

## International Air Rail Organisation

IARO report 17.13

A worldwide review of Air-Rail



**IARO Report 17.13: A world wide review of Air-Rail**

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£250 to non-members

IARO's mission is to spread world class best practice and good practical ideas among airport rail links world wide.

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## **1. Introduction**

IARO's vision is to be the trade organisation of choice for key stakeholders in the air/rail sector, which facilitates communication, shares best practice and promotes its members' interests. This report includes areas of best practice and some examples where a better solution might have been considered.

Many of IARO's members are, or have been, directly involved in the planning, design and operation of the air rail links discussed in this report. Details of their activity and the lessons to be learned can be obtained by becoming a member of IARO.

This report uses information from the IARO database, from other IARO sources, from websites and from personal visits, discussions and experience. Data given is as up to date as possible. Fares are given as the standard class, one way, peak time fares but there almost always discounts available. Journey times and frequencies are given as weekday mid morning but may vary at other times. The report seeks to describe many of the air rail links from all around the world, but may not cover every location.

## 2. North America

### Toronto



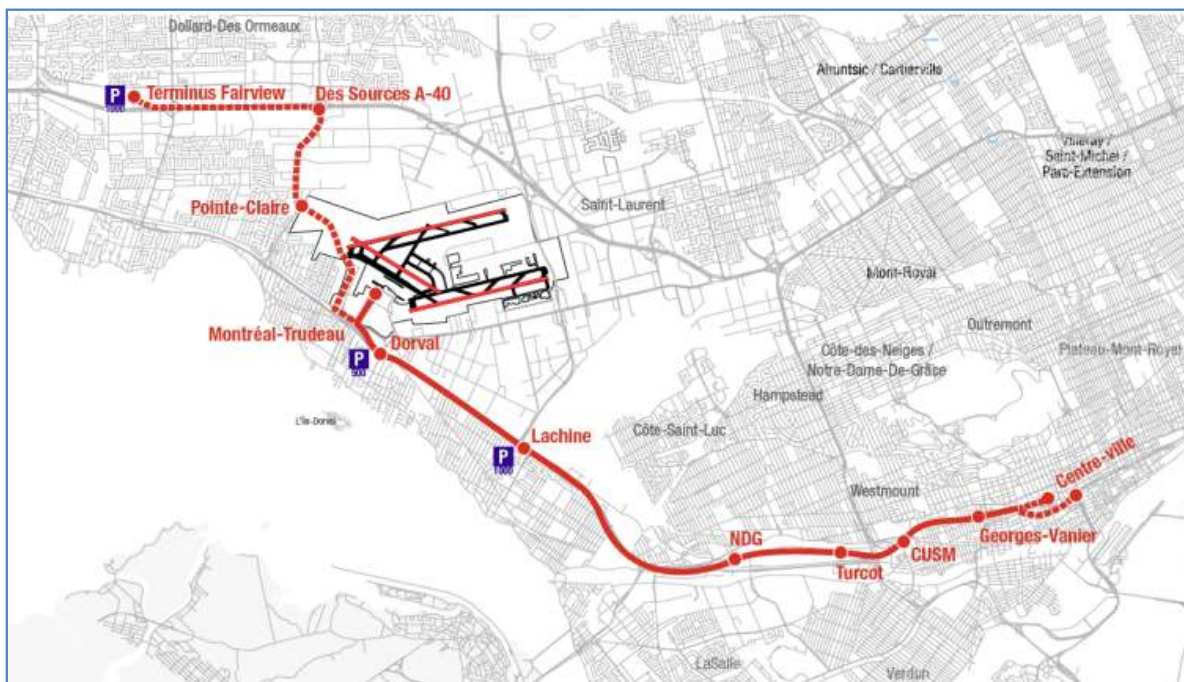
Toronto Pearson International Airport is located 23 km from downtown and handled 34.9 million passengers in 2012. Union Pearson Express is the name of the project to create a high quality service between Toronto Pearson International Airport and Union Station. The service will run every 15 minutes and will take 25 minutes for the 25 km route, calling at two intermediate stations. The Sumitomo diesel trains (capable of conversion to electric power) will seat 180 people. The project is due for completion by 2015 and is being managed by IARO member Metrolinx, the regional transportation agency. The cost is CAN\$456 million and estimates of ridership are between 1.2 and 1.8 million passengers in the first 12 months.

### Montreal

Aéroports de Montreal (AdM), an IARO member, is the operator of Pierre Elliot Trudeau International Airport, otherwise known as Dorval, which is 20 km from downtown and handled 13.8 million passengers in 2012. For some years AdM has been planning a rail link because the highways which serve the airport are becoming increasingly congested. As part of the expansion of the airport terminal a box for the location of a rail station was built and land has been reserved at the airport for the line.

Previous ideas for the link have included the 'Aerotrain', a dedicated line to the downtown Central Station using rights of way belonging to Canadian National Railways. However, the need for a public sector contribution to the financing has led to the development of a light rail shuttle scheme which would also serve the local community. AdM are still leading this project but other stakeholders are now involved. The specification includes two separate services using a common infrastructure, an express service with trains designed for air passengers, plus a high frequency commuter service, a

central downtown station as well as good connectivity with the metro. The Airport service would be every 10 minutes and the suggested fare is CAN\$15. Subject to the go ahead decision, the opening date could be 2020.



## Vancouver

The 2009 IARO conference took place in Vancouver just as the Canada Line to the airport began operating, in time for the 2010 Winter Olympics. The automated light rail line has 12 stops from the Airport to the Waterfront terminus and has a second branch to Richmond. The total cost was CAN\$1.9 billion of which around two thirds was publicly funded with the remainder from the concessionaire, which built and operates the Canada Line (for 31 years). The train service operates from 0445 to 0115 with headways of 3 minutes on the shared section and 6 minutes on each of the branches. Each two-car train has a capacity of 334 passengers. The single fare to Waterfront is CAN\$7.75 and the journey takes 26 minutes. Vancouver Airport handled 17.6 million passengers in 2012. 17% used the Canada Line.



### Best practice - train internal layout

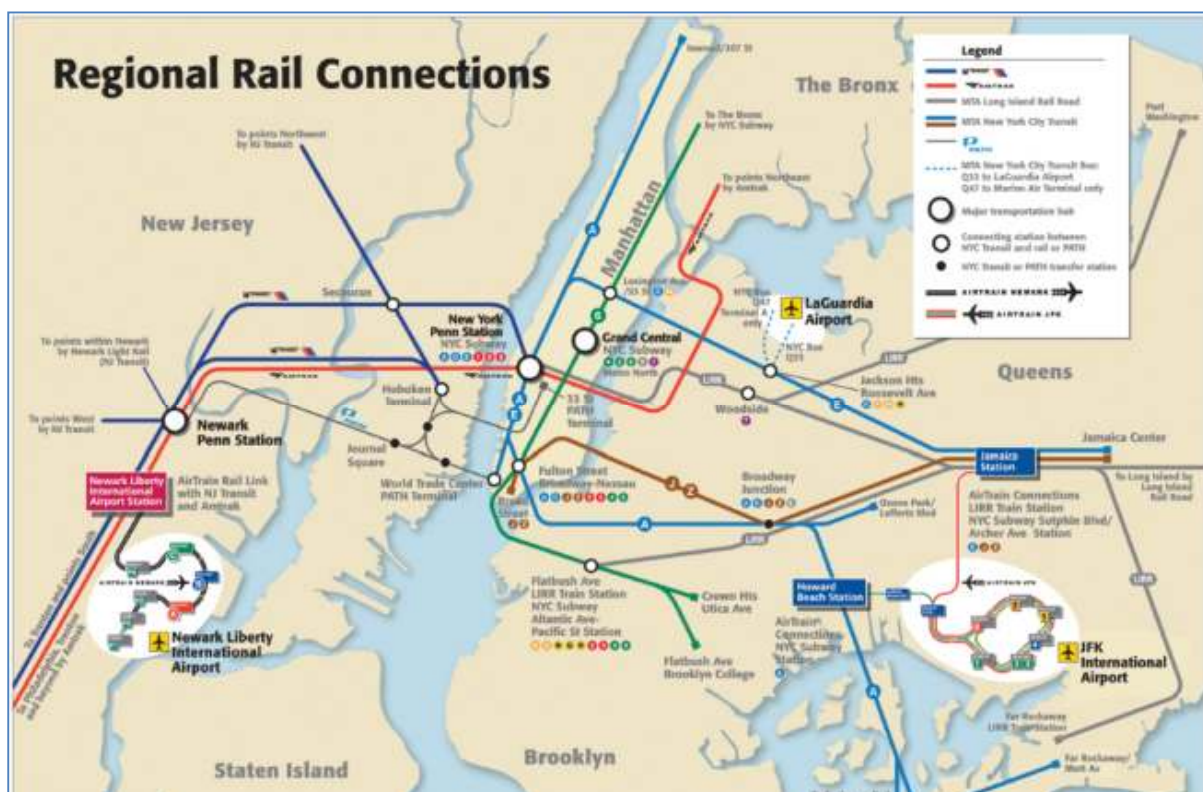
Although a limited number of seats may seem to be contrary to best practice for an airport rail link, the large open spaces in the Canada Line trains enables passengers to move around easily with their luggage and keep it close, which avoids concerns about security.



## New York

New York's three major airports, JFK, La Guardia and Newark are owned and operated by the bi-state Port Authority of New York and New Jersey (PANYNJ).

JFK Airport handled 47.7 million passengers in 2011. It is a multi terminal airport and the Airtrain automatic transit connects the terminals, various remote areas and rail stations. JFK Airtrain opened in 2003 and was used by 5.5 million passengers in 2011. One line connects with the Subway and Long Island Rail Road (LIRR) at Jamaica and the other with the Subway at Howard Beach, giving a range of routes to downtown with varying times and costs. The fastest route to Manhattan Penn Station is the LIRR taking 35 minutes and costing US\$15.50, while to Lower Manhattan by the Subway from Howard Beach takes 60 minutes and costs US\$7.50. The cost of around US\$1.5 billion was funded by the PANYNJ in part through a tax on every passenger using the airport. The market share of rail JFK air passengers is around 8%. A major project to bring the LIRR to Grand Central Station (the East Side Access project) is expected to be completed by 2019.



Newark Liberty Airport handled 33.7 million passengers in 2011. The inter terminal monorail which dates from 1996, was extended to a new station on the North East Corridor Line in 2001 and rebranded as Newark Airtrain. The station serves Amtrak long distance trains as well as New Jersey Transit (NJT) services. NJT trains go to Penn Station in Manhattan as well as serving the local area. There are three trains per hour (more at peak times) and the journey to New York Penn takes about 30 minutes, at a cost of US\$12.50. The market share to rail of Newark air passengers is around 5%. The Port Authority Trans Hudson (PATH) line, which is separate from the NY Subway system, runs from the World Trade Centre to Newark and there are plans to extend it to the Airport Station.

### Lessons to learn - avoiding complexity

It has not been possible to create a single ticket for some journeys and the complexity of the interchange at Jamaica and the fact that LIRR trains are full at peak times means that visitors find the link somewhat of a challenge.

## Boston

Logan Airport is located 5km from the Central Business District and handled 29.3 million passengers in 2012. The MBTA subway Blue Line serves the Airport, but a bus shuttle is required from the Airport Station to the terminals. The Silver Line is actually a bus rapid transit which connects to South Station, a major rail interchange. Rail mode share is 6%

## Washington

Ronald Reagan Washington National Airport handled 19.7 million passengers in 2012 and is located just across the Potomac River from Washington DC in Virginia. It is operated by the Metropolitan Washington Airports Authority (MWAA) under a 50 year lease from 1987. The Airport is served by the Washington Metro Blue and Yellow Lines. The Blue and Yellow Lines each run every 12 minutes, giving 10 trains per hour in total taking different routes through the city, taking 10-20 minutes. The fare is US\$2.50 at peak times. The rail share of air passenger journeys is 13%, one of the highest in the US.



Dulles Airport is located 42 km from downtown Washington and handled 22.6 million passengers in 2012. The airport is not currently served by rail but a major project to build the new Metro Silver Line is under way with the airport reached on completion in 2018. The MWAA has been given the revenue from the Toll Road and the route uses the median between the carriageways. When complete, trains will run every 7 minutes in the peak.



Baltimore Washington Airport is 51 km from Washington and handled 22.4 million passengers in 2012. A rail station is located about 2km from the terminal and is connected by a free shuttle bus. The station is served by Amtrak Northeast Corridor trains and by the MARC Penn Line, giving travel times of 10 minutes to Baltimore and 35 minutes to Washington. Trains are generally hourly but more frequent in the peak. The Maryland Transit Administration's Light Rail Line has served the international terminal since 1997. Trains run every 20 minutes at the peak and take 45 minutes to downtown for a fare of US\$1.60. The rail share of air passenger journeys is 3%.

## Atlanta

Hartsfield-Jackson Airport is 11 km from the central business district of Atlanta and is the world's busiest in terms of passenger numbers, handling 95.5 million passengers in 2012. However, over 60% of passengers are transferring between flights so the number requiring ground transportation is significantly less. The Airport opened in 1980 and has been steadily expanded. The airport was



connected to the Metropolitan Atlanta Rapid Transit Authority (MARTA) Red and Gold Lines in 1988, although the station had been constructed as part of the terminal. The airport station is well located in a ground transportation centre which provides access to all modes, with the entrance to the rail station close to baggage reclaim. Both lines serve downtown and each run every 15 minutes, giving a total of 8 trains per hour. The journey time to Five Points is 17 minutes and the fare is US\$2.50. Rail's share of non transfer air passengers journeys is 10%.



#### **Best practice - station location**

The MARTA station at Atlanta Airport is located close to the baggage reclaim area and is closer than any of the alternative modes. Business passengers looking for the fastest way to get downtown, particularly if they are regular visitors, will seek out the services that saves even a few minutes, and short distances, plus the high frequency train service, make MARTA a popular choice, even where the distance and time by road is relatively short.

## **Chicago**

O'Hare Airport is 27 km from downtown Chicago and is operated by the Chicago Department of Aviation. In 2012 it handled 66.8 million passengers. The airport is undergoing a major modernisation programme to provide it with parallel instead of intersecting runways, plus a new western terminal. There is an automated transit system connecting the terminals.

#### **Best practice - 24 hour service**

Even if flights are not operating for 24 hours, staff have to report for duty well before the first passenger arrives and long after the last has gone, so a 24 hour service is particularly attractive to staff.

Since 1984, the Chicago Transit Authority (CTA) Blue Line (called the 'L') has served O'Hare Airport, operating 24 hours a day with trains every 10 minutes (more in the peak) taking 40-45 minutes to downtown. The full fare is US\$2.25.

The rail share of air passenger journeys is 5%, but the link is very popular with airport staff (around 20% of journeys to work). O'Hare Airport is also served by Metra Rail commuter rail service from Chicago Union Station to Antioch 90 km from Chicago. A free shuttle bus connects the Metra Station to the Airport transit system.

Midway Airport is located 13km from downtown and handled 19.5 million passengers in 2012.



When the terminals were redeveloped they were moved closer to the transit line. It is served by the orange Line of the 'L', taking around 25 minutes with trains every 7 to 9 minutes. The rail share of air passenger journeys is 6%.

The CTA lines operate around an elevated loop in the city centre. A plan to create a dedicated high speed airport service linking the Blue and Orange Lines with a new underground interchange in the city centre

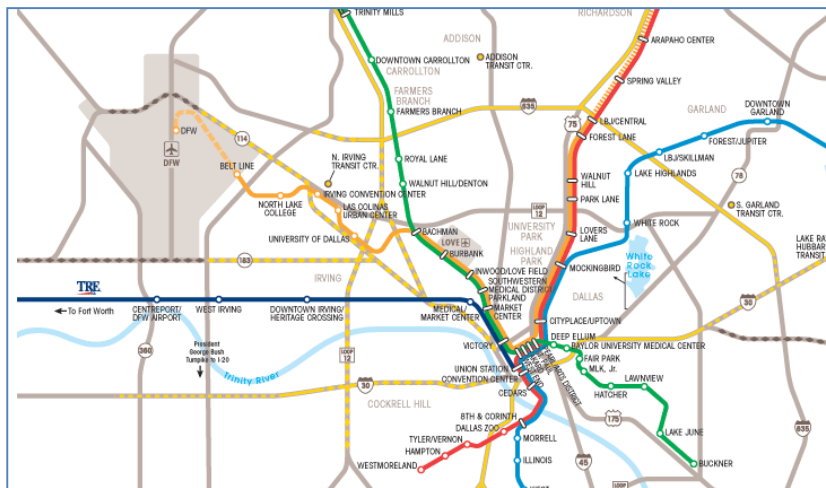
(Block 37) which would have by-passed the loop and created a downtown air terminal, was shelved after high costs and design issues emerged. IARO's 2005 conference took place in Chicago.

## Dallas Fort Worth

DFW Airport is located between the cities of Dallas (34 km) and Fort Worth and handled 58.6 million passengers in 2012. The Trinity Rail Express currently serves Centre Port, from where a shuttle bus connects with the terminals. Trains run every hour (more in the peaks) taking about 30 minutes in either direction to Dallas or Fort Worth for a single fare of US\$2.50. Dallas Fort Worth is a large connecting hub so only a minority of air passengers are terminating, but the rail share of their journeys is very small (<1%).

### Lessons to learn - remote stations

Centre Port DFW station is 10km from the centre of the terminals, and the terminal layout is dispersed, so the shuttle bus takes a long time to connect the station to the terminals. Coupled with the infrequent commuter service (none on Sundays) the Trinity Rail Express attracts very few air passengers.



A project to link DFW Airport to the Dallas Area Rapid Transit (DART) network will be completed in 2014, following a US\$600-700 investment. The station will be at a multi-modal facility linked by connecting walkways to the terminals. It is a light rail system and currently trains run every 15 minutes with a single fare (actually a 2 hour pass) for US\$2.50.

## Minneapolis St Paul

The airport is 16 km from both the downtowns of Minneapolis and St Paul and handled 33 million passengers in 2012. The Hiawatha light rail link opened in 2004 and was funded by a combination of the state, airport, county and federal government. There are two airport stations at the two terminals, with access via an airport transit link or through the car parks, although more direct connections are planned. The train also provides a free link between the two terminals. Trains run every 10 minutes at peak times and take 10 minutes to the terminus beyond the airport in one direction and 20 minutes to downtown Minneapolis in the other. The fare is US\$2.25 at peak times. The rail share is estimated to be less than 5%.



## Philadelphia



Philadelphia Airport is 11km from downtown and handled 30.8 million passengers in 2011. SEPTA operates a regional rail service between the airport and Center City with stops at Universal City, Amtrak's 30th Street, Suburban and Market Street Stations. There are four stations at the airport serving the terminals, which are close meaning short walking distances. The fare is US\$6 (\$7 on board) and the trains run from 5.25am to 11.25pm every 30 minutes taking between 14 and 18 minutes. The rail share of air passenger journeys is 3%.

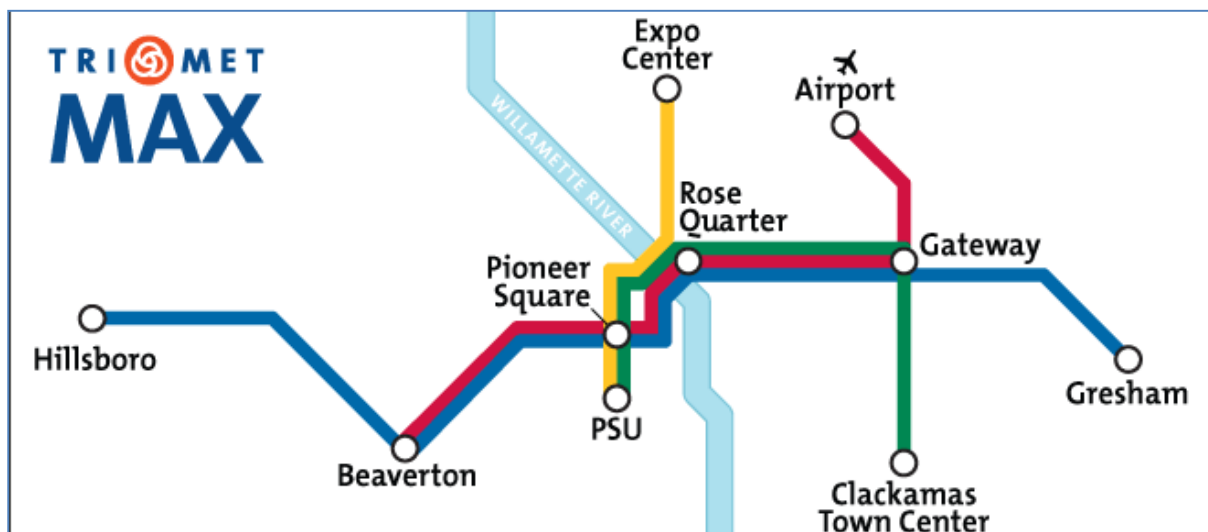
## Portland

Portland Airport is 10km from the city centre and handled 14.4 million passengers in 2012. The Portland MAX light rail Red Line opened to the airport in 2001 and was a joint venture between the operator, Tri-Met and Bechtel. Bechtel's contribution recognised the increased value of their land near the airport which comes from the new line. The Red Line operates from 3.30am to midnight and the journey from Pioneer Square takes 40 minutes, every 15 minutes, for a fare of US\$2.50. The rail share of air passenger journeys is 6%.



### Best practice - step free access

The MAX Red Line airport station is located on the same level as the baggage reclaim area and the platforms and most of the trains have floors at the same level, so that passengers can easily roll their luggage on to the trains. This also makes it easy for passengers who use a wheelchair.





## Salt Lake City



Salt Lake City Airport is 6 km from the central business district and handled 20.1 million passengers in 2012. The TRAX Green Line, operated by IARO member Utah Transit Authority (UTA) opened in April 2013. The light rail link has some separate rights-of-way and some street running. The service is every 15 minutes and the journey takes 18 minutes at a fare of US\$2.35. At Guadalupe Station there is a connection to the FrontRunner commuter service. The project has cost the UTA US\$250-290 million.

## San Francisco

San Francisco International Airport is located 21 km south of downtown and handled 44.5 million passengers in 2012. The Bay Area Rapid Transit (BART) system has served the airport since 2003, along with the Air Train shuttle which connects the BART Station with the terminals. The airport is served by the Pittsburg/Bay Point-SFO/Millbrae Line. Trains operate from 4am to midnight every 15 minutes (every 20 minutes off peak) and take 30 minutes to downtown, for a fare of UD\$8.25. At Millbrae Station, there are connections to the Caltrain, although this normally requires a change a San Bruno Station. The rail share of air passengers journeys is 7%.

A high speed line for California is being planned with a stop at Millbrae. This is being built in stages with the initial phase, to be completed in 2026, linking the existing tracks in the northern and southern parts of the state, such that high speed trains will run at reduced speed on existing tracks. When complete, trains will cover the 695 km from San Francisco to Los Angeles in 2 hours and 38 minutes.



Oakland Airport also serves the Bay Area and handled 10.0 million passengers in 2012. It is linked to the BART system by the AirBART shuttle bus to Coliseum Station for a fare of US\$3. Amtrak's Capital Corridor long distance train calls at a separate Coliseum Station linked by a pedestrian bridge. Somewhat surprisingly, the rail share of air passenger journeys is 9%, higher than for San Francisco Airport. A Doppelmayr people mover is under construction to replace the shuttle bus, for completion in 2014.

## Seattle

Seattle-Tacoma International Airport handled 33.2 million passengers in 2012. Since 2009 it has been served by the Central Link light rail line. This is the initial phase of the Sound Transit Link Light

Rail system. Trains operate from 5am to 1am every 10 minutes (more at peak times) taking 30 minutes for a fare of US\$2.75.

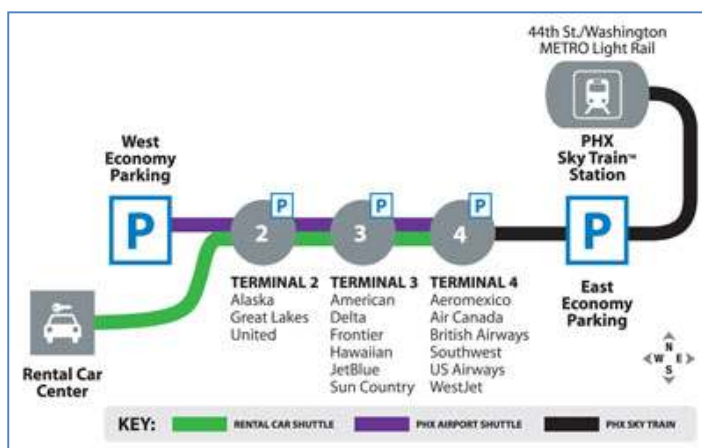


## Denver

Denver Airport handled 53.2 million passengers in 2012. As part of FasTracks, a US\$6.5 billion public transportation expansion plan, a commuter line is planned to open by 2016 on the East Corridor. The 38 km line will link Denver Union Station with Aurora and the airport, with seven stations. The project is a public private partnership, with a 34 year design, build, finance, operate and maintain contract. The concessionaire is Denver Transit Partners, a partnership of Fluor Enterprises, John Laing, Lloyds Bank and others. Electric trains will operate every 15 minutes with a 35 minute journey time to downtown Denver.



## Phoenix



Phoenix Sky Harbor Airport is located 5 km from the central business district and handled 40.5 million passengers in 2012. Metro Light Rail trains run every 12 minutes and take about 15 minutes from downtown to 44th Street and Washington Station for a fare of US\$2.00. The recently opened Phoenix Sky Train is an automated people mover which links the Light Rail Station with an airport parking lot and Terminal 4. Further phases will extend the Sky Train to the other terminals.



### 3. Central and South America

#### Mexico City

Juarez International Airport handled 29.5 million passengers in 2012. Terminal 1 has been served by Line 5 of the city's subway system since 1982. The fare is MXN\$3. the service operates from 5am to midnight.



#### Sao Paulo

Congonhas Airport is owned by the City of Sao Paulo and is only 8 km from the city centre. In 2012 it handled 16.8 million passengers. Line 17 of the Sao Paulo Metro is a monorail, the first stage of which opened in 2011, linking to Line 1. Stage 2 will extend the line to the city centre and is to open in 2013 (ahead of the Football World Cup in 2014). It is funded by loans from a state owned bank and the city and state of Sao Paulo.

Guarulhos Airport handled 32.8 million passengers in 2012. An airport express line is being built as part of the commuter network, and the station will also serve trains on the high speed line planned to connect Sao Paulo to Rio de Janeiro and Campinas.

#### Rio de Janeiro

Galeao Airport handled 17.5 million passengers in 2012 and is 20 km from the city centre. There are plans for a high speed rail network connecting Rio de Janeiro with Sao Paulo which would include a station at the Airport.

## 4. Europe

### London Heathrow

Heathrow Airport handled 69.9 million passengers in 2012 and is owned by a international group led by Ferrovial, which also owns Southampton, Glasgow and Aberdeen Airports in the UK.

Heathrow was first linked to the London Underground in 1976 and the Piccadilly line today serves four stations at the Airport (Terminals 123, Terminal 4, Terminal 5 and Hatton Cross in the Maintenance Area). There are 12 trains per hour which take around 45 minutes to central London, for a single fare of UK£5.50 (with discounts for Oyster cards). The current trains were refurbished in the mid 1990s and are due to be replaced along with a major upgrade of the line.



#### **Best practice - airport information notices**

London Underground is world renowned for its signs and clear notices in the trains give details of which airlines serve each terminal, and how to get further information

The Heathrow Express rail link opened in 1998 and the service now operates from London Paddington Station to via Terminals 123 to Terminal 5, every 15 minutes with a non stop journey time of 15 minutes from Terminals 123 to Paddington. Terminal 4 is served by a shuttle train from Terminals 123. The link was planned, built and is operated by Heathrow Airport Ltd, initially costing UK£500 million. A baggage check in service was initially offered at Paddington but ceased after 2001 because of costs and security regulations. A second service called Heathrow Connect, runs between Terminals 123 to Paddington every 30 minutes, calling at intermediate stations with a journey time of 27 minutes. Heathrow Connect is jointly operated by Heathrow Express and First Great Western Trains. The services use 18 km of the Great Western Main Line operated by Network Rail and 8 km of the line in tunnel, including the three airport stations, owned by Heathrow Airport. Heathrow Express fares are UK£20 (£25 on board) and Heathrow Connect costs UK£9.50. Heathrow Express carried 6.2 million passengers in 2011. The overall rail share of air passenger journeys (Heathrow Express, Heathrow Connect and the Piccadilly Line) is around 25%.

Further rail developments are in hand at Heathrow. Crossrail is a major new line which will run in tunnel from Paddington through the centre of London to Liverpool Street, connecting services from east to west. From 2018, four Crossrail trains per hour will run from Heathrow on this route, giving through journeys to the City of London and beyond. Phase 1 of HS2, the planned high speed line from London to the Midlands and North of the UK, will include a station in west London giving interchange with trains to Heathrow. Phase 2 of HS2 may include a direct high speed rail line to Heathrow, depending on the outcome of a review of the Airport's future. A plan to create a rail link to the west is also being considered.

Heathrow Airport and Heathrow Express are members of IARO.

## London Gatwick

London Gatwick handled 33.8 million passengers in 2012 and is owned by an international group led by Global Infrastructure Partners, who also own London City and Edinburgh Airports.

Gatwick was one of the first airports in the world to be served by rail in the 1930s and the rail service has developed over a long period. For many years, there was a baggage check in facility in Central London but this is not now provided. Today there are four services: Gatwick Express, Southern (both part of the Southern franchise, but operated as separate brands), First Capital Connect and First Great Western. Gatwick Express has four trains per hour from 0500 to midnight taking 30 minutes for the non stop journey to London Victoria. The fare is UK£19.90. At peak times the Gatwick Express trains operate to or from Brighton. Southern trains operate from around the region via the Airport to London Victoria, with one or more intermediate stops. The fare is UK£14.50 and the journey time around 35 minutes. First Capital Connect trains operate four times per hour from Brighton via the Airport to London Bridge and then through to the north of London. The journey time to London Bridge is 28 minutes and the fare is £10.40. First Great Western Trains operate an hourly service from the Airport to Reading. The rail share of air passenger journeys was 35.5% in 2011.

### Lessons to learn - the wrong trains

For many years, Gatwick Express had purpose-designed trains but these have been moved elsewhere and replaced with old intercity trains, whose layout is inappropriate for airport services, with narrow doors and vestibules, limited baggage racks and narrow gangways. At peak times, air passengers find that these trains are already busy with non airport passengers (as they operate beyond the airport). Gatwick Airport is undertaking a campaign to improve the service, and it is becoming difficult to justify a premium fare.

Current developments at Gatwick include a major improvement of the station, with the provision of an additional track and platform. Gatwick Airport and Gatwick Express are members of IARO.

## London Stansted

Stansted Airport is owned (from March 2013) by the Manchester Airport Group and handled 17.4 million passengers in 2012, mostly on low cost airlines. The Stansted Express service is part of the Greater Anglia franchise, currently operated by Abellio and operates every 15 minutes from 4.40am (earlier on certain days) to 11.25pm. The journey to London Liverpool Street takes around 47 minutes and the trains call at intermediate stations including Tottenham Hale which gives interchange to the London Underground. New trains were introduced on the route in 2011 The single fare is UK£23.40. An hourly service to Cambridge and beyond is operated by the Arriva Cross Country franchise. 25% of air passenger journeys use rail.

A campaign has been launched to reduce the journey time to 30 minutes and for other improvements. The airport currently has significant scope to grow to 35 million passengers while the long term future is the subject of the Airports Commission which is currently considering options for major airport developments to serve London.

## London Luton

London Luton Airport is 57 km north of London and handled 9.6 million passengers in 2012. Luton Parkway Station opened in 1999 and is served by First Capital Connect trains (6 per hour) to and through London and East Midlands Trains to London, Nottingham and Leicester (1 per hour). The journey to London takes around 32 minutes. The Station is 2km for the airport terminal and a bus

shuttle runs every 10 minutes and takes 10 minutes. The fare (including the bus shuttle) is UK£15. The rail mode share of air passenger journeys was 17.2% in 2010. Detailed analysis of passengers shows that the most likely users of the rail service are non UK business passengers with origins and destinations in central London. The Thameslink project, due for completion in 2015, will improve capacity for the through London services and will see new longer trains.



### London City

London City Airport is located in the Docklands area of London, 11 km from the City of London, with the runway built on a former dock. The runway length is limited and steep approaches are required but the airport is well located for the redeveloped financial district at Canary Wharf and is therefore popular with business travellers. In 2012 it handled 3 million passengers. Since 2005, the airport has been connected to the Docklands Light Railway (DLR) which is part of the London Rail network run by Transport for London. Automatic trains serve the station (which is very close to the terminal entrance) every 8-10 minutes and the journey to Canary Wharf takes 17 minutes and to Bank takes 24 minutes. The cash fare is UK£4.50 with cheaper fares with an Oyster card and off peak. The rail share at London City Airport is the highest in the UK and second highest in the world, at around 50%.





## London Southend

London Southend Airport is 58 km from central London. Following a UK£100 million development programme, Easyjet began operations in April 2012 and by the end of the year the airport had handled 0.6 million passengers. The forecast for 2020 is 2 million. Part of the development was the construction of a new railway station on the existing line between London Liverpool Street and Southend Victoria. The rail station cost UK£15 million and was paid for by the airport, who also operate the station. The train service is part of the Greater Anglia franchise, currently run by Abellio. Trains operate every 20 minutes (more in the peak) and take 53 minutes to Liverpool Street. The fare is UK£14.90. The rail share of air passenger journeys is 25%.



### Best practice - stations close to terminals

Both London City and London Southend are relatively small airports and are therefore able to locate the station very close to the terminal, in both cases around 100 metres. The short distance means that, whether you are a business traveller wanting to get to your destination quickly, or a leisure passengers with baggage, the rail service is likely to be popular.

## Birmingham

Birmingham Airport handled 8.9 million passengers in 2012 and is a member of IARO.. It is located 10 km from the city centre. The airport is connected to Birmingham International Station by a Dobbeltmayr cable-hauled automatic transit which takes 90 seconds for the 600 metre journey. The station also serves the major exhibition centre with services by Virgin West Coast and London Midland trains. There are trains to Birmingham New Street station approximately every 10 minutes with a journey time of 10-15 minutes, costing UK£3.40. Virgin Trains provide long distance services to London and the North of England and London Midland trains operate to a range of regional and local stations. The rail share of air passenger journeys is 9%.

The High Speed 2 project, the first phase of which is to be completed in 2026, will include a major new interchange station at Birmingham, as well as a station in the city centre, which will also be connected to the airport by a transit system. High speed trains will have a journey time of 38 minutes to Central London and 39 minutes to Manchester, enlarging the catchment area and making it more competitive with other airports.

## Manchester

Manchester Airport is 14 km from the city centre and handled 19.8 million passengers in 2012. The rail link opened





in 1993 to central Manchester with a route to the south following in 1996. The station is in the centre of the airport linked by overhead walkways to the terminals, and is integrated with the bus station. A third rail platform was added in 2008. Trains to Manchester Piccadilly leave every 10 minutes, take around 15-20 minutes and cost UK£4.70. Most trains go on from Manchester to a wide range of destinations in Northern England. Trains also go south from the airport to the Midlands. The current rail share of air passenger journeys is 7%.

The Manchester Metrolink, an extensive light rail network, is being extended to the airport station in a project due for completion in 2016, with a funding contribution from the airport (although the airport is owned by the local authorities). The Metrolink will run through residential areas to the north of the airport and will be suitable for many airport employees.

Manchester Airport is also to have a station on Phase 2 of High Speed 2, for completion in 2032. A major new commercial development, Airport City, is being built to the north and west of the terminals and the Metrolink could well be extended through it to the new HS2 station.



## Edinburgh

Edinburgh Airport is 9km from the city centre and handled 9.2 million passengers in 2012. A previous project to link the airport to the main lines in the area was abandoned for cost reasons. However, the city's new tram network will open its first line to the airport in 2014. Trams will run every 10 minutes from 6am to midnight and the journey time will be approximately 30 minutes to Haymarket. Fares are expected to be UK£1.40.



## Stockholm

Arlanda Airport is 37 km from the city and handled 19.7 million passengers in 2012. The airport is owned and operated by IARO member Swedavia. The Airport's operation is subject to strict environmental controls and can only grow if it keeps within a carbon limit. Surface journeys represent about one half of the carbon emitted so the airport is keen to see road journeys replaced by rail, especially as rail is powered by zero carbon hydro or nuclear electricity. Arlanda Express opened in 1999 and is a Build Operate Transfer 40 year public private partnership established at that time because the government wished to minimise the risk to public finances. The original contractor and supplier consortium sold the operation and it is now owned by Macquarie. Arlandabanan (also

an IARO member) is a state owned organisation which owns the rail link infrastructure although it is operated and maintained by A Train, which also runs the Arlanda Express. Arlandabanan's role is to manage the infrastructure and ensure that the public part of the partnership delivers and receives its responsibilities and rights. SJ Swedish Railways also operate regional and long distance services on the line and, since 2012, this has included a direct service to central Stockholm. There are two stations for Arlanda Express at the Airport and one for SJ trains.

The Arlanda Express, operated by A Train, runs 4 times per hour (more at the peaks) and the journey to Stockholm Central takes 20 minutes at a fare of SEK260. The SJ train is cheaper but takes longer. In 2012, Arlanda Express carried 3.3 million passengers, SJ carried 1.1 million and the rail share of air passengers journeys was 24%.

#### **Best practice - timekeeping guarantee**

There are many features of Arlanda Express which can be described as best practice, not least for its designs. However, for those travellers who like to be on time, Arlanda Express offers a guarantee that the train will arrive within 2 minutes of the timetable, or else you will receive a free ticket.



## **Oslo**

Gardermoen Airport is 50 km north of the city and handled 22.1 million passengers in 2012. When it opened in 1998, it replaced Fornebu Airport which was much closer to the city and the requirement was to have a rail link which would be as quick as getting to the old airport. The station is integral with the terminal building but, as part of an airport expansion plan, the station is to be enlarged in its central location, although temporary arrangements will be in place during construction.

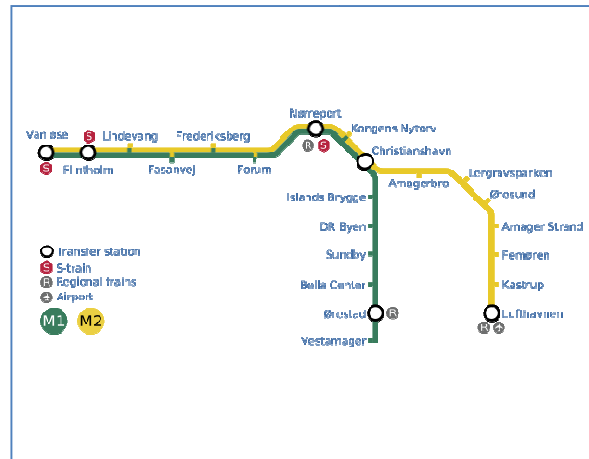


The Airport Express service is called Flytoget with trains every 10 minutes between Oslo Central Station and the airport, which take 19 minutes. Every other train starts at Drammen, south west of the city. The fare from Oslo Central is NOK170. Flytoget is operated by an independent company wholly owned by the Norwegian Government and the infrastructure is owned directly by Norwegian Railways (NSB). NSB also run local and regional trains to the airport, which take longer and are cheaper from Oslo Central, but also connect to other cities. Rail's share of air passenger journeys is 47%, one of the highest in Europe.

## **Copenhagen**

Kastrup Airport is 8 km from the centre of Copenhagen. It handled 23.3 million passengers in 2012 and is a listed private sector company.

At the airport a centrally located sub surface station on the intercity line between Copenhagen and Malmo in Sweden (using the Oresund Crossing) opened in 1998. There is a wide range of local and longer distance trains including to the city centre every 10 minutes and to Malmo every 20 minutes. A connection to the automated light metro opened in 2007, with the airport at the terminus of Line M2. The Metro runs every 4 minutes at peak times and take 15 minutes to Norreport in the city centre. The fare is DKK23. The rail share of air passenger journeys is 55%, the highest in the world.



## Moscow

Moscow has three main airports at Domodedovo, Sheremetyevo and Vnukovo. Domodedovo Airport is 42km from the city centre and handled 28.2 million passengers in 2012. Sheremetyevo Airport is 29km from the city centre and handled 26.0 million passengers in 2012. Vnukovo Airport is 28km from the city centre and handled 9.5 million passengers in 2010.

All three airports are served by IARO member aeroexpress rail links, owned partly by Russian Railways. The Domodedovo service is every 30 minutes from 6am to 11.30pm from Paveletsky Station and takes 49 minutes, for a fare of RUB320. The Sheremetyevo service is every 30 minutes from 5am to 1 am from Belorussky Station and takes 35 minutes for a fare of RUB320. The Vnukovo service is every hour from 6am to midnight and takes 38 minutes for a fare of RUB320.

Aeroexpress also operates rail links at Sochi (site of the 2014 Winter Olympics) and Vladivostk, and is planning a link for St Petersburg to open in 2015.



### Best practice - simple proposition

aeroexpress offers the same product at all three Moscow airports and this makes is easy for visitors, unfamiliar with the transport network or the language (particularly as some of the characters not familiar to westerners), to choose the service. The simple, clockface timetable (00 and 30 minutes) is particularly easy to understand.



## Amsterdam

Schiphol Airport is 9km from Amsterdam and handled 51.0 million passengers in 2012. The station is located central to the terminals at Schiphol Plaza. The airport is located on the main line between Amsterdam and Rotterdam and is a major station on the rail network, with trains to all parts of the country, and internationally. Trains to Amsterdam Central operate every few minutes and take 15-20 minutes, at a fare of €3.90. All of Netherlands Railways is moving towards a chip-card for fare payment. Different types of trains operate including local stopping trains and intercity services, using a variety of rolling stock including double-deck trains. Thalys (an IARO member) high speed trains operate to Brussels and Paris and Fyra high speed trains began operations in 2012 but ongoing difficulties with the new trains mean that this service has not been fully implemented. Some airlines offer through booking on Thalys with a long haul flight. Rail's share of air passenger journeys is 35%.



## Brussels

Brussels Airport is 11 km from the centre of Brussels and handled 19.0 million passengers in 2012. It has been connected to the rail network since 1955 and currently there are three trains per hour to Brussels Central, a journey which takes 26 minutes and costs €7.80. Trains also go to other Belgian cities and there is a once a day Thalys (an IARO member) train to Paris. Some airlines offer through booking on Thalys with a long haul flight.

In 2012, the Diabolo project was completed which enables trains to operate through the airport station either to the north or south. This means that more through trains can now serve the airport station. The Diabolo project was a public private partnership is partly paid for by a supplement on all fares for journeys using the airport station. It is anticipated that this will lead to an increase in rail's share of air passengers' surface journeys from the current level of 16%.



## Frankfurt

Frankfurt Airport is located 12km from the centre of Frankfurt and handled 57.5 million passengers in 2012. The Airport is operated by IARO member Fraport AG, a listed company, with shares owned by the State of Hesse, City of Frankfurt, Lufthansa and others.

Current Flight Arrivals		Current Flight Departures				
Search for flight <input type="text"/> Please enter destination <input type="text"/> or Flight number <input type="text"/> at <input type="text"/>						
Flight	From/Via	Sched.	Estim.	Terminal	Est.	Remarks
ET 236	Addis Ababa	16:30	16:44	1 B		
3U	Split	16:30	16:30	1 B		approaching
KE 241	Seoul-Incheon	16:35	17:30	1 B	B2	baggage delivery finished
3U	Moscow-Shermetyevo	16:40	16:51	2 C	E	baggage delivery
AF	Paris-Charles de Gaulle	16:50	16:49	2 D	D	baggage delivery
KE 209	Seoul-Incheon	16:50	17:38	2 D	D	baggage delivery
KL	Amsterdam	16:50	16:46	2 D	D	baggage delivery
IC	Cologne central station	16:50	16:50	1		train
BA 206	London-Heathrow	16:55	16:53	2 D	D	baggage delivery
101	Berlin-Tegel	17:00	16:49	1 A	A3	baggage delivery
3U	Munich	17:05	17:09	2 D	D	landed
101	Munich	17:05	16:50	1 A	A3	baggage delivery finished
AI 200	Thessaloniki	17:10	17:15	1 A	A3	baggage delivery
CA 209	Shanghai Pudong	17:10	17:43	1 B	B2	landed
AF	Palma de Mallorca	17:15	17:30	2 C	E	baggage delivery

The original rail station opened in 1972 at the same time as the new terminal (now Terminal 1). A second station, primarily for high speed ICE trains, opened in 1999 followed by the Frankfurt-Cologne high speed line. More than 180 long distance trains depart from every day to a range of German cities. Services from Stuttgart (every 2 hours), Siegburg/Bonn and Cologne (every hour) are branded as AirRail in a joint venture Lufthansa and Deutsche Bahn, have Lufthansa flight numbers and include check in at the station and through tickets. There are more than 220 daily regional, express and S-Bahn trains. The S8 and S9 operate every 15 minutes and take 20 minutes to Frankfurt Central Station, at a fare of €4.25. Baggage check in for departing air passengers is offered on the walkway leading from the rail station to the terminals. The rail share of air passenger journeys is 27%.

### Best practice - air/rail intermodality

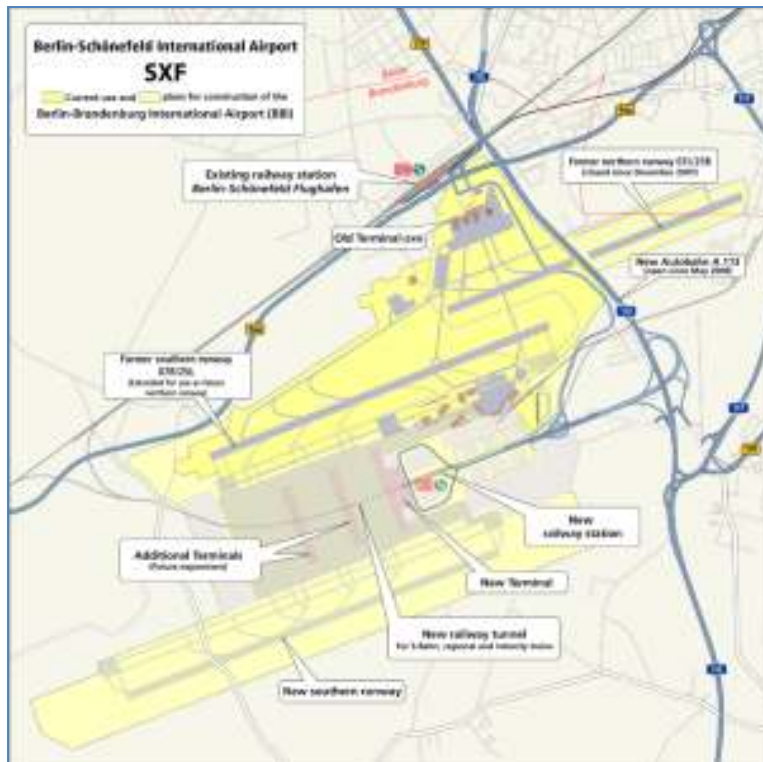
Getting air and rail systems to work together is the holy grail of intermodality and several attempts have not succeeded, but the AirRail services at Frankfurt provide a genuine air rail product that means that Lufthansa no longer offers flights between Frankfurt and Cologne and has reduced flights to Stuttgart, saving valuable slots at Frankfurt Airport and offering a good service to passengers transferring to and from long haul flights at Frankfurt.

## Berlin

Schönefeld Airport is located 18 km from the centre of Berlin and handled 7.1 million passengers in 2012. Schönefeld has a rail connection to the S9 and S45 S-Bahn lines plus the AirportExpress which operates every 30 minutes with a journey time of 28 minutes to the Central Station for €3.10. Tegel Airport handled 18.2 million passengers but will close when the new Berlin Brandenburg opens, probably in 2014. Berlin Brandenburg Airport is located at Schönefeld and will have two new runways and a new midfield terminal. An integrated rail station is located beneath the new terminal, with excellent direct connections into the terminal. The new station has 6 platforms, 4 for main line and S-Bahn trains and 2 for U-Bahn. The Airport Express trains will run every 15 minutes and take 30 minutes, with regional train routes running to other parts of Berlin hourly. The forecast mode share is 27% by Airport Express trains, 14% by U-Bahn and 1% by regional trains (not including



long distance trains). Long distance trains, including ICE, will connect the airport to Dresden, Hamburg, Leipzig and Rostock as well as Poznan, Stettin and Krakow in Poland. The 2012 Air//Rail conference was held in Berlin.



### Lessons to learn - opening delays

The opening date for the airport has been delayed, initially from 2012, now to 2014 (although this is not confirmed). Although the delay was unconnected with the rail service, the impact on the rail network has been significant, as timetables are set a year in advance, and other changes were assumed to take place at the same time as the airport opened. The lesson is to ensure that there are contingency arrangements should the planned change have to be delayed.

## Hamburg

The airport is located 8km from the centre of Hamburg and dates from 1911. It is owned by the City of Hamburg (51%) and Hochtief (49%) and handled 13.7 million passengers in 2012. An S-Bahn link opened in 2008. The S1 line is operated by HVV, the Hamburg Transport Authority, and runs every 10 minutes, from 4.30am to midnight, takes 24 minutes for a fare of €2.95. The station is centrally located next to the Airport Plaza between the two terminals. The initial mode share was 26%. The Air//Rail 2009 conference took place in Hamburg.



## Dusseldorf

Düsseldorf Airport is 7 km from the centre of Düsseldorf and handled 20.8 million passengers in 2012. The Airport, which is 50% owned by the City of Düsseldorf and 50% by Hochtief and Aer Rianta, contributed to the financing of the S Bahn link and the long distance rail station. Since 1975 there has been a station for S-Bahn Line 11 located beneath the terminals (called Düsseldorf Airport Terminal) which connects the airport with the main station in the city. Trains run twice an hour and take 12 minutes, for a fare of €2.50. The main airport station, called Düsseldorf Airport, opened in 2000 and is 2.5 km from the terminals on the main line, connected by the Skytrain, a suspended

monorail which takes 6 minutes and also links with remote car parks. From the main airport station, 350 daily S-Bahn, regional and long distance (including ICE) trains operate to a wide range of destinations in the Rhine region. Baggage check in for departing air passengers was initially offered at the main airport station, but was little used and ceased to be provided in 2004. The rail share of air passenger journeys is 18% (5% on the S11, 13% at the main airport station).

## Munich



Munich Airport is 29 km from the centre of the city and opened in 1992. It handled 38.4 million passengers in 2012. The S8 S-Bahn line opened at the same time as the airport and a second S-Bahn route, S1, opened in 1998. The rail lines were built by MVV, the city and regional transport authority, with a €100 million contribution from the airport. The two lines take separate routes but both serve the Central Station, giving a train every 10 minutes and a journey time of 41-45 minutes for a fare of €10.40. The rail share of air passenger journeys is 31%.

A plan was developed for a maglev link to the airport which would have reduced the connection time to 10 minutes. However, this project was scrapped by the Government in 2008 because of costs.

## Liepzig Halle

Leipzig Halle Airport handled 2.3 million passengers in 2012, and is a substantial air cargo hub. A station under the terminal was opened in 2002 and serves long distance including ICE trains. A rail link to the cargo area is used for aviation fuel delivery. The trains also provide a twice hourly service to the city centres of Leipzig and Halle, taking 14 and 12 minutes respectively, for a fare of €4 (Regional) or €8 (ICE). Luggage can also be collected in advance and delivered to a home address for an additional cost.

## Cologne Bonn

Cologne Bonn Airport is 15 km from Cologne city centre and 16 km from Bonn. It handled 9.3 million passengers in 2012. The airport is owned by the federal government, the state of North Rhine Westphalia, the cities of Cologne and Bonn and two local districts. A rail loop line was constructed in 2004 as part of the Cologne-Frankfurt high speed line. Funding partly came from the fund associated with the move of central government to Berlin, from the federal government, the state and the airport. S-Bahn trains provide a service every 20 minutes to Cologne taking 14 minutes for a fare of €2.60. Other regional and long distance trains provide an hourly service to Bonn and other destinations.

Cologne is one of the destinations for the joint DB/Lufthansa AiRail services from Frankfurt, provided hourly by an ICE train. The service started in 2003 and flights between Cologne and Frankfurt ended in 2007. The initial service included a full baggage check in and reclaim at Cologne Station and a dedicated coach on the train, but the baggage service is no longer provided and seats are now reserved in any coach.

## Vienna

Vienna Airport is 18 km from the city centre and handled 22.2 million passengers in 2012. The airport's shareholders are the Province of Lower Austria, the City of Vienna, employees and private shareholders. The City Airport Train (CAT) is a member of IARO and is a joint venture between the airport and Austrian Railways (ÖBB). It began operating in 2003 and provides a train every 30 minutes from 5.38am to 11.35pm with a non stop journey time of 16 minutes, for a fare of €11. The city terminal at Vienna Mitte Station provides baggage check in. The CAT service is powered by electricity from hydroelectric and wind sources, demonstrating the company's environmental credentials. CAT is also keen to maintain a high quality service and underwent a refurbishment in 2011 of every element from trains to uniforms. A S-Bahn train also runs every 30 minutes and calls at several stations, taking 30 minutes, for a fare of €3.80. The rail share of air passenger journeys is 30% (14% CAT, 16% S-Bahn). The Air//Rail 2007 conference took place in Vienna.



### Best practice - dedicated service

Vienna's City Air Terminal (CAT) is an excellent example of how a service designed specifically for air passengers attracts customers, even at a fare three times the standard rail product. CAT's attention to detail, provision of helpful staff and clear design message all help to avoid the natural concerns that visitors have about using an unfamiliar system.

## Istanbul

There are two airports serving Istanbul. Ataturk is located on the European side of the city, 24 km from the centre and served 45.0 million passengers in 2012. It is operated by TAV Airports. Sabiha Gokcen is 35 km from the centre on the Asian side and handled 14.5 million passengers in 2012. A new airport is planned with a capacity of 150 million passengers and 6 runways.

Ataturk Airport is served by the Metro operated by Istanbul Ulasim, a public enterprise. Line M1 was the first line opened in 1989 and was extended to the airport in 2002. Trains operate from 6am to 00.30am, every 7-10 minutes (more at peaks) and the journey to the city centre takes 30-35 minutes for a fare of TL3.00. Line M4 is being extended to serve Sabiha Gokcen Airport.

## Rome

Rome has two airports, Leonardo da Vinci/Fiumicino and Ciampino. Fiumicino is 35 km from the city centre and handled 37.0 million passengers in 2012. Ciampino Airport is 12 km from the city and handled 4.5 million passengers in 2012. Fiumicino is served by the Leonardo Express train operated by Trenitalia which takes 30 minutes to Termini Station every 30 minutes for €14. Local trains leave every 15 minutes and stop at a number of stations to Tiburtina taking 48 minutes for €8. Major redevelopments are planned including a connection to the Rome subway system and, in the longer term, to a high speed rail line.



## Milan

Malpensa Airport, owned by the Municipality and Province of Milan, is 40 km from the city centre and handled 18.5 million passengers in 2012. The Malpensa Express train runs from the airport's Terminal 1 to Cadorna Station every 30 minutes taking 29-34 minutes and to Central Station also every 30 minutes taking 41 minutes. The rail link is to be extended to Terminal 2. Trains operate between 5am and midnight. High speed trains and a suburban service ran for a short while but are no longer operating. Linate Airport is 15 km from the city centre and handled 9.2 million passengers in 2012. A new automatic metro line is being constructed to serve the airport in time for the 2015 Expo, but it is unlikely to be complete to the city centre.



## Zurich

Zurich Airport is owned by the Canton and City of Zurich, plus other shareholders. It is located 13 km from the city centre and handled 24.8 million passengers in 2012. The rail link was opened in 1980 with a station located beneath the terminal. S-Bahn services on Lines S2 and S16 plus other trains provide a frequent service to the city taking 11 minutes for a fare of CHF3.30. Intercity and regional trains link the airport to many other Swiss cities. Baggage check in is available at 50 stations with the Fly Rail service at a price of CHF22. Bags are checked in the day before departure, and for arriving passengers bags are delivered to the rail station, usually the next day. Rail mode share of air passengers journeys is 42%.



The Glattalbahn tram services nos. 10 and 12 connect the airport with the city and suburbs. Trams run every 7-15 minutes.

## Geneva

Geneva Airport is 4 km from the city centre and handled 13.9 million passengers in 2012. The train takes only 6 minutes and operates every 12 minutes. A visitor promotion provides a free ticket for arriving passengers, although the normal fare is CHF2. Trains also operate to many other Swiss cities. As with Zurich, the Fly Rail Baggage service is available to and from 50 stations. Rail mode share is 21%.

### Best practice - integration

Railways in Switzerland are part of a fully integrated transport network and it is clear that this also applies to airports, with Zurich and Geneva Airports significant stations on the national network. Trains carry a very high percentage of all passenger journeys in Switzerland, and airport access trips are no exception.

## Paris

Paris has two main airports, CDG and Orly, both operated by IARO member Aeroports de Paris. CDG is 25 km from the city centre and handled 61.6 million passengers in 2012. It opened in 1974 with Terminal 1, while Terminal 2 has opened progressively. There is also a Terminal 3 for low cost airlines. The RER rail link opened with the airport in 1974 and the first station is located at Roissypole, a central location where there are hotels, offices and other facilities. Initially this was connected to the terminal by bus, but is now linked by a automatic CDGVAL shuttle, which also connects all parts of the Terminal 2 and its rail station. The second RER station is at Terminal 2, along with the TGV station. The RER service is eight trains per hour, four of which have limited stops and take 30 minutes to Gare du Nord, the other four stopping at all stations. The fare is €9.50. The rail share of air passenger journeys is 28%.

### Lessons to learn - train describers

The RER trains are each known by a four letter code ('mission'), which is shown on the train indicator display and on the front of the train.



These describers are understood by local and frequent travellers, but can be confusing to visitors, who think that they are the destination of the train.



CDG is also served by TGV trains, with direct services to a number of French cities and Brussels. A partnership between Air France, other airlines and SNCF, tgv'air, provides a connection to 9 French cities on the same ticket and with through check in.

A project to provide a dedicated service, the CDG Express, has been planned but has not yet started. The plan would connect to Gare de l'Est and would provide a train every 15 minutes with a journey time of 20 minutes. Other major rail developments in Paris, such as the 'Grand Paris' and 'Interconnection Sud' will provide opportunities for more rail services to both airports.

Orly Airport is 13 km from the centre of Paris and handled 27.2 million passengers in 2012. It is linked to the RER Line B station at Antony by the OrlyVAL transit. There are eight trains per hour and the total journey time to Denfert-Rochereau is 20 minutes to and the fare is €11.30. The rail share of air passenger journeys is 14%.



## **Lyon**

St Exupery Airport is 20 km from the centre of Lyon and handled 8.5 million passengers in 2012. Aeroports de Lyon is a public limited company and an IARO member. The 2010 Air//rail conference took place at the Airport.

The airport dates from 1975 and a TGV station was opened in 1994, funded by SNCF, the regional government and others. TGV services operate to Paris, destinations in Southern France and Italy. In 2010 the Rhonexpress began operations, with trams every 15 minutes and a journey time of 29 minutes to the city centre, for a fare of €15. Rhonexpress is a group of eight companies and was awarded a 30 year concession to part finance, design, build and operate the service. The concession was awarded by the Rhone Departement, with the remaining funding coming from central and regional government.



## **Barcelona**

El Prat Airport is owned and operated, like most Spanish airports, by AENA and handled 35.1 million passengers in 2012. Terminal 2 is served by a commuter train which provides a service every 30 minutes with a journey time of 27 minutes for a fare of €3.80. A shuttle bus connects to Terminal 1.

Until 2007 the Barcelona-Madrid air route was the busiest in the world, with 971 flights per week. In 2008, a high speed rail line was opened between the cities, with 25 trains per day and a 2 hour 30 minute fastest journey time. The rail share of journeys on this route has risen from just over 10% to over 50% .

## **Madrid**

Barajas Airport is 9 km from the city's financial district and 13 km from the historic centre. It handled 45.2 million passengers in 2012. The airport has been served by the Madrid Metro since

1999 and by a suburban line to Terminal 4 since 2011. The Metro link was funded partly by central and local government but 80% of the construction cost was met by the EU cohesion fund. The Metro journey to Nuevos Ministerios is 12-15 minutes and the fare is €5. The suburban service connects Terminal 4 with the main stations in Madrid and takes €2.40. The suburban station has been sized for future use by high speed trains.

## Valencia

Valencia Airport is 8km from the city and handled 4.8 million passengers in 2012. It is connected to Lines 3 and 5 of the city's Metro which provides six trains per hour taking 24 minutes for a fare of €2.80.

## Lisbon

Lisbon Airport is located 7 km from the city centre and handled 15.3 million passengers in 2012. It is owned and operated by ANA Aeroportos de Portugal, an IARO member, which was recently privatised and sold to Vinci. The airport has been connected to the Lisbon Metro since 2012, which operates from 6.30am to 1am. The service on the Red Line is every 5-8 minutes and takes 16 minutes to Saldanha, for a fare of €1.40.

A project to build a new airport at Alcochete was announced in 2008 and would have involved a new rail link to the city as well as being on a proposed high speed rail line connecting with Spain. However, both the new airport and high speed rail projects are not currently being pursued.

## Porto

Also owned and operated by ANA. Porto Airport is 11 km from the centre of the city and handled 6.0 million passengers in 2012. Since, 2006, it has been served by Line E of the Porto Metro. Trains run every 30 minutes and take 30 minutes to Campanha Station, for a fare of €1.80.



## Warsaw

Warsaw Chopin Airport handled 9.6 million passengers in 2012 and is owned by the Polish Airports State Enterprise. The rail link was opened in 2012 and was built at a cost of PLzł 230 million. The airport station was built as part of Terminal 2 which opened in 2008. Two services are operated. The SKM Lines S2 (every 30 minutes) and S3 (every hour) serve different routes and stations in the city taking 22-24 minutes to Central Station and KML Masovian Railways provides a service every hour which runs through to Modlin Airport. The single fare is PLzł 4.40.



Modlin Airport is 40 km from the city and opened for low cost carriers in 2012. However, it closed later in the year for runway repairs and is expected to reopen in 2013.

## 5. Middle East

### Dubai

Dubai Airport handled 57.7 million passengers in 2012. The Red line of the metro has served Terminal 3 since 2009 and Terminal 1 has been served since 2010. It is operated by Serco under contract to the Dubai Roads & Transport Authority. The automatic trains have five cars and carry 643 passengers. A trip to downtown will take 28 minutes and cost AED2.50.

#### **Best practice - women only compartments**

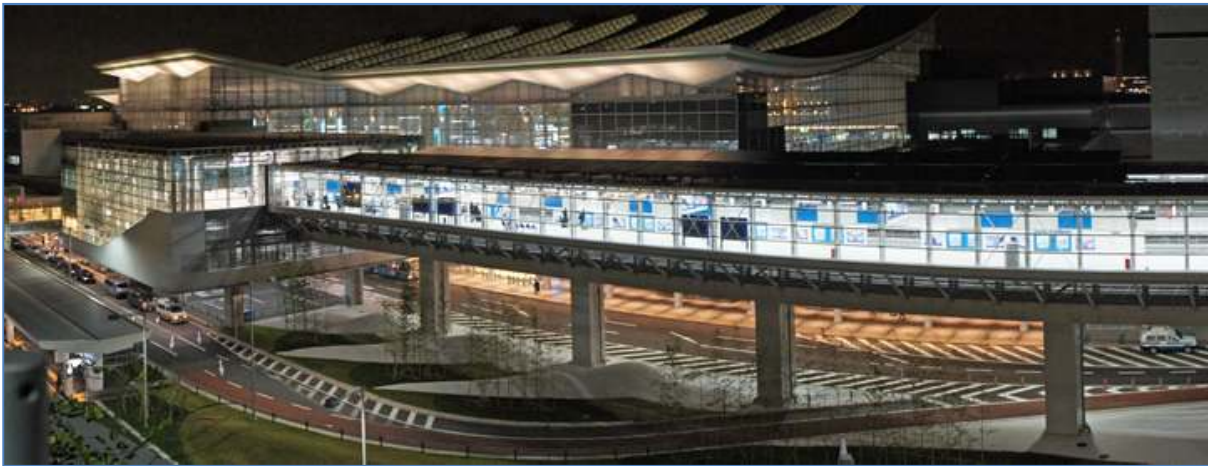
Although it would not be appropriate in many counties, Dubai Metro's women-only compartments are a reminder that customs and cultures are very different around the world, and any air rail link which wants to attract visitors should remember this. As it is impossible to provide facilities for every possible situation, staff training to ensure sensitivity is probably the best way of catering for a wide range of visitors.



## 6. Asia

### Tokyo

Narita Airport handled 35.5 million passengers in 2007. It is 59 km from the city centre and there are several rail services, including the Skyliner, Narita Express, Keisei Main Line and Narita Sky Access Line. They have a range of journey times, stopping patterns and fares, with the non stop Narita Express taking 55 minutes and costing ¥2940 and the Skyliner taking 50 minutes and costing ¥2400. The Keisei Express has reduced its journey time to 36 minutes following a new route. The rail market share of air passenger journeys is around 40%.



Haneda Airport is closer to the centre of Tokyo and was, until recently, limited to domestic flights but is now expanding with international flights and handled 64.2 million passengers in 2010. There are two rail lines, the Keikyu Airport Line and the Tokyo Monorail. The Keikyu Line has four types of service and the Tokyo Monorail three, each with different station calling patterns. There are trains every 4 minutes on the Monorail and the fastest journey time is 13 minutes from Hamamatsucho and the service operates from 5am to midnight. The fare is ¥470 on the Monorail or ¥400-600 on the Keikyu Line. Historically, it is believed that the rail services at Haneda carried over 60% of air passengers, but this figure has not been verified recently.

#### Lessons to learn - complexity

Rail services at both Tokyo airports are very complex, with a huge range of routes, service types, journey times and fares. Local travellers may like to have such a choice and it is undoubtedly correct that a 'one-size-fits-all' service would not be appropriate. However, given the difficulties that foreigners have with the Japanese language, there is a danger that they will seek a simple solution such as a taxi. Needless to say, it is often only Japanese patience and politeness which enables visitors to find the best route.

### Osaka

Kansai International Airport was built on reclaimed land in Osaka Bay and is connected to the mainland by a road and rail bridge. 14.1 million passengers were handled in 2010. Two rail lines serve the airport, JR West which operates the Haruka and Kansai Airport Rapid service and Nankai Electric railway which operates the rapi:t and Nankai Rapid services. The Haruka service runs every 30 minutes from Kyoto Station with two stops in Osaka, taking 73 minutes, with fares starting at ¥2980. The rapi:t service from Namba Station in Osaka takes 29 minutes and stops at a number of



intermediate stations and costs ¥1390. The JR and Nankai Rapid services take longer and call at more stations but are cheaper.

Itami Airport serves primarily domestic flights and handled 14.2 million passengers in 2010. It is served by the Osaka Monorail from the northern suburbs of Osaka and trains run every 10 minutes, the journey to the terminus at Kadoma-sho takes 36 minutes and costs ¥540.

## Fukuoka

Fukuoka Airport is close to the city centre and handled 18.1 million passengers in 2006. The Domestic Terminal is at the end of the Kuko Line on the city subway, with a 5 minute ride to Hakata Railway Station and 10 minutes to Tenjin in the city centre. The International Terminal connects via a shuttle bus. Subway trains operate every 4-8 minutes and the fare to Tenjin is ¥250.

## Kobe

Kobe Airport is built on an artificial island on the opposite site of Osaka Bay from Kansai Airport. It was built as part of the recovery plan from an earthquake and opened in 2006, and handled 2.2 million passengers in 2010. It is connected to the city by the Port Line automated guideway transit system. Travel time to Sannomiya is 16 minutes, the trains run every 3-5 minutes and the fare is ¥320



## **Nagoya Chubu**

Central Japan Airport at Chubu serving Nagoya opened in 2005 on reclaimed land and handled 8.9 million passengers in 2011. The airport is served by the Meitetsu Airport Line operated by Nagoya Railroad. There are two services on the line, the  $\mu$ Sky Limited Express and the Limited Express. The  $\mu$ Sky service connects the airport with Meitetsu-Nagoya, next to the JR Nagoya station for Shinkansen services, runs every 30 minutes, calls at two intermediate stations and takes 28 minutes. The Limited Express trains run four times per hour and call at other stations so take longer. The fare on all services to Meitetsu is ¥850.



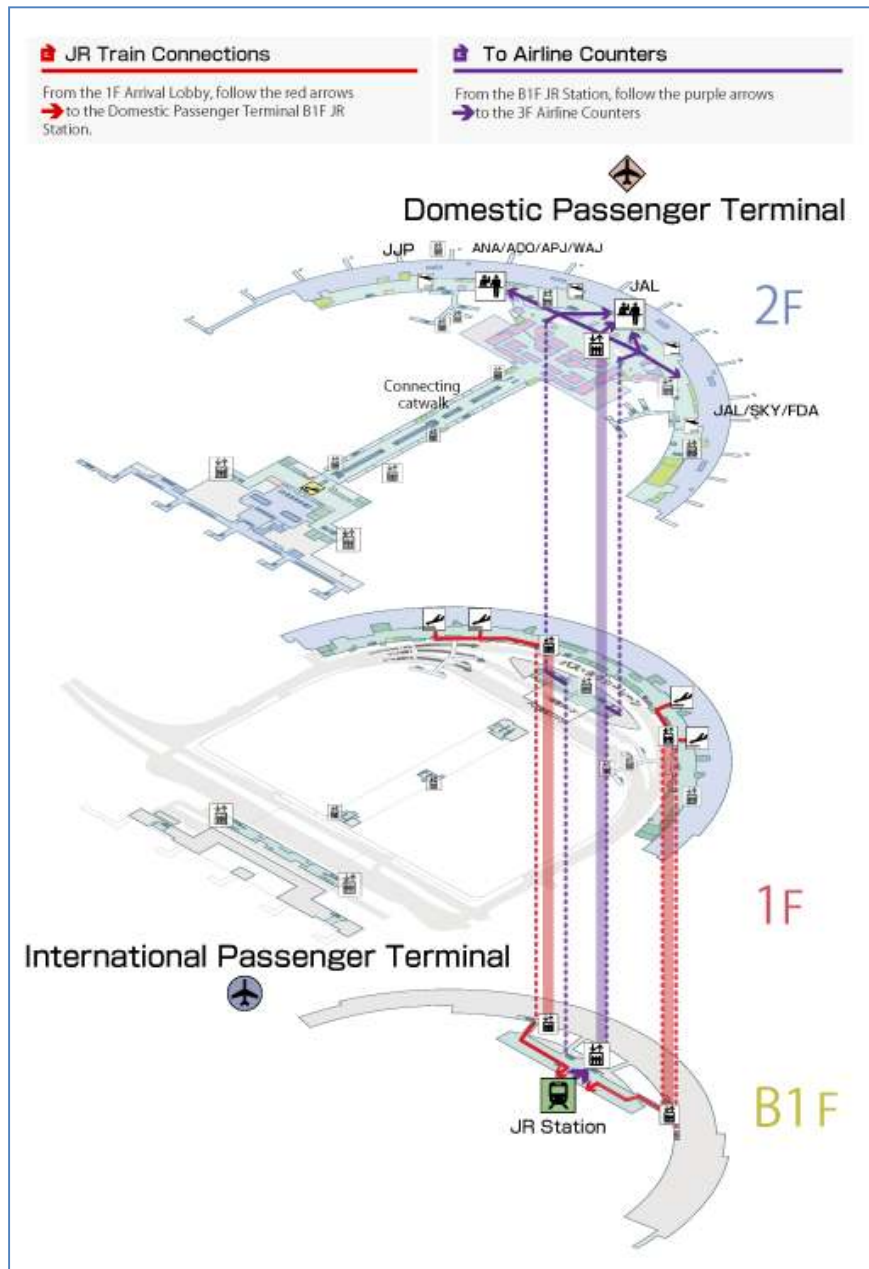
## **Okinawa**

Naha Airport serving Okinawa Island is 4km from the city centre. It is served by the Okinawa City Monorail which opened in 2003. The monorail has 15 stations, trains run every 10 minutes (more at peak times) and it takes 27 minutes to travel the entire length of 12 km, which goes through the city and costs ¥320.



## **Sapporo Chitose**

The Airport handled 15.8 million passengers in 2011. It has been served by a main line rail line since 1980 but a rail spur was added when a new airport terminal was opened in 1992. The station is directly beneath the airport terminal. Rapid Airport Express trains run every 15 minutes and take 36 minutes to Sapporo and cost ¥1040. Every other train is extended to Asahikawa and Otaru.



## Sendai

Sendai Airport is 13 km from the city centre and was flooded after the 2011 earthquake, with services resuming later in that year. The rail spur to the airport was built by the airport authority and opened in 2007. The journey takes between 17 and 25 minutes and costs ¥630.

### Lessons to learn - high speed rail

It is interesting to note that none of Japan's high speed rail lines directly serve airports. The Shinkansen services, which were the world's first high speed trains, concentrate on city to city routes. On the busiest routes, such as Tokyo-Osaka, there are very high frequencies of both high speed trains and flights.



## Beijing

Beijing Capital Airport is 32 km from the city centre and handled 81.9 million passengers in 2012, the second largest in the world. The airport has expanded rapidly with a third terminal, additional runway and the rail link opened in 2008, in time for the Olympics. A new airport at Daxing is being planned for completion in 2018.

The rail link is provided by the Airport Express Line of the Beijing Subway, also known as ABC (Airport Beijing City). There are two airport stations and one stop on the way to the city centre and the journey takes 16-20 minutes for a fare of CHN¥25. Automatic, driverless trains, designed by Bombardier, run every 10 minutes (more at peaks) from 6am to 11.30pm. The rail share of air passenger journeys is 18%.



## Shanghai

Shanghai has two main airports at Honggiao and Pudong. Honggiao, 13 km from the city centre, is mainly domestic and handled 33.1 million passengers in 2011. Pudong, 30 km from the city, is the international hub and handled 44.9 million passengers in 2012.

At Honggiao Airport, Terminal 2 is on Line 2 of the Shanghai Metro which opened in 2010 and both terminals are on Line 10 also opened in 2010. Fares are from CHN¥2-6. There is also a station on the high speed rail lines to Beijing, Hangzhou and Nanjing.

Pudong Airport is also on Line 2 of the Shanghai Metro and in addition is served by a maglev link. The Metro costs CHN¥6-7 and takes around 1 hour to the city centre. The maglev opened in 2004 as the world's first commercial long distance operation. The journey time is 8 minutes with trains every 15 minutes, for a fare of CHN¥50.



## Hong Kong

Hong Kong International Airport at Chep Lap Kok is built on reclaimed land and opened in 1998. In 2012 it handled 56.5 million passengers. The rail link was built at the same time as the airport by the Mass Transit Railway Corporation (MTRC), a member of IARO, and consists of two lines which share most of the route. The Airport Express Line starts at Asia World Expo (since 2005) which is also located on the reclaimed land. The airport station is on two levels relating to the departure and arrival levels of the terminal. It then calls at Tsing Yi and Kowloon and terminates at Hong Kong Station, which is on Hong Kong Island. Trains operate every 10 minutes from 6am to 0.45am and the journey takes 24 minutes. The fare is HK\$100. Dedicated buses then operate from the station to hotels in Hong Kong. A full check in service, including baggage, is provided at the downtown Hong Kong Station and at Kowloon Station, paid for by the MTRC. In 2012 the Airport Express Line carried 12.7 million passengers, 21.8% of air passengers.



### Best practice - step free stations

There are many best practice examples in MTR's Airport Express, but one particular feature is the airport station, which has platforms at the same levels as the departures and arrivals levels of the terminals, meaning that there is no need for lifts or escalators.

The Tung Chung Line shares most of the route although it serves the communities next to the airport service areas instead of the terminal and calls at intermediate stations. There is also a shuttle from the Tung Chung Line to the Disneyland Resort. MTRC is a profitable company as it develops property around the stations as the network expands.

## Bangkok

Suvarnabhumi Airport opened in 2006 and is located 25 km from the centre of Bangkok. In 2012 it handled 51.5 million passengers. The airport was built with finance from Airports of Thailand and the Japan Bank for International Cooperation. Growth has been rapid and the second phase is now being constructed.

The rail link was opened in 2010 and is operated by SRTET, as subsidiary of the State Railway of Thailand. It runs on mostly elevated track. Three services are provided, two Airport Expresses and the City Line. The Airport Expresses run separately from 6am to midnight every 30 minutes non stop to Makkasan and Phaya Thai taking 15 and 17 minutes respectively for a fare of THB90. The City Line also operates to Phaya Thai three times an hour calling at 6 intermediate stations taking 30 minutes for a fare of THB45. The airport station is located beneath the terminal. Baggage check is offered at the city air terminal at Makkasan Station. The rail link cost THB30 billion and was built by a consortium including Siemens who supplied the trains.



## Kuala Lumpur

Kuala Lumpur International Airport opened in 1998 and is 60 km from the city. It handled 39.9 million passengers in 2012. A low cost carrier terminal was added in 2008 but is to be replaced when a new terminal opens in 2013.

Space was provided in the terminal for a station and the rail link began operations in 2002. A 30 year concession was granted to Express Rail Link Sdn Bhd, whose shareholders are YTL Corporation, Lembaga Tabung Haji and Trisilco Equity Sdn, to design, finance, build and operate the link. The trains were supplied by Siemens and the project was funded by equity, local loans and German export credit.

Two services are operated, the KLIA Ekspres and KLIA Transit, both from 5am to 1am. KLIA Ekspres operates every 15 minutes at peak times and takes 28 minutes to KL Sentral for a fare of RM35. KLIA Transit operates every 20 minutes at peak times and 30 minutes off peak and calls at three intermediate stations. A baggage check in facility is provided at the city terminal. The low cost carrier terminal is currently linked to one of the intermediate stations on the the KL Transit

### Best practice - clockface times

One of the many excellent features of the KLIA Ekspres service is the fact that trains depart at set times past the hour (00, 15, 30 and 45 in the peaks, 00, 20 and 40 off peak) from both ends, making the timetable easy to explain and to remember.



service, but the line is being extended to the new terminal. KLIA Ekspres offers a number of additional services include a VIP transfer to and from KL Sentral Station. The operator has also been particularly active in developing new technologies for booking and paying for travel, including contactless smart cards. The rail share of air passenger journeys is 18%.



## Singapore

Changi Airport opened in 1981 and by 2012 was handling 51.2 million passengers. Terminal 2 was completed in 1989 and Terminal 3 opened in 2008. The Budget Terminal, for low cost carriers, opened in 2006 and closed in 2012 when airlines moved to Terminal 2, to make way for the construction of Terminal 4. There is a transit system between the terminals.

The Singapore MRT (Mass Rapid Transit) service to the airport began in 2002 to Terminal 2. A branch of the East-West Line terminates at the airport, but it operates as a shuttle to Tanah Merah Station, where passengers transfer to trains to the city centre. The journey takes 32 minutes and the fare is S\$2.00. A new cross island line is planned from the airport to the centre of the island.



## Delhi

Indira Gandhi International Airport is 26 km from the city centre, is owned by the Airports Authority of India and handled 35.9 million passengers in 2011. The airport is served by the Delhi Airport Metro Express which opened in 2011 having been built at a cost of INR ₹ 57 billion by a concessionaire made up of Reliance Infrastructure and CAF. The concession is for 30 years. About three quarters of the line is underground and the rest is elevated. The planned journey time is 18 minutes, but currently there are speed restrictions while technical problems, which caused the line to be closed in 2012, are resolved. The service currently operated every 13 minutes for a fare of



IND₹ 150. Security is particularly tight on the line with many airport-style security checks as well as platform screen doors.

## Seoul



Incheon International Airport is 48 km from the city and handled 35.1 million passengers in 2011. It was built on reclaimed land and opened in 2001. The Airport Express (AREX) is operated by Korean Railways (Korail), an IARO member. The airport station is located in the Transport Centre adjacent to the main terminal building. There are two services, the first every 30 minutes taking 43 minutes and a more frequent all stations service which takes 53 minutes which also serves Gimpo Airport. Many of the stations have interchanges with the Incheon and Seoul subway systems. Baggage check in is provided at the City Airport Terminal at Seoul Station. The Express fare is KOR₩ 8,000 and the all stations fare is KOR₩ 3,950.

### **Best practice - baggage facilities**

Air passengers, particularly on long haul flights, carry large bags and it is essential to provide good baggage facilities on the air rail service, not least in the trains, as are provided on the AREX service, plus step free access throughout the station and between platform and train.

Gimpo Airport is now Seoul's second airport and is 15 km from the city centre, handling 18.5 million passengers in 2011. It is served by Lines 5 and 9 of the Seoul Subway as well as the AREX all stations service. The Subway runs every 6 minutes (more at peak times) and the fare is KOR₩ 1,550.

## 7. Africa

### Johannesburg

The O R Tambo International Airport handled 19 million passengers in 2011/12. Gautrain is a high quality train serving the Airport and other communities and was designed, built and part financed by the Bombela consortium of contractors and suppliers which has a 20 year concession to operate the service. The fare is R135 and the train operates from 5am to 9pm, every 12 minutes at peak periods and every 20 minutes at off peak periods, or 30 minutes at weekends which takes 14 minutes to Sandton. There is an integrated bus service.



#### **Best practice - high quality**

In a region where train services have historically been primarily poor quality, Gautrain has introduced a remarkable high quality service which attracts a much wider range of passengers, including visitors.

## 8. Australasia

### Brisbane

Brisbane Airport is privately owned and handled 21 million passengers in 2011/12. The Airtrain is also privately owned although it is integrated into the Queensland railways network and commenced operations in 2001. Trains run every 30 minutes (more in the peaks) from 5.42am to 9.59pm to the centre of Brisbane in 19 minutes. Some trains run on to the Gold Coast.

#### Best practice - interactive website

The Airtrain website includes a simple map which shows the journey time and fare from each station to the airport.



### Sydney

Kingsford Smith Airport handled 35.6 million passengers in 2012. Since 2000, it has been served by the Airport & East Hills Line with two stations at the airport terminals. The Airport Line was built and is operated by a private company. Trains are every 7-8 minutes and take 10-12 minutes to Central Station. The fare is AUS\$15.90-16.70. In 2006 11% of air passengers used the train.

#### Lessons to learn - premium fare for a non premium service

The investment in the high cost of building the Airport Line is being returned by a surcharge on airport station users, meaning that the fares are much higher than other users of the line. The line carries large numbers of commuters and is often full at peak times, so that air passengers with baggage have to travel on a crowded train while paying a high fare.