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Research Project 2503

Collaborative Funding to Facilitate Airport Ground Access

CASE STUDY REPORT: JOHN F. KENNEDY INTERNATIONAL AIRPORT AIRTRAIN

Geoffrey D. Gosling, Ph.D.
Dennis Freeman

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To order this publication, please contact:

Mineta Transportation Institute
College of Business
San José State University
San José, CA 95192-0219

Tel: (408) 924-7560
Fax: (408) 924-7565
Email: mineta-institute@sjsu.edu
transweb.sjsu.edu

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ABSTRACT

This case study report documents the experience with collaborative funding of airport ground access involved in the development of an automated people mover, termed the AirTrain, at John F. Kennedy International Airport (JFK), New York. The AirTrain system links the airport passenger terminals to two nearby rail stations, the Jamaica station of the Long Island Rail Road (LIRR) and the Howard Beach station of the New York City subway system, as well as providing intra-airport transportation. The project was developed by the Port Authority of New York and New Jersey (PANYNJ), the operator of JFK airport. In addition to connecting the seven passenger terminals in the airport central terminal area and the two rail stations, the AirTrain serves the airport long-term and employee parking lots, rental car facilities, the airport cargo area, and an airport hotel.

The AirTrain system comprises an 8.1-mile guideway that includes a 1.8-mile loop within the central terminal area and ten stations. Construction of the system commenced in 1998 following the award of a design-build-operate-maintain (DBOM) contract to a consortium of four firms operating as the Air-Rail Transit Consortium, and the system opened for service on December 17, 2003. The estimated cost of the project at the time the DBOM contract was awarded was \$1.66 billion, but this subsequently increased to \$1.9 billion with the addition of improvements at the Jamaica LIRR station and an enhanced connection between the AirTrain station and the LIRR station.

The principal source of funding for the project was \$1.148 billion in Federal Passenger Facility Charge (PFC) revenue collected at all three New York Airports. The majority of the remainder of the project funding came from PANYNJ capital funds, with some funding from the New York Metropolitan Transportation Authority for related improvements to Jamaica Station and Howard Beach Station.

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. The PFC program requires projects to be located on land owned or controlled by the airport sponsor. Therefore, to construct the link between the airport and the LIRR station, the PANYNJ acquired a strip of land in the median of the Van Wyck Expressway that runs between the airport and Jamaica, and additional property adjacent to the Jamaica station. The use of PFC revenue for this part of the system was challenged in court by the airline industry but upheld by the courts.

JOHN F. KENNEDY INTERNATIONAL AIRPORT AIRTRAIN

INTRODUCTION

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 1. The eighth terminal (Terminal 6) was demolished in October 2011 to accommodate future expansion of Terminal 5.¹

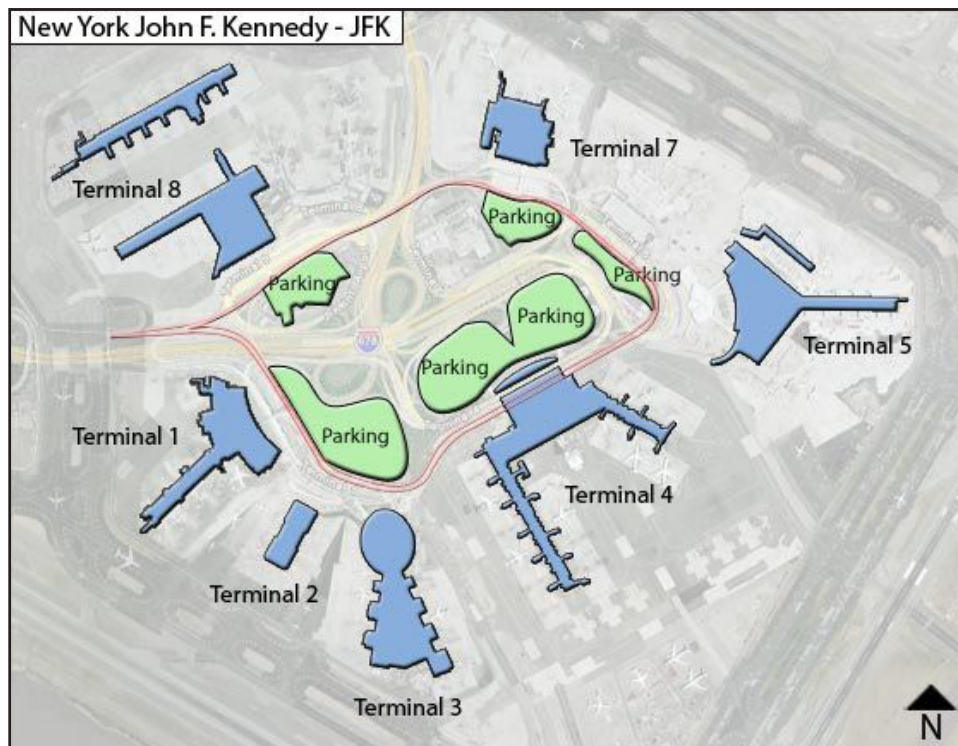


Figure 1. JFK Central Terminal Area

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

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 generally refer to it as a people mover. The AirTrain would replace the inter-terminal shuttle buses and connect the CTA with the long-term and employee parking lots, Howard Beach station, and Jamaica Station in Queens.

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 and employee parking lots, and Long Island Rail Road (LIRR) commuter trains at the Jamaica station in Queens, as shown in Figure 2.² The AirTrain system uses fully automated, driverless vehicles with steel wheels running on steel rail and a linear induction propulsion system.³ The cars have steerable trucks to accommodate the sharp curves in the CTA. The cars are 57 feet 9 inches long with two doors per side, each 6 feet wide to allow easier boarding for passengers with baggage and baggage carts.⁴

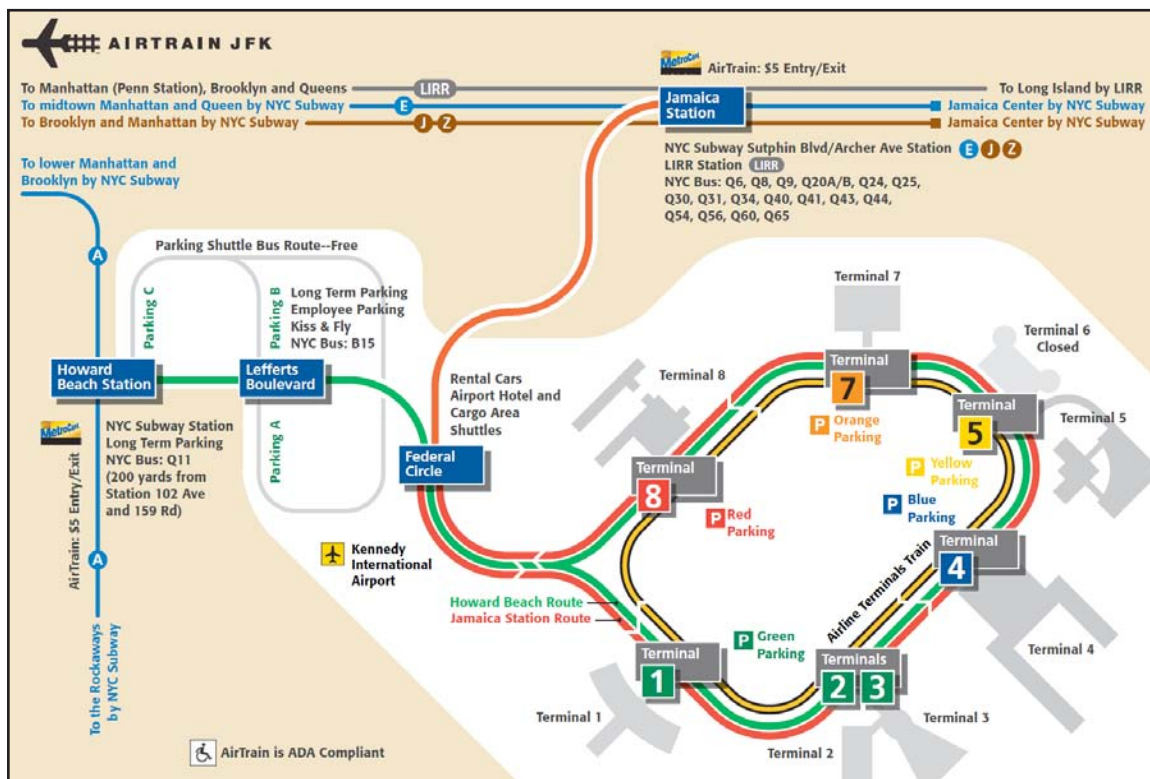


Figure 2. JFK AirTrain System Map

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 and employee parking lots, rental car facilities, the airport cargo area, and the airport hotel at Federal Circle. As can be seen in Figure 2, the CTA is served by a double-loop track with inter-terminal trains running clockwise on the inner track and trains serving Jamaica and Howard Beach stations running counter-clockwise on the outer track. This configuration allows passengers traveling between terminals to proceed in either direction around the CTA loop, depending on which direction is shorter. The six CTA stations have center platforms to allow passengers to transfer between trains traveling in opposite directions. The 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 3. 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. The Jamaica station also provides connections to the NYCT subway E, J, and Z lines at Sutphin Boulevard/Archer Avenue stations. 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.



Figure 3. JFK Regional Rail Connections

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

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 or from Manhattan. The AirTrain cars were sized 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 found to be desirable. However, the current AirTrain cars do not meet design standards for heavy rail operation and their linear induction propulsion system would not allow operation on LIRR tracks, so it would be necessary to develop a different vehicle to allow operation by AirTrain cars to Manhattan, although this would appear to be technically feasible.⁵

Aside from any issues that interoperability might raise from the use of Passenger Facility Charge (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 between the airport and 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 vastly 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 between Jamaica Station and 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 way to improve rail access to JFK from Manhattan. In 1978, the MTA began operating the Train-to-the-Plane, a limited stop service using special-purpose subway cars between Manhattan and the Howard Beach subway station using existing subway tracks.⁶ 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 Manhattan, 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.⁷ On August 1, 1995, the Federal Aviation Administration (FAA) approved a PANYNJ request to use PFC revenues to fund part of the project.⁸ 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.⁹ 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.^{10,11} 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 the National Environmental Policy Act.^{12,13} In February 1998 the FAA approved partial funding of the project from PFC revenues with some restrictions¹⁴ and in May 1998 the PANYNJ awarded a design-build-operate-maintain (DBOM) 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).¹⁵ The contract made ARTC responsible for the project's preliminary engineering, design completion, construction, installation, testing, demonstration, and operations and maintenance for a 5-year period, with optional one-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.¹⁶

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) 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.¹⁷ 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.¹⁸

Construction of the AirTrain system began in 1998 following award of the DBOM 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.

Use of a Design-Build-Operate-Maintain Contract

The PANYNJ decided to use a DBOM contract to construct and operate the system with the intent that this would 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. In addition, this approach was chosen with the additional goal of reducing the staffing requirements on the part of the PANYNJ, particularly for operating the system once it was constructed. At the time the DBOM contract was signed, the JFK AirTrain system represented one of the largest, if not the largest, applications of the DBOM approach to an airport project in the U.S. Therefore the details and effectiveness of this approach has been the subject of a number of subsequent papers and studies.

The project management issues and challenges involved in the DBOM contract are discussed in a 2001 paper by Anthony Cracchiolo and Victor Simuoli, two senior PANYNJ and consultant personnel involved in managing the project.¹⁹ The paper describes the approach to maximizing the effectiveness of the DBOM process and concludes with some of the lessons learned from the experience on the project. These include the importance of developing well-defined contracts, establishing good performance criteria, and clearly defining key roles and responsibilities. In addition, effective risk management requires the development of a balanced allocation of risk between the owner and the DBOM contractor, and allowing the contractor to proceed at its own risk when appropriate. Project management lessons include:

- The need to establish and maintain open channels of communication between the owner and DBOM contractor;
- Allowing “fast track” review of design submittal to accommodate early construction of key project elements;
- Establishing third-party agreements at an early stage;
- Accepting innovation by the DBOM contractor;
- Developing and executing risk management strategies.

A recent study for the Transit Cooperative Research Program addressing competition requirements of design/build, construction manager at risk, and public-private partnership contracts included a case study of the JFK AirTrain DBOM contract.²⁰ This described the process followed by the PANYNJ in defining the scope of work and selecting the DBOM contractor, as well as key contract provisions and project performance. It was noted that a number of conflicts arose between the PANYNJ and the DBOM contractor due to the limited functional design information provided in the Request for Proposals, particularly with respect to the design aesthetic for the AirTrain stations.

Continuing Studies of Improved Rail Access to JFK

The opening of the AirTrain service linking the airport with Jamaica and Howard Beach stations has not ended efforts to improve rail access to JFK from Manhattan. During the subsequent years, consideration was given to a plan to improve rail service between Lower Manhattan and the airport. From September 2003 to April 2004, the Lower Manhattan Development Corporation (LMDC), the MTA, the PANYNJ, and the New York City Economic Development Corporation undertook a joint study to investigate the feasibility of a rail link that would provide a direct connection between Lower Manhattan and the LIRR Jamaica station.^{21,22} This had the dual objective of improving service to commuters from Long Island, as well as improving the connection between Lower Manhattan and JFK. It was envisaged that the rail link could be used by AirTrain cars to provide a one-seat ride between Lower Manhattan and the airport.

The study examined a number of alternatives and recommended pursuing construction of a new tunnel under the East River between the Atlantic Avenue terminus of the LIRR Atlantic Branch in Brooklyn and Fulton Street in Lower Manhattan, as shown in Figure 4.

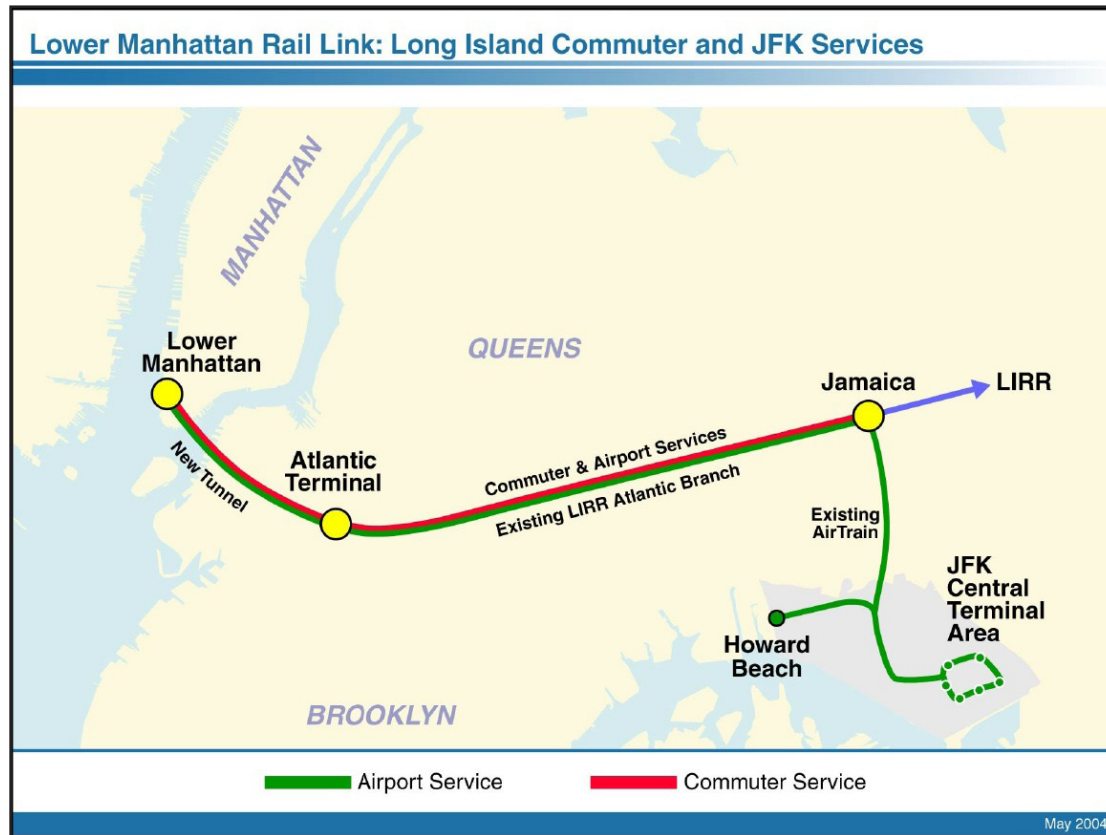


Figure 4. Proposed New Rail Link from Lower Manhattan to Jamaica/JFK

Source: LMDC et al., *Lower Manhattan Rail Link: Long Island Commuter and JFK Airport Services*, www.renewnyc.com/plan_des_dev/transportation/2004_feasibility_study.asp (accessed June 6, 2012).

In 2005, the four agencies, under the lead of the MTA, initiated the Lower Manhattan-Jamaica/JFK Transportation Project that undertook a more formal alternatives analysis that was intended to result in the selection of a preferred alternative and the preparation

of an Environmental Impact Statement.²³ However, work on the project ended in 2008 without preparing an EIS.²⁴

The study concluded that the capital cost of the project would vary between \$6.6 billion and \$9.9 billion, depending on the alternative adopted and whether or not a one-seat ride service was provided between Lower Manhattan and the airport. The provision of the one-seat ride service increased the estimated capital costs by \$1.7 to \$2 billion and the study concluded that the additional capital cost was disproportionate to the increase in ridership that would result. By 2009, the project was reported to have been abandoned due to the cost,²⁵ although as of the date of this report it was still listed on the website of the Lower Manhattan Development Corporation as one of the transportation projects under the Plan for Lower Manhattan.

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 DBOM contract to \$1.134 billion, as shown in Table 1. In addition, the PANYNJ established a contingency fund of \$129 million to cover uncertain or unanticipated costs arising during construction and reduce provision for contingencies in the negotiated contract amount.²⁶ The project budget also included \$400 million for direct PANYNJ expenses, including land acquisition, some mitigation expenses, and a part of the design work.²⁷ By the end of the construction phase of the project, some \$99 million of the contingency fund had been used.²⁸

Table 1. 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.

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.²⁹ 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.

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.³⁰ 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.³¹

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.³²

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 Station and Howard Beach Station.

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 CONCLUSIONS

The John F. Kennedy International Airport (JFK) AirTrain system is an automated people mover that provides inter-terminal connections between the seven unit terminals within the airport central terminal area, as well as links to two nearby rail stations, long-term parking lots, rental car facilities, and an airport hotel. It is the most extensive automated people mover system at any U.S. airport, comprising an 8.1-mile guideway and ten stations. The entire project cost almost \$2 billion, including a major improvement to the Jamaica station of the Long Island Rail Road (LIRR), one of the two rail stations served by the system.

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

- The use of Passenger Facility Charge (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 Port Authority of New York and New Jersey (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 design-build-operate-maintain (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 Air Transport Association of America, representing many of the U.S. airlines using JFK, filed a lawsuit in federal court challenging the Federal Aviation Administration (FAA) approval of the use of PFC revenues for the link to Jamaica Station, but the court upheld the 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 Van Wyck Expressway and at Jamaica Station required extensive involvement by PANYNJ staff and consultants.

ABBREVIATIONS AND ACRONYMS

| | |
|--------|--|
| ARTC | Air Rail Transit Consortium |
| ATA | Air Transportation Association of America |
| CTA | Central terminal area |
| DBOM | Design-build-operate-maintain |
| FAA | Federal Aviation Administration |
| JFK | John F. Kennedy International Airport, New York (airport code) |
| LIRR | Long Island Rail Road |
| LMDC | Lower Manhattan Development Corporation |
| MTA | Metropolitan Transportation Authority (New York) |
| MTI | Mineta Transportation Institute |
| NYCT | New York City Transit |
| PANYNJ | Port Authority of New York and New Jersey |
| PFC | Passenger Facility Charge |
| VWE | Van Wyck Expressway (New York City) |

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PEER REVIEW

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