interstate 880 to the northeast of the airport. Improvement of Airport Drive and 98th Avenue increased the capacity of the access roadway link between the airport and I-880 and enabled this link to accommodate the additional traffic between Bay Farm Island and I-880. The project thus met both airport development needs and provided enhanced local circulation for the communities adjacent to the airport.

DEVELOPING A REGIONAL CONSENSUS ON PROPOSED PROJECTS

Key to developing a successful funding strategy for proposed intermodal airport access projects is developing a local and regional consensus on the importance of the project not only to the airport but to the regional transportation system. This, of course, is more easily said than done and will be highly dependent on the nature of the project and its ability to satisfy multiple transportation and land development needs. To the extent that a proposed project can not only enhance airport ground access but support economic development in the adjacent area and meet wider regional transportation needs, it will

be easier to engage local and regional agencies in planning the project and obtain their support, and, ultimately, their financial contributions. This is obviously a lot easier to do in the early stages of planning a project, while details are still fluid and the exact location and scope of the project can evolve as different stakeholders become engaged in planning the project and identify potential synergies. Designing a proposed intermodal project as a key node on the regional transportation system that happens to be located in the vicinity of an airport and enhances airport ground access in addition to other functions is more likely to generate broad support for the project than taking a project that is obviously designed primarily to meet airport ground access needs and adding a few ancillary functions in an attempt to attract broader regional support.

Indeed, the former approach is not only more likely to lead to regional consensus on the importance of the project, but is likely to result in a better project. Even major airports do not generate particularly large flows of airport travelers relative to typical flows on the regional transportation network and intermodal airport access projects will typically only attract a fairly small percentage of total airport trips (most U.S. airport rail links attract significantly less than 10% of total air passenger ground access trips, as reported in a recent ACRP study[268]). Thus the transportation service levels provided by the intermodal project and the economics of operating the facility and associated services will be significantly enhanced if the project serves a wide range of users, not just airport trips. Likewise, there is a growing interest in developing a range of airport-related economic activity in the vicinity of major airports, including hotels, office parks, air freight forwarders, warehousing, and logistics services, all of which find proximity to the airport of value but also generate their own commute and other trips. By integrating development in the vicinity of the airport with the intermodal project, the trips generated by these other activities can form a major component of the justification for the project. For example, funding for the extension of the Portland MAX light rail system to Portland International Airport described in the previous section included contributions from the developer of a large mixed-use development, Cascade Station, located adjacent to the airport and with its own station on the light rail line. In addition, light rail passengers traveling to and from Cascade Station ride trains that also serve airport travelers and their fares contribute to the operating costs of the airport service.

Facilitating Regional Airport Ground Access Planning

In order to undertake comprehensive planning for airport ground access and ensure that this planning is integrated into land use planning for the airport environs it is recommended that a multi-agency airport ground access task force be established and charged with developing an airport ground access plan that includes intermodal connections. Although the institutional structure of such a task force will most likely vary with the local circumstances and issues, it would probably be most effective if it were co-chaired by appropriate representatives of the airport authority and the regional metropolitan planning organization (MPO). These representatives should be senior enough (Planning Director or similar positions) to ensure that the work of the task force is adopted by both the airport authority in its Airport Master Plan and the MPO in its Regional Transportation Plan. These representatives should also be senior enough to attract appropriate representatives of

other stakeholder agencies, including the state Department of Transportation, local transit operators, and congestion management agencies where these exist.

The task force should have access to sufficient funding to retain consultants to provide the specialized technical expertise that airport ground access projects generally require and to assemble the necessary data to document the current performance of the airport ground access system, identify potential future issues, and perform preliminary analysis of potential solutions. These data would typically include the results of air passenger and airport employee surveys, landside operational data routinely collected by the airport authority, such as parking lot usage and commercial vehicle trips on the terminal roadways obtained from automated vehicle identification systems, ridership on transit or other high-occupancy services serving the airport, and vehicle counts on arterial streets and freeway ramps in the vicinity of the airport. Assembling these data into a comprehensive database that can be updated and maintained on an ongoing basis not only will support the work of the task force to identify required airport ground access improvements, but can serve as a resource for subsequent planning by the airport authority, local jurisdictions in the vicinity of the airport, and regional transportation agencies. By viewing airport ground access planning as a collaborative undertaking by the multiple agencies involved in airport ground access issues this should help facilitate the necessary interagency cooperation that will be essential in putting together appropriate funding packages for different types of projects.

DEVELOPING PROJECT FUNDING STRATEGIES

Developing an appropriate funding strategy for a given project generally involves two steps: identifying the funding programs for which the project might qualify and then holding discussions with the agencies responsible for managing each of the potential funding programs to determine how the project will fit into the general priorities of those programs and the likely level of available funding. Because there are almost always more projects competing for available funding that funds available, it is important to identify the criteria that are used to determine project funding priorities and assess how well the proposed project addresses those criteria and whether the project could be modified to result in it being given a higher priority. Since assigning project priorities always involves a large element of judgment, developing a strong multi-agency regional consensus on the importance of the project can have a significant influence on how funding agencies prioritize the project.

Federal, State, and Local Funding Programs

The various federal funding programs that might be relevant for an intermodal airport ground access project have been described in Section III. In the case of surface transportation funding programs, these funds are often allocated and prioritized through state Departments of Transportation or regional metropolitan planning organizations. Therefore coordination with potential funding agencies should include discussions with the relevant offices within the state DOT or MPO. In the case of projects located within the jurisdiction of an MPO (which as a practical matter is likely to be the case for most airport intermodal ground access projects) it will be necessary to get the project included in the regional Transportation Improvement Program.

Where a project could qualify for funding from the AIP or use of PFC funds, or where it is unclear whether this is the case, discussions will be necessary with the local FAA Airport District Office to which applications for those funds are submitted. In the case of major projects or those that present situations where the eligibility of the project for funding from the program in question is unclear, discussions may also be necessary with relevant staff at the FAA regional office or even FAA headquarters to determine how eligibility has been determined for similar projects elsewhere.

In addition to managing federal surface transportation funding, many states have their own transportation funding programs based on revenues from a state fuel tax or other sources. The eligibility criteria for these programs are likely to vary from state to state, and so discussions will be needed with the relevant state offices. In some cases, these may be the same offices that manage federal funds and in other cases they may be separate.

It generally will be helpful to initiate discussions with agencies managing potential funding programs at an early stage in the project. This will not only allow the project to be designed in a way that can better fit potential funding programs, but will serve to increase the awareness of the project in those funding agencies and allow them to anticipate a future funding application in their long-range planning.

In addition to federal and state funding programs there may also be local funding sources for which intermodal airport ground access projects may be eligible. In many cases these funding sources result from special-purpose local tax measures, such as a sales tax increment dedicated to transportation projects. Several of the intermodal airport ground access projects described in the case studies in Section IV included funding from such sources. The legislation governing local tax measures may require that projects to be funded from the measure are specified in the ballot measure authorizing the tax. In such cases it is obviously critical for project sponsors to coordinate with the proponents of the tax measure and the agency or agencies assembling the list of projects for the ballot in order to include the proposed project in the list of projects. Even where projects to be funded by a local tax measure do not have to be specified on the ballot authorizing the measure, the sooner discussions are held with the agency that will decide how to allocate the funding from the measure, the better.

Documenting Project Benefits

A key component of developing a regional consensus on the value of a given project and ensuring that a project is viewed as a high priority by potential funding agencies is the preparation of detailed documentation of project benefits. This documentation needs to be done in a thorough and thoughtful way so that the results are viewed as credible and not simply a promotional ploy. Care should be taken to avoid inflating projected benefits through overly optimistic assumptions. While inflated estimates of the benefits of a project may at first sight appear to strengthen the case for the project, any such justification is likely to be challenged by parties with an interest in stopping the project or with a concern about the cost of the project. The resulting debate is likely to raise doubts about the justification for the project and weaken any regional consensus or political support that has been established.

In many cases it may be necessary to undertake a significant amount of research and survey work to develop credible estimates of project benefits. The cost involved in such work should be viewed as an integral part of the development costs of the project and budgeted appropriately. In any case, much of this work will be required eventually to prepare the environmental documentation for the project, so many of the costs of documenting project benefits are simply a transfer from other parts of the project budget.

In documenting project benefits, care is needed in the treatment of the value of travel time savings or increases by both users and other travelers, including both those making airport trips who do not use the facility or service in question and non-airport travelers. The current FAA guidance on the value of travel time to be used in benefit-cost analysis of airport capacity projects[269] distinguishes between those making business and personal trips, but does not provide values that vary with the income level of the user, although guidance prepared by the U.S. DOT on which the FAA guidance is based recognizes that some adjustments for differences between local and national income levels may be appropriate with suitable documentation. Both the FAA and U.S. DOT guidance provides a range of values for use in sensitivity analysis.

While the FAA guidance limits the values of travel time that can be used in economic analysis to justify projects for federal grant funding, this need not restrict the values used by project sponsors to prepare estimates of project benefits for the purpose of developing a regional consensus on the value of the project. For this purpose, it would seem reasonable to use values that are consistent with the values used in the justification of other major regional transportation investments, such as an extension of a regional rapid transit system, with appropriate adjustments for differences in the composition of the passengers served by the different projects. After all, in order to make a meaningful comparison between the benefits from an intermodal airport ground access project and those from the use of the same resources on different projects, it is obviously necessary to use consistent assumptions about the value of the changes in travel times involved.

It should be noted that intermodal airport ground access projects may result in longer travel times for those users attracted from other airport access modes but also significant costs savings compared to continued use of those other modes, which provide the incentive to switch modes. However, even those airport travelers who continue to use established modes, as well as non-airport travelers, may benefit from intermodal airport access projects if those projects reduce congestion on the rest of the surface transportation system serving the airport. Therefore the assessment of the benefits of a proposed intermodal airport access project needs to consider a broad range of airport and non-airport travelers and take into account changes in both travel time and travel costs.

This will generally require the use of an airport ground access mode choice model to analyze how the changes in service levels on the different components of the transportation system resulting from the proposed intermodal airport access project is expected to cause airport travelers to switch between different modes and hence change the travel times and user costs involved. Developing the necessary modeling framework to perform this analysis can be a relatively expensive process, although not compared to the capital and operating costs involved in most intermodal airport access projects. As discussed in Section IV,

these projects often cost several hundred million to more than a billion dollars, so spending several million dollars on the planning process is not only a very small proportion of the total project cost, but may allow to the project to be designed in a way that saves far more than the entire cost of the planning process.

Unfortunately, modeling airport ground access mode choice at an adequate level of resolution to reflect the effect of an intermodal airport access project on the mode use of airport travelers is significantly more complex than most urban travel modeling, in part because of the wide range of different modes involved and the characteristics of the trips being made. In addition, there is currently a lack of industry-standard analysis tools for performing this type of analysis. A recent ACRP Synthesis Report[270] reviewed the state of the art of airport ground access mode choice models and found that these varied widely in both model structure, detailed model specification, and estimated model coefficients. Thus common practice is to build a custom modeling framework for each project. However, over the past few years the California Department of Transportation has been funding the development of a modeling tool that can be used to evaluate proposed intermodal airport ground access projects on a consistent basis and with much less model development effort.[271,272] As of May 2012 development of the tool was still underway, but this is expected to be completed by the end of the year. Some work would be required to prepare the necessary data to use the tool to evaluate a proposed project at an airport where it has not been applied before and to estimate or calibrate the necessary airport access mode choice model for that airport.

Identifying Opportunities for Public-Private Partnerships

There is growing interest in the potential role of public-private partnerships as a means to supplement limited public funding for making capital investments in transportation infrastructure. Some of the considerations in the use of private funding for transportation projects have been discussed in Section III while a number of the intermodal airport ground access projects described in Section VI have made use of private funding in various ways. These range from providing land development rights in return for a financial contribution to the project, as in the case of the Portland MAX light rail extension to Portland International Airport, to rent from private-sector users of the facility, as in the case of the consolidated rental car facility at the Miami Intermodal Center.

In the extreme case, an intermodal airport ground access facility or service could be funded under a design-build-finance-operate-maintain contract, with no public investment and the facility being transferred back to the project sponsor at the end of the contract period. However, for such an arrangement to be attractive to a private investor, the project would have to generate a large enough revenue stream to cover the operating and maintenance costs and provide an adequate return on the capital investment. Most intermodal airport ground access projects would be unlikely to generate sufficient revenue to achieve this without some ongoing contribution of public funds or a large enough transfer of development rights that the private-sector investor could achieve a sufficient return from the profits from the development to justify the investment in the intermodal project.

Notwithstanding the challenges involved in defining a private-sector role in an intermodal airport ground access project that is financially attractive to both the private-sector investor and the project sponsor, the potential opportunities for a public-private partnership should be explored as part of developing a funding strategy for a particular intermodal access project.

SUMMARY

Because intermodal airport ground access projects are typically too large and complex to be funded from a single transportation funding program, planning such projects generally requires the development of a funding strategy that involves multiple agencies and funding sources. While the relevant airport authority will typically play a major role in a multi-agency partnership to plan and sponsor the project, restrictions on the use of both federal AIP funds and local airport revenues, including Passenger Facility Charges, will generally require these funds to form one part of a more complex funding strategy that involves federal, state and local transportation funding programs, and possibly private-sector involvement as well.

While the exact mix of funding sources and the proportion of the total cost of the project derived from each source will vary with the nature and scale of the project, the implementation of a multi-agency, multi-program funding strategy will require the development of a broad regional consensus on the importance of the project. The development of such a consensus forms a critical component of the planning for any large-scale intermodal airport access project. This will be facilitated by the establishment of a multi-agency airport ground access task force, consisting of senior staff from the relevant agencies. This task force should have a wider scope than just pursuing a particular intermodal access project, but should take a broad perspective on airport ground access issues and needs, and address intermodal airport access facilities and services within a broader context that includes land use planning in the area adjacent to the airport, opportunities for synergistic development that takes advantage of the proximity to the airport, and the transportation needs of the surrounding area. In order to effectively address the complex issues involved in airport ground access planning, the task force will need to have adequate resources to assemble a broad range of relevant data and retain consultants with the specialized experience required to undertake airport ground access modeling and planning.

The second key element in developing a regional consensus on the importance of a proposed intermodal airport access project in addressing airport ground access needs is a balanced and thorough documentation of the expected benefits of the project. This should draw on the data and analytical capabilities assembled by the airport ground access task force. These will need to include an airport access mode choice model that is capable of predicting the shifts in airport access trips between the different modes as a result of the proposed project, which in turn will allow estimates of the effect of the project on airport access travel times and costs.

In developing funding strategies for intermodal airport ground access projects, consideration should be given to opportunities for public-private partnerships that can provide access to private-sector funding. The private-sector partners will need to be able to obtain a return

on their investment and since intermodal facilities do not typically operate at a profit, other ways will need to be found to provide sufficient return on the investment. These could include the award of development rights linked to the intermodal project, as was done with the Airport MAX light rail extension to Portland International Airport, or co-location of revenue-generating functions such as parking or a consolidated rental car facility, as has been done at the Miami Intermodal Center. However, care is needed in structuring such partnerships to make sure that the public interest is best served by this approach.

VI. RECOMMENDATIONS FOR CHANGES TO PROGRAM RULES AND REGULATIONS

As shown in the case studies described in Section IV, funding for intermodal airport ground access projects typically involves a number of different funding sources, each of which may have different restrictions on what they can be used for. While some of these restrictions reflect the source of the funds used in the program or the modal responsibilities of the agencies administering the funding program, others are intended to narrow the scope of projects for which the funds can be used in order to direct the funds to the type of projects for which the program was originally intended.

None the less, some changes in the program rules, regulations, and how they are applied would greatly facilitate development of intermodal solutions to meeting airport ground access needs.

FEDERAL PROGRAMS AND REGULATIONS

Perhaps the most significant restrictions from the perspective of intermodal airport ground access projects are the limitations on the use of federal AIP and PFC funds for ground access projects located off the airport and the so-called revenue diversion rules that restrict the ability of airport authorities to use airport revenue to fund projects located off the airport. In addition, federal surface transportation programs also include limitations on the types of project they can be used for, although the regulations governing these programs do not explicitly consider intermodal airport ground access projects so these projects are treated no differently from other eligible projects. Thus this is rarely a restriction on the use of these funds for such projects, although of course this also means that these projects have to compete for funding with other types of eligible projects.

Federal Airport Funding Programs

The regulations governing the two federal airport funding programs, the AIP and PFC programs, both contain restrictions on the use of funds from the programs for airport ground access projects off airport property, as discussed in Section III. In some cases, airport authorities may be able to get around these restrictions by acquiring the right-of-way or land for intermodal ground access projects, thereby making these facilities no longer “off-airport” projects. This was done by the Port Authority of New York and New Jersey in acquiring a strip of land in the median of the Van Wyck Expressway for the right-of-way for the AirTrain people-mover link between John F. Kennedy International Airport and the Jamaica station of the Long Island Railroad. This example also shows that a determined airport authority can often find ways around the restrictions if the intermodal project is considered important enough. Even so, this approach can introduce its own difficulties and limitations. Other agencies may well be willing to partner with the airport authority in a jointly-funded project, but not to transfer ownership and control of land or facilities to the airport authority. The restrictions on the use of airport funds for projects located off the airport can also make it difficult to share in the cost of a project that benefits both airport travelers and other travelers.

In recent years, the FAA has shown greater flexibility in allowing airport funds to be used for projects that serve both airport travelers and other travelers, as long as the costs of the project are divided between the airport authority and other agencies in proportion to the anticipated use of the project by the two groups of travelers. An example is the use of airport revenues at Minneapolis-St. Paul International Airport to help fund the extension of the Metro Transit light rail Hiawatha Line across the airport to the City of Bloomington south of the airport.[273] However, the current regulations for both the AIP and PFC programs explicitly preclude the use of funds from those programs for projects located on land that that is not owned or controlled by the airport sponsor or that serves both airport travelers and other users, as discussed in Section III above. Two obvious changes to the regulations governing the use of funds from the AIP and PFC programs, which may require enabling changes to the authorizing legislation, would be (1) to allow funds from the AIP and PFC programs to be used for airport ground access projects located off airport property without requiring the airport sponsor to own or operate the facility, and (2) to allow funds from the AIP and PFC programs to be used for airport ground access projects in proportion to the use of those projects by airport travelers where their use is shared by both airport and non-airport travelers.

Since airport sponsors are able to use airport revenues from sources other than the AIP and PFC programs for these purposes, it makes little sense to preclude airport sponsors from funding such projects using funds from AIP or PFC programs. Use of other airport revenues to fund airport ground access projects located off airport property or owned and operated by other agencies reduces the funds available for projects located on the airport that would be eligible for AIP or PFC funding, and thereby increases the need for AIP or PFC funding for those projects. It can be argued that the federal government has a much greater interest in encouraging the development of intermodal connections between airports and the surface transportation system than in supporting development of airport passenger terminal facilities that can generally be funded fairly easily from fees paid by airport users through such mechanisms as general airport revenue bonds.

The rationale for having a federal airport capital grant program like the AIP is threefold:

1. To subsidize the development of airport facilities at airports that might not be able to finance these facilities solely from airport revenues;

2. To reduce airport borrowing costs for large capital projects by providing grant funding derived from taxes and fees on air transportation activity that are generated broadly across the air transportation system on an ongoing basis;

3. To encourage airports to develop facilities or implement programs that improve safety, enhance capacity, or reduce the environmental impacts of the airport activity that they might not otherwise undertake if they had to pay the full cost from airport revenues.

To the extent that developing improved intermodal connections at airports is a stated policy of the federal government, it would seem reasonable that federal programs to provide capital grants to airports to support facility development would be structured to allow

funds from those programs to be used to support the development of improved intermodal connections. These projects typically meet all three aspects of the above rationale for having a federal airport capital grant program in the first place. Intermodal connections generally do not generate sufficient revenue to cover their capital and operating costs, and thus require some level of subsidy from other sources. These projects are often very capital intensive and thus, if funded through borrowing, would incur significant borrowing costs whose support would require the commitment of other airport revenues for the life of the bonds. Finally, many airport sponsors are unlikely to view the development of improved intermodal connections as a high priority because in general the airport does not bear the externality costs of relying on private vehicles and other low-occupancy modes, such as taxis and rental cars, to meet airport ground access needs. Indeed, most airports derive significant revenue streams from continued reliance on these modes and are unlikely to be particularly enthusiastic about using those revenues to develop intermodal connections that would not only contribute little if any revenue to the airport but would tend to reduce the revenue from other modes.

In contrast, many of the airport facilities that are currently eligible for AIP and PFC funding, such as public space in passenger terminals and on-airport roadways, while they do not generate revenue directly, are directly associated with related facilities that do, such as leased space in passenger terminal buildings or on-airport parking facilities. Similarly, development of many needed airside facilities can in principle be funded from aircraft landing fees and other airfield user charges. The fact that an airport sponsor chooses to set landing fees at a level that does not provide sufficient revenue to cover needed airside improvements is not really a good reason for the federal government to make up the difference.

However, the conditions under which airport funds derived from revenue-generating space or activities can be used in partial support of off-airport projects have not been clearly defined in the relevant regulations and guidance material, such as the *AIP Handbook*. With revisions to the *AIP Handbook* needed to address changes resulting from the recently enacted *FAA Modernization and Reform Act of 2012*, this presents an opportunity for the FAA to provide additional clarification and guidance. Indeed, the Act has added a requirement that airport master plans include consideration of passenger convenience, airport ground access, and access to airport facilities. Most airport master plans already include some consideration of airport ground access and the existing FAA Advisory Circular *Airport Master Plans* contains a section on Ground Access, Circulation, and Parking Requirements that notes that:

> *as a general rule, large airports try to develop strategies that reduce the number of single-person private vehicle trips and to encourage greater use of high-occupancy vehicles. … Light rail systems, intermodal stations, or other alternate modes of transportation are often examined in these efforts.*

However, beyond this rather general statement, no further guidance is provided and even the term “single-person private vehicle trips” provides a misleading characterization of the issues involved in reducing airport ground access vehicle trips. Many air passengers travel in multi-person parties, and even those making an air trip alone are often driven to

or picked up from the airport by a family member, relative, or friend, so the vehicle is only a single-person trip in one direction. Thus the real issue is not just reducing single-person vehicle trips, but private vehicle trips in general, whether or not the vehicle happens to have only one person in it.

In the case of airport employees, a focus on single-person vehicle trips is appropriate, since encouraging ride-sharing or use of high-occupancy modes can reduce vehicle trips significantly. However, for air passengers, reducing drop-off and pick-up trips by private vehicle offers the greatest opportunity for reducing vehicle trips, because each one-way air party trip involves two vehicle trips, one to the airport and a return trip from it. In addition, in most cases the majority of these trips provide no revenue to the airport.

Given the rather limited treatment of the topic of airport ground access in the FAA Advisory Circular on airport master plans and the recent Congressional legislative directive on the need to give consideration to airport ground access in airport master plans, it is recommended that FAA consider either expanding the treatment of airport ground access in the Advisory Circular on airport master plans or preparing a separate Advisory Circular on airport ground access planning, with a particular emphasis on strategies that can reduce the number of single-party private vehicle trips.

Two other areas where some changes in program eligibility rules would be helpful would be to allow AIP and PFC funds to be used for public transportation fare collection equipment and space in intermodal facilities and for maintenance facilities and equipment required to support airport people-mover systems. Public transportation fares rarely cover the full costs of providing the facilities and services, much less generate surplus revenue, so fare collection equipment and space are not revenue-generating facilities in the same sense that car parking structures or concession space are. Rather they are an integral part of providing the public transportation service, and it makes no sense to exclude these from being funded by AIP grants or PFC revenue. Similarly, APM systems cannot operate without maintenance facilities and equipment, any more than they can operate without guideways or stations, so it makes no sense for these to be ineligible for AIP or PFC funding. While the intent of these capital development programs is not to fund operations, that is a different issue from funding the capital facilities and equipment needed to perform the operations.

Revenue Diversion Rules

The U.S. Department of Transportation should consider amending its rules on airport revenue diversion to allow airport revenues other than those derived from AIP grants or PFC revenue to be used to support airport ground access projects and services in locations off the airport, with appropriate limitations to restrict the use of airport revenues to projects that benefit the airport or its users. Clearly, travel to and from the airport by air passengers and airport employees, as well as the surface movement of air cargo to and from the airport, is essential to the functioning of the airport and the air transport operations it serves, so it makes no sense to preclude the airport authority from using airport revenue to improve the accessibility of the airport. Furthermore, a significant component of airport revenues derives directly from airport ground access and egress travel, so it makes even

less sense to prevent the airport authority from using part of those revenues to improving the airport ground access system that supports those trips.

Beyond consideration of the interests of the airport in enhancing the airport ground access system serving the airport, federal law has established that it is the policy of the United States:

> *to encourage the development of intermodal connections on airport property between aeronautical and other transportation modes and systems to serve air transportation passengers and cargo efficiently and effectively and promote economic development* (CFR Title 49 Section 47101(a)(5)).

While the policy specifically addresses intermodal connections on airport property, it is clearly impractical in many cases for such intermodal connections to be entirely on airport property, since the surface transportation mode with which the connection is being made may be located at some distance from the airport, although obviously one end of the connection has to be on airport property or it is not a connection. If the goal of the policy is to encourage the development of intermodal connections at airports, rather than to encourage airports to acquire nearby property containing intermodal facilities that serve the airport, then it clearly makes sense to allow the airport authority to use airport revenues to support the development of those intermodal connections, whether or not they are located on airport property.

The primary concern with the airport revenue diversion rules is to prevent airport sponsors, which are typically local jurisdictions with many other responsibilities, from using airport revenues for purposes unrelated to airport operations. However, this is an entirely different issue from funding intermodal connections that directly serve airport travelers or air cargo surface movements. Where such facilities serve other trips in addition to airport trips, the share of costs that could be eligible for funding from airport revenues could be limited to the proportion of users of a given facility that are making trips to or from the airport, thereby upholding the basic principle of not using airport revenues for non-airport purposes. At the core of this issue is question of whether air travelers, airport employees, or air cargo surface movements become “airport trips” when (or until) they cross the boundary of the airport property or when they set out from the trip local origins or arrive at the trip final destinations. The unstated premise underlying the stated policy that encourages the development of intermodal connections at airports is that air passengers and air cargo movements do not just travel between airports but in fact these trips involve a segment on the surface transportation system. If this were not the case, then there would be no need for intermodal connections.

It can be argued that where these trips are using facilities that mainly handle other types of traffic and were not constructed primarily to provide airport access, then the airport trips are just one of many users and pay for those facilities in the same way as the other users, whether from vehicle fuel taxes, fares or tolls, or other transportation funding programs. However, where an intermodal ground access facility or service has been developed primarily or entirely to serve airport trips, then it is no longer simply another link in the general surface transportation system but forms part of the infrastructure directly

supporting the airport, and as such it is appropriate for the airport authority to contribute to the cost of developing and operating the facility or service.

Beyond simply amending the revenue diversion rules to allow the use of airport revenues to pay for intermodal connections located off the airport but used primarily or entirely for travel to and from the airport, it may be considered desirable to specify which sources of airport revenue can be used for these purposes. From a practical perspective, this is largely a semantic issue due to the economic concept of the fungibility of money (or, stated more colloquially, dollars are all the same color once they go in the till). If a million dollars from parking revenue is spent on an intermodal connection, that money is not available to spend on a passenger terminal improvement. Conversely, if the intermodal connection is funded with a million dollars from passenger terminal space rental fees, which otherwise would have been used for passenger terminal improvement, and the contribution to the intermodal connection from parking revenues is thereby reduced by a million dollars, which is then used to contribute to the passenger terminal improvement, the net effect is identical.

However, from a political perspective there are two reasons why it may be prudent to limit funding of intermodal connections to revenue from airport ground access services. The first is that airlines and other aeronautical users may object to using revenue from fees and charges that they pay to the airport to fund ground access improvements rather than facilities that they use directly. They would have a much harder time arguing that revenue from automobile parking or rental car concession fees that are paid directly by air passengers is money that should be used only for facilities that airlines use directly. The second reason is that this would limit the amount of airport revenue that could be spent on intermodal connections to the net revenue from airport ground access services after paying for the costs of providing those services (e.g. the construction and operating costs of the parking facilities). As a practical matter, no airport authority is likely to agree to spend that much of its revenue on an intermodal connection, so this limitation is never likely to be invoked, but including it in the rule will help address concerns that a very expensive intermodal connection project, such as extending a rail transit system to the airport, could end up requiring additional funding from passenger terminal and airside revenues.

One possible objection to such an approach is that users of most intermodal connections or services do not typically contribute to an airport's ground access revenues, or any contribution is fairly small, and the users of the ground access facilities and services making the largest contribution to airport revenues, those using parking or rental cars, do not make use of intermodal connections other than highway links. It can be argued that users of parking and rental cars do benefit from the reduced highway and street congestion that results from improved public transportation access to the airport. Indeed, reducing highway and street congestion from vehicle trips generated by the airport is often the primary motivation for developing improved intermodal connections and services. At the same time, air passengers being dropped off or picked up by private vehicles, which typically contribute by far the largest proportion of vehicle trips generated by an airport, also generally pay nothing to the airport for the use of the airport roadways and terminal curbfront, so these users are also in effect being subsidized by those using parking and rental cars.

Clearly the current way in which airport revenues are being generated and used is already rife with cross-subsidy between different categories of user. These cross-subsidies go well beyond the airport ground access system and extend to revenues from concessions within the passenger terminal and the structure of aircraft landing fees. In this context, perhaps subsidizing users of public transportation access modes from users of different ground transportation facilities and services is not the greatest concern with cross-subsidy in the current system of airport finance.

Even so, it may be timely for any discussion of changing airport revenue diversion rules to take place as part of a larger discussion of the cross-subsidies inherent in the current structure of airport finance and distortions in airport and user decision making that can result from this. To the extent that ground access facilities and services are used by all airport travelers, it would seem reasonable to fund these from revenue sources to which both originating air passengers and airport employees (or their employers) contribute. In the case of air passengers, the PFC program provides a fairly equitable mechanism, in that all air passengers pay a fixed amount per passenger. Although PFCs are also paid by connecting passengers in most cases, it is unclear whether this results in a significant degree of cross-subsidy between originating and connecting passengers, since large connecting hub airports have to provide more terminal facilities than would be required to handle only the originating and terminating passengers.

STATE PROGRAMS

Since state transportation funding programs that can be used to fund airport intermodal connections and services vary from state to state, any recommendations for changes to the rules and procedures for those programs would need to be tailored to the specific circumstances of a given state. To the extent that these programs mirror the federal surface transportation funding programs, similar recommendations would apply.

Many states have taken a strong policy position on developing improved intermodal connections within the state's transportation system, as illustrated by the Florida DOT leadership in developing the Miami Intermodal Center and efforts within California to fund the development and operation of improved intercity passenger rail systems. However, the majority of these programs still operate within a funding structure that is organized on a modal basis. It may be helpful to create a funding program specifically structured to support the development of intermodal connections and improved intermodal coordination.

LOCAL PROGRAMS

Not surprisingly, local programs are even more diverse than state programs, both in terms of their scope, management, and funding levels. Commonly these programs are funded from an increment in the local sales tax, since this is commonly a revenue source that can be modified by the local electorate, both in terms of the tax rate and the uses to which the tax revenues can be put. To the extent that these programs reflect local priorities and willingness to invest in improved transportation facilities serving the affected communities, differences in the programs from jurisdiction to jurisdiction are more likely to result from

differences in local needs and opportunities than from a failure to take advantage of opportunities represented by other programs.

Even so, when designing such programs, or selecting projects to fund through such programs, it is important to ensure that opportunities for improved intermodal connections are given appropriate consideration. These will not necessarily be projects that will have a lot of local political visibility or voter support, since their value is often only apparent after the fact or perhaps not obvious at all, since those who would benefit from the improved connectivity provided by the project are often, by necessity, currently using other routes or modes. Therefore, local transportation planners should work to identify needed improvements in intermodal connectivity in the region and define proposed projects to address these needs, so that those developing or supporting proposed local funding programs, or selecting projects to receive funding from such programs, are aware of the opportunities to fund improvements in intermodal connectivity. In terms of projects to improve intermodal airport ground access, it is important that airport planners work closely with regional transportation officials and those involved in developing local funding programs to ensure that these projects are considered. This is where a regional airport ground access task force, as discussed in the previous section, can prove particularly helpful.

Although the majority of local transportation funding programs are based on revenue from sales taxes, this is largely a consequence of the limited alternative revenue generation options, as well perhaps as a quirk of voter willingness to consider increasing sales taxes but resistance to other taxes (such as vehicle registration fees or local gas taxes). However, a sales tax increment is not a particularly good revenue generation mechanism from the perspective of transportation policy. In addition to the well-known regressive aspect of sales taxes, it provides no visible price signals to the users of the transportation system that might encourage them to change their travel behavior in a way that would reduce both the need for expanded highway facilities and the adverse environmental consequences of current patterns of mode use.

Therefore those planning to introduce new local funding programs would be well advised to follow the development of new and innovative transportation funding mechanisms to see if some of these could be adapted to support local funding programs. Two such developments are the increased use of vehicle transponders to support automated tolling, such as programs to allow single-occupancy vehicles to use high-occupancy vehicle lanes by paying a toll, and proposed programs to charge a mileage-based fee, termed a vehicle-miles of travel (VMT) fee, in place of a fuel tax. The former is already being implemented at a growing number of locations in many states and the latter is undergoing experimental testing in a few trial locations. Both programs offer the opportunity to easily add a local component to the tolls or fees being charged. By raising the toll or VMT fee in a particular local jurisdiction, this not only generates revenues for meeting local transportation needs, but sends price signals to highway users that their driving habits are imposing costs on the transportation system and on other users of that system. These mechanisms also have the advantage that the toll or fee can be varied by time of day to reflect changing levels of congestion and hence encourage temporal shifts in travel as well as changes in mode use.

Although these revenue generation options apply generally to funding the broader transportation system, they can be tailored to support intermodal airport ground access projects. For example, a VMT fee could include a surcharge for users of airport roadways, while high-occupancy lane tolls on airport access highways could include a component to fund intermodal airport access projects that are designed to reduce vehicle trips generated by airport travelers.

VII. SUMMARY AND CONCLUSIONS

The research described in this report has examined the challenges of funding airport ground access projects and the role of collaborative funding strategies between the different agencies that typically become involved in such projects. The report summarizes the recent literature on funding airport ground access projects as well as funding transportation projects more generally, and includes a detailed review of current federal transportation funding programs relevant to airport ground access projects as well as a discussion of state and local funding programs and potential opportunities for private-sector funding.

A major component of the research described in the report comprised detailed case studies of seven selected airport ground access projects, including a major intermodal center, two automated people-mover projects, two access highway projects, and two airport rail links. These case studies examined the history of each project, the costs involved, and the funding programs and mechanisms used to finance the projects.

CASE STUDY FINDINGS

The case studies have illustrated the wide range of funding programs and mechanisms that have been used to finance the development and implementation of major airport ground access projects. Two of the seven projects can be considered megaprojects by any standard, with total costs of $1.9 billion and $2.0 billion respectively. The case studies also illustrate the diversity of institutional arrangements that have been used to develop these projects and the importance of a strong commitment by the primary project sponsor, which in five of the seven cases was not the airport authority. In three cases this was regional transit authority, in one case it was the state Department of Transportation, and in the case of the Richmond Airport Connector it was a private-sector firm operating under a public-private partnership with the state.

The extent of collaborative funding provided by other agencies also varied considerably across the cases, with the Oakland Airport Roadway Project having the most diverse funding arrangements, involving contributions from two adjacent cities as well as state and regional agencies and federal grants. Several of the case study projects made use of federal loans through the federal Transportation Infrastructure Finance and Innovation Act and two of the projects had significant private-sector investment. The mix of federal, state, local and private-sector funding also varied widely across the projects, with some projects making extensive use of federal grants from various airport or surface transportation funding programs and others being largely funded from local or private-sector sources.

NEED FOR CHANGES TO FUNDING PROGRAM RESTRICTIONS

Although many airport ground access projects have been funded using the existing framework of transportation funding programs and other funding arrangements, including those projects studied in the course of this research, this is not to say that the current programs and procedures are well structured to finance improvements to airport ground access, particularly intermodal connections to local and regional transit systems. There are a number of potential changes to the rules and regulations governing the eligibility of

projects for various funding programs that could significantly facilitate the development of improved intermodal connections at major airports. In particular, the current restrictions preventing the use of funds from the federal Airport Improvement Program and Passenger Facility Charge program for airport ground access projects located off airport property make no sense. Provision of landside access capacity to airports is no less important than provision of airside capacity. Both are needed to ensure that future traffic levels can be accommodated without excessive delays and adverse environmental impacts. Indeed, to the extent that opposition to airport expansion by nearby communities often arises from concerns over the impact of ground traffic generated by the airport on congestion on local streets, developing effective airport access service by transit and other high-occupancy modes may help move airside development projects forward.

Needless to say, these projects are typically at least partly located off the airport property, so restrictions on the use of airport development funds for such projects can prove counter-productive. It is understandable that aviation interests, including the airlines and airport sponsors, do not want to see airport development funds used to pay for transportation projects that are serving trips unrelated to the airport. However, existing procedures for sharing cost responsibilities where on-airport projects serve both airport and non-airport trips can be easily extended to handing off-airport components of projects that serve both airport access trips and non-airport travel.

There are also a number of other restrictions in current federal legislation that could usefully be corrected by Congress in future reauthorization of the federal airport development programs. One is the prohibition on the use of PFC funds for revenue-generating equipment and associated space in transportation facilities. While it makes sense that there is no need for airports to be able to use PFC funds to construct facilities that are devoted to such revenue-generating uses as parking structures or restaurants, collecting fares from users of public transportation access facilities is a different situation entirely. These fares typically only cover part of the cost of constructing and operating such systems, sometimes only part of the operating costs and none of the capital costs. Another restriction on the use of PFC funds prevents their use for maintenance facilities and equipment. However, in the case of automated people-mover systems, the vehicle maintenance facilities and equipment form an integral part of the system, which cannot operate without these resources. From the perspective of an air passenger using the system, these facilities and equipment are just as essential as the guideway and vehicle control system, so it is not clear why they should be treated any differently.

CONCLUSIONS

Intermodal airport ground access projects not only present some of the greatest opportunities to improve intermodal coordination in the transportation system, directly addressing the interface between the surface and air transportation systems, but are also likely to become a critical solution to meeting future airport ground access needs at many airports. At the same time these are some of the most challenging transportation projects to plan and fund due to the large number of different agencies that can become involved in such projects and the restrictions imposed in current funding programs. As a result collaborative approaches to funding such projects are often essential to their successful

implementation. These approaches can draw on a wide range of federal, state, and local funding sources, as well as opportunities for private-sector involvement.

While future changes to federal legislation and regulations could greatly facilitate funding such projects, there are already many existing funding programs that can be used, as illustrated by the case studies described in this report. However, in order to take full advantage of these opportunities, it is necessary to develop a regional consensus on the importance of a given project to the regional transportation system. This can be greatly facilitated by establishing a regional airport ground access task force to work on an ongoing basis to identify and plan needed facilities to enhance airport ground access and develop collaborative funding strategies. This task force should comprise senior staff from the major airports, the MPO, the state Department of Transportation, transit agencies, local jurisdictions in the immediate vicinity of the airports, and other relevant stakeholders. It should have adequate resources to assemble required data, undertake studies, and retain consultants for specialized studies or analysis.

The development of an appropriate funding strategy for a given airport ground access project will depend on the nature of the project and the local institutional and transportation funding situation, including the potential availability of funding from state and local programs. One important objective of establishing a regional airport ground access task force is to ensure that airport ground access issues get appropriate consideration when agencies are formulating their long-range capital improvement plans and funding priorities.

ABBREVIATIONS AND ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AC Transit	Alameda Contra Costa Transit District (San Francisco Bay Area transit agency)
ACRP	Airport Cooperative Research Program
ACTA	Alameda County Transportation Authority (San Francisco Bay Area agency)
ACTIA	Alameda County Transportation Improvement Authority (San Francisco Bay Area agency)
ADP	Airport Development Program (Oakland International Airport)
AGT	Automated guideway transit
AGTC	Airport Ground Transportation Center
AIP	Airport Improvement Program
AIR-21	Wendell H. Ford Aviation Investment and Reform Act for the 21st Century
ALRS	Airport Light Rail System (SFO people-mover system)
ANPRM	Advanced Notice of Proposed Rulemaking
APM	Automated people-mover
ARCA	Amended and Restated Comprehensive Agreement (toll road agreement between VDOT, PPA and Transurban (USA) Development Inc.)
ARP	Airport Roadway Project (Oakland International Airport)
ARRA	American Recovery and Reinvestment Act
ARTC	Air Rail Transit Consortium (JFK AirTrain joint venture)
ATA	Air Transportation Association of America
BART	Bay Area Rapid Transit (San Francisco Bay Area transit system)
BATA	Bay Area Toll Authority (San Francisco Bay Area agency)
CAAA	Clean Air Act Amendments
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CATIA	Clean Air and Transportation Improvement Act (California)
CFC	Customer Facility Charge

CFR	Code of Federal Regulations (U.S.)
CHP	California Highway Patrol
CMAQ	Congestion Mitigation and Air Quality Improvement (Program)
CM@Risk	Construction Manager at Risk
CTA	Central Terminal Area
CTC	California Transportation Commission
CY	Calendar year
DART	Dallas Area Rapid Transit
DB	Design-build
DBOM	Design-build-operate-maintain
D.C.	District of Columbia
DEIR	Draft Environmental Impact Report (California document)
DMV	Department of Motor Vehicles
DOT	Department of Transportation
FAA	Federal Aviation Administration
FDOT	Florida Department of Transportation
FFGA	Full Funding Grant Agreement
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	Fiscal year
GAO	Government Accountability Office
HIRE	Hiring Incentives to Restore Employment (Act)
ISTEA	Intermodal Surface Transportation Efficiency Act
ITIP	Interregional Transportation Improvement Program (California program)
JFK	John F. Kennedy International Airport, New York (airport code)
LAX	Los Angeles International Airport (airport code)
LIRR	Long Island Rail Road

LOI	Letter of Intent (Airport Improvement Program)
LRTP	Long Range Transportation Program
MAX	Metropolitan Area Express (Portland, Oregon transit system)
MCS	Miami Central Station
MDAD	Miami-Dade Aviation Department
MDBCC	Miami-Dade Board of County Commissioners
MDCT	Miami-Dade County Transit
MIA	Miami International Airport (airport code)
MIC	Miami Intermodal Center
MPO	Metropolitan Planning Organization
MTA	Metropolitan Transportation Authority (New York City)
MTC	Metropolitan Transportation Commission (San Francisco Bay Area)
MTI	Mineta Transportation Institute
Muni	San Francisco Municipal Railway (city transit system)
NAAQS	National Ambient Air Quality Standards
NCHRP	National Cooperative Highway Research Program
NCSL	National Conference of State Legislatures
NEPA	National Environmental Policy Act
NHS	National Highway System
NPIAS	National Plan of Integrated Airport Systems
NPRM	Notice of Proposed Rulemaking
NYCT	New York City Transit
OAC	Oakland Airport Connector (AGT link to OAK)
OAK	Oakland International Airport (airport code)
PANYNJ	Port Authority of New York and New Jersey
PATH	California Partnership for Advanced Transit and Highways
PCGA	Project Construction Grant Agreement
PDC	Portland Development Commission (Oregon)
PDX	Portland International Airport (airport code)

PFC	Passenger Facility Charge
PGL	Program Guidance Letter (Airport Improvement Program)
PIM	Program Information Memorandum (Airport Improvement Program)
PTA	Public Transportation Account (California program)
PTP	People's Transportation Plan (Miami-Dade County program)
PPA	Pocahontas Parkway Association (Virginia toll road agency)
PPP	Public-Private Partnership
QTA	Quick turnaround area (rental car facility)
RAC	Richmond Airport Connector (airport access road at RIC)
RCC	Rental Car Center
RIC	Richmond International Airport, Virginia (airport code)
ROD	Record of Decision
RTIP	Regional Transportation Improvement Program
RTPA	Regional Transportation Planning Agency
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SamTrans	San Mateo County Transit District (San Francisco Bay Area transit agency)
SFO	San Francisco International Airport (airport code)
SFRTA	South Florida Regional Transportation Authority
SIB	State Infrastructure Bank
SHA	State Highway Account
SHOPP	State Highway Operation & Protection Plan (California program)
SLTPP	State-Local Transportation Partnership Program (California program)
STA	State Transit Assistance (California program)
STIP	State Transportation Improvement Program
STP	Surface Transportation Program (federal program)
STTF	State Transportation Trust Fund
TCRF	Traffic Congestion Relief Fund (California program)
TCRP	Transit Cooperative Research Program

TDA	Transportation Development Act (California)
TEA-21	Transportation Equity Act for the 21st Century
TIF	Transportation Investment Fund (California program)
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIGER	Transportation Investment Generating Economic Recover (federal program)
TIP	Transportation Improvement Program
TRB	Transportation Research Board
URA	Urban Renewal Area
USDOT	U.S. Department of Transportation
VDOT	Virginia Department of Transportation
VMT	Vehicle-miles of travel
VWE	Van Wyck Expressway (New York City)
WMATA	Washington Metropolitan Area Transportation Authority

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