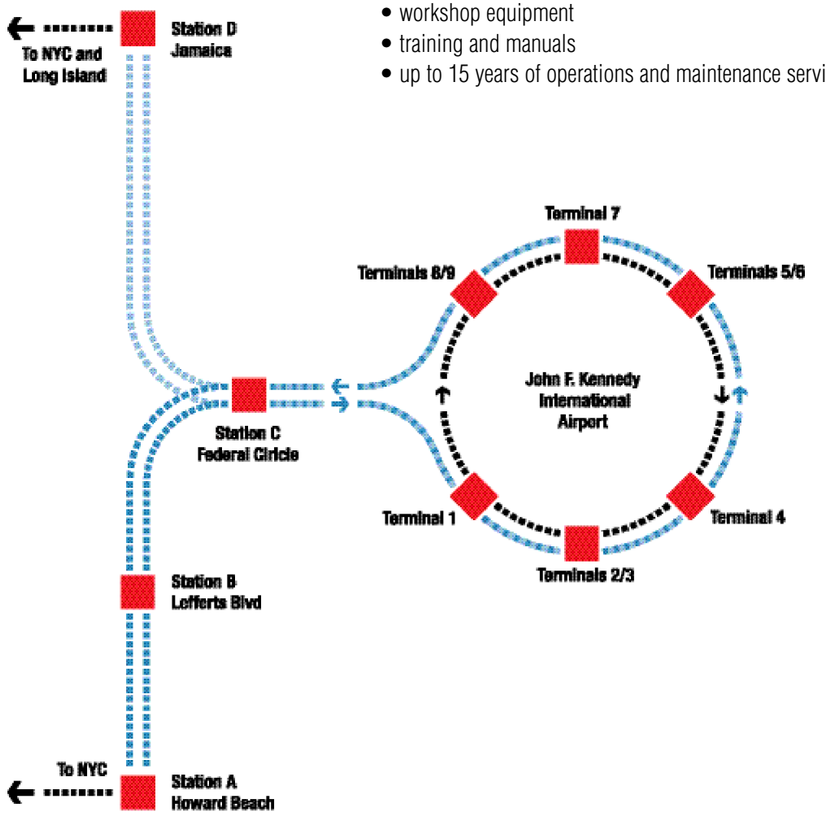
Advanced Rapid Transit System

AirTrain JFK International Airport, New York, USA

The AirTrain JFK system connects 10 fully enclosed stations and links all terminals in JFK's Central Terminal Area with two branches that interface with New York's regional transit system. Both branches use a common section between the Central Terminal Area 2.5-km (1.6-mi.) loop and the junction. The ARTC Construction Joint Venture, which was led by Skanska USA and included Perini Corporation, was responsible for the design and construction of all related civil works.

In addition to the manufacture and supply of vehicles, Bombardier's share of the project work included:

- 32 ART MK II vehicles
- project management
- systems engineering and integration
- testing and commissioning
- automatic train control
- communications systems
- automatic fare collection system
- traction power system
- platform doors for 10 stations
- workshop equipment
- training and manuals
- up to 15 years of operations and maintenance services



Under contract to the Port Authority of New York and New Jersey, Bombardier Transportation, as part of the AirRail Transit Consortium (ARTC), was responsible for the design and supply of a fully automated (driverless) Advanced Rapid Transit (ART) system for New York's JFK International Airport.

The fleet of 32 ART MK II vehicles feature linear induction motor (LIM) technology similar to the ART vehicles operating in the Malaysian capital, Kuala Lumpur, and in Vancouver, Canada. AirTrain JFK* vehicles are equipped with steerable-axle bogies and are ideally suited to the system's tight curves, steep grades, precise stopping requirements and demanding schedule adherence.

Providing ride comfort in all-weather conditions, the 3-metre (10-feet) wide vehicles feature extra-wide doors and on-board luggage racks to accommodate airline passenger baggage.

Bombardier Transportation is operating and maintaining the system for five years with two additional five-year operations and maintenance options.

*Trademark of The Port Authority of New York and New Jersey

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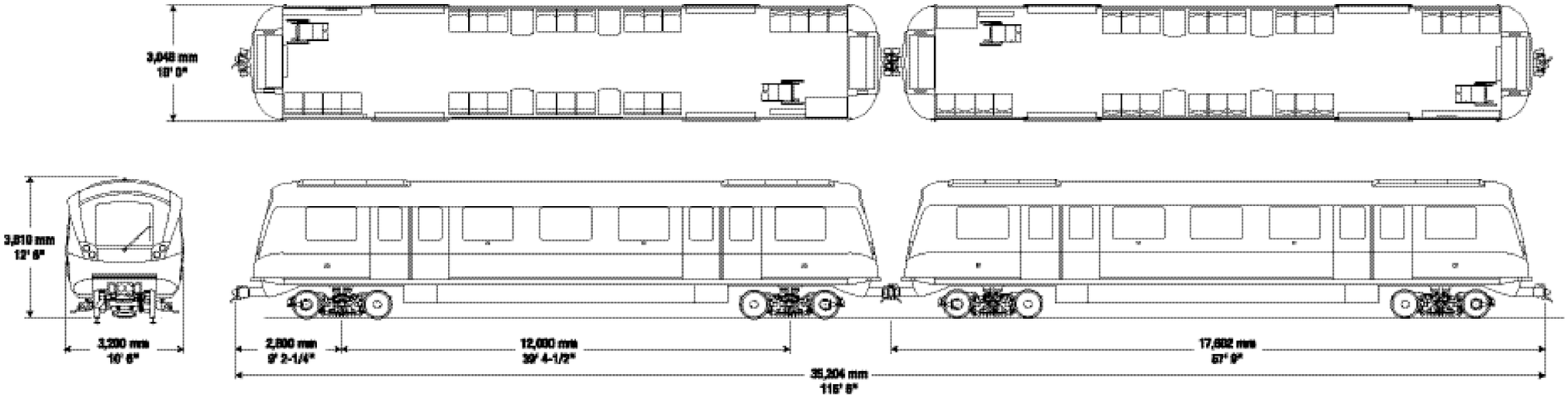
nonstop



Project Schedule

Contract Award
May 1998
Start Site Work
September 1998
First Vehicle Delivery
November 2000
Revenue Service
December 2003

Major Subsystems

Vehicle
ART (Advanced Rapid Transit)
Signalling
moving block, 2 modes of operation
- automatic train operation (ATO)
- emergency manual

Power Supply & Distribution
750 Vdc; third rail
Traction Power Substations
7
Communications
station dynamic displays, full PA system, CCTV cameras, telephones, O&M and emergency radio systems, fibre optic communication network
Automatic Fare Collection
equipment at interchange stations

System Description

System Type
Advanced Rapid Transit System
System Length
13 km / 8 mi., double-tracked
Number of Lines
3
Vehicle Fleet
32
Train Control
fully automated 24-hour operation
Maximum Grade
5.35%
Fare Collection
MTA Metro Card compatible
Intermodal Connections
airplanes, subway (metro), commuter rail, bus

Fixed Facilities

Guideway Types
- at-grade: concrete tie and ballast
- underground: cut and cover
- elevated: single and dual guideway, segmental precast post-tensioned

Minimum Single Elevated Guideway Width
5,867 mm / 19' 3"
Minimum Dual Elevated Guideway Width
9,449 mm / 31' 0"
Maximum Elevated Guideway Span
40 m / 131' 0"
Track Gauge
1,435 mm / 4' 8 1/2"
Trackwork
- at-grade: concrete tie and ballast
- elevated and underground: direct fixation with spring clip and elastomeric pad

Number of Stations
10, all elevated
Average Station Spacing
1.29 km / 0.8 mi.
Platform Loading
high level
Platform Length
73 m / 240' 0"
Station Features
elevators, escalators and stair access, platform screen doors, elevated connectors with moving walkways
Station "Accessibility" Provisions
station elevators
Maintenance Building Size
5,440 m^2 / 60,000 ft^2 (approximate)
Yard Operation
fully automatic unmanned storage and coupling
Yard Storage Capacity
36 vehicles, expandable to 52

General Data

Type of Vehicle
ART (Advanced Rapid Transit)
Quantity Ordered
32 vehicles
Train Consist
1- to 4-car trains

Dimensions & Weight

Length (over coupler faces)
17,602 mm / 57' 9"
Overall Width
3,200 mm / 10' 6"
Width Over Door Thresholds
3,048 mm / 10' 0"
Top of Rail to Top of A/C Unit
3,810 mm / 12' 6"
Top of Rail to Floor
1,118 mm / 44"
Doorway Width (side doors)
1,830 mm / 6'
Doorway Height (side doors)
1,910 mm / 6' 3 1/4"
Floor to Ceiling Height
2,114 mm / 6' 11 1/4"
Wheel Diameter
660 mm / 26"
Truck Wheelbase
1,900 mm / 6' 2 3/4"
Truck Centres
12,000 mm / 39' 4 1/2"
Track Gauge
1,435 mm / 4' 8 1/2"
Car Weight (empty)
24,000 kg / 52,910 lb.

Technical Characteristics

Primary Power
750 Vdc
Auxiliary Power Supply
480 Vac, 60 Hz, 3ø
Low-voltage Power Supply
48 Vdc
Linear Induction Motors (LIM)
2 per car
Propulsion Inverters
2 IGBT inverters per car
Service Braking
regenerative dynamic, supplemented by electro-hydraulic disc brake system
Carbody
steel underframe with painted aluminum roof, sidewalls and bulkheads
Truck
fabricated steel, forced steered
Parking Brakes
spring-applied disc
Emergency Brakes
magnetic track, supplemented by spring-applied discs
Automatic Couplers
each end of car
Side Windows
non-opening, tinted, laminated, high impact safety glass
Doors
4 bi-parting, outside sliding (per vehicle)
Heating, Ventilation and Air-conditioning
microprocessor-based, thermostatically controlled roof mounted self contained, 2 units per car (6-ton cooling capacity each)

Performance and Capacity

Acceleration Rate (service maximum)
1.34 m/s^2 / 3.0 mphps
Braking Rate (service maximum)
1.00 m/s^2 / 2.24 mphps
Braking Rate (emergency minimum)
1.43 m/s^2 / 3.2 mphps
Maximum Design Speed
110 km/h / 68 mph
Maximum Operating Speed
100 km/h / 62 mph
Buff Load
890 kN / 200,000 lb.
Wheelchair Location
2 per car
Number of Passenger Seats
26 seats per car (plus 2 wheelchair locations)
AW2 Capacity Per Car, Passengers with Luggage:
71 standees + 26 seated = 97 total, with standees @ 2.2 pass./m^2 (5 sq.ft./pass.), seated @ 2.3 pass./m^2 (4.75 sq.ft./pass.)
AW3 Capacity Per Car, Passengers without Luggage:
179 standees + 26 seated = 205 total, with standees @ 5.4 pass./m^2 (2 sq.ft./pass.) seated @ 2.3 pass./m^2 (4.75 sq.ft./pass.)