

IARO report 16.13

Light rail to airports

IARO Report 16.13: Light rail to airports

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*Our mission is to spread world class best practice and good practical ideas
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Introduction

Light rail or light rapid transit is one of the categories of rail service to airports. It is one which is growing in popularity, especially in the United States, but one with a fairly low profile.

This report looks at the issues around this type of airport railway, reviewing the examples which have been developed around the world.

In particular, factors such as routing, construction, operations, airport integration, usage and characteristics, are examined.

Another chapter draws on the Annex detailing the examples currently in operation, deriving some conclusions from these.

Future plans for the surprisingly large number of new projects in planning or under construction are also reviewed.

As usual with these reports, comments, feedback and updates are welcome.

Andrew Sharp

Policy Adviser

Abbreviations and acronyms

AABD	Atelier d'Architectes Bruno Dumetier
ABB	Asea Brown Boveri
ABTN	Air Business and Travel News
ACRP	Airports Cooperative Research Program, part of the TRB
AFB	Air Force Base
AG	Aktiengesellschaft (German joint-stock company)
APM	Automated people mover
APTA	American Public Transport Association
ARRA	American Recovery and Reinvestment Act of 2009 (Public Law 111-5)
Bn	Billion
BOStrab	Strassenbahn-Bau- und Betriebsordnung (German Federal LRT Construction & Operation Regulations)
BSAG	Bremer Straßenbahn AG
BWI	Baltimore Washington International Thurgood Marshall Airport
CARE	City Airport Rail Enterprises
CEO	Chief Executive Officer
CFEL	Chemin de Fer de l'Est de Lyon
CHF	Swiss Francs
CMAQ	Congestion Mitigation and Air Quality Improvement Program
CP	Canadian Pacific Railroad
CSDC	Cascade Station Development Company (Portland, Oregon)
CUSS	Common-use self service kiosk
DART	Dallas Area Rapid Transit
DBO	Design, build, operate
DBOM	Design, build, operate, maintain
DC	District of Columbia
DFW	Dallas-Fort Worth International Airpor

DKK	Danish Kroner
DLR	Docklands Light Railway
DM	Deutschemark
DOT	Department of Transportation
EIS	environmental impact study
EMC	electro-magnetic compatibility
EU	European Union
FAA	Federal Aviation Authority (US)
FFGA	Full funding grant agreement (US)
FFR	French franc
FIDS	Flight information displays
FTA	Federal Transit Authority
GAC	General Aviation Centre
GAO	Government Accountability Office (US)
Hbf	Hauptbahnhof - main station
IARO	International Air Rail Organisation
IG	Inspector General
K	thousand
km	kilometre
LRT	light rapid transit
LRV	light rail vehicle
MAC	Metropolitan Airports Commission (Minneapolis – St. Paul)
MARC	Maryland Area Regional Commuter
Mdnt	midnight
MO	Missouri
MPO	Metropolitan Planning Office
mppa	million passengers a year
MSP	Minneapolis-St. Paul International Airport

MTA	Maryland Transit Administration
no	number (the American #)
p	page
PEIS	Programmatic Environmental Impact Statement
Pfc	passenger facility charge. Levy made by some US airports on passengers to fund improvements
PHX	Phoenix Sky Harbor airport
PPP	public-private partnership
PSTC	Puget Sound Transit Consultants
RAV	Richmond – Airport - Vancouver
RBS	Royal Bank of Scotland
RPI	Retail Prices Index
RTA	Regional Transportation Agency
RTC	Regional Transportation Council (Texas)
SeaTac	Seattle-Tacoma International Airport
Section 106	of the 1990 Town and Country Planning Act (UK)
SEMALY	Société d'Études du Métro de l'Agglomération Lyonnaise (now Egis Rail)
SFr	Swiss Franc
SH	State Highway
SJC	San Jose Airport
ST	Sound Transit
STP	Surface Transportation Programme (USA)
S106	Section 106 of the 1990 Town and Country Planning Act
TBM	Tunnel Boring Machine
TCRP	Transit Co-Operative Research Program, part of the TRB
TEA-21	Transportation Equity Act for the 21 st century
TEN-T	Trans European Networks - Transport
TfL	Transport for London

TIGER	Transportation Investment Generating Economic Recovery (US)
TL	Turkish Lire
TRAX	Transit Express (Utah)
TRB	Transportation Research Board
TRE	Trinity Rail Express (Texas)
Tri-Met	Tri-County Metropolitan Transportation District of Oregon
U-Bahn	untergrundbahn (German underground railway)
UITP	Union Internationale des Transports Publics (International Public Transport Union)
UK	United Kingdom
UMTA	Urban Mass Transit Administration (US)
US	United States (of America)
UTA	Utah Transit Authority
VAG	Verkehrs-Aktiengesellschaft (Nürnberg public transport operator)
VBG	Verkehrsbetriebe Glattal (Switzerland)
VBZ	Verkehrsbetriebe Zürich (public transport operator)
VDV	Verband Deutscher Verkehrsunternehmen (Association of German Transport Companies)
VLM	Vlaamse Luchttransportmaatschappij (Belgian airline)
VTA	Valley Transportation Authority (California)
¥	Yen
ZVV	Zürcher Verkehrsverbund

Note that UK conventions are used for dates (day/month/year) and numbers (in 9,999.99 the comma , separates thousands: the full stop . is a decimal point). A billion is a thousand million, following US conventions.

There are occasions when UK (United Kingdom) is used for simplicity when the term Great Britain (the UK excluding Northern Ireland) would be more accurate.

What is light rail, and where does it serve airports?

Defining light rail is difficult – there is no consistent definition. Indeed, some transport professionals dislike the term and prefer to use something more specific in different cases. Light rapid transit (LRT) is another term sometimes used. Terminology is quite loose – something found elsewhere in classifying airport railways.

The systems described in various parts of the world as light rail vary quite a lot. Some – officially or otherwise - are probably better described as light metros: others can best be described as trams or streetcars.

Generally, the way a system is officially described is what is used in this report and by IARO generally. For example, the Docklands Light Railway (DLR) in London and the Metro in Newcastle-upon-Tyne are very similar operations – the main difference being that the DLR is driverless. But one is officially described (and therefore classified by IARO) as light rail and the other as a metro. The automated rubber-tyred Neihu Line, serving Taipei's domestic Sungshan airport, is also a borderline case: it is however officially described as a light metro.

The exceptions are the Metro do Porto (which this report regards as light rail because of the significant amount of street running on the system) and the Copenhagen Metro (an automated system akin to the DLR).

Complicating the issue are tram-trains, vehicles designed to run on both city tramlines and the national rail network. These are particularly popular in Germany: Karlsruhe, Kassel and Saarbrücken have particularly good examples.

In Germany, federal regulations (BOStrab) describe different modes of operation. Running on sight (the classic street tram, with no signals), or signal controlled (railway style) are two signalling options. Trams typically run at-grade and on-street: other modes of operation are at grade and on segregated right of way, and grade-separated and on private right of way.

Trams (streetcars or trolleys) are included in this report: they are usually designed for short-distance multi-stop services¹, with much on-street running. Light rail tends to have less on-street running. In those cases where there is no or virtually no street-running, light metro is probably a better description. Two monorails – Chongqing and Okinawa – are included.

Automatic people movers are not included. These are short-distance systems for moving people between (typically) an airport and a railway station.

¹ Although see the RhônExpress system, serving Lyon St-Exupéry Airport, described on page 53

Trolleybuses and guided buses are not covered either. There is an argument that guided trolleybuses are more properly described as rubber-tyred trams because they cannot generally be steered or operated off their guideway. And rubber-tyred metros are still regarded as metros!

For convenience, the term light rail is generally used unless there are issues specific to any specific sub-type.

In February 2013, the IARO database listed 29 airports with a light rail connection² and many others with one in planning or under construction. See page 31, Future plans, for more information on these.

Light rail systems in operation serving airports were at

Baltimore Washington Thurgood Marshall International (BWI), Blackpool, Bremen, Bucharest Baneasa, Chongqing, Dallas Love Field, Dallas-Fort Worth, Erfurt, Hillsboro (Oregon), Istanbul Ataturk, Copenhagen (København) Kastrup, London City, Lyon Bron, Lyon St-Exupéry, Melbourne Essendon, Minneapolis-St. Paul, Montpellier, Nürnberg, Okinawa, Phoenix, Portland (Oregon), Porto, Pusan, St. Louis Lambert (the system also serves the Scott Air Force Base), San Jose, Seattle/Tacoma, Vancouver and Zürich.

Of these,

- Blackpool, Bremen, Bucharest Baneasa, Erfurt, Lyon Bron, Melbourne Essendon, Montpellier and Porto could best be described as trams (they predominantly run on ordinary streets, with little or no reserved track);
- Baltimore Washington International, Dallas Love Field, Dallas Fort Worth, Hillsboro, Lyon St-Exupéry, Minneapolis-St. Paul, Phoenix, Portland (Oregon), San Jose, Seattle/Tacoma and Zürich have limited on-street running; and
- the rest could be described as light metros.

There is one interesting variation³. The line serving Lyon St-Exupéry is an express tram, running a fast high quality limited stop service partly on shared track with some street running and partly on its own dedicated high speed track, connecting city and airport. Classification is not easy!

² Direct to the airport, or with reasonably dedicated shuttle buses or an automated people mover connection between the light rail line and the airport

³ Although in addition, the planned Line 6 of Shenzhen's mass transit system, which will serve the airport, is described as express LRT: few details are known and its current status is uncertain

Issues around planning, construction and implementation

Introduction

A key benefit of light rail is its ability to fit into the urban fabric. At the heavier end of the scale, it tends to use former railway rights of way or newly created dedicated infrastructure: at the lighter end, it can run on-street with minimal interference with other road users⁴. It can typically cope with steeper gradients and tighter curves than heavy rail (although tight curves can necessitate speed restrictions – and precautions against wheel-squeal⁵).

A particularly dramatic example can be seen in Portland (Oregon). On the route between the airport and the city, the Red Line goes through a 360° turn in order to gain height in a constricted area (see page 77 for more details).

The line in Tenerife, which will ultimately serve Norte airport, has gradients of 8.5%: the RhônExpress line in Lyon has 100 km/h capability.

While light rail typically uses light construction, there are cases where heavy engineering has been used – in Seattle and again in Portland (Oregon), there are good examples of significant tunnels under hilly areas.

Planning: where do you start?

Transport authorities are normally responsible for the characteristics of the future system, however it is funded and operated in the future. They need to set clear legal and financial boundaries, and to establish a time frame.

Some systems are operated by the local transport authority: in others, there is a concessionaire. There can be a separation of responsibilities - for example for infrastructure and operations – and in these cases there needs to be a clear definition of roles. Problems typically occur at interfaces.

In Copenhagen, there was initially ambiguity among authorities about whether or not to serve the airport (see page 38). This probably contributed to the fact that at least at first, the light rail station was poorly connected to the airport.

If you have to choose, do you serve an airport or suburban areas? The ideal is to do both – to improve the accessibility of the major employment area at the airport to a pool of labour. Typically a light rail service to an airport will attract 5% - 10% of terminating air passengers and a similar number of employees. Not only are these a valuable market in themselves, but also they tend to travel out of or against local commuter peaks.

⁴ Although there are service frequency issues: frequencies in excess of 8/hour are unlikely to be possible in mixed street operation except in special circumstances

⁵ which not only annoys neighbours but indicates damage being done to the rails

When putting together a concession, it is good practice to define requirements (outcomes) rather than specifying inputs. Potential operators may have innovative ways of meeting the requirements, and tying them down with unnecessary specifications will not release these.

Functional requirements need to be set out: technical specifications are necessary when there are interfaces with other systems. These need to be discussed with potential operators and suppliers to try to reach optimal solutions before the tendering phase.

Planning - selling the case

Local funding is often needed: again, local support is essential. Good promotion of the concept by strong political personalities is valuable.

Tours of existing high-quality systems for opinion-formers can be useful: they can show people what is possible. It can also show the reactions of local people after implementation of a system to compare with those being expressed beforehand where the new system is under consideration. Usually operators of existing systems are very helpful and cooperative.

A review of the annex will show a number of places where there have been delays or changes of plan, often in response to budget problems.

In Nottingham, full consultation and engagement with the local community – residents and businesses – was seen as the key to implementation of a successful light rail project. Such consultation can bring forward ideas for improvements with the benefit of local knowledge. People who are engaged with the project take ownership – it is their project, and they want it to succeed. Support is more effective if it comes from local people, local businesses. Getting closely involved in the detail of local issues, providing easily accessible information in large quantities frequently and by diverse means of distribution, and being prepared to adjust scheme details and the programme when needed to overcome local issues, were seen as important lessons⁶.

Another example was the planned Merseytram, in Liverpool, which worked with the local Chamber of Commerce to generate support among local businesses.

Plans for park and ride car parks along the route are a demonstration that the system will take traffic off the local streets, which local people can see as a benefit.

An appearance of integration with the rest of the local transport system is beneficial. In Edinburgh, the trams are being positioned as the next step up from buses – a logical progression, giving more capacity and more comfort.

⁶ “The Karlsruhe friendship bridge” by Chris Parker in *The Rail Engineer*, March 2013 p8

Construction disruption - fears

A key issue, particularly for systems which involve much street running, is that of disruption during construction. Both disruption and fear of disruption can generate much opposition and resentment: this opposition can increase the length and costs of the planning stage. It needs to be countered with a well-thought out plan which will allow life to continue normally as far as possible, with much local input and influence. This will generate local support, which is essential.

An example is the West London Tram, where local businesses saw only the downside and were the backbone of local opposition which campaigned against and finally killed the scheme.

Another issue is greater use of level crossings⁷ – how will this impact on the community? It needs to be handled sensitively. A public education campaign will be necessary to inform people - especially motorists – of the issues.

Construction disruption - minimisation

Disruption during construction can be reduced by intelligent planning - for example ensuring that, where it is necessary to move utilities, all of them are moved at the same time on each stretch of road, rather than each utility doing its own thing, following its own timetable and digging up the road just after someone else has finished putting it back again.

The promoter needs to be in full control of the contractors. When Vancouver's Canada Line was being built, it appeared that the contractor and not the promoter was in charge of the construction method and timescale.

A search of the web reveals numerous complaints about the result. There are comments that streets were virtually closed, even for delivery and emergency vehicle access: this led to considerable problems for residences and major issues for local businesses (several of which closed down as a result). This was exacerbated because much of the tunnelling was by cut-and-cover.

Only on the airport section was significant external control exercised, because the airport authority, as a stakeholder and funder of the project, was able to manage the construction activity.

As the line was being completed, efforts were made to regenerate the areas worst hit during construction – places like Cambie Street and Granville Street.

The same thing happened as the light rail extension was being built in St. Paul, in Minnesota. It was felt that no-one was taking a business-like approach to solving the problems caused during construction: remedies were either taking too long to implement or were ineffective.

⁷ Grade crossings, in US terminology

As ever, communications matter. Excellence here can be seen in the case of Salt Lake City. When UTA was building the light rail line to the airport, it issued regular bulletins about the work actually being done. The 10km route was split into 7 specific lengths: each week an email listed the works to be done in each of these lengths and, in red, full details of the work being done that week. Full information about the impact on the community - the type of work, the hours of work and the need for road closures - was given.

To help further, from time to time the bulletins publicised a specific business. Shops and offices along the route – mostly along North Temple Street - were offered the opportunity to advertise special promotions or their routine business. A web-site was created – www.shopnorthtemple.com – with local businesses publicised: many took advantage of this publicity to promote special deals and offers. This was further promoted by a YouTube video on the Airport Line construction page of the UTA website as well as posters and banners along the route.

The same idea was used in Phoenix.

In Edinburgh too, work was done with local communities and businesses to ensure good relationships. The City Council ran an ‘Open for Business’ initiative, spending over £1m to support and publicise local firms during construction disruption. As part of this, a committee of local businesses and residents was set up in the west end of the city – the West End Action Group – to run local events like themed markets, classic car fairs and fashion shows to attract people to the area most affected by the building of the tramway.

Another good example of disruption minimisation was seen in Heilbronn, where an impartial ombudsman was appointed to mediate between local residents and businesses and the construction manager.

Under or over?

Should a system be built at ground level (at grade), on elevated structures or in tunnels?

The answer will tend to depend on local geography and, near an airport, on the requirements of the airport itself. These will include safety zones, radar reception and electro-magnetic compatibility – EMC (see page 16).

It has been estimated⁸ that, if the cost of a ground-level line is 1, an elevated system would cost 2 and one in tunnel, 4.5. Tunnels are becoming cheaper because of advances in tunnelling technology.

⁸ See “Above or below ground” by Nasri Munfah, Chair, Tunnel Services, HNTB Corporation, in HNTB’s “In Transit”, Fall 2012 page 5. He refers to a 2004 study by the International Tunnelling Association.

Other construction issues

When UTA was building its major light rail and commuter rail system in Salt Lake City, it developed a collaborative approach with its contractors. They were able to manage cash-flow, pace construction to suit economic conditions, and take advantage of lower construction costs as this became possible over the life of the building project.

Treatment of land acquisition risk was something which was a valuable part of the collaboration agreement.

They also found that building five lines more or less together allowed them to make significant economies in project management and overheads generally (9% of the total cost rather than a more typical 20%).

Implementation and commissioning

The operator needs to establish the system requirements: these will feed into vehicle design, station size and layout, and key operating characteristics.

Joint purchasing of vehicles is sometimes possible: cooperating with another transport operator to increase the order size will reduce the unit cost.

Production of the first vehicle is likely to take around 15 months: this can to a degree overlap with the engineering phase, when key documents for procurement, approval and acceptance are produced. Commissioning takes 3-9 months, depending on the complexity of the system and the expertise of the commissioning team.

Several systems have experienced major technical problems in the first few months – underestimation of vehicle loads leading to cracked bogie frames and gearboxes, mismatches between vehicle and infrastructure leading to derailments, and problems with doors, air conditioning systems and noise generally. Contingency planning for this kind of problem is valuable.

Because of the susceptibility of airport equipment in particular, there is a need for an EMC plan for electrified systems serving – or even going close to – an airport. Basically, this needs the range of frequencies emitted by electrical equipment of any sort to be measured: those above a certain point will trigger a need for some kind of damping action or elimination through design.

Operational issues

Especially where there is on-street running, trams and light rail vehicles are likely to be involved in accidents involving other road users. Even more than with heavy rail vehicles hitting careless motorists at level crossings, there is likely to be negative publicity, with media headlines about the “Tram accident” – when really it is a road accident involving a tram.

This is particularly so because an accident involving a tram is likely to involve more material damage than one involving just cars. As with rail accidents, the very fact that, unlike ordinary road accidents, they are unusual, makes them news.

The public relations team need to be prepared for this, and ready to counter any allegation or implication that light rail is dangerous. A collection of statistics can be useful ammunition, especially if it is stored in such a way that it can easily be analysed.

A full safety plan is of course essential: regular high profile updates with statistics and plans for improvements are valuable.

Rolling stock design

Introduction

Light rail rolling stock tends to be designed for mass transportation. Is it really suitable for air passengers?

There are several responses to this.

Airport access trips

First, at least a third of all airport access trips are by airport-based employees⁹. Their travel is the standard journey to work, needing facilities appropriate to mass transit standards rather than anything more specialised.

An additional point with employees is that they tend to travel out of or against the local commuter peaks. This makes good use of some of the spare capacity inherent in a commuter operation.

Second, not all air passengers are the same. Airports vary considerably in the type of passenger they handle – generally, and day to day, week to week and month to month. For example Las Vegas sees a lot of inbound vacation traffic – holidaymakers with a lot of luggage. Oslo, by contrast, sees many business passengers going out and back in a day on the Scandinavian Triangle routes: they tend to have very little luggage.

Light rail systems

Equally, not all light rail systems are the same.

First, as was said in the opening chapter, they vary in the degree of lightness – from the typical city tram running on-street to the light metro like Docklands Light Railway which is barely distinguishable from a full metro.

Second, rolling stock varies. Some is 100% low floor: some is 100% high floor and there are variations in between these extremes.

Case study – MTA Maryland's light rail.

The writer remembers riding this from Baltimore Washington International Airport to the Convention Centre with a 2 metre x 1 metre pack of display panels, a box of IARO publicity material and a suitcase. Getting these into and out of the light rail vehicle meant negotiating four steps. The journey was off-peak, so there was no problem with space – the luggage went between the seats. When preparing to alight at the downtown station he noticed the driver looking back through an internal mirror to ensure that everything was off the train before the doors were closed.

⁹ Limited information is available, but around 20% of light rail passengers at Portland (Oregon) and Vancouver airports are airport employees and 55% are air passengers – see pages 75 and 92

Light rail vehicles

The light rail line to the airport in Portland (Oregon) uses a combination of old high-floor and new low-floor vehicles: it is a matter of luck which happens to be on any specific train. Low floors are clearly better for those with luggage.

Dallas's DART light rail, with a legacy of high floor vehicles, found an interesting solution to the problem of needing low-floor vehicles. They launched a programme of inserting a new low-floor vehicle between pairs of old high-floor ones, simultaneously improving accessibility and the number of seats available.

The Docklands Light Railway (DLR) is the classic light metro, with high platforms and trains whose floors are virtually on a level with them. This is highly convenient to passengers, and is a factor behind the very high mode share – 51% of London City Airport's passengers access it using the DLR.

The need for multi-purpose luggage space is discussed on page 22.

Standards

It is likely to be more cost-effective to use a standard design of vehicle with customised front end, livery and seating rather than a completely new design. Organisations like the Association of German Transport Undertakings (VdV) produce a number of EU-wide standards for different aspects of tramway construction and design, and use of these is likely to produce efficiencies of scale as well as drawing on valuable past experience.

Usage and characteristics

Statistics

Statistics about the airport-specific usage of light rail systems are difficult to find. The following give an impression of some of the light rail systems serving airports. Statistics refer to the section between airport and city only.

	Journey time (minutes)	Distance (km)	Fare (US\$)	Trains /hour	First train	Last train	Mode share %
BWI	45	16	1.60	7	05:10	00:45	5
Bremen	15	3	3.19	6	04:55	23:45	
Copenhagen	15	12	5.96	12	05:00	mdnt	20
London City	22	8	5.20	6	05:30	00:15	51
Nuremberg	12	7.5	2.59	3	05:00	00:35	
Portland Oregon	38	14	2.30	4	05:00	00:05	8
Porto	30	18	2.00	4	06:00	01:30	
St. Louis	25	21	3.50	6	04:30	mdnt	5

Notes:

Mode share = approximate percentage of air passengers using light rail

BWI = Baltimore Washington International Airport

Mdnt = Midnight

Success factors

The following can be regarded as key success factors:

- Convenience
- Level platform and train floor
- Provision for luggage
- Hours of service
- Information

and these are analysed below.

Convenience

An essential element of convenience is to go where passengers want to go – both at the airport and downtown.

Case study: DLR and Canary Wharf

The DLR carries 51% of all air passengers using London City Airport – a very impressive statistic, the second highest rail mode share in the world. It is, however, estimated by the airport that this would increase to 70% if the railway served the Canary Wharf financial centre by a direct train. At the moment, passengers have to make one change of train – getting off at one station, waiting on the same platform for the next train and catching that.

An interesting illustration of the deterrence effect, the hassle factor, of interchange.

A key point made in ACRP report 4¹⁰ is the concentration of downtown origins and destinations. A high percentage of airport users will have origins and destinations in a relatively small number of places in the city centre – the hotel area, the convention centre area, the office and finance area. This applies particularly to inbound passengers – and these are also people who do not have their own car available. A relatively small area contains most of the zones with a high density of airport trip ends – a conclusion which would be supported by a student of Pareto. There is a need to find where these are and serve them.

One of the drawbacks of the airport express type of airport railway is that there is usually only one downtown station. This is not a disadvantage shared by a light rail connection: the downtown circulation and distribution is generally good.

A piece of infrastructure being completed as this report is being written is Salt Lake City's Airport Line, where the current plan is to put the airport station (opening 2013) at the extreme south end of the terminal complex. This abuts the check-in area of Terminal 1 used by the carriers with relatively few flights. It is remote from – and indeed invisible from – Terminal 2, used by Delta, the largest airline at the airport.

A terminal expansion project now under consideration will put light rail in a more central position to the new combined south terminal, at connector bridge level and closer to the terminal than the car parks. This will be significantly more convenient, user-friendly and attractive.

Lessons can be learnt from Phoenix. Passengers travelling from the airport to the city need to take an internal automated people mover to the stop nearest to the light rail line. From there, they need to take a moving walkway across a connector bridge, and then go down an escalator to street level to catch the light rail train.

¹⁰ “Ground access to major airports by public transportation” ACRP Report 4, TRB 2008

There was much debate (see Annex, page 71) about the location of the airport station; and the situation has sometimes been confused by referring to an internal automated people mover as “The airport train”.

The initially-planned tunnel allowing light rail to serve the terminals directly may not have been justified, but it is unlikely that the present combination is either. The moving walkway seems to be an unnecessary addition: why did the automated people mover not go closer to the light rail line in the first place?

The history shows a probable lack of expertise in airport connections (or a lack of imagination) on the part of the planners involved.

Another convenience issue is the ability to buy tickets easily. Whatever the policy on the rest of the network, it is best if ticket machines at the airport accept notes (bills) and if possible credit and debit cards. Passengers arriving from other countries are unlikely to have coins: they cannot usually get them from bureaux de change.

If there is no local source of ticket machines accepting notes, a company which supplies the US market is worth trying. Most ticket machines there accept bills, although they usually only give change in coin.

The ticket machines on the metro in Washington DC show a lack of thought in their design. They ask passengers to use “quarters, dimes and nickels” only. This can confuse visitors from other countries – of whom there could well be many in the nation’s capital. Asking people to use 25¢, 10¢ and 5¢ coins instead would have been more user-friendly – the coins each carry their numeric value but not all have their local name!

The New York subway has a different tourist trap. Some of its machines accept credit cards. It is perfectly possible to go through most of the steps necessary to purchase a ticket using a credit card and then be asked for a 5-number zip code. Not everyone has one of these – in particular, visitors from Canada and the UK. Happily, any 5-digit number seems to work – but one can lack the confidence to try this!

Level platform and train floor

Ideally, platforms should be on the same level as the train floors, with as small a gap between the two as possible. This helps people with wheeled cases, buggies and golf carts: it is also extremely useful to the disabled.

The provision of facilities specifically for the disabled is a very poor second best. People who are not disabled – or do not want to categorise themselves as disabled – are reluctant to use facilities they perceive as being for wheelchair users, for example.

Provision for luggage

Most light rail systems make some provision for bulky luggage – things like buggies and bikes. This can also be used for air passengers’ luggage.

There does need to be some provision. Air passengers will bring luggage, and if there is nowhere convenient to stow it, it will end up on the seats, between the seats, in the aisles and in the vestibules. At best this is a nuisance: at worst it's dangerous.

The luggage area can be fitted with tip-up seats, so that when not in use for luggage people can actually sit there.

Hours of service

Hours of service matter, especially for employees. They need trains to meet the needs of their shifts. Consultation with the airport will help to find start and end times of key shifts.

If employees cannot get to the airport for one of their shifts, they are unlikely to make a long-term commitment to travel by public transport. If they have to use a car for one of the shifts they work, they will probably use it for all of their shifts.

A glance at an airport departure list will reveal many flights leaving between 6:00 and 6:30, and between 6:30 and 7:00. What time do passengers need to be there to check in for those flights? What time do the check-in staff, the retail and catering staff and the baggage handling staff need to be there?

Case study: Salt Lake City International Airport

The extension of the TRAX light rail line to Salt Lake City airport posed some interesting questions – one of which was the issue of hours of service.

The airport line itself does not use any infrastructure also used by freight trains, but trains need to use freight infrastructure to access the depot where they are stored and maintained overnight. There are restrictions on the mixed use of freight infrastructure in North America – passenger trains cannot use a line at the same time as freight trains might be using it unless they are extremely heavily engineered, so a system known as temporal separation has been devised. The impact of this in Salt Lake City was that light rail vehicles could not leave their depot before 6:00 – so they could not be at the airport before about 7:00.

A solution came in an economic downturn, meaning that the freight service no longer needed to use the line in question.

Service start and end times are important, especially for employees. Reliable timed transfers at transit centres or other interchange points are valuable for optimal downtown or suburban distribution.

Information

There is a theory that, as the quality of an airport rail connection moves down from a dedicated Airport Express to a regional link to a suburban railway to light rail, so the standard of information needs to improve especially at the airport.

This is because an Airport Express is (or should be) almost self-explanatory. It is the airport in the city, very obvious and user-friendly as far as the traveller from abroad is concerned.

Almost inevitably, a high capacity light rail or metro system, designed for mass transportation within a city, is less geared up to the infrequent user and especially to the infrequent user who does not speak the local language.

So signage on light rail systems serving airports needs to be excellent. The presence on the web - including details on, and a link from, the airport's web-site – also needs to be excellent. Depending on the airport and the characteristics of its passengers, a multi-lingual section may be needed.

At St. Louis Airport, there is an information desk for the transit system in the terminal area, staffed by volunteers – an excellent idea. In Salt Lake City, the transition point between airport and light rail is called the Welcome Centre: it has the potential to distribute tourist information as well as guidance on the use of the (excellent) local transit system.

Lessons from systems in operation

Notes on all of the systems currently in operation are in the Annex which starts on page 33. The following lessons are drawn from these.

Surges of people

Historically, London City Airport has prided itself on being a queue-free airport. Check-in time is ten minutes: people know they can arrive and get through formalities without waiting in line.

Departing passengers arrived at the airport by car in ones and twos, and by bus in low tens and twenties.

However, once the Docklands Light Railway started to serve the airport, this changed. 200 people could arrive on one train: because it is a very short walk from platform to check-in and security, they all arrived there at much the same time. All of a sudden London City Airport had queues! This needed quick managerial action to increase staffing, and longer term measures to remove some of the physical bottlenecks which had resulted.

Mission creep

This is a military concept, deriving from forces being sent into a country to do a particular job and then that job gradually being added to so that they end up doing something quite different from their original task.

In this context, there is a danger that a light rail system put in to improve local public transport may be given too many different jobs and end up doing all of them badly. It is something which needs to be watched. In particular, it needs imagination in the planning phase.

In an airport context, it is possible for too much attention to be paid to the airport end of the business (or, of course, too little!). The amount of attention should be proportionate to the actual or potential business there and perhaps weighted in accordance with its importance to local economy.

It could, for example, be worth having luggage stacks on trains rather than just an open area for bikes, buggies and big bags.

It could be worthwhile having a limited-stop airport operation, especially early morning and late evening. This would certainly be popular with airport users, but it needs careful evaluation. This is where mission creep can come into the frame, because it may need a disproportionate amount of effort to make it work. It would impact on the timetable, because a limited-stop train will run faster than – and catch up with – the all-stations train in front. This will affect the service interval, possibly damaging the clock-face timetable used by many light rail systems. It may need sections of overtaking track, which is best provided at stations.

This kind of thing was investigated for Baltimore's system, and is being done on the system in Lyon on the line serving Lyon St-Exupéry airport (see page 59 below). Here, four tracks are provided at some of the stations so that the limited-stop airport service can overtake the all-stations service. It is not necessary to provide four tracks, incidentally: if trains are not too frequent it is possible, with careful timetabling, to provide three – two outer ones (one for each direction of travel) and one inner one, bi-directionally signalled, for trains in either direction to overtake trains going in the same direction.

Express services are planned for the system being built in Bergen¹¹: phase 1 of this is open, phase 2 is being built and phase 3 will serve the airport.

Parking

There is a range of attitudes to overnight parking at local rail stations generally. Some authorities prohibit overnight parking, presumably with penalties¹². Some passively allow it, although it is not always clear how it is charged for: it probably varies from place to place. A few actively promote it.

There is likely to be a demand from air passengers for secure overnight parking, for varying durations of stay. This and the level of demand will vary with location (how far is the station from the airport?) and the nature of the airport (business, leisure, charter, new entrant carrier: leisure trips tend to be of longer duration and involve more baggage). It is also likely to be quite difficult to assess what the level of demand actually is – so it probably needs testing, in a limited experiment. It is likely to need publicity, and a package (secure overnight or multi-night parking plus airport transfer).

Houston Metro has investigated use of technology to increase the security of its car parks¹³: the same technology could be used for secure overnight parking. They use CCTV monitoring together with the ability to open and close gates remotely and remote public address for security purposes: the same package could be used to create secure overnight parking for air passengers.

In Minneapolis/St. Paul, the Metro Transit web-site is initially unwelcoming. It says that overnight parking is allowed at Northstar commuter rail stations, but not 'generally' at light rail stations. However, further investigation shows that there is a Ramp-Ride-Fly programme, whereby air passengers can pre-book on-line for overnight parking at Ramp C, a downtown parking and transportation hub¹⁴. Discounted parking rates are available for stays of 3 days and more: this must be booked 72 hours in advance. Train tickets need to be bought separately.

San Jose is another example of a system which has dedicated secure premium air passenger parking lots – see page 83.

¹¹ International Railway Journal October 2009 p27, "Northern light" by Keith Barrow

¹² The website of Valley Metro, operating Phoenix's light rail system, explicitly warns that parking for more than 24 hours is forbidden – see http://www.valleymetro.org/park_and_rides/airport_connection (accessed 25 March 2013)

¹³ "Working to keep public transit secure and safe" by Susan R. Paisner in "Passenger Transport", 5 July 2010

¹⁴ http://www.mplsparking.com/reservations/ramp-ride_fly.aspx

The initial terminus of the DART Orange Line at Belt Line, connected to DFW airport by shuttle bus, has long-term parking – see page 45.

In Vancouver, there are restrictions on provision of parking along the Canada Line route, to protect airport parking revenues.

Hence it would be wise for a transit system to discuss with its airport well in advance the potential for remote parking at transit stations. Reactions will vary between airports – and also, probably, over time. Some may be hostile – and this may influence the decision to go ahead. Others may welcome and support it, and help with marketing. The latter reaction is more likely if the approach is made early on in the development of the project.

Funding

Two particularly good things about the Copenhagen system are its funding method and its passenger guarantee.

The funding came from the sale of development rights – land along the line of the light rail system increased in value as a result of the line being built, so it is entirely fair that the increase should fund the line. Portland (Oregon) has a similar arrangement (see page 73).

The passenger guarantee is described on page 39: that at Lyon St-Exupéry is on page 61.

In Dallas-Fort Worth, use of a sales tax as a funding source led to problems with planning and phasing work, especially when various options were possible: the discussion on page 44 illustrates this point.

In Okinawa there was debate with bus operators about compensation for lost revenues from discounted integrated ticketing – see page 70.

In Portland (Oregon) it proved possible to use pfcs to part-fund the airport railway: this was also the case in St. Louis and Minneapolis – St. Paul¹⁵.

Marketing

There have been some interesting marketing ideas at London City Airport – integrated air-rail publicity, and two separate entrances each with a different fare (see page 52). In addition, airport staff were to be encouraged to use public transport.

There are proposals under consideration in Phoenix for off-airport check-in (see page 71). Here too, airport staff were to be encouraged to use trains to relieve congestion on roads and in car parks.

The system at Minneapolis – St. Paul has heated platform shelters, to cope with the harsh winters.

Bremen (page 35) shows excellence in signage.

¹⁵ The aviation industry in the US is very averse to the use of aviation revenue – such as pfcs – off airport property

Vancouver's Canada Line trains have intercoms and passenger silent alarms for emergencies.

Costs

A review of the case studies discussed in detail later on in this report will show many where costs appear to have increased significantly during project development.

Why is this?

There are various reasons.

One is that price levels and project content are rarely defined in the technical press. Are price levels those ruling at the time of the forecast, in prices of the day (those actually incurred during the project) or in the price level ruling at the time of completion?

Is the project being referred to the complete project – including, for example, rolling stock? Has value engineering removed key elements to save costs? Do the costs quoted at the first stage of the project include all elements included at another (project management, for example)?

- The Copenhagen case study (page 37) shows evidence of this – the length of the route in phase 3 varies between reports.
- The case of the London City Airport extension is also interesting. The report cited on page 54 shows that the capital cost was forecast to be £140m in 2002: construction had an investment value of £175m and the 30-year concession was worth £300m.
- The Minneapolis – St. Paul case (page 67) shows an unexplained difference of \$114m in the final cost in the same report: a clear illustration of the difficulties of ascertaining the exact cost of a specific line.

More research is necessary to come to firm conclusions on cost inflation.

It should also be noted that the process of bringing costs to a common level using an index like the Retail Price Index (RPI) is flawed. The cost inflation of some items purchased for building a railway bears no relationship to those incurred by an average household (which is what the RPI measures). Iron, steel, copper and concrete are key materials whose prices will fluctuate in line with international demand and will bear no relationship whatever to changes in the costs of ordinary goods and services.

Around 2005, for example, high levels of demand from China led to considerable increases in the cost of steel worldwide. The price of this key element of light rail construction increased significantly more than general inflation.

More generally, the cost of light rail schemes does vary considerably, as a recent article in the technical press showed¹⁶. In France, costs tend to be low (£15.1m/km in Le Mans to £27.3m/km in Nice) because they do not include moving utilities. In the US, costs have ranged from £11.1m/km (Sacramento's Folsom line) to £46.8m/km (San Diego's Mission Valley line).

Patronage

The case studies detailed in the annex show a number of instances of systems exceeding forecast carryings (by 25% to 100%). This was true, for example, in Minneapolis – St. Paul (page 67), Nürnberg (page 69), Phoenix (page 72), Portland (Oregon) (page 76) and Vancouver (page 94).

No evidence has been found of over-estimation of patronage.

Other issues

There is good next train signage at Portland (Oregon) airport (see page 77), compared with poor signage for the less frequent service at BWI (see page 34).

It is generally reckoned that, for air passengers, the fare is irrelevant – but the service must give value for money. People will pay a premium fare for a premium service, but will object to paying a premium fare for an ordinary service which happens to go to an airport.

Systems in St. Louis and Minneapolis – St. Paul provide free inter-terminal transfers. At Minneapolis – St. Paul in 2006, the Airport Authority noted cost savings of around \$1m a year in bus shuttle costs from use of light rail rather than bus for inter-terminal transfers. No doubt this also leads to a reduction in CO₂ emissions.

At Vancouver, the Canada Line is used for transfers between Air Canada offices and the terminals (see page 92): some Zürich hotels encourage use of light rail by not providing shuttles (page 96).

Consideration has been given to use of light rail for freight in Bremen (see page 35), Portland (Oregon) (page 76) and Vancouver (page 89).

¹⁶ “Dispelling the myth of the UK’s ‘expensive’ tramways” by Howard Johnston in *Tramways & Urban Transit* February 2013 p48

Airport integration

General

The ability of light rail to negotiate steep gradients and tight curves should mean that it can more easily be fitted into airport infrastructure as well as the urban landscape.

Stations at airports

It is important for ground transportation to serve places at the airport where potential passengers want to go – the terminals, airport hotels, and major employment centres like the cargo and maintenance areas. This is easier to do with operations which are at the lighter end of the light rail scale.

Of the light rail systems in operation

- The one at BWI has two stops at the airport, one of which serves the terminal. This stop is very convenient for international passengers since it is adjacent to international arrivals. However, it can involve a long walk for domestic passengers - especially those of Southwest, whose gates are at the opposite end of the horse-shoe shaped terminal building complex. The second stop serves the BWI business district.
- St. Louis Lambert airport has two light rail stations, one for each terminal, as does Minneapolis – St. Paul.
- Zürich's new Glattalbahn serves both the passenger terminals and the cargo area.

All others have just one station at the airport.

Vancouver's Canada Line has a stop at the main terminal (at the junction between the domestic and international parts of the terminal). Another stop, Sea Island Centre, serves Air Canada's offices. Rides between these two stops are free of charge, encouraging airline staff to use light rail – which saves the expense of operating staff buses.

Airport size

Most European airports with light rail services are relatively small: the largest are Copenhagen with over 21 million passengers and Zürich with nearly as many: the next largest is Porto with 4 million. Hence there is limited need for multiple stops.

The situation in North America is different: the airports with a light rail connection are larger (10 million – 20 million annual passengers). Public transport access to airports tends not to be regarded as a priority, so it can be given sub-optimal sites in terminals. In part this stems from the fact that airports make a significant amount of revenue from car parking and car rental (although IARO has statistics to show that many airports make more from retail and catering than from parking). Another issue is that people using public transport have sometimes been regarded as down market, not suitable to come too close to an airport terminal!

Future plans

Airports with light rail in planning or construction.

The IARO database shows the number of planned light rail connections to airports at the start of 2013 as follows. This compares with 29 in operation as this report was being completed (see page 11).

Region	Number of planned light rail links	Number of other planned links
Australia/New Zealand	4	14
Europe	47	130
Middle East and North Africa	12	26
Southern Africa	5	9
North America	55	68
South America	8	23
Asia	14	52

It has to be said that some of these plans are firmer than others. Some of the links were under construction: a few are unlikely ever to be¹⁷. But it gives an idea of the scale of developments in this market.

Clearly, light rail is more popular in some parts of the world than others – 81% of planned North American links are light rail, compared with 25% of those in Asia. In the rest of the world, between a quarter and a half of planned links are light rail. The high percentage in North America may be associated with the difficulty of using existing freight rights of way for new heavy rail passenger services.

¹⁷ for example a tram extension to Euroairport Basle/Mulhouse/Freiburg, evaluated in 2002, is unlikely to be built: plans have been superseded by plans for a heavy rail link

Conclusions

IARO's role

As has been noticed in other areas of air-rail intermodality, a number of different solutions have evolved in different places to solve similar problems.

The role IARO can play is to inform organisations about those different solutions and, where possible, their benefits and disbenefits. This approach is especially valuable to people wishing to introduce similar systems, but will also be of use to those already running them.

Timeline

Most existing projects are relatively new, but Blackpool and Essendon airports are on old tram routes.

Hamburg and Chicago Midway airports were on long-standing tram routes (and were probably not alone), but these have now been withdrawn. Hamburg certainly had one of the first airport rail connections, and almost certainly the first light rail connection, in the world¹⁸ (as well as claiming to be the oldest operating airport in the world¹⁹).

Mülheim/Ruhr Airport used to be served by tram route 104, but this ceased in April 2012²⁰. The airport is the base for Westdeutsche Lutwerbung, making air advertising airships.

The future

We hope to keep this report updated: feedback from readers would be welcome.

¹⁸ It opened in 1928 – see Airports International March 2011 page 19, “Hamburg is 100” by Tom Allett and Katja Tempel

¹⁹ The airport opened in January 1911 (“Expanding airport capacity under constraints in large urban areas: the German experience” by Hans-Martin Niermeier. OECD ITF 2013)

²⁰ Although continued closure and funding for its continuation is still a matter of dispute between the operator and the regional transportation authority, according to a report in Tramways & Urban Transit for March 2013 (page 108)

Annex: where light rail serves airports

Purpose

This annex reviews all known light rail systems serving airports which were in operation at the time of publication (March 2013). It gives a history of the planning and implementation of the system, then a brief description of the service and any key issues.

The source is IARO's unique database.

The level of coverage varies from system to system. Some have a significantly more complex planning history than others. For some, there is good information about development history, key issues and the service provided; but for others only limited information is available.

Baltimore-Washington International (BWI)

History

In early 1994²¹, Maryland Mass Transit Administration (MTA) was awarded an FTA grant to acquire land and undertake further engineering work for three extensions to Baltimore's Central Light Rail Line. Scheduled for service in 1997, they were to provide new routes southward from Timonium to Hunt Valley, southward from Linthicum to BWI Airport and a short spur from Mount Royal to Penn station. Tenders had been requested under a turnkey project.

For these, 18 new vehicles were ordered in late 1995 from ABB Traction by the State of Maryland for delivery between February and June 1997²².

The 3.2 km spur to BWI was planned to extend directly into the airport's new international terminal, which was under construction in 1996²³. Revenue services on this route began on 6 December 1997, linking the airport with Baltimore Penn station²⁴.

Service frequency on the airport line doubled on 13 December 1999, to every 17 minutes. It should have started with this frequency, but the rolling stock was delivered late. Ridership in early 1999 was reported to be around 1,900/day²⁵.

The MTA timetable dated 30 January 2000 showed that trains from the airport ran between 5:23 and 0:05, with trains back running between 5:04 and 23:04 (11:03 – 20:07 and 10:44-19:14 on Sundays). Journey time was 45 minutes.

²¹ PRm April/May 1994 p7, Urban Briefs

²² PRm November 1995 p7, "ABB Traction to build more Baltimore LRVs"

²³ PRm May/June 1996, "Baltimore light rail wins Federal funds"

²⁴ Railway Gazette International February 1998 p74

²⁵ Tramways & Urban Transit March 1999 p110

At the end of 1999, it was announced that doubling of the 15 km of single track sections on eight parts of the route was to start in mid 2000, in a seven year project costing \$150m²⁶. This meant temporary suspension of the airport service.

In mid 2004, it was reported that, with double-tracking on the south end of the Central Light Rail Line proceeding on schedule, MTA planned to resume service from Camden Station to North Linthicum in July. Construction, which began in early March, had been substantially completed and test trains were running. The segment included six stations that had been closed since the end of February, a controversial step that had been taken to help complete work and restore service to the majority of stations three months ahead of schedule. BWI Airport station would re-open in autumn. When the entire project was completed in March 2006, about 90 percent of the system would be double tracked, leaving only 4.2 km with one track where lack of available land made expansion impossible²⁷.

By 2010 the service from the airport had stopped serving Penn station, running between BWI and Hunt Valley instead. It is not known when the routing changed.

Description of the service

This is a multi-stop light rail system with dedicated right of way outside the downtown area and street running inside. The system has a core main line with branches.

Issues

- The first train is not until 10:45 on Sundays – very late for air passengers and too late for employees
- There are four steps up into trains
- There is no formal baggage space
- Train times are not on the airport FIDs – although those of Amtrak and MARC trains are. Service on the light rail line can be as infrequent as two an hour, and start quite late, so train information is needed
- The journey is relatively slow: it takes 45 minutes from airport to downtown with 11 intermediate stops
- There are stops by the Convention Center and major downtown hotels, convenient for inbound passengers

²⁶ Railway Gazette International November 1999 p696

²⁷ Rail Transit On Line 15 June 2004

Blackpool

History

The tram has been serving the airport area since 1931²⁸.

A study commissioned by the Borough Council and Lancashire County Council from Steer Davies Gleave in 2001 recommended a new link running closer to the airport at Squires Gate²⁹. In 2006, the airport expressed an interest in improving the line near the airport³⁰.

In October 2010, the OLE was upgraded from 550v to 600v DC to allow for an intensification of service. Tender documents for a consultancy study were being prepared: one option was extension of the tramway down Squires Gate Lane to the airport (something originally proposed in World War II)³¹.

As part of a Fylde Coast Transport Study, plans for extending the tramway from Starr Gate into Blackpool Airport were being considered in 2011³².

Description of the service

Trams run mostly on street every 7 minutes to city centre from Squires Gate station (about a kilometre from the airport).

Issues

- With the nearest stop around a kilometre from the airport, it is not really a good connection, although plans are under consideration to improve this.
- That said, the airport itself is small, with relatively few commercial flights and around half a million passengers a year

Bremen

History

23 May 1998 saw the inauguration of the 1.6 km stretch of line 6 to the airport. This was partly a reconstruction of an earlier tram route which had served the airport since 1934^{33,34}.

²⁸ "Railways and aviation" by Michael Pearson (undated)

²⁹ Tramways & Urban Transit September 2001 p324/5

³⁰ Tramways & Urban Transit September 2006 p333, "Cash at last will kick-start Blackpool's tram revival"

³¹ Tramways & Urban Transit October 2010 p386, "Blackpool tramway's new wave" by Paul Grocott

³² Modern Railways June 2011, Modern Railway Update page 9, "Blackpool tramway extension considered"

³³ "Railways and aviation" by Michael Pearson

³⁴ Tramways & Urban Transit March 1999 p93

A 2002 report said, “The 1998 extension from the BSAG depot to the airport is to be made suitable for the carriage of freight traffic for the Airbus production facility.”³⁵

Description of the service

Tram no. 5 takes 15 minutes, and runs largely on street every 7.5 to 10 minutes with 8 stops between Hbf and the airport³⁶. It is 22 metres from the airport stop to check-in.

Issues

- There is high profile publicity at the airport – quite un-missable, and an excellent example of good practice

Bucharest Baneasa

History

Baneasa is the city’s domestic airport, used for internal flights.

A 2005 map showed the status of the tram to Baneasa and on to the international airport at Otopeni as “Upgrading planned”³⁷.

A 2007 map showed tram route 5 terminating at Baneasa airport, and a proposed metro (line M5) going to both Baneasa and Otopeni. The text said, “In June 2006, it was decided to build a branch from M4 to serve Otopeni International Airport and the smaller Baneasa Airport”. This branch is line M5, leaving line M4 at Carpati³⁸.

Description of the service

City tram route, probably to be upgraded.

Issues

- No information

Chongqing

History

A 2002 report said that construction of light rail line 5 was to start after 2010: in the long term the line was to be extended northwards to Jiangbei airport³⁹.

³⁵ Tramways & Urban Transit December 2002 p464

³⁶ Swissair timetable winter 1997/98

³⁷ Metro Report 2005 p25

³⁸ Tramways & Urban Transit August 2007 p302, “New trams, line refurbishment” by C.J.Wansbeek

³⁹ <http://www.britishembassy.org.cn/english/chongqing/cpiswc1.shtml>, accessed 14 November 2002

A 2007 report about the airport noted that, “The new terminal also encourages the development of infrastructure for the surrounding area, with a new monorail and subway already under construction”⁴⁰.

Monorail line 3 was extended north by 21.8 km to Jiangbei International Airport from 30 December 2011. In addition, a 4-station Airport Express (line 10) was proposed⁴¹.

Description of the service

Multi-stop monorail.

Issues

- No information

Copenhagen (København) Kastrup

History

In 1996, it was reported that tenders for phase 1 of an automated light metro were being evaluated. It would run to Ørestad with a connection to the airport. Phase 3 was to open in 2003: it would use a disused freight line (the Østamager Line) along east coast of Amager Island to the airport⁴².

Work started in October 1996 on the construction of the first 15 km of the 22 km Copenhagen mini-metro. It was reported at the time that a third phase would extend the system from Lergravsparken to Kastrup Airport⁴³.

By the summer of 1997, it was noted that, “Work is in progress to build a mini-metro in Copenhagen. Construction is by the British Comet consortium whilst rolling stock and control gear will be provided by Ansaldo Trasporti of Italy. Stage 1 of the plan involves a line from Norreport south east to Christianhavn with a 4.3 km branch to Lergravsparken and an 8.4 km branch to Vestamager. Stage 2 will be a 5.4 km extension west to Vanløse and stage 3 from Lergravsparken south to Kastrup and the airport. Trains will be 40 metre three-car articulated units seating 96 people, weighing 53 tonnes, and operating off a 750v dc overhead system”⁴⁴.

At the end of 1998, the 11 km phase 1 of Ørestad mini-metro was forecast to cost \$750m. Much of the funding was to come from the sale of property development rights on the island. For later extensions, the sources of the funding for the airport link were the city of Frederiksberg and Copenhagen County. The metro to Kastrup was planned to open in 2004, although a 1997 report commented that no station sites had been reserved and there was no obvious provision at the airport.

⁴⁰ Airports International September 2007 p21, “A glimpse into China” by Peter Budd

⁴¹ Tramways & Urban Transit March 2012 p110

⁴² International Railway Journal May 1996 p41, “Copenhagen invests in light and heavy rail”

⁴³ International Railway Journal November 1996 p 41, “Ansaldo wins in Copenhagen”.

⁴⁴ Today’s Railways June/July 1997 p41

Carl Bro and Maunsell began design work on phases 2b and 3 in August 1998, using an integrated team of engineers in the UK and Denmark. The link to the airport was to be on embankment and viaduct, with six stations including one at the airport: it would cost £90m⁴⁵.

In Autumn 1999 it was reported that, “There is still no official decision about stage 3 of the metro, which will extend the line south of Lergravsparken along a disused freight line towards the airport. The southern half of the 4 km extension lies in Copenhagen County. The county is involved in financing part of the extension but feels that a proposed light rail link along the Ring 3 highway connecting the large suburban towns of Lyngby, Herlev, Glostrup and Hundige has a higher priority. In the probable event of the extension receiving the go-ahead, a site for the elevated metro airport station has been reserved at the tip of the delta wing formed by the mainline station terminal. The extension to the airport is of great importance to the metro as this will be the source of a large number of passengers, especially airport employees many of whom live on the island of Amager”⁴⁶.

Bids were received in December 2002 for phase 3 of the metro. It was then forecast to open in 2007⁴⁷. This phase was 4.5 km long, of which 0.5 km was underground. The cost was forecast to be DKK 1.5bn. Projected usage of the extension was 5 million passengers/year⁴⁸.

In early summer 2007, there was a report that the airport extension was to open 28 September 2007, a month early⁴⁹.

In Autumn 2008, Metroselskabet said that, for the last 5 months, there had been about 5,000 passengers a day using the airport station⁵⁰.

Remodelling of Terminal 3 at the airport was completed on 5 June 2009. Improvement of the rail and metro interchange had been a key point because up to 54% of travellers reached the airport by public transport. The previously separate rail and metro stations had been better integrated, and new escalators had been provided to connect the metro platforms. The ticket office had been moved to free up floor space⁵¹.

⁴⁵ PRm November/December 1998 p9, “Copenhagen metro phases 2b and 3”

⁴⁶ International Railway Journal September 1999 p44, “Copenhagen’s first metro line takes shape”

⁴⁷ Railway Gazette International January 2003 p31

⁴⁸ International Railway Journal October 2005 p42, “Copenhagen plans ring metro line”

⁴⁹ International Railway Journal July 2007 p13

⁵⁰ Email from Metroselskabet, 12 September 2008

⁵¹ Airports of the World July-August 2009 p8, “Copenhagen T3 remodelled”

A 2012 report⁵² said that the airport had invested in and built the metro station at the airport. The source, the airport authority web-site, merely says it built the station⁵³, although the authority's annual report for 2007 confirms that it did in fact invest⁵⁴.

Description of the service

The trip from the airport to Kongens Nytorv in downtown Copenhagen takes 15 minutes. Tickets can be bought at ticket machines or at the counter in Terminal 3. The trip between the airport and downtown Copenhagen costs DKK28.50 (approximately €3.82 or \$4.75).

The Metro leaves every 4-6 minutes depending on the time of day, and runs between 05:00 and 24:00 (Thursday and Friday around the clock)⁵⁵.

Issues

- Access between light rail and the airport was initially complex and not intuitive – this has been cured by subsequent remodelling
- There is no baggage space on trains
- Downtown stations are inconspicuous, with low-key signage
- Good central area distribution – better than the heavy rail link, which serves Central Station, and northern and western suburbs as well as Skåne
- The metro was planned to have a passenger guarantee - if there was a delay of more than 30 minutes, passengers could take a taxi and would get a refund of up to 200 DKK⁵⁶

Dallas-Fort Worth (DFW)

History

A 1998 report said that, “In the next 15 years, DART will add 33 miles of light rail service to suburban cities and 27 miles of commuter rail to Dallas Fort Worth Airport and to the city of Fort Worth”⁵⁷.

⁵² “Airport competition in Europe”. Copenhagen Economics June 2012 p92. See http://www.moodiereport.com/pdf/Copenhagen_Economics_Study_Airport_Competition_2012.pdf

⁵³ “The airport today – 2000+” at <http://www.cph.dk/CPH/UK/ABOUT+CPH/History/The+airport+today+2000+plus.htm> accessed 8 April 2013

⁵⁴ <http://www.cph.dk/NR/rdonlyres/9C952BC8-8FB4-4702-A6A2-A61C7D568D9D/0/GroupAnnualReport2007.pdf> accessed 8 April 2013

⁵⁵ www.copenhagenpictures.dk/getting-from-cph-to-copenhagen-copenhagen-pictures.html, accessed 16 November 2007

⁵⁶ Mass Transit September/October 1997 p81, “Driverless metros are on a roll” by Larry Fabian

⁵⁷ Mass Transit March/April 1998 p17. Metric equivalents are 53 and 44 km

Among the routes being considered was a link between downtown, Love Field Airport, a new sports arena, Las Colinas, and DFW Airport (which employed 50,000 people)⁵⁸.

The light rail route to Farmers Branch, Carrollton and Irving was to start at the existing West End station and follow the Trinity Railway Express (TRE) right-of-way to Medical Center station before crossing into Harry Hines Boulevard.

Just northwest of Love Field airport station, the line would divide, with one route heading north on a Union Pacific corridor through Farmers Branch to Frankford Road in Carrollton: this was to open by 2008.

The other line would continue northwest past the University of Dallas, then north along state highway 114 and through Las Colinas to a temporary terminal in Irving. This five-station segment could be open as early as 2008, with a two-station extension to DFW Airport following in 2012⁵⁹.

On 10 June 2000, the DART board of directors voted to ask voters for the authority to issue long-term bonds to speed up light rail construction. The agency was then constrained to five-year financing, which limited long-term planning for LRT expansion. The special vote was to be held in August and, if approved, could mean that trains would reach destinations such as Carrollton, South Oak Cliff, Rowlett and DFW Airport five years sooner than anticipated. The sale of up to \$2.9bn in 30-year bonds would not trigger a tax increase: the existing 1% sales tax would still be the main local revenue source. The proceeds would be used to help build around 80 km of new light rail routes in addition to the 38 km now under construction⁶⁰.

The bond package was approved overwhelmingly by the electorate of North Texas on 12 August 2000. The first new line to be financed by this was to be the extension to Fair Park and Pleasant Grove, followed by the initial sections of a \$1.4bn route serving Love Field and DFW airports⁶¹. Light rail to DFW was then thought likely to open in 2010⁶². Preliminary engineering for these lines was to get under way by the end of 2001⁶³.

In 2000, plans called for completion of an implementation plan and the start of environmental studies by the end of 2001. No construction funding had been identified but the authorities were counting on a substantial federal contribution⁶⁴.

At the first meeting of the Airport Regional Transportation Committee in June 2001, DFW officials said that construction of a commuter rail station at the airport should be fast-tracked as part of a strategy to make the airport the hub of a regional rail system. But the project needed to start soon to be ready for the 2012 Olympics, which Dallas hoped to host.

⁵⁸ Railway Gazette International December 1998 p872, "Success drives DART expansion" by Julian Wolinsky

⁵⁹ Rail Transit On Line 15 March 2000 - "Dallas – More LRT"

⁶⁰ Rail Transit On Line 15 June 2000 "DALLAS – New Funding Source"

⁶¹ Rail Transit On Line 15 August 2000

⁶² Railway Gazette International September 2000 p516

⁶³ Rail Transit On Line 1 December 2000

⁶⁴ Rail Transit On Line 1 July 2000

One option was to build direct connections from the TRE line from the east and west to the terminal area, and a north-south line between the CentrePort/DFW Airport station and the terminal. Another was to build an underground tunnel from Dallas to the terminal area for a light rail line. See plan, page 46.

Airport officials considered that the time frame for the \$750,000 planning and implementation study was short and the focus had to be on achievable goals. Also, rather than dealing with the politics and timing of future commuter rail lines, such as the controversial Cotton Belt line, the study would focus only on the airport and its immediate surroundings.

During the initial phase, which would cost about \$197,000, they would identify which neighbourhoods would use a DFW train the most, and would evaluate the most valuable rail line options.

The second phase would cost about \$432,000 and would include the selection of a strategy and public input.

The remaining \$120,000 would be used as a contingency fund or for the final engineering and environmental analysis. At that point, it should have become clear which federal agency would be asked for money - the FTA and the FAA were among the possibilities - and which authority should ask.

Funding for the construction of the rail station had not been secured. Although use of pfc's might be possible, it was thought more likely that federal funding would be needed.

Officials of DFW, the North Texas Council of Governments' transportation department, DART, Fort Worth Transportation Authority and the Texas Department of Transportation (Fort Worth and Dallas districts) were involved in the planning.

The public would get its first sight of the project in early July, when DFW conducted its first focus group. After a list of viable options was compiled, there would be a public meeting⁶⁵.

In July 2001, it was reported that officials at DFW Airport believed construction of a passenger railway into their property was imperative to maintain convenient access and to improve the region's chances of being awarded the 2012 Olympics. Although only a broad concept, a station location had been identified between Terminals C and E in the median of International Parkway.

What kind of trains would serve the station was yet to be decided, but the two obvious alternatives were commuter rail (TRE) or an extension of DART's light rail network. If commuter rail were selected, a north-south line could be easily built between the existing CentrePort/DFW Airport station and International Parkway.

In April 2002, officials made public a four-phase plan to provide comprehensive rail service to DFW.

⁶⁵ Fort Worth Star-Telegram, Texas 20 June, 2001 "Officials Study Dallas-Fort Worth, Texas, Airport as Rail Hub"

Phase 1 was operating, with TRE commuter trains providing hourly service from Dallas and two-hourly service from Fort Worth to CentrePort/DFW station. A dedicated bus shuttle running non-stop to the various airport terminals met each train⁶⁶.

Phase 2 would be part of a planned commuter rail service from Fort Worth to north east Tarrant County over the former Cotton Belt (St. Louis South Western) railroad line.

Phase 3 would be light rail from Dallas, and three possible routes had been examined. Two of these would circle runways to reach the terminals, but the third would be in tunnel beneath the runways. The chosen alternative would be completed by 2010.

The fourth phase would extend TRE into the airport. This option received the lowest priority because it was about twice as far from the terminals as the Cotton Belt alternative and would cost about twice as much.

All four phases would connect with the soon-to-be-built airport people mover that would replace an existing system, looping though all terminals and extending to parking, car rental offices and other facilities (although this, of course, was airside, unlike its predecessor). Total cost to complete all four phases was estimated at \$287m. Estimated usage was 12,500 riders daily⁶⁷.

A month later, it was noted that with stage 2 of the LRT nearly complete, attention was moving to the 66 km stage 3, due to be completed by 2010⁶⁸. It was to serve Love Field and DFW⁶⁹.

In 2003 a connection from DFW airport to Dallas involving an extension of DART's proposed north-west light rail line through Irving to the airport was proposed. Although DART and Irving city officials were sketching out an alignment, completion of this line was estimated for 2014, three years later than originally anticipated because of DART's looming financial crisis⁷⁰.

In 2006, it was said that stage 1 of the DART light rail extension to DFW would go to Belt Line Road because of new taxiway considerations. The location of the airport terminal of the light rail system was also under review: it might be at the international terminal⁷¹.

⁶⁶ This was the report in Rail Transit On Line, but it is not known if buses ever ran direct from CentrePort to the terminals: certainly more recently, they ran to Remote Parking South where passengers had to transfer to another bus to the terminals. Only when the Orange Line was extended to Belt Line at the end of 2012 did buses run direct between the terminal and CentrePort station (see page 44)

⁶⁷ Rail Transit On Line 15 April 2002

⁶⁸ Note that these stages are not the same as the phases referred to above

⁶⁹ Rail Transit On Line 15 May 2002

⁷⁰ Rail Transit On Line 15 May 2003

⁷¹ Discussion with Thomas Marking, S.R.Beard & Associates, at the South Central High Speed Rail Conference January 2006

In May 2006, it was noted that construction was to start in late 2006 on an expansion programme of the DART light rail system. This would include a north-west line to Love Field and Carrollton and a branch to Las Colinas and DFW⁷².

A \$700m full funding grant agreement (FFGA) was signed in July 2006: this launched the \$2.5bn expansion of the DART light rail system. The system would double in size, to 145 km, by 2013. The FFGA would support a 34 km north-west to south-east Green Line linking Farmers Branch, Love Field and Pleasant Grove. It would be completed by 2013. The Orange Line would serve Las Colinas and DFW by 2013⁷³.

A 2007 report said that the western terminus of the Orange Line would be north of DFW. It was not clear whether the airport terminals would be served, or a shuttle bus provided for the last 1.5 km⁷⁴.

However, a presentation by Curvie Hawkins⁷⁵ in 2007 showed a DART station at Terminal A and The T's Cotton Belt line from Fort Worth having a station at Terminal B. There would be a connector between the two. Both lines would come into the airport from the north.

According to an EIS document, the proposed DFW North station would be at the intersection of the south-west to north-east line from Fort Worth and the DART line from Dallas. Both lines would then run in parallel to the airport, where there would be separate stations – The T at Terminal B and DART at Terminal A. These stations would be under the connector road bridge, and separated by a kiss'n'ride lot. They would be at the extreme north ends of their terminal buildings⁷⁶.

In December 2008, it was reported that DART had awarded a design-build contract for the first two sections of the Orange Line to a joint venture of Kiewit, Stacey and Witbeck, Reyes, and Parsons. The value was \$430m, for 14.5 km including 6 stations from Bachman on the Green Line to Belt Line Road adjacent to DFW Airport. A contract for the third section was to be awarded later. Phase 1 to Las Colinas was to be completed by December 2011: phase 2 a year later and the airport section by December 2013⁷⁷.

The T planned to run along the Cotton Belt line between Fort Worth and the airport by 2013. DART planned to operate along the same line from the airport east to Plano. But one option published in May 2008 for fast-tracking their part of the Cotton Belt line was to end the Orange Line at the Cotton Belt line station, DFW North, where passengers would transfer to the Cotton Belt line or a shuttle bus into the airport. This would remove the direct Dallas – airport connection.

⁷² Tramways & Urban Transit May 2006 p197

⁷³ Passenger Transport 10 July 2006 p3, "FTA approves \$700m FFGA for Dallas light rail"

⁷⁴ Tramways & Urban Transit February 2007 p58, "Passenger boom fuels major expansion" by C.J. Wansbeek

⁷⁵ Planning Manager of The T, the Fort Worth Transportation Authority, at the Texas Transportation Summit August 2007

⁷⁶ Southwest to Northeast EIS newsletter February 2008

⁷⁷ Rail Transit On Line 17 December 2008, "Orange line design-build contract awarded"

Alternatively the Cotton Belt line could bypass the airport, with a connection onto the Orange Line into the terminal area⁷⁸.

There was then a time of confused stories about routes into the airport. The sketch map on page 46 may help.

One of these was a report in the Dallas News⁷⁹. This said that the Orange Line could go to the terminals and then loop back to the Cotton Belt line just north of the airport, with every third Orange Line train running along the connector and the rest following the original Orange Line route.

According to DART's website in 2009, the Cotton Belt Line alignment was to be extended into DFW. However, an option was to extend the Orange Line to connect to the Cotton Belt Line at Airport North station, with the Orange Line or a shuttle continuing south to the DFW Terminal area⁸⁰.

In May 2009, the DART Board decided that the final section of the Orange Line was to connect to Terminal A at DFW by December 2013. There was also a plan for a future light rail connection from the Orange Line to the Cotton Belt line, which crosses airport property north of SH 114. DART wanted to use this to connect the Red Line at Plano to DFW by 2027. The T planned to operate trains between Fort Worth and the airport by 2013⁸¹.

A 2009 report said that the 8.7 km segment between Bachman and Irving Convention Centre was to open in December 2011, with a 6.3 km extension to Belt Line Road the following December and the final 7.56 km to DFW Airport in December 2013⁸².

However, another report in 2010 said that lower than expected sales tax receipts were likely to cause a 10-year delay to the Orange Line extension to DFW⁸³.

A new financial strategy was presented to the DART Board on 10 August 2010, seven weeks after DART announced that there was insufficient funding to build the third phase of the Orange Line into the airport because of lower-than-expected sales tax revenue. It was based on a re-examination of spending and revenue estimates together with new income sources, cost cutting and more borrowing⁸⁴.

⁷⁸ Texas Cable News 17 May 2009, "Irving sees red over possible changes to DART's plans for Orange Line connecting to D/FW airport" by Brandon Formby, www.txcn.com accessed 3 June 2009

⁷⁹ 31/5/09, "Irving officials wary of DART's new Orange Line plan" by Brandon Formby, www.dallasnews.com accessed 3 June 2009

⁸⁰ www.dart.org/CottonBeltppp, accessed 3 June 2009

⁸¹ Destination Freedom 6 July 2009 page 8, "Board sets Orange Line connection to DFW airport: opening set for December 2013"

⁸² Global Mass Transit Report November 2009 p37, "Dallas light rail expansion project, USA"

⁸³ Dallasnews.com 24 March 2010, accessed same day. "Dallas transit officials warn of service cuts, trouble for new rail projects as funds dry up" by Michael Lindenberger

⁸⁴ Rail Transit On Line 18 August 2010, "LRT to DFW may be possible after all"

In October 2010, it was reported that the DART DFW line was to be completed by 2014⁸⁵.

In December 2011, it was confirmed that construction of the final section of the Orange Line to DFW Airport was scheduled to begin in 2012⁸⁶.

In January 2012, it was noted that a joint venture of Kiewit/Stacey and Witbeck/Reyes/Parsons had won a \$150m design and build contract to extend the Orange Line to DFW Terminal A by December 2014⁸⁷.

In March 2012, it was reported that the extension to the airport would cost \$1.25bn⁸⁸.

In June 2012, it was reported that the second section of the Orange Line was to be completed by December 2012. This would put it on airport property⁸⁹.

Another report the same month listed TEX Rail⁹⁰ stations. DFW North station was to be built between Grapevine and DFW and would give connections to DART. DFW Airport station was to be the terminus, sited between Terminals A and B⁹¹.

In July 2012, a press release said that DART would open the second phase of the Orange Line to North Lake College and Belt Line Road on 3 December. At Belt Line station, buses would meet trains to take passengers to DFW Airport. DFW station was scheduled to open on 15 December 2014⁹².

It was reported in November 2012⁹³ that bus route 500 would run from Belt Line Station on the Orange Line to Terminal A at DFW (7 days a week) and then continue to CentrePort (Mondays – Saturdays). It would connect with DART and TRE. It would have a 15 minute interval in rush hours, run every 20 minutes off peak, and every 30 minutes late evenings. The press release said that there would be long term parking at Belt Line Station⁹⁴.

⁸⁵ Rail Transit On Line 6 October 2010

⁸⁶ Passenger Transport 19 December 2011 p17, “New destinations ahead: opportunities abound” by Gary C. Thomas

⁸⁷ Railway Gazette International January 2012 p17

⁸⁸ Tramways & Urban Transit March 2012 p114

⁸⁹ Passenger Transport 4 June 2012 p6, “At DART, 250 million passengers is a good start” by Gary Thomas

⁹⁰ The new name for the Cotton Belt Line

⁹¹ Passenger Transport 4 June 2012 p26, “Fort Worth’s TEX Rail moves forward to construction”

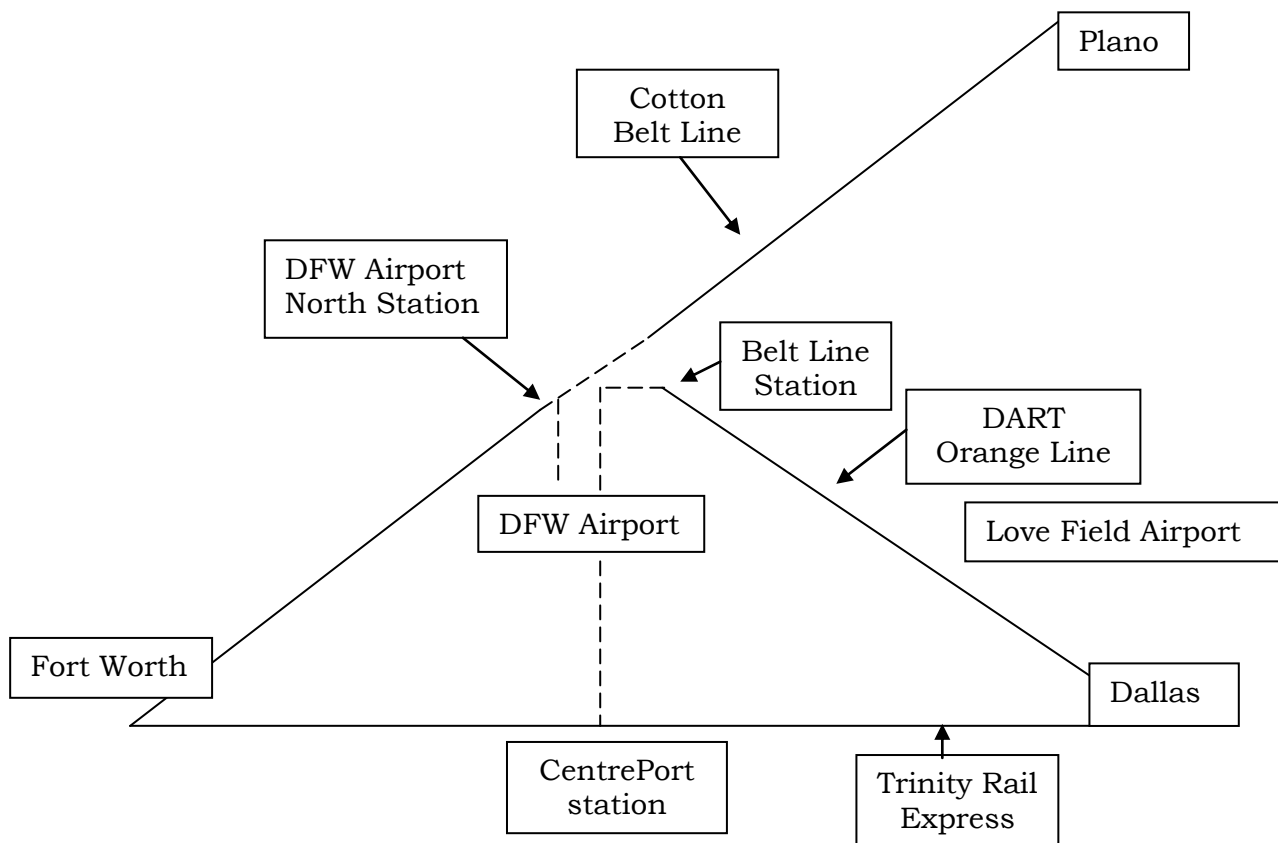
⁹² DART News Release 23 July 2012 accessed 17 August 2012, “DART Rail Orange Line opens new possibilities in Irving”. www.dart.org/news/news.asp?id+1022

⁹³ “DART to open 2 airport lines” in <http://www.metro-magazine.com/news/story/2012/11/dart-to-open-2-airport-lines.aspx> 13 November 2012 accessed 23 November 2012

⁹⁴ DART’s web-site (<http://www.dart.org/riding/paidparking.asp>) talks about a charge for long term parking of \$7/day for residents, \$9/day for non-residents – people living outside DART’s service area. People using long-term parking are asked to enter the number of days they intend to leave their car and pay at the quoted rate for each 24 hours

In mid December 2012, the FTA approved a \$119.9m Transportation Infrastructure Finance and Innovation Act (TIFIA) loan which would help finance the \$397m Orange Line Phase III expansion. The 35-year loan would be used to fund construction of an 8.3 km segment of DART's 23.4 km Orange Line⁹⁵.

Further funding of \$120m came in the shape of an FRA loan for the final segment into the airport: at the same time, the RTC approved \$100m to purchase 20 diesel LRVs for the TEX Rail line⁹⁶.



Description of the service

Orange Line of the DART light rail system between downtown Dallas and Belt Line, with a bus shuttle (route 500) to the airport. There is some on-street running, but generally the Orange Line runs on segregated track.

Bus 500 is not a dedicated shuttle: it calls at intermediate points between Belt Line and DFW. At DFW, it only serves Terminal A then runs non-stop to CentrePort (most journeys, not Sundays). It does not connect with every train: it runs on a 20" interval service. On the Orange Line, there is a Bachman – Belt Line shuttle operating earlier in the morning than the Dallas – Belt Line trunk service⁹⁷.

⁹⁵ DART news release 14 December 2012 accessed 17 December 2012, "U.S. Department of Transportation Approves \$120 Million Loan to Strengthen Public Transit in Dallas" <http://www.dart.org/news/news.asp?ID=1045>

⁹⁶ Tramways & Urban Transit March 2013 p111

⁹⁷ Notes of visits, January 2013. Trains from Bachman to Belt Line start at 3:50: the first train from downtown Dallas is at 4:25 and the next at 6:27

Issues

- None known

Dallas Love Field

History

Among new routes being considered for light rail in December 1998 was a link between downtown, Love Field Airport, Las Colinas and Dallas-Fort Worth International Airport⁹⁸.

The route to Farmers Branch, Carrollton and Irving was approved in February 2000 by the DART board following a two-year major investment study. It was forecast to cost \$1.4 bn⁹⁹.

It was to start at the existing West End station and follow the TRE right-of-way to Medical Center before switching into Harry Hines Boulevard. It was hoped to have the 11-station initial section serving Love Field open by 2008.

A bond package was approved by electorate of North Texas on 12 August 2000. This allowed DART to sell long-term bonds instead of being limited to 5-year ones, and this accelerated construction of the system. The first new lines so financed were to be the extension to Fair Park and Pleasant Grove, followed by the initial sections of a \$1.4bn route serving Love Field and DFW airports¹⁰⁰.

In May 2002, with phase 2 of the LRT nearly complete, attention was moving to the 66 km phase 3, due to be completed by 2010, which would serve Love Field and DFW¹⁰¹.

In August 2002, a budget deficit caused by reduced sales tax revenues for DART was threatening the \$161m Love Field extension. The split of funding was \$109m from DART and \$52m from the City of Dallas – which also had financial problems. At that time, the Love Field stop was planned to be underground, adjacent to the terminal¹⁰².

A report to DART's directors on 27 August 2002 said that only relatively modest delays would be required if the NorthWest light rail line to Carrollton was diverted to serve Love Field. This would be much more convenient for airline passengers and employees than a bus shuttle from the nearest station but it would cost an estimated \$160m.

Under this scenario, a new line through the downtown area, a Blue Line extension in South Oak Cliff, new service to north-west Dallas and Fair Park and a link to Las Colinas and DFW would be postponed by one year.

⁹⁸ Railway Gazette International December 1998 p872, "Success drives DART expansion" by Julian Wolinsky

⁹⁹ Rail Transit On Line 15 March 2000 - "Dallas – More LRT"

¹⁰⁰ Rail Transit On Line 15 August 2000

¹⁰¹ Rail Transit On Line 15 May 2002

¹⁰² Rail Transit On Line 15 August 2002

LRT service from Fair Park to Pleasant Grove would be delayed two years but the extension to Carrollton would be built as scheduled, with trains reaching Love Field by 2008.

A decision would have to be made by the end of 2002 to allow work on the north-west branch to be completed when promised. But some board members from the areas that would be subjected to delays in LRT service said they still had to be convinced that the Love Field project justified the higher cost and the extra year¹⁰³.

In December 2003, it was reported that, of the necessary \$160m for a tunnel into the terminal, \$100m had been pledged by the City of Dallas, DART and the North Central Texas Council of Governments: the latter were now promising another \$13m and would seek \$40m from the Texas Mobility Fund (whose income was from traffic fines and fees). It was reckoned that this would be just enough¹⁰⁴. However, plans for light rail into Love Field were turned down by the FTA in January 2005¹⁰⁵. See the section on Issues, on page 49, for a discussion of this.

In May 2006, it was reported that construction was about to start on an expansion programme of the DART light rail system. This was to include a NorthWest line to Love Field and Carrollton¹⁰⁶.

Two months later, it was reported that Southwest Airlines were prepared to spend up to \$200m for a new main terminal and a people mover from the airport to a rapid transit line¹⁰⁷.

The 2030 Transit System Plan published by DART in October 2006 explained that direct rail access had been studied in the NorthWest Corridor PEIS: the best option was a tunnel with a station at the terminal area. This would have added \$160m to the cost, which would have changed the FTA's rating of the scheme so that the project would have been ineligible for federal funding.

In September 2005, DART completed the Dallas Love Field Transit Service Options Study, which looked at a bus shuttle, an automated people mover (APM) or light rail between the airport and Inwood or Love Field stations. A bus shuttle was the recommended interim option: however because of the subsequent repeal of the Wright Amendment (giving significantly more potential for traffic at Love Field) an APM might be better. The City of Dallas would therefore seek to use pfc's to fund an automated people mover, which would run from the south end of Love Field station to the terminal. It would not prejudice eventual implementation of a light rail option.

In May 2010 it was reported that the Love Field service was to open on 6 December 2010 as part of the second phase of the 39 km 15 station Green Line¹⁰⁸.

¹⁰³ Rail Transit On Line 1 September 2002

¹⁰⁴ Tramways & Urban Transit December 2003 p466

¹⁰⁵ Tramways & Urban Transit January 2005 p27

¹⁰⁶ Tramways & Urban Transit May 2006 p197

¹⁰⁷ Airline Business July 2006 p16, "Love Field war is over"

¹⁰⁸ Rail Transit On Line 5 May 2010 p2, "Green Line completion set for Dec 6th"

Total cost was \$1.8bn, funded by a 1% sales tax plus \$700m FFGA from the federal government and \$78m from ARRA. Trains would run every 15 minutes, with twice that frequency in the peaks¹⁰⁹.

In July 2011 it was noted that a proportion of the funding for a planned underground automated people mover linking the terminals at Love Field to Burbank station¹¹⁰, near Southwest Airlines' HQ, might get diverted to fund operation of the Oak Cliff tramway. A surface link to Inwood station (replacing the present bus shuttle) would be \$100m cheaper¹¹¹.

In November 2012, it was reported¹¹² that bus route 524 was to connect the terminal at Love Field to Inwood station. It would match DART frequencies (every 15 minutes in the peak, 20 minutes off peak and 30 minutes late evening).

A report in March 2013¹¹³ said that \$30.87m had been reallocated by the RTC from the Love Field connector to the downtown Oak Cliff tramway.

Description of the service

Bus shuttle (not dedicated: it serves intermediate stops) from Inwood, on the Green and Orange Lines of the DART light rail.

Issues

The major issue with Love Field was the location of the airport station. An obvious location was under the terminal, but an FTA review in 2004 concluded that this would add significantly to the cost (and less significantly to the revenue). The combination would depress the value for money below the level needed for federal funding – which was to meet about a third of the cost. DART accepted this and opted instead for a surface alignment and a bus shuttle.

In October 2006 the process of lifting the restrictions imposed by the Wright Amendment started¹¹⁴. This allowed airlines to serve a significantly larger range of destinations from Love Field, increasing the airport's traffic potential.

It is unclear how the FTA assessed the airport traffic initially. It is understood that at one time they did not include this in calculations at all, and certainly in 2004 they are likely to have assumed a low mode share¹¹⁵.

¹⁰⁹ DART press release 23 November 2010, "DART rail Green Line creates new connections, completes nation's longest light rail construction project"

¹¹⁰ Burbank station is signed as having a future link to the airport

¹¹¹ Tramways & Urban Transit July 2011 p280

¹¹² "DART to open 2 airport lines" in <http://www.metro-magazine.com/news/story/2012/11/dart-to-open-2-airport-lines.aspx> 13 November 2012 accessed 23 November 2012

¹¹³ Tramways & Urban Transit March 2013 p86, "Brookville wins Oak Cliff"

¹¹⁴ <http://thomas.loc.gov/cgi-bin/bdquery/z?d109:SN03661:@@R%7C/bss/d109query.html>

¹¹⁵ At the time, the standard reference would have been "Improving public transportation access to large airports", TCRP report 62, which revealed limited use of airport railways in North America

Air traffic volumes at Love Field for a representative sample of years are as follows:

2004	2006	2008	2011
5.89m ¹¹⁶	6.87m ¹¹⁷	8.06 ¹¹⁸	7.98m ¹¹⁹

This shows an increase of 35% between 2004 and 2011. Would that, plus the increased attractiveness of a direct service rather than a shuttle bus, have justified the cost of the tunnel?

By comparison, figures for DFW for the same years (from <http://www.dfwairport.com/stats/index.php>) are 59.45m, 60.23m, 57.09m and 57.81m – a decrease between 2004 and 2011 of 2.75%.

Erfurt

History

In 2002, approval was given for a €10m extension of the city tram service to Flughafen, to be completed in 2005¹²⁰.

The 3.6 km extension to tram route 4 opened on 20 June 2005. It had six stations and cost €20m¹²¹. Funding was 60% from the State, 25% from Thuringia and 15% from the city¹²².

No reasons have been found to explain the apparent doubling of the cost in three years.

Description of the service

The Airport tram stop is on line 4 of the city's tram system, which is an extension of line 1. It is right in front of the terminal building. The journey to Hbf takes 20 minutes.

Issues

- None known

Hillsborough

History

This General Aviation and business airport (which has very few commercial flights) is close to the light rail station on NE 34th Street, giving access to Hillsboro (4 stops away) as well as to downtown Portland.

¹¹⁶ <http://www.dallas-lovefield.com/pdf/statistics/200512Enplanements.pdf>

¹¹⁷ <http://www.dallas-lovefield.com/pdf/statistics/200612Enplanements.pdf>

¹¹⁸ <http://www.dallas-lovefield.com/pdf/statistics/200812Enplanements.pdf>

¹¹⁹ <http://www.dallas-lovefield.com/pdf/statistics/201112Enplanements.pdf>

¹²⁰ Tramways & Urban Transit September 2002 p344

¹²¹ Railway Gazette International August 2005 p468

¹²² Tramways & Urban Transit June 2006 p137, "Erfurt: one of Europe's best tramways – and it's getting better" by C.J. Wansbeek

A map shows the station as being 500 metres away.

The opening date was 12 September 1998¹²³.

Description of the service

The station is called Fair Complex/Hillsboro Airport and is on the Blue Line of the city's light rail system. This runs from Hillsboro to Gresham, running through the city centre: it is a 48 minute journey from Portland to the airport.

Issues

- The ride on tight curves is sometimes poor
- The airport control tower is visible from the station, but there is no signage
- It is a seven minute walk: the direction is obvious¹²⁴

Istanbul Atatürk

History

In 1992, a map in the technical press showed that a balloon loop from Yenibosna (the end of section currently under construction) through the airport was “planned”¹²⁵.

Later that year, it was reported that work was due to start soon on the second stage of the Istanbul light metro. The 10.4 km line would run from Ferhatpasa on the existing line south west to Istanbul airport. Acer Group was to supervise engineering and construction¹²⁶.

In 1998 it was noted that 60 cars had been assigned to the LRT line connecting Aksaray and Yenibosna in anticipation of the airport extension (1.4 km, 2 stations)¹²⁷.

In autumn 1998, it was reported that Istanbul Metropolitan Municipality was expecting to invite bids in October for a 1.8 km extension from Yenibosna to the World Trade Centre and the airport. Estimated cost was \$30m: work was to be completed within a year¹²⁸. Bids were in fact invited in early 1999¹²⁹: the lowest bidder (in May 1999) was a grouping of Gülemak AS and Yertas for TL3,251bn¹³⁰.

¹²³ <http://www.trimet.org/about/history/westblueline.htm>

¹²⁴ Notes of visit August 2003

¹²⁵ Railway Gazette International May 1992 p302

¹²⁶ International Railway Journal July 1992 p53, Transit Briefs

¹²⁷ Public Transport International April 1998 p46, “UITP visit to Turkey” by L. Daubry

¹²⁸ Railway Gazette International November 1998 p754. “Istanbul progress”

¹²⁹ Railway Gazette International March 1999 p134

¹³⁰ Railway Gazette International May 1999 p270

In July 2000, work on the light rail extension to the airport was expected to be completed by the end of the year¹³¹. In fact, it was not extended to Atatürk airport until 29 October 2002¹³².

In early 2008, it was reported that a guided busway between Topkapi and the airport was to be introduced at the end of the year. The 50 Phileas guided buses to operate the service would cost €63m¹³³.

Description of the service

The light metro line from Atatürk airport to downtown Istanbul was designed to handle 160,000 passengers daily with trains running every 7.5 minutes from 6:00 to 24:00¹³⁴.

Issues

- None known

London City

History

On 17 June 1998 the Deputy Prime Minister approved a £35m extension of the Docklands Light Railway (DLR) to London City Airport¹³⁵. The project could mean 500,000 fewer car journeys between the airport and Central London each year¹³⁶.

A Transport & Works Act application¹³⁷ was expected to be submitted in mid 1999. The aim was to complete the link between 2002 and 2004 to cope with the 1m to 3m increase in passengers expected at the airport by 2005. Sinclair Knight Merz were to provide traffic and revenue forecasts and assist in project appraisal and procurement strategies¹³⁸.

WS Atkins and ERM were appointed by DLR in autumn 1998 to undertake feasibility studies¹³⁹. These were co-financed by a TEN-T grant of €0.4m in 1999¹⁴⁰.

In early 1999 it was announced that DLR had selected a 3.6 km route from Canning Town with three intermediate stations as the preferred option for its £80m extension to London City Airport: it was expected to open in January 2003¹⁴¹.

¹³¹ Tramways & Urban Transit July 2000 p266

¹³² Tramways & Urban Transit December 2002 p467

¹³³ Tramways & Urban Transit May 2008 p195

¹³⁴ Airport World February/March 2003 p7, "Turkish delight"

¹³⁵ Railway Gazette International July 1998 p444

¹³⁶ PRm July/August 1998, "Docklands air link"

¹³⁷ The way planning permission is given for construction of relatively minor railways in Great Britain

¹³⁸ PRm October 1998 p5, "Airport extension study"

¹³⁹ International Railway Journal November 1998 p57

¹⁴⁰ "Air rail links are taking off in Europe" Airrailnews (date uncertain), quoting Giuseppe Rizzo

¹⁴¹ Railway Gazette International April 1999 p197

At that time, DLR Ltd. formally invited private sector proposals for the construction of the planned branch¹⁴².

The preferred route for the airport extension was from Canary Wharf to the airport using the former Silvertown Tramway. An advantage of this was that no dock crossing would be needed. Trains to the airport would be in addition to the existing services. There were plans to extend the line to North Woolwich and across the Thames to Woolwich Arsenal. Commissioning and opening were planned for 2003/2004¹⁴³.

An application was lodged under the Transport & Works Act on 7 March 2000 for an extension from Canning Town to North Woolwich. The document stated that the line would be, "passing through or close to Silvertown and the London City Airport, comprising ground level sections and elevated sections (on embankment and viaduct)." On 24 March the Minister for Transport announced a £30m Government contribution to the extension "subject to statutory procedures".

It was thought that the package of new vehicles ordered in December, submission of the application and Government funding were all intended to ensure fast completion of the line.

This was all designed to encourage urban regeneration in this part of east London and improve public transport facilities to the airport¹⁴⁴.

In the 2000 budget, the extension was given a Government grant of £30m towards the total cost, then estimated at £100m¹⁴⁵.

In 2000, it was reported that 22% of passengers and 35% of employees arrived at the airport by public transport (mainly by shuttle bus). 54% of passengers used taxi. The forecast was that 40% of users would ride the DLR extension. There would be a £20m contribution to the capital cost as a premium from developers of property in the area¹⁴⁶.

A report at the end of 2000¹⁴⁷ said that the results of a public enquiry into the London City Airport extension were due in summer 2001, and DLR was thought likely to let the contract in autumn for construction in 2002. The new line would open in late 2004, providing five new stations and a 22 minute journey time to the City.

¹⁴² Railway Gazette International March 1999 p134

¹⁴³ Howard Smith, Director of Planning and Development, at the Urban Transport and Airports Conference, London, 20 September 1999

¹⁴⁴ Tramways & Urban Transit May 2000 p165, "It's the fast track for Docklands line to City Airport"

¹⁴⁵ Keeping Track Bulletin March/April 2000 p5

¹⁴⁶ Hermann Maier, Sinclair Knight Merz, at the Seventh International Air/Rail Conference on air-rail intermodality, 20-22 September 2000, Hotel Sofitel, Roissy Charles-de-Gaulle Airport, Paris, France

¹⁴⁷ Tramways & Urban Transit November 2000 p405

In 2001 it was reported that DLR were now hoping, following discussions with airlines, that all air tickets would include a DLR pass: unfortunately this did not happen¹⁴⁸. Money for the link was to come from the Regeneration Budget (£30m), the airport, the London Development Agency, developers and the concessionaire. Total cost was forecast to be £115m¹⁴⁹.

In early 2002, it was reported that DLR were to submit an application for powers for an extension of the airport line to Woolwich Arsenal in May¹⁵⁰.

Also in early 2002, the Government approved a £115m 4.4 km 4-station extension to the DLR from Canning Town to the airport and King George V Dock. Construction was due to start later that year and the new extension was due to be in service by 2005¹⁵¹.

As part of those plans, it was reported that the airport station was to have two separate exits – one to the terminal and one to the community. DLR would get some funding from developers through the London Borough of Newham under Section 106 of the Town & Country Planning Act 1990. The balance would come from the concessionaire. There would be five trains an hour: journey time between London City Airport and Bank would be 21 minutes¹⁵².

On 27 August 2002 it was announced that City Airport Rail Enterprises (CARE), formed by AMEC Investments Ltd and Royal Bank of Scotland (RBS) Project Investments Ltd. in a 50:50 joint venture, was the preferred bidder for a 30-year concession to design, finance, build and maintain the airport extension. CARE announced on 25 February 2003 that it had reached financial close. Contracts were expected to be signed in mid-December 2002, with work starting in January¹⁵³.

RBS was to provide the bulk of the funding for initial construction through a bank loan, with the balance being made up of equity from both partners. Construction had an investment value of £175m, while maintenance, management, interest costs and profit over the remaining 27 years of the concession brought the total price for the project to £300m. As with the Lewisham extension opened in 1999, the consortium would recoup their investment through track access charges.

Capital cost was put at £140m. Negotiations with property developers who would benefit financially from the line were continuing and it was hoped that they would contribute.

¹⁴⁸ Possibly as a result of the impact of 9/11 on airline finances: a similar initiative by KLM – “Plane ticket = train ticket” – was certainly a victim of this

¹⁴⁹ Modern Railways April 2001 p32

¹⁵⁰ Tramways & Urban Transit March 2002 p84

¹⁵¹ International Railway Journal April 2002 p11

¹⁵² Tramways & Urban Transit May 2002 p164

¹⁵³ Railway Gazette International October 2002 p610, “CARE selected for Docklands”

At the end of 2002 it was reported that, “The formal signing of contracts in December 2002 should herald an immediate start on the 30-month construction, with a hoped-for opening date of autumn 2005. The money will be generated from a wide variety of sources: the Government has already provided £30m from the Capital Modernisation Fund towards the capital cost of the project, while DLR, through the London Borough of Newham, will be securing Section 106 grants from developers and beneficiaries of the scheme (an initial Section 106 arrangement with London City Airport is already in place). The balance will come from the DLR paying CARE a fee for the right to run trains.”¹⁵⁴

Ceremonies were held on 4 March 2003 to mark the start of work on the extension. Completion was scheduled for autumn 2005¹⁵⁵. The branch from Canning Town was to have stations at West Silvertown, Pontoon Dock, London City Airport and King George V.

In May 2004, it was noted that the elevated airport station was to have escalators and lifts from platforms to concourse level. There would be separate exits for the airport and the neighbourhood. Work was to start on the Woolwich extension in 2005, with completion expected by the end of 2008¹⁵⁶.

In July 2004, it was reported that the £130m DLR extension to London City Airport was due to open on 15 December 2005. Trains would run every 10 minutes¹⁵⁷. The new service was to have continuous radio feed, allowing news, stock prices, airport departure information and advertisements to be displayed. All were to be silent¹⁵⁸.

In April 2005 it was reported that journey times would be 22 minutes to Bank and 14 minutes to Canary Wharf¹⁵⁹.

50% of passengers on the airport extension were expected to come from the airport, whose staff would be encouraged to use public transport¹⁶⁰.

The line was opened 6 December 2005 by the Mayor of London¹⁶¹. By the end of January 2006, a typical weekday was witnessing 11,000 passenger journeys on the branch, ‘a bit ahead of expectations’ according to Jonathan Fox, Director of DLR Ltd (the arm of TfL that owned the railway). ‘About 40% of passengers are going to and from the airport, while the other three stations on the branch make up about 20% each’¹⁶².

¹⁵⁴ Tramways & Urban Transit November 2002 p408, “Docklands: airport extension is flying”

¹⁵⁵ Railway Gazette International April 2003 p184, “DLR starts airport branch”

¹⁵⁶ Modern Railways May 2004 p14

¹⁵⁷ ABTN 12 July 2004

¹⁵⁸ Modern Railways August 2004 p45

¹⁵⁹ Modern Railways April 2005 p54, “City airport line nears completion” by John Sully

¹⁶⁰ Tramways & Urban Transit April 2005 p143

¹⁶¹ London City Airport press release 6 December 2005

¹⁶² Modern Railways March 2006 p54, “DLR aims for Charing Cross”

In May 2006, it was reported that ridership on the London City Airport extension was 13,000 a day on weekdays, and rising¹⁶³.

London City Airport was owned by Dermot Desmond, who had paid £23.5m for it in 1995. A valuation in 2005 by property advisers said that the rising passenger numbers and the extension of the DLR to the terminal meant it was now worth £300m¹⁶⁴.

In early 2007, there was a report that the London City Airport extension was handling 85,000 passengers/week¹⁶⁵. After a year of operation, the annualised figure for numbers boarding and alighting at London City Airport station was 4.5m. 49% of airport passengers were using DLR, whose target had been 50% after three years¹⁶⁶.

The Belgian airline VLM started a joint promotional campaign with DLR in early 2007, showing that the Manchester Airport – London city centre journey time was just 80 minutes¹⁶⁷.

The 4.4 km DLR extension had cost £140m of which the airport contributed £2m. It carried 4m passengers in the year ended 31 March 2007¹⁶⁸. Presumably these were actual numbers (including the build-up phase), unlike the annualised figure of 4.5m quoted above. DLR said that the airport “had got a good deal”¹⁶⁹.

Before the opening of the line, 27% of passengers had used the two shuttle bus services. One ran to and from Liverpool Street, in the City, and the other to Canning Town, serving the Docklands financial district. These were operated by the airport. The Canning Town one ended when the DLR started: the Liverpool Street one lasted another four months (passengers with a destination at the northern end of the City used it). Originally they ran every 20 minutes: running them twice as often meant a smaller deficit.

Mode share for the airport in early 2008 was 28% cab, 9% car, 13% bus or limo, and 50% DLR. Many cab users were going to or from Canary Wharf: they preferred to pay £10 for a direct cab than £1.50 and have a same-platform interchange at Poplar. DLR were reported to be building a flyover which would permit a direct Canary Wharf service.

¹⁶³ ABTN 8 May 2006

¹⁶⁴ Financial Times 15 May 2006, “City airport appoints bank after approach” by John Willman

¹⁶⁵ Tramways & Urban Transit January 2007 p7

¹⁶⁶ Modern Railways March 2007 p35, “DLR expansion continues” by John Scully

¹⁶⁷ Modern Railways April 2007 p13, “DLR in Manchester flights tie-up”

¹⁶⁸ Tramways & Urban Transit November 2007 p414, “Passenger numbers rise”

¹⁶⁹ “Passengers’ experience of air travel”. House of Commons Transport Committee 8th report of session 2006-07, July 2007, para. 54

The airport had 800 parking spaces – with the arrival of the DLR extension, these were no longer full despite a 40% increase in passengers at the airport. Car use dropped more than the airport anticipated: the split was 50:50 kiss'n'ride:park'n'ride. The short stay car park cost £40 a day and parking rates increased three times in 2008: the airport needed to balance price against the problems of local on-street parking. Parking space was constrained: an increase would mean that they would need to deck over the surface car park and this would be expensive.

In the morning peak, there were sometimes long queues at the DLR ticket machines – queues which obstructed the escalators to the platforms. DLR were using queue-combers to relieve the situation.

In 2008, the airport had two check-in kiosks on the route from the station to the airport: they had plans for more. These would almost certainly be CUSS machines, and not owned by airlines. They were to be in the DLR booking hall area. They also wanted them at Canning Town, Canary Wharf, Bank and if possible on trains.

The airport was looking forward to completion of the Woolwich extension: it would be good for a new labour pool¹⁷⁰. This opened 7 weeks early on 12 January 2009¹⁷¹ at a cost of £180m¹⁷².

In early 2009, the upgrade of Tower Gateway station meant Woolwich line trains could run every 5 minutes instead of every 7¹⁷³.

From the opening of the Stratford line in mid 2011, the Woolwich line was to have a Bank service of 8-10 trains an hour plus a Stratford International service of 8 an hour in the morning peak, 9 in the evening peak¹⁷⁴.

It was announced in late 2011 that TfL was to buy the two companies responsible for the operation of the Woolwich and London City Airport extensions, which would save them up to £250m. The savings would come from a restructuring of the financing arrangements¹⁷⁵.

Description of the service

The 4.5 km route leaves the Becton line east of Canning Town and is mainly on viaduct or embankment. The airport station is fully covered, and has a central platform (two faces) with lifts and escalators to an intermediate concourse level. It has an enclosed waiting area.

Trains run between 5:30 and 0:30 (Sunday 7:00 and 23:30)¹⁷⁶.

¹⁷⁰ Discussion with London City Airport 18 March 2008

¹⁷¹ Rail Management 12 January 2009

¹⁷² Modern Railways February 2009 p8, “DLR Woolwich Arsenal route opens”

¹⁷³ Tramways & Urban Transit April 2009 p127

¹⁷⁴ Modern Railways July 2011 p76, “DLR reaches Stratford International” by James Abbott

¹⁷⁵ TfL Press Release 25 November 2011, “TfL to restructure the financing arrangements of DLR’s London City Airport and Woolwich Arsenal extensions”

¹⁷⁶ TfL press release 6 December 2005

There are two exits at the country end with lifts and escalators. It is a two minute walk to the check-in area which is 70 metres from the foot of the escalator from the DLR. On the way, there is a ticket office and ticket machines¹⁷⁷.

The exit at the London end is into the residential neighbourhood of the airport.

Issues

- There is no dedicated bag space on trains – not a big problem as most of the passengers at London City Airport are on short-haul business trips
- One of the major downtown stations (Bank) is relatively inconvenient especially for those with bags, although a major upgrade is planned which should ease this: it will include step-free access¹⁷⁸
- One problem the DLR brought was that of peaks. Before DLR, people used to arrive at the airport in small numbers (10-20 at a time off a bus, for example). With the DLR open, over 100 could get off one train, and with the short distance to the terminal and internet check-in they all hit security at the same time
- The line has good interchange to London Underground lines
- Mode share would be 70% with direct connection to Canary Wharf – thought to be coming
- It is a very short distance between train and check-in

Lyon Bron

History

In summer 2012, it was reported that a branch from line T2 of the city's light rail system was being planned to serve the exhibition site at Bron airport. This – Line 2+ - was to open in December 2012, with services running during exhibitions only¹⁷⁹.

The line opened on 17 November 2012: it was then described as Line T5, a €59.3m 3.8 km spur from Les Alizés with four new stations¹⁸⁰.

Description of the service

Tram running on exhibition days to serve the exhibition site at Bron airport.

Issues

- Not really an airport service!

¹⁷⁷ Notes of visit, 21 December 2005

¹⁷⁸ “Bank station capacity upgrade” on <https://consultations.tfl.gov.uk/tube/bank>, accessed 8 February 2013

¹⁷⁹ Tramways & Urban Transit June 2012 p228

¹⁸⁰ International Railway Journal January 2013 p11

Lyon St-Exupéry (formerly Satolas)

History

In 2001, Semaly and the Lyons-based architects AABD were engaged by the city's General Council to examine the potential for converting a lightly-used 15 km rail line running east from the Part-Dieu area out to Meyzieu into a tram route. Costing about €128m, the line could ultimately be extended to St-Exupéry Airport for an extra FFr250m. The General Council was ready to take responsibility for the management of the project, but wanted the state, the Rhône-Alps Regional Council, the Greater Lyon District and Semaly to participate financially in the project¹⁸¹.

In 2001, the new mayor of Lyon backed a rail link to the airport using the Est Lyonnais alignment through Meyzieu¹⁸².

The 2001 Annual Report for Lyon Airports said that the project for an east Lyon tramway had been reactivated, and there was a strong probability that the end of the decade would see it up and running. Existing infrastructure made the project economically realistic, and the change in location of the Eurexpo conference centre would enable it to be reached by the tramway.

In 2002 it was reported that the inner section of the former Est de Lyon railway (CFEL) was to be converted to an express tramway between Part Dieu, Décines and Meyzieu with 9 stations. This might in future be extended to St-Exupéry airport¹⁸³.

Public consultation began on 2 September 2002 for the conversion. The President of the Rhône département and his counterpart from Grand Lyon launched the project, which would link Part-Dieu with St-Exupéry airport.

The CFEL alignment still carried a limited freight service, operated under contract by SNCF. Under the proposals the route would be converted to a light rail line, carrying two overlapping services.

One, designated Lea (Ligne de l'est de l'agglomération) was being planned by Sytral on behalf of the city. This would provide an urban tram service from Part-Dieu to Meyzieu, serving the 10 stations in the suburbs of Villeurbanne, Vaulx-en-Velin, and Décines.

The other, Leslys, was being promoted by the Rhône département, and would provide a fast service from Part-Dieu to the airport. This would make only limited stops in the urban section, and would offer a 25 minute journey over the full 23.2 km to the airport. The Leslys vehicles would probably have more powerful motors to allow faster speeds.

¹⁸¹ UTI March/April 2001 page 11

¹⁸² Railway Gazette International April 2001 p215

¹⁸³ Railway Gazette International May 2002 p232

The project schedule envisaged a formal public enquiry in September 2003, leading to the award of a Declaration of Public Utility in the first quarter of 2004. Construction would start the same year, with the line to be opened by December 2006. Systra put the estimated cost of Lea at €165m whilst the 8.6 km Leslys extension to Lyon St-Exupéry was priced at €65.6m in 1999¹⁸⁴.

The aim was to have an express rail service between Lyon Part Dieu and St-Exupéry, with a guaranteed travel time of 25 minutes and trains every quarter of an hour. St-Exupéry station would become Lyon's second station: both downtown Lyon and St-Exupéry would then both serve TGV links.

The service would allow for fast access to St-Exupéry, and to urban and economic centres situated along the route. In particular, these included Villeurbanne, Vaulx-en-Velin, Décines and Meyzieu. Estimated cost of project was €275m¹⁸⁵.

In 2004, it was reported that Leslys was to start in 2007¹⁸⁶. Later that year, it was announced that Alstom had been awarded a €28m contract for the supply and installation of light rail infrastructure on the route out to Lyon St-Exupéry airport¹⁸⁷.

A report in late 2005 said that east of Meyzieu, a completely new extension would be built to the airport. Trains on the Leslys line would reach 100 km/h on the airport – Meyzieu section, and then have only one stop (at La Soie, for Metro Line A) between there and central Lyon. There would be passing loops on the Lea line to allow airport expresses to overtake ordinary trams¹⁸⁸.

On 6 October 2006 a Vinci-led consortium was selected as preferred bidder for the Leslys express light rail system - a €100m project. The operating partner was Veolia¹⁸⁹.

In 2007, it was noted that completion would now be in 2008, a year later than planned, and the cost would be €70m¹⁹⁰.

In early 2008, six Stadler Tango part low floor LRVs were ordered by Veolia. They were 26.5m x 2.55m, 750v DC, costing €4.166m each. They weighed 36.5 tonnes, with a maximum speed of 100km/h. Delivery would permit the Leslys service to be inaugurated in May 2009¹⁹¹. The Declaration of Public Interest had been delayed because of environmental concerns¹⁹².

¹⁸⁴ Railway Gazette International October 2002 p609, "Lyon launches Lea and Leslys"

¹⁸⁵ "Lyon St-Exupéry airport: Gateway to Europe", December 2002, pages 38 and 40

¹⁸⁶ Marie-Christine Bernier of Lyon St-Exupéry Airport at the Air//Rail 2004 conference (SAS Radisson Hotel Brussels, 23/24 September 2004)

¹⁸⁷ Modern Railways January 2005 p65

¹⁸⁸ Tramways & Urban Transit October 2005 p402, "Lyon: new tramways are never ending" by C.J.Wansbeek

¹⁸⁹ Railway Gazette International November 2006 p702, "Light rail to the airport"

¹⁹⁰ Tramways & Urban Transit March 2007 p99, "More light rail for France's second city" by Eric Stuart

¹⁹¹ Tramways & Urban Transit February 2008 p71

¹⁹² Tramways & Urban Transit April 2008 p152

In June 2008, it was reported¹⁹³ that Leslys was expected to start in autumn 2009. The first 13.4 km was shared with line T3 (which, incidentally, has a different operator). There would be a 15 minute interval in the peak, 30 minutes off-peak, and a 25 minute journey time with two intermediate stops.

In November 2008, it was announced that Leslys was to open on 9 August 2010¹⁹⁴. Work started in October 2008: it was forecast to take 18 months. The 7 km extension from Meyzieu was redesigned to run south of Pusignan because of public reaction¹⁹⁵.

The project was officially launched on 24 November 2008. It was a PPP involving the RhônExpress consortium¹⁹⁶ who had a 30 year concession to design, build and operate the service. €17.7m of the funding came in equity from the shareholders, €31.5m as a subsidy from the local authority, the French government contributed €10m and there was €62m in bank debt. Rhône département agreed to pay an annual sum of €3.5m towards bank debt repayment. The concessionaire was to bear the operation, maintenance and traffic risks¹⁹⁷. The cost was €110m (of which €65m was for infrastructure¹⁹⁸).

The first two trams were delivered to Meyzieu on 11 December 2009¹⁹⁹. First tests of the new vehicles started 13 January 2010²⁰⁰.

When the service opened on 9 August, a temporary station was available at the airport²⁰¹: the permanent station opened on 21 June 2011. The millionth passenger was carried on 11 July 2011²⁰².

Description of the service

Upmarket express tram with some street running between downtown Lyon and the airport.

Issues

- The concessionaire has a monopoly, so if there is a strike, there is no alternative public transport mode – only taxis.
- Passengers are offered a 50% refund if the train is 10 minutes late, 100% if 20 minutes late

¹⁹³ Metro Report International June 2008 p29, “Many modes keep the city working” by Nick Kingsley

¹⁹⁴ Conversation with Marie-Christine Bernier, Lyon St-Exupéry airport, November 2008

¹⁹⁵ Tramways & Urban Transit December 2008 p472

¹⁹⁶ Stakeholders were Vinci 32.4%, Caisse des Dépôts et des Consignations 36.6%, Veolia 28.2%, Cegelec 2.8%

¹⁹⁷ Vinci press release 25 November 2008 (accessed 19 December 2008)

¹⁹⁸ Tramways & Urban Transit February 2009 p69

¹⁹⁹ Tramways & Urban Transit March 2010 p108

²⁰⁰ Tramways & Urban Transit April 2010

²⁰¹ Website www.rhonexpress.net, accessed 5 August 2010

²⁰² Tramways & Urban Transit October 2011

Melbourne Essendon

History

Tram route 59 ran into Essendon Airport from 1943 until the end of scheduled domestic air services in June 1971²⁰³. The extension into the airport formally closed on 6 October 1976²⁰⁴.

Description of the service

Essendon Airport is still open for general aviation, and served almost directly by tram. Passengers only need to cross a motorway on a bridge to be in the airport²⁰⁵.

Issues

- None: Essendon has relatively low demand for public transport

Minneapolis – St. Paul (MSP)

History

In April 1999 the newly elected State Governor said that he firmly backed the proposed Hiawatha corridor²⁰⁶ light rail project in Minneapolis and expected it to move ahead with all possible speed. The total cost was estimated at \$440m including a tunnel through the airport. The state had bonded \$50m and the budget allocated another \$60m over the next two years, completing the required State match of \$100m. Final design was under way and refined cost estimates were due by mid June. If the FTA approved the plan, construction could start in 2000 and trains could be running by 2003²⁰⁷.

Later that year it was noted that a battle was brewing over state funding for the Hiawatha project. The Governor had given his endorsement, as had most local elected officials. When the State Senate passed the budget on 19 April, it had included \$60m in construction funding by a vote of 51 to 12. This was a major part of the local share needed to generate around \$225m in federal money. But the House version of the budget did not include any funding for the line. A conference committee was supposed to resolve differences between the two versions during May and light rail supporters hoped House members would reverse their vote²⁰⁸.

²⁰³ "Railways and aviation" by Michael Pearson

²⁰⁴ Transit Australia March 1997 p55, "Rail access to airports" by Michael Pearson

²⁰⁵ Notes of visit October 1998

²⁰⁶ So called because it runs partly along Hiawatha Avenue

²⁰⁷ Tramways & Urban Transit April 1999 p152

²⁰⁸ Tramways & Urban Transit, June 1999 p230

The January 1998 cost estimate had been \$400m: this had increased because of a change of route (5th Street rather than Washington Avenue downtown) and a southern extension (to 87th Street). These raised the cost to \$446m: the extension was later eliminated and the cost rose to \$500m (including inflation)²⁰⁹.

In 1999 it was reported that two stations (serving the two terminals) were likely to be under construction shortly. The line would have 15 stations, and 24,000 riders a day. The airport liked the concept: they had co-operated on market research.

Total cost was forecast at \$548m: \$117m was to come from the State, \$70m from the airport, \$87m from Hennepin County and the remaining 50% from the Federal Government. The airport's \$70m contribution was on the basis that 50% of the riders would use the airport. There was a quote from the airport that some people missed flights because parking was difficult. Target opening date was 2003²¹⁰.

Late in 1999, a report in the technical press said that a design and build contract was to be awarded in August 2000. The line was given \$42.8m in Federal funds under the new transportation bill. This brought federal funding up to \$70m: total cost was forecast at \$548m and it was expected that the Federal Government would pay half of this²¹¹.

It was reported in early 2000 that the Airports Commission had selected a team led by HNTB Corporation to design a station to be located under the main terminal and a tunnel under the two main runways. Design was expected to be completed by April, with more detailed documents to be completed by July. Minnesota DOT would then install track, systems, and power supply for that section of the project²¹².

On 26 April 2000, the State Governor announced that federal agencies would allow the Hiawatha Avenue light rail project to move forward in final design and would permit the use of \$70m in airport funds to help build it. Construction still hinged on a commitment by the FTA to pay half of the \$548m cost, a decision not expected until October. The project included a \$117m tunnel underneath the Airport, with stations at the Humphrey and Lindbergh terminals²¹³.

In July 2000, it was reported that two FAA rulings would allow airport funds to be spent on rail stations serving the airport terminals and the rail tunnel under its runways²¹⁴. This was significant, because such use of aviation funds was unusual.

²⁰⁹ Tramways & Urban Transit September 1999 p348

²¹⁰ APTA Expo 1999, session on "Airport access: is successful collaboration possible?" 12 October 1999, comment by Scott Biehl, Federal Transit Administration

²¹¹ Rail Transit Online 15 October 1999

²¹² Passenger Transport 24 January 2000 p5, "Light rail at Twin Cities airport"

²¹³ Tramways & Urban Transit June 2000 p227

²¹⁴ Tramways & Urban Transit July 2000 p270

Public meetings held in late 2000 sought input from residents on several transit options, including three light rail routes, for the 19.8 km Riverview Corridor that connected St. Paul's east side and downtown area with MSP Airport and the Mall of America. An analysis of seven alternatives, including a busway and enhanced conventional bus service, had recently been completed.

The state legislature had already appropriated \$50m for development of a busway but county officials were still considering light rail for Riverview. The study forecast 16,000 weekday riders if the line was built. Each of the light rail options would share tracks with the soon-to-be-built Hiawatha line between the airport and the Mall of America. Bus rapid transit would have 12,000 daily boardings but would cost less²¹⁵.

A \$56m contract was awarded to Bombardier in 2000 for 18 light rail cars with spares, tools and system support. Options for four additional cars would increase the price to \$65m. Each car would have three sections and would carry 187 passengers. They would have a 90 km/h top speed. There were to be luggage racks and bike hangers near the centre of the cars²¹⁶.

The Airports Commission agreed in November 2000 to increase its contribution to the project from \$70m to \$87m²¹⁷.

Minnesota Transit Contractors²¹⁸ received the contract from Minnesota DOT to design and build the 18.7 km Hiawatha line on 28 September 2000, for completion in 2004. The \$291m 17 station project would connect downtown Minneapolis with the airport and Bloomington. The work excluded the 3.2 km tunnel and stations at the airport²¹⁹.

The Federal government was to pay \$384m, the State \$100m, the Metropolitan Airports Commission \$102m, and Hennepin County \$89m (total \$676m)²²⁰.

It was reported²²¹ that the 2001 FFGA with Metro Transit in Minneapolis St. Paul provided \$334.3m in federal funding to assist with design and construction of the \$675m light rail project. In fact, the \$334.3m was an FTA New Start grant²²².

The 2000 forecast ridership for 2004 was 19,300 riders a day: for 2020, it was 24,800²²³.

²¹⁵ Rail Transit On Line 1 September 2000. "St. Paul - Transit Options"

²¹⁶ Passenger Transport 4 September 2000 p4, "Bombardier cars selected for Twin Cities light rail line"

²¹⁷ Tramways & Urban Transit November 2000 p430, "Minneapolis, MN"

²¹⁸ A joint venture consisting of Parsons Transportation Group, Edwards & Kelcey, Granite Construction Company and McCrossan Co

²¹⁹ Passenger Transport 4 December 2000 p8

²²⁰ Rail Transit On Line 1 January 2001

²²¹ Passenger Transport 29 January 2001 p2, "FTA awards full funding grants to Chicago, Pittsburgh, Minneapolis, Seattle"

²²² "Before and after study Hiawatha light rail transit line". Metro Transit, August 2010

²²³ Metro January 2002 p84

Ground was broken on 17 January 2001 at the future site of the line's Yard and shops in Minneapolis.

The line would open for partial service, from downtown Minneapolis to Fort Snelling, by 2003, with full service anticipated by the end of 2004. The line would be owned by the Metropolitan Council and operated by Metro Transit. The DOT was responsible for design and construction of most of the line, while the Metropolitan Airports Commission (MAC) was responsible for design and construction of the airport tunnel and stations²²⁴.

A TBM started on the first of the two tubes under the runways in mid October 2001: this was to be completed by March and work was then to start on a second 2200 metre tunnel. They would be 20 metres underground and would include a 160 metre long station under the parking structure serving the main terminal. A ground level station would serve the Humphrey Terminal²²⁵.

In April 2004 it was reported that boring of the first tube to carry the line beneath MSP Airport was completed on 25 April 2002, six months after work started. The 320-ton tunnelling machine was to be disassembled, raised to the surface and returned to the north side of the airport, where it would start digging the second 5.7 metre tube.

There would be two stations at the airport, one underground near the main Lindbergh terminal and the other on the surface near the new Humphrey terminal. The first segment of the 18.7 km line was to open in late 2003²²⁶.

A 2003 report²²⁷ noted that Hiawatha line trains were to have a system which balanced the train floor and kept it level with the platform.

In 2004, it was reported that the total cost of the project was \$715m at 2003 prices²²⁸. It was a design – build programme. Work started in January 2001. It would use 24 articulated Bombardier LRVs, 28.6 metres long²²⁹.

In July 2004, it was noted that the first phase had opened on 28 June 2004. The second phase, including the airport stations, was to open in December²³⁰. Four months later, the opening date was given as 4 December, four weeks ahead of schedule²³¹.

Average ridership on the line in February 2005 was 18,000 on weekdays, 13,600 on Saturdays and 8,800 on Sundays – about 40,000 a month more than expected. 39% of riders were new to transit²³².

²²⁴ Passenger Transport 29 January 2001 p2, “FTA awards full funding grants to Chicago, Pittsburgh, Minneapolis, Seattle”

²²⁵ Rail Transit On Line 15 October 2001

²²⁶ Rail Transit On Line 15 April 2002

²²⁷ Passenger Transport 12 February 2003 supplement page 4

²²⁸ \$334m from federal funds (TEA-21), State of Minnesota \$100m, MAC \$87m, Hennepin County \$84m, air quality programme \$50m, MinnDOT \$20m

²²⁹ Railway Gazette International Metro Report 2004 p28, “Hiawatha joins light rail family” by Joe Marie

²³⁰ Rail Transit On Line 1 July 2004

²³¹ International Railway Journal November 2004

²³² Tramways & Urban Transit May 2005 p195

Three more cars were ordered from Bombardier in October 2005, to bring the fleet up to 27. These were low-floor vehicles with 66 seats and space for 120 standing: they cost around \$3m apiece.

The airport segment was built under a separate design-build contract at \$143.5m. Typical station costs were \$1m - \$1.5m including a heated shelter²³³.

A 2006 GAO report said that the total capital expenditure had been \$715.3m (dollars of the time, 1999 – 2004). This included 24 light rail vehicles, 19 km of track, 17 stations and tunnels under the airport²³⁴.

In June 2006, a report said that Lindbergh Terminal was the third busiest station on the line, with 11.4% of passengers using it – 3,425 passengers each weekday on average. MAC estimated that free transfers between terminals using the light rail system saved them \$1m a year in bus operation²³⁵.

In September 2006, light rail service between the two terminals was suspended for a year for highway construction²³⁶.

In 2009, with 2008 ridership nearly 30% up on 2005, the first full year of operation, work started on extending platforms for 3-car operation²³⁷.

A backcheck – a before and after study²³⁸ - was published by Metro Transit in 2010. This gave much information about the planning history, the ridership forecasts, the costs and revenues and the land use issues arising from construction of the line: a summary is given in the next few paragraphs.

A major 6-8 lane highway had been planned along the Hiawatha corridor (and indeed land was acquired and cleared to build it) when it was halted for an Environmental Impact Study, completed in 1990. The outcome of this was a much smaller-scale road and the light rail line. Funding was approved in 1998 (\$40m from the State of Minnesota) and 1999 (a further \$60m from Minnesota, \$70m from Hennepin County and \$70m from MAC).

A Corridor Management Committee (of elected and appointed public officials) and a Community Advisory Committee were set up to ensure good communications with local residents.

²³³

http://designbuild.construction.com/print.asp?REF=http://designbuild.construction.com/features/archive/2005/0511_cover.asp, printed 16 December 2005

²³⁴ “Intermodal transportation – challenges to and potential strategies for developing improved intermodal capabilities”. Statement to Subcommittee on highways, transit, and pipelines, Committee on transportation and infrastructure, House of Representatives, by Katherine Siggerud of GAO, 15 June 2006

²³⁵ “Intermodalism: Hiawatha light rail transit line and the Minneapolis-St. Paul International Airport”. Statement to Subcommittee on highways, transit, and pipelines, Committee on transportation and infrastructure, House of Representatives, by Peter McLaughlin of Hennepin County, 15 June 2006

²³⁶ Tramways & Urban Transit November 2006 p435

²³⁷ Railway Age Passenger Rail Planner’s Guide 3/09 pG8

²³⁸ “Before & after study: Hiawatha light rail transit line” by Metro Transit, August 2010

In 2000, average daily ridership in 2020 was forecast to be 24,800: in November 2004, surveyed ridership was 20,635. By October 2005, ridership was a million a month – in excess of 2020 forecasts. Much of the growth came from the airport and the Mall of America.

Annual ridership figures were 2.93m in 2004 (over twice the forecast), 7.91m in 2005 (154% of the forecast) and 9m in 2006 (121% of the forecast).

In its first 18 months of operation (26 June 2004 to December 2005), the line carried 10.9m passengers – 65% above forecast.

The original FFGA was made on 16 January 2001, when the total project cost was \$675.4m: this was amended (because of a new alignment at the Mall of America) to \$713.2m. That agreement required the line to open before the end of 2004: in fact it opened on 4 December 2004.

According to page 39 of the back-check, the \$713.2m budget came from the following sources: FTA New Starts \$334.3m, FTA Formula Grants \$30m, Hennepin County \$84.2m, Federal Grants (Surface Transportation Programme – STP – and CMAQ) \$49.8m, Mall of America property donation \$6.3m, MAC \$70m, Minnesota DOT property donation \$20.1m, State of Minnesota \$100m and locally funded betterment \$1.3m.

A table on the previous page says that overall funding was from the FTA (\$274.3m), the State of Minnesota (\$100m), Minnesota DoT (\$17.3m), Hennepin County (\$87m), and the MAC (\$70m). This totalled \$548.6m (in year-of-expenditure dollars). The back-check also identifies \$49.9m in associated highway costs and land assembly costs which were already known and included in the budget. These were met by grants from the STP (\$43m) and CMAQ (\$6.9m) bringing the total to \$598.5m.

It is likely that the \$114m difference arises from the use of different price levels (year of expenditure and year of completion), but this is not clear from the report.

Full year operating and maintenance costs were forecast for 2004 in 1999 as \$15.127m: for 2005 and 2006, forecasts were \$15.581m and \$16.049m. These would come from fares, State General Fund appropriations and property taxes. The system did not operate for the whole of 2004: for 2005 and 2006, actual operating costs were \$16.664m and \$18.725m. Part of the increase was driven by the above-forecast ridership, but there was also a major problem with ice formation in the airport tunnels.

A new high level walkway opened between the station and Terminal 2 (the Humphrey Terminal) in January 2011, to save passengers having to walk through the car parks. It included escalators, lifts and moving walkways²³⁹.

From 2014, the Hiawatha Line is to become the Blue Line of the Metro²⁴⁰.

²³⁹ www.progressiverailroading.com/prdailynews/news.asp?id=25523 Progressive Railroading 18 January 2011, “Twin cities airport opens new Skyway for Hiawatha riders”, accessed 19 January 2011

²⁴⁰ Tramways & Urban Transit May 2012 p197

In early 2013, the city of Minneapolis launched a programme to reduce road traffic delays by better adjusting road and rail traffic control systems to optimise flows²⁴¹.

Description of the service

A relatively upscale light rail line.

Issues

- None known

Montpellier

History

Line 1 of the city's tramway was opened on 1 July 2000. It has a shuttle bus connection to the airport from Place de l'Europe station²⁴².

It is possible that at some point Line 3 will be extended to the airport²⁴³.

Description of the service

Modern city tram.

Issues

- None known

Nürnberg

History

In March 1996 it was noted that a 2-station 3.3 km extension of U-Bahn line U2 to the airport was planned. Completion was forecast for 2000, at a cost of DM227m. There would be a significant amount of single track. The aim was to increase the airport's modal split to 50% public transport²⁴⁴.

In 1997 it was reported that line U2 was being extended to the airport. This section had been under construction since 1995 with opening planned for 1999²⁴⁵. Another 1997 report forecast completion in November 1999 at a cost of DM134m²⁴⁶.

²⁴¹ "Hiawatha Traffic Signal Timing Project", <http://www.ci.minneapolis.mn.us/cip/all/WCMS1P-096258> 29 January 2013 accessed 8 February 2013

²⁴² <http://www.montpellier.aeroport.fr/en/acces-a-l-aeroport/en-transports-publics> accessed 3 April 2013 says that passengers should take tram line 1 to Place de l'Europe and then a 120 shuttle bus

²⁴³ Metro Report 2005, map on p36

²⁴⁴ Railway Gazette International March 1996: "Nürnberg line U2 extended"

²⁴⁵ UTI May/June 1997 p26

²⁴⁶ Railway Gazette International October 1997 p650

In January 2000 the railway press reported that, “Oberburgermeister Ludwig Scholz and Bavaria’s Interior Minister Günther Becker were guests of honour on November 27 when Nürnberg Transit celebrated the extension of U-Bahn line 2 to the city’s airport. The 3.5 km extension northwest from Herrenhütte cost DM 180m, including an intermediate station at Ziegelstein. VAG Executive Chairman Herbert Dombrowsky said the extension brought an “international flair” to the network, with the introduction of multilingual announcements.”²⁴⁷

In mid 2000, it was reported that the new underground connection to Nürnberg airport had exceeded all expectations. According to the VAG (Nürnberg transport authority), daily carryings amount to 3,250 whereas only 2,100 had been expected²⁴⁸.

Description of the service

A light metro, part of the city’s system, with a 12 minute journey, city to airport, with seven intermediate stops. There are three trains an hour (six in the peak).

There is a choice of escalator, lift or steps at the airport terminal²⁴⁹.

In 2000, trains left Hbf between 4:57 and 0:49 (5:09 – 0:49 weekends), and the airport between 5:02 and 0:31 (5:21 – 0:31 weekends)²⁵⁰.

Issues

- The line was converted to a mix of manned and automated trains: it has been fully automated since September 2009²⁵¹

Okinawa

History

Work started in mid 1997 on the construction of a 13.1 km Alweg monorail on Okinawa, with completion anticipated by the end of 2002. The line was to link the island’s main airport with the principal city of Naha. Starting from the airport in the west, the line would loop through Akamine and Onoyama to skirt the bay separating the airport from the city.

Running across the city centre via Asahibashi, Miehashi and Furujiima, it would terminate at Tera. The line would be elevated throughout, and would follow a river channel for part of the route. Trains would run every six minutes in the peak, with an end to end journey time of 30 minutes including 13 intermediate stops²⁵².

²⁴⁷ Railway Gazette International January 2000 p9, “Airport link”

²⁴⁸ UTI May/June 2000

²⁴⁹ Notes of visit by Michael Pearson May 2000

²⁵⁰ Timetable May 2000

²⁵¹ <http://www.railway-technology.com/projects/neuremburgautobahn/>
“Nuremberg Automatic U-Bahn, Germany” undated, accessed 29 March 2013

²⁵² Railway Gazette International June 1997 p350, “Okinawa monorail”

In mid 2002, it was reported that the line would open in January 2003. It would use Hitachi trains²⁵³.

A December 2002 report said that a monorail train had made the first test run over the whole route at the end of November. It was scheduled to go into service in 2003²⁵⁴.

In May 2003, it was reported that the start of the service – to be named Yuirail – was to be on 10 August 2003. The fare would be ¥290. There was an ongoing debate with local bus companies about discounted integrated tickets: the bus companies maintained that the monorail company should bear the cost of discounting because they were going to lose traffic²⁵⁵.

A report later the same year said that the construction cost had been ¥112.8bn – mainly funded by state subsidy, but the company had a debt of ¥35bn. 95% of the revenue was expected to be from tickets: the remainder would be from ancillary income. ¥2.4bn compensation had been paid to local bus companies. On optimistic forecasts (31,000 passengers/day), break-even was in 27 years²⁵⁶.

Early in 2012, it was reported that work was to start in 2013 on a ¥35bn 4.1 km extension with four stations, to open 2019²⁵⁷.

Description of the service

13 km 15 station elevated monorail opened 10 August 2003 linking Naha airport and Shuri. Peak interval is every 6.5 minutes: off peak every 7.5 – 15 minutes²⁵⁸.

Issues

- None known

Phoenix

History

In 1999, a coalition of city and public agencies formed Valley Connections to promote a 37 km light rail link to connect the city with the airport, Tempe and Mesa²⁵⁹. The local share was to be funded by a transit tax²⁶⁰.

²⁵³ <http://www.metropla.net/as/naha/naha.htm>, printed 29 July 2002

²⁵⁴ <http://www.japanupdate.com/previous/02/11/29/story6.shtml>, printed 6 December 2002

²⁵⁵ <http://www.japanupdate.com/previous/03/05/09/story2.shtml>, printed 12 May 2003

²⁵⁶ <http://www.japanupdate.com/previous/03/06/06/story2.shtml>, printed 10 June 2003

²⁵⁷ Railway Gazette International March 2012 p17

²⁵⁸ Rail Transit On Line 15 August 2003

²⁵⁹ Tramways & Urban Transit February 1999 p72

²⁶⁰ Tramways & Urban Transit March 2000 p110

Phase 1 of the proposed Central Avenue light rail corridor would link the Chris-Town Mall, the uptown business district, the downtown Government area and Sky Harbor airport. The 27.3 km line was scheduled to open in 2006. Funding was to be 50% from a sales tax, and 50% from federal funds²⁶¹. A ballot for local funding for light rapid transit was agreed on 14 March 2000²⁶².

In August 2000 it was reported that the most difficult decision was whether to serve Sky Harbor airport directly or with a people mover connection to an off-airport stop. Sky Harbor already had a 6 km intra-terminal circulator on the drawing board: this could be extended to a transfer station at 24th Street. If it served the terminal directly, the partially underground train would cost an estimated \$740m, the high price resulting from the need to tunnel.

Airport officials agreed with transit experts that light rail should not enter the airport because too many stops would be required, slowing trips by commuters. Shuttle buses would make the connection between light rail and the airport until the people mover was completed²⁶³.

In 2001, a report said that transit officials were considering routing the proposed light rail system into Sky Harbor Airport to provide a closer connection with a planned \$200m people mover. The Central Phoenix/East Valley rail alignment approved by the City Council would have LRT running along Washington Street, skirting the north side of the airport.

The people mover would connect with the 32.7 km line at the 24th Street station, where passengers could check their luggage: two airlines had already indicated they would consider establishing ticket counters there.

The cost of building track into the airport had been estimated at \$300m or more, much of which would be needed for a tunnel.

The city intended to ask the FAA for permission to use proceeds from the \$3 pfcs for the airport portion of the line. Detailed planning for the people mover had yet to begin, but it was hoped to have it ready by 2006 when light rail was scheduled to begin revenue service²⁶⁴.

In 2004 it was announced that the line was now due to open in December 2008, and to cost \$1.3bn (\$100m more than previously estimated). Among the add-ons was a relocation of the airport stop to a more convenient site²⁶⁵.

A half-cent sales tax was voted for in January 2005, to fund the project²⁶⁶.

²⁶¹ Rail Transit On Line 1 April 2000

²⁶² Tramways & Urban Transit May 2000 p187

²⁶³ Rail Transit On Line 1 August 2000

²⁶⁴ Rail Transit On Line 15 January 2001. "Phoenix - LRT Into The Airport?"

²⁶⁵ Tramways & Urban Transit June 2004 p229

²⁶⁶ International Railway Journal January 2005 p9

In April 2005 it was noted that construction had started. Vehicles were due to be tested on a 1.6 km section by Spring 2006. The line would run from north Phoenix to the city centre, the airport and through central Tempe, to end about 1.6 km into suburban Mesa²⁶⁷.

The airport hoped the rail link would ease congestion on the roads and in its car parks, with many of the airport's 30,000 staff expected to be encouraged to use the train. The project would be funded by bonds repaid through airport revenues and a \$4.50 pfc charge²⁶⁸.

Revenue service was scheduled to start on 27 December 2008²⁶⁹.

Trains are 850v DC standard gauge 30 metre long 3-section Kinki Sharyo units. They are 70% low floor, with 66 seats and capacity for 226²⁷⁰.

In April 2009 it was reported that the average weekday ridership on the line was 30,600, compared with forecasts of 25,000²⁷¹. A report a year later said that there were 11.3m users in the first year, 34% above forecast. About 1,000 passengers were using the airport link each day²⁷².

In November 2011, it was reported that about 1,300 people a day, 10% of its riders, transfer to and from light rail at the airport station: in 2010 about 800 people a day rode the shuttle buses to and from the light rail station. The airport was negotiating with airlines to provide check-in and boarding pass services at 44th Street^{273, 274}; and this was likely to be provided both at the station and at the East Economy Parking station²⁷⁵.

The bag-drop at the East Economy Lot opened in December 2012, and that at 44th Street on 8 April 2013 with the opening of the first phase of the SkyTrain automated people mover: they were for passengers of Southwest and US Airways only²⁷⁶.

²⁶⁷ International Railway Journal April 2005 p9

²⁶⁸ Airport World April/May 2005 p16, "Raising Arizona"

²⁶⁹ Railway Gazette International August 2008 p480, "Valley LRV on test"

²⁷⁰ Tramways & Urban Transit March 2009 p97, "Phoenix: a city rescued by light rail" by Vic Simons

²⁷¹ Tramways & Urban Transit April 2009 p145, "Phoenix light rail ridership exceeds expectations"

²⁷² Tramways & Urban Transit April 2010 p151

²⁷³ "Sky Harbor awaits train to ease congestion" by Sean Holstege in www.azcentral.com, 10 March 2011 accessed 11 March 2011

²⁷⁴ The airport station is at 24th Street and Washington, at the west end of the airport: the station at 44th and Washington is at the east end

²⁷⁵ "Phx mayor touts light rail/Sky Harbor train connection" in http://www.tucson sentinel.com/local/report/111412_phx_light_rail/phx-mayor-touts-light-rail-sky-harbor-train-connection/ 14 November 2012 accessed 23 November 2012. East Economy Station is served by the airport people mover

²⁷⁶ Press release "PHX SkyTrain to open April 8". <http://skyharbor.com/pressreleases/SkyTrain.html>, 21 March 2013 accessed 25 March 2013

Description of the service

A light rail line between the city and Mesa, with a station at 24th/Washington Street. At that point, passengers need to go up to a connector bridge which they cross by a moving walkway to the automated people mover serving the airport terminals.

Issues

- Multiple changes of mode required

Portland (Oregon)

History

In 1998, it was reported that Tri-Met had recently been given the contract to build and operate a 5 km link to the airport.

As part of the airport's south side expansion, a light rail extension was being considered and would probably be developed as a PPP. Bechtel would bear the costs of part of the light rail line in return for development rights at a nearby port-owned site. Total cost was forecast at \$130m - \$170m. It could serve 4,000 – 5,000 passengers a day by 2001. Construction was to start in 1999²⁷⁷.

On 23 September 1998 the TriMet Board approved a \$115m 8.8 km airport light rail line, as a PPP²⁷⁸.

At the end of 1998, it was reported that a design and construction contract was likely to be awarded to Bechtel: cost was forecast at \$125m²⁷⁹. The FAA might or might not allow the Port of Portland to use pfc's for its share of the costs. Construction could start in March 1999 for completion in September 2001.

DevCo (Bechtel and property developer Trammel Crow) were to contribute \$28.5m in exchange for development rights on property near the airport owned by the Port of Portland²⁸⁰.

²⁷⁷ Passenger Transport World April 1998 p11, "Light rail for Portland?"

²⁷⁸ Tramways and Urban Transit November 1998 p416, "US Vice President Gore launches Portland's new Westside route"

²⁷⁹ The split between stakeholders was TriMet \$30.5m, Cascade Station Development Corporation (DevCo) joint venture \$28.2m, Port of Portland \$28.3m, City of Portland \$23m, and Metro Regional Planning Authority \$15m

²⁸⁰ Railway Gazette International November 1998 p754. "Airport to follow Westside line"

In late 1998, it was reported that the extension to the airport would cost nearly \$183m²⁸¹. Under proposed PPP, Bechtel would build the line to Tri-Met's specification and pay \$125m²⁸² in recognition of increased property value. Construction was likely to start in February and finish in August 2001²⁸³.

In early 1999, three airlines said that they opposed the use of airport funds to finance the Port of Portland's share of the cost of the extension. However United Airlines indicated that it would not take the matter to court if the FAA approved the use of these funds²⁸⁴.

Preliminary work started on 15 March 1999, although the final FAA decision on use of pfcs to provide funding was not due until June²⁸⁵.

In July 1999 it was reported that a \$3 airport departure tax had been approved to help under-write \$43m in bonds that Port of Portland was raising to part fund the \$125m cost of a light rail extension to Portland International Airport. Bechtel Enterprises and Trammell Crow were providing 22.5% of the cost in return for development rights on land near the airport²⁸⁶.

At the same time, it was reported that Siemens Transportation Systems had been awarded a \$29m contract to fulfil engineering and design roles in addition to supplying and installing the signalling and electrification and communications systems for the airport extension of Portland's light-rail system. The line would be able to transport passengers from the airport to downtown Portland in 33 minutes²⁸⁷.

While most Siemens light rail vehicles in use in North America were adaptations of proven European designs, the SD660 for the MAX service was an exception. It was a completely new design developed for North American use²⁸⁸.

The FAA approved its share of funding for the line on 28 May 1999. The most-likely completion date was September 2001. Although a final decision had still to be made regarding the operating plan for the line, solo LRVs were to be used, and it was thought very likely that all journeys would run to the SW 11th Avenue original terminus. This would require seven cars to provide a 15 minute headway.

²⁸¹ \$125m infrastructure: the rest was for rolling stock and terminal improvements (see page 74)

²⁸² In fact, \$28.5m: \$125m is the total cost of the infrastructure

²⁸³ RailNews November 1998 p33, "Airport line leaps ahead"

²⁸⁴ UTI January/February 1999 p28, "Light rail set back at Portland"

²⁸⁵ Tramways & Urban Transit May 1999 p191

²⁸⁶ Railway Gazette International July 1999 p422, USA

²⁸⁷ Mass Transit July/August 1999 page 88

²⁸⁸ Tramways & Urban Transit August 1999 p311

At Gateway, the new line coming from the north would pass about 100 metres west of the station and then make a 30 metre radius U-turn to connect into the existing line just south of the station. There were to be three intermediate stations, two serving the Cascade Station development where Bechtel was providing 20% of the light-rail funding in return for exclusive 85-year development rights. Ultimately this should generate more patronage than the airport.

By June 2000, track laying was in progress along Airport Way. The last of the new light rail vehicles arrived on 10 April 2000²⁸⁹.

Design and construction cost \$125m (\$28.3m Port of Portland through pfc's, \$45.5m Tri-Met, \$23m city of Portland, \$28.2m Cascade Station Development Company). LRVs, airport terminal improvements and Cascade station cost \$55.4m²⁹⁰.

In July 2000, there was a report that the new light rail station at Portland International airport was beginning to take shape and, starting 1 August, contractors Stacy & Witbeck would begin installing the 1000 metres of track closest to the terminal. The \$8.4m station was to feature an indoor waiting room with 80 seats and a clock counting down until the next departure. Trains were to run every 15 minutes using four single LRVs, turning back at Southwest 11th Avenue in downtown Portland. Two of the cars were to be equipped with experimental luggage racks.

An airport improvement program was also underway which included new elevators and escalators from the train platforms to the airline ticket counters, part of an effort to make public transit more attractive to travellers and airport employees. The schedule called for Bechtel to begin integrated testing of the entire branch on 15 March 2001 followed by a handover to Tri-Met in mid-July and revenue service on Labor Day²⁹¹.

At the end of 2000, it was reported that the airport line was to open in September. It would be known as the Yellow Line. It would be completed in April: 7 LRVs were to be retrofitted with luggage racks²⁹².

In April 2001, it was reported that officials were the first people to ride the line on 11 April 2001. The project was then 98% complete. The service was to start on 10 September 2001, with trains running every 15 minutes²⁹³.

The line had four new stations. One innovation which hit the press was the Quick Drop concept - special short term parking areas near six of the stops. At these, passengers with luggage could interchange easily between car and light rail²⁹⁴.

²⁸⁹ Tramways & Urban Transit June 2000 p227

²⁹⁰ Tri-Met fact sheet 28 March 2000, www.tri-met.org/airport/index.htm, printed 30 June 2000

²⁹¹ Rail Transit On Line 15 July 2000

²⁹² Railway Gazette International November 2000 p700

²⁹³ Rail Transit On Line 15 April 2001

²⁹⁴ "Oregon Live", 30 July 2001

Funding came from the Port of Portland (through pfcs) \$28.3m, TriMet \$45.5m, City (urban renewal funds) \$23m, Cascade Station Development Company (CSDC) \$28.2m. This gave a total of \$125m. With new LRVs, terminal improvements and Cascade Station improvements, this amounted to \$180.4m. CSDC got a long lease for 120 acres at Cascade Station²⁹⁵.

Shortly before opening, the decision to install luggage racks was reversed: four bike hangers were put in each low-floor car instead. Forecast carryings by September 2002 were 2,300/day. Tri-Met offered annual passes for \$34 to employees living near the line²⁹⁶.

In September 2001 it was reported that the line to the airport opened on September 10, five weeks ahead of schedule and under its \$125m budget. Bechtel Enterprises had contributed \$28.2m in exchange for development rights. No new taxes were imposed and no federal money was involved, significantly accelerating the line's planning and construction. This was the first public-private partnership in the US involving transit and real estate development as well as being the first airport rail link on the west coast²⁹⁷.

Airport MAX carryings averaged 3,400/week in September 2001 (including, presumably, those unable to fly out of the airport on 9/11)²⁹⁸.

An October 2001 survey showed that 54% of passengers at the airport station were air passengers, and 21% employees²⁹⁹.

Airport MAX carryings averaged 2,800 a day in September 2002, a year after opening, compared with a forecast of 2,300³⁰⁰.

The Environmental Report for 2001-2002 said that average ridership since September 2001 had been 2,200 a day, reducing car miles travelled by 6.3m. By 2015, it was forecast that the line would attract 2.7m rides a year.

After the line opened, it was reported that the MPO had discussed with MAX the possibility of moving freight to and from the airport by light rail. Many high-tech industries were on the west side of the city and the airport was in the east: the Westside line runs past the industrial area. The MPO's idea was directed at companies like FedEx, DHL and UPS who would have consolidation points where containerised shipments would be rolled onto converted light rail cars. The real problem was a lack of spare cars: another was TriMet's attitude that they were in the business of moving people, not cargo³⁰¹.

²⁹⁵ Tri-met web-site 31 August 2001 (<http://www.tri-met.org/airport>)

²⁹⁶ "The Oregonian" on-line issue 7 September 2001

²⁹⁷ Rail Transit On Line 15 September 2001

²⁹⁸ Tramways & Urban Transit 1 November 2001

²⁹⁹ Airports Magazine May/June 2002 p47

³⁰⁰ Tramways & Urban Transit November 2002 p428

³⁰¹ Tramways & Urban Transit September 2007 p360, letter from Ed Immel, retired rail planner in Oregon DoT

Description of the service

An 8.8 km extension of the city's light rail system, with four new stations. The part of the extension on airport property is owned by the Port of Portland but operated by Tri-Met³⁰². Trams run every 15 minutes: it is a 37 minute ride between downtown and the airport. They run into the lower level of the airport terminal: the station is 50 metres from the south baggage claim. The trams have a bike area which is usable for bags. There are neither stacks nor overhead racks. Announcements are in English and Spanish.

In the airport, the time to the next two departures is shown on screens by the baggage reclaim. Signs to light rail use the heavy rail pictogram. The airport station has two platforms and plenty of ticket machines (accepting notes, coins and cards). It is called Airport. The destination on the front of trains is City Center. The cars have a clean interior, mainly low floor level with platforms, although up to three steps up over the bogies. Generally there is 2+2 seating. The service is operated by two-car three section trains, sometimes operating in 2x2 formations. On the maps on board, the station is called Portland International Airport.

There is some single track – the first bit from the airport and near Gateway station. Barrier protected level crossings have very solid portal warnings of height restrictions. There are some very sharp curves, with particularly tight geometry at Gateway. The line from Gresham comes into the station then turns through right angle to go downtown; and the line from the airport comes from the opposite direction and turns through 180° to reach the station then 90° to run along the Gresham line into the city – crossing the line from the airport as it does so³⁰³.

Service hours are 4:16 to 23:05 then 23:35³⁰⁴.

Issues

- The journey is relatively slow
- Some trains have steps up
- There is good provision for bags, bikes and strollers
- The service has excellent downtown distribution

Porto

History

In 2002 it was reported that the metro extensions planned for the city included a branch to the airport³⁰⁵.

³⁰² “Intermodal transportation. Potential strategies would redefine federal role in developing airport intermodal capabilities”. GAO July 2005

³⁰³ Notes of visit August 2003

³⁰⁴ Tramways & Urban Transit October 2001 p390

³⁰⁵ Tramways & Urban Transit 12 January 2002 p450

In 2004, it was noted that bids had been requested for a light rail link to the airport from Estação dos Verdes³⁰⁶.

Construction of the airport line began in March 2005 with €74m of funding from the EU's Cohesion Fund³⁰⁷.

At the end of 2005, it was reported that the line was to be ready by December 2005. It would follow Line B and then use a new 1.4 km branch (costing €42m, nearing completion) from Verdes, south of Pedras Rubras, to the airport³⁰⁸.

The light rail Violet line E serving the 1.6 km branch to the airport was opened on 27 May 2006³⁰⁹.

Description of the service

According to Metro do Porto's web-site³¹⁰, trains run every half hour between 6:00 and 0:30, and take about 30 minutes. The cost is €1.80.

The station is directly in front of the terminal building, and connected to it by a pedestrian tunnel³¹¹.

Issues

- None known

Pusan

History

On 29 May 2000 Bombardier Transportation signed a memorandum of agreement with Kumho Engineering & Construction to bid for construction of an automated light metro in the South Korean port of Pusan. The municipal government had called for bids for a 23.9 km rail link from the city centre to Kimhae International Airport. It was to be part-financed by the private sector: the Korean government and the municipality were prepared to finance 40% of the 1,200bn won project.

Bombardier and Kumho, with Econ of Singapore, Lotte Construction and Iljin Electric, put in a bid to supply a fully-automated line. Construction was due to get under way in 2001, with the line to be completed by 2005³¹².

³⁰⁶ International Railway Journal June 2004 p8

³⁰⁷ Railway Gazette International October 2006 p679

³⁰⁸ Today's Railways December 2005 p29, "Porto network reaches 4 lines" by Manuel Tão and Carlos Fonseca

³⁰⁹ Tramways & Urban Transit August 2006 p313

³¹⁰ http://www.metroporto.pt/en/PageGen.aspx?WMCM_PaginaId=16201

accessed 26 February 2013

³¹¹ "Lighting up Porto" by Levent Bergkotte in Airports of the World July/August 2010 p74

³¹² Railway Gazette International July 2000 p401

An international consortium with Bombardier Transportation as co-leader was selected in August 2000 to negotiate a concession for a turnkey design, construction and operations contract for a system linking Kimhae with Pusan. The fully automated line would also serve the international airport at Kimhae.

Bombardier would be responsible for overall system design, systems engineering and integration, supply of train control, communications and power supply systems, automatic fare collection, trackwork, testing and commissioning. They would also manufacture the line's initial fleet of 46 cars and provide operations and maintenance start-up assistance and training for Korean personnel.

It would be the first South Korean rapid transit project to be built under a public-private partnership. The contract was expected to be signed during the first quarter of 2001, with construction beginning by December of that year. Completion was scheduled for 2005 and the project was estimated to cost approximately \$1.1 bn, with Bombardier's share valued around \$300m³¹³.

In 2002, the South Korean Transport Ministry selected a Hyundai-led consortium to build the planned light metro between Pusan and Kimhai International airport at a cost of 774bn won. Work was to start in 2003 for opening in January 2008. The Kumho-Bombardier consortium chosen in 2000 later withdrew³¹⁴.

The Pusan – Kimhai driverless light metro opened to passengers on 9 September 2011, with free travel before the formal opening ceremony on 16 September. It was built by Hyundai and Posco Construction. It is operated by Seoul Metro, with 25 2-car Hyundai Rotem trainsets using 750v DC and Thales signalling³¹⁵.

Description of the service

It is an elevated automated light metro serving Kimhai airport and Kaya University: it has 21 stations.

Issues

- None known

³¹³ Rail Transit On Line 1 September 2000, "South Korea"

³¹⁴ Railway Gazette International July 2002 p348

³¹⁵ Railway Gazette International October 2011 p16, "Driverless line opens"

St. Louis Lambert

History

In 1988 it was reported that, with the preliminaries leading up to release of an initial Urban Mass Transportation Act (UMTA) capital grant all but complete, the Bi-State Development Agency³¹⁶ at St. Louis, Missouri, should be ready to move into final design stage for its 29 km MetroLink light rail system that would join East St. Louis with central St. Louis, the city's suburban areas to the north west, and the international airport.

It would be double track apart from a single track branch to the airport. The line should come into operation during the last half of 1992. It would be funded by a 75% UMTA grant: the rest was in the value of the land (disused railways, tunnels and bridges) given by the city of St. Louis³¹⁷.

The 4.8 km extension from North Hanley to the airport was formally opened on 24 June 1994 by President Bill Clinton³¹⁸.

A report in Spring 1998 said that on 1 May 1998 MetroLink was due to open a second station at Lambert airport. Passengers would be allowed to ride free between the Main and East Terminals under a subsidy arrangement between the airport and the Bi-State Development Agency³¹⁹.

However, opening of a second MetroLink station was delayed by a design issue at East Terminal. The station is elevated, and there were no barriers to safeguard passengers if doors opened on the wrong side. This was due to be rectified by September 1998³²⁰.

In 1999, it was reported that the new modern East Terminal was a traveller friendly state of the art facility with a MetroLink station providing a service from the airport to 12 stops throughout downtown St. Louis³²¹.

In 2000, ridership on the line between Lambert and East St. Louis reached 42,000³²².

Total cost of the initial system was \$463m – a Federal grant funded \$353m and local assets worth \$110m provided the rest³²³. In addition, \$4m in pfcs was used for the station on the airport³²⁴.

³¹⁶ Which changed its name to Metro in February 2003

³¹⁷ International Railway Journal May 1988 p44, "St. Louis gears up"

³¹⁸ Railway Gazette International August 1994 p489

³¹⁹ Railway Gazette International May 1998 p285, "Metrolink heads east"

³²⁰ Rail News November 1998 p34

³²¹ Passenger Terminals 1999 p182

³²² Tramways & Urban Transit November 2000 p431

³²³ Metro Report 2001 p48

³²⁴ "Intermodal transportation – challenges to and potential strategies for developing improved intermodal capabilities". Statement to Subcommittee on highways, transit, and pipelines, Committee on transportation and infrastructure, House of Representatives, by Katherine Siggerud of GAO, 15 June 2006. The report is unclear about whether pfcs funded one station or both

Description of the service

Light metro, with six trains an hour³²⁵.

The line is on elevated structure near the airport, otherwise at ground level or in tunnel or cutting downtown. The initial section is single track, then it is double from East Terminal. There are several protected level crossings. Some formation is old railway right of way and some is shared with freight, especially downtown³²⁶.

Issues

- There is no baggage space on trains
- Downtown distribution is reasonably good
- The service is highly visible from airport

St Louis Scott AFB (and the little-used Mid America Airport)

History

On 17 July 1997, the Bi-State Development Agency received a \$1.5m grant from Illinois, allowing a final engineering design to begin on the MetroLink extension to Scott Air Force Base³²⁷.

In 1998, the extension (costing \$80m) was awaiting a decision on federal funding³²⁸. It would be 14.2 km long with two stations - one serving Scott Air Force Base and the other serving the new Mid-America Airport³²⁹.

This was on the second phase of the St. Clair County MetroLink extension. Design work was to be completed by September 1999. Illinois DoT had granted \$15.5m for design: the St. Clair County Transit District would match this. Design and construction were likely to cost \$120m³³⁰.

On 9 December 1999 the Bi-State Development Agency confirmed the funding for a 13.7 km extension of MetroLink from Belleville to Scott Air Force Base and MidAmerica Airport. The FTA and Illinois would each contribute \$60m to the \$124m project, and St Clair County would raise the rest. The 28.5 km extension from East St. Louis to Belleville Area College was due to open in May 2001³³¹.

In March 2000, it was reported that the Senate Banking Committee and both the House and Senate Appropriations Subcommittees had informally told the FTA not to fund the proposed MetroLink extension from Belleville to Scott Air Force Base/Mid-America Airport because of low projected ridership.

³²⁵ Railway Gazette International December 1995

³²⁶ Notes of visit February 2008

³²⁷ Railway Gazette International September 1997 p566

³²⁸ Railway Gazette International May 1998 p285, "Metrolink heads east"

³²⁹ PRm November/December 1998, "St. Louis Metrolink project"

³³⁰ www.bi-state.org/BAC-MAA.htm (probably summer 1999)

³³¹ Railway Gazette International January 2000 p9

A December audit by the DoT's Inspector General (IG) showed the line would only carry 1,931 weekday passengers by 2010, primarily because the civilian airport had been shunned by the airlines and little chance was seen of any change. Given the \$121m cost, the IG said the sparse ridership would "pose a risk about the economic viability of the proposed project."

The study was released just days after the Administration announced a full funding agreement for the extension with the Bi-State Development Agency. The financing package had the FTA contributing \$60m, the State of Illinois providing another \$60m and St. Clair County supplying the remainder. A 28.1 km extension from East St. Louis to Bellville was now being built and was scheduled to open in July 2001³³².

One (un-named) airline was promising to start a service at Mid-America airport in the autumn³³³.

The Governor of Illinois had pledged \$60m in state funds for the extension to Scott Air Force Base and Mid America Airport. The action represented the first funding commitment towards the estimated \$124m construction cost. The FTA had recommended giving another \$60m to the project, but Congress first needed to appropriate the money. Ridership on the existing line between Lambert Airport and East St. Louis had reached 42,000³³⁴. That figure was expected to grow substantially when the \$339m, 28 km extension to Belleville was completed in May. The project was currently within budget and on schedule³³⁵.

In November 2001, it was reported that a 5.8 km \$75m extension to Shiloh-Scott near Scott AFB was under construction³³⁶. Trackwork was scheduled to start that winter: opening date was to be mid 2003³³⁷.

Construction began in Spring 2002. \$60m of the cost was to come from Illinois FIRST (Fund for Infrastructure, Schools and Transit) and \$15m from St Clair County³³⁸.

In March 2003, it was confirmed that the extension was to open in summer 2003. It would run for 5.6 km from South-western Illinois College in Belleville to Scott-Shiloh station. The public would use one side of that station: military police would control access to the air force base from the other. The line was expected to be used heavily by the 13,000 people at the base flying through Lambert airport³³⁹.

The 750v power system along the route was energised on 18 April 2003. The final 8.2 km extension to Mid America airport was stalled due to lack of Federal funding – there were still no flights there³⁴⁰.

³³² Rail Transit On Line 1 March 2000. "St. Louis – Caution Urged"

³³³ Rail Transit On Line 15 August 2000

³³⁴ Presumably in 1999

³³⁵ Tramways & Urban Transit November 2000 p431. "St. Louis, MO"

³³⁶ Rail Transit On Line 1 November 2001

³³⁷ Rail Transit On Line 15 December 2001

³³⁸ UTI May/June 2002 p33, "St Clair metro shines in first year"

³³⁹ Rail Transit On Line 15 March 2003

³⁴⁰ Rail Transit On Line 1 May 2003

In May 2003, it was reported that the Shiloh-Scott MetroLink extension would begin revenue service on 23 June 2003, preceded by two days of celebrations. The \$75m project, which was on time and under budget, would extend the Metrolink system from Belleville to Scott Air Force Base, the third largest employer in the St. Louis region³⁴¹.

Description of the service

Conventional fast light metro system.

Issues

- None known

San Jose

History

It is uncertain when the service started. The Caltrain service started in the 1860s, well before the airport (which opened in the 1940s), and the VTA service on 21 April 1991³⁴².

Description of the service

Bus shuttle from the VTA light rail station to the airport terminal and on to the nearby Caltrain station.

A Santa Clara Valley bus map dated January 2001 showed a VTA/SJC airport flyer free shuttle bus (route 10) running every 10 minutes between Metro/Airport light rail station, the airport terminal and Santa Clara Caltrain station.

A number of VTA stations³⁴³ had designated airport long-term parking lots for up to 7 days: in total, 240 spaces were available.

In 2005, buses on route 10 still connected Metro/Airport LRT station, the terminal and Santa Clara Transit Centre (Caltrain station). They ran 3-4 times an hour between 5:00 and 23:30 with fewer buses at weekends. The fare was \$1.75. Journey time was seven minutes to the LRT station, 13 to Caltrain³⁴⁴.

In the airport's masterplan, there are proposals for an automated people mover covering the same route³⁴⁵.

³⁴¹ Rail Transit On Line 15 May 2003

³⁴²

http://www.vta.org/news/factsheets/vta_information/01_1_vta_history_102604.pdf
7 November 2005 accessed 1 March 2013

³⁴³ Almaden, Blossom Hill, Branham, Capitol, Cottle, Curtner, Evelyn, Ohlone/Chynoweth, Santa Teresa, Snell, and Tamien

³⁴⁴ Local airport flyer timetable 4 July 2005

³⁴⁵ http://www.flysanjose.com/fl/about/improve/overview/Jan_Add_2011.pdf
accessed 1 March 2013

Issues

- Airport based employees are given a pass allowing unlimited use of VTA buses and light rail trains³⁴⁶

Seattle-Tacoma (SeaTac)

History

In 1994 the Regional Transportation Agency (RTA) approved a package of improvements that included light rail³⁴⁷.

In 1997, voters approved local tax increases which would generate \$3.9bn for major improvements to public transport centred on Seattle. This included \$1.7bn for an LRT line. This north-south line was initially to be 32 km long and would link the university district with the centre of Seattle, the Boeing aircraft plant, and SeaTac airport. Two thirds of the line would be grade separated.

An existing trolleybus tunnel, built with LRT in mind, would be incorporated, and a further 6.5 km of bored tunnel would be built. The first section was to open in 8 years time³⁴⁸.

In early 1998, the RTA awarded a \$23m contract for preliminary engineering for Seattle's Link light rail. Puget Sound Transit Consultants³⁴⁹ were to undertake on-site surveys for 26 stations and assess track alignments and design. RTA hoped to begin operations at the SeaTac end in 1999, with extensions to Lakewood and Everett later³⁵⁰.

The route for the \$1.8bn link between SeaTac and the University was agreed on 25 February 1999: it would run to the airport and terminate at South 200th Street³⁵¹.

In June 1999, the City Council of Tukwila withdrew its support from the project because Sound Transit (ST) would not route the line into the South Centre Mall, a focal point of the community development. Instead, the plan called for tracks along State Highway 99 at the western edge of Tukwila, which would save eight minutes of travel time along the 38.6 km line to the airport.

ST also believed that the longer alignment would reduce the attraction of light rail if it was extended south from SeaTac Airport to Federal Way and Tacoma³⁵².

³⁴⁶ See footnote 345

³⁴⁷ PRm February/March 1995 p36, "Growth continues in North American light rail" by Richard Kunz.

³⁴⁸ International Railway Journal February 1997 p44, "Seattle to have LRT and commuter rail"

³⁴⁹ PTSC - Parsons Brinkerhoff Quade & Douglas, ICF Kaiser Engineers, and BRW Inc

³⁵⁰ Railway Gazette International March 1998 p142, "Seattle makes a start"

³⁵¹ Railway Gazette International April 1999 p193

³⁵² Tramways & Urban Transit, June 1999 p231

In early 2001, it was reported that work on the last 23 km between South Lander Street and SeaTac was to get under way in 2004³⁵³. Originally, the target opening date was the end of 2006, but that was changed to 2009. The overall result was a considerable amount of controversy³⁵⁴.

Originally, the 33.8 km route included an airport stop, but the project was truncated when projected construction costs soared, with an increase of around a third in the forecast total capital outlay being reported³⁵⁵. In an effort to salvage the Link from those financial problems, in April 2001 it was suggested that the line south from SeaTac should be constructed first³⁵⁶.

In August 2001, two alternatives were under evaluation - one running south from downtown Seattle to South 200th station, including a stop at the airport; and the other going to an interim terminal at South 154th, 2 stops north of South 200th, with a bus shuttle to the airport.

The airport wanted the light rail station to be within the proposed north terminal, plans for which would not be completed for at least two years. This made the second option more attractive³⁵⁷.

A month later, it was confirmed that the final version of a 22.5 km truncated route for the Central Link light rail project would start at Convention Place station in the downtown bus tunnel and end at South 154th Street, about 1.5 km north of Sea-Tac International Airport. There, airport passengers would transfer to express buses that would stop at every terminal. The line would not serve the airport because of the cost and the uncertainty about when a planned new terminal would be built.

The proposal, which would cost \$2.1 bn, was to be considered by the ST Board at its September meeting after the finance committee examined it³⁵⁸, and on 29 November 2001 the Board formally approved this.

Staff were investigating completion of an airport extension by 2009 (when the approved section was to open) despite not having sufficient money in the budget. The station was likely to be located in the North End Aviation Terminal then being designed: it would have automated people movers to other terminals³⁵⁹.

On 15 January 2003 ST and the Port of Seattle announced an agreement in principle for a future light rail station and track alignment at Sea-Tac Airport. Construction would follow opening of the line from downtown to South 154th Street in 2009.

³⁵³ Rail Transit On Line 1 February 2001

³⁵⁴ Metro Magazine April 2001 p46, "Sound start to Seattle's commuter rail system"

³⁵⁵ "Light-rail cost soars \$1 billion" in

<http://community.seattletimes.nwsources.com/archive/?date=20001213&slug=TTGI2KF2J>, 13 December 2000 accessed 8 February 2013

³⁵⁶ Rail Transit On Line 15 April 2001

³⁵⁷ Rail Transit On Line 15 August 2001

³⁵⁸ Rail Transit On Line 15 September 2001

³⁵⁹ Rail Transit On Line 1 December 2001

The agreement identified the way forward to develop an alignment south of 154th Street and a station at the airport. The station would be adjacent to the airport's existing terminal and parking garage, integrated within the Port's updated plans for expanding the airport.

The location of the route and station had been stalled because the Port had wanted it placed in a new north terminal. That project was shelved in favour of an incremental expansion of the existing terminal and reconstruction of the North Airport Expressway that would include the light rail alignment down the centre. Once design of the expressway was completed in 2005, Sound Transit would begin preliminary engineering, environmental review and final design for the extension. Revenue service was envisaged for 2011³⁶⁰.

When the light rail started service in 2009, shuttle buses would meet light rail passengers at the line's interim southern terminus, at South 154th Street, and carry them to the airport.

The station planned at the airport would be developed on port property, on the western edge of International Boulevard. Sound Transit Board had authorised \$10m to design the extension to the airport, and the Port of Seattle Commission authorised \$10.6m to develop a comprehensive development plan for the SeaTac Airport North End Development programme³⁶¹.

The plan put the station on the fourth level of the existing airport parking garage, with an elevated walkway to International Boulevard and a pedestrian connection to the airport's ticket counters. The connection was to be completed before the 2010 Winter Olympics in Vancouver.

Sound Transit outlined a financial plan for covering the estimated \$225m cost of the light rail extension, relying entirely on existing revenue sources. The Port of Seattle reported financial capacity for the airport and roadway improvements that would enable the light rail extension to be completed.

Sound Transit, the Port of Seattle and the city of SeaTac agreed to work closely together on integrating plans for the rail connection with plans for expanding the airport. The port's plan for adding capacity would expand the existing airport terminal to the north and east. In 2003, Sound Transit and the Port of Seattle began working in earnest to integrate expansion plans for both the Central Link and the airport. When this work began, 2011 was identified as the earliest possible time by which a light rail extension could be completed. Much work was done to identify options that would make a December 2009 opening date feasible.

Sound Transit estimated that by 2020 approximately 3,000 light rail riders would use the airport station each day. Travel time between the Airport Station and downtown Seattle was expected to be 35 minutes³⁶².

³⁶⁰ Rail Transit On Line 1 February 2003, "Seattle — Airport Station Agreement"

³⁶¹ Passenger Transport 3 February 2003 p5, "Sound Transit, Port agree on light rail to airport"

³⁶² Passenger Transport 24 January 2005 p1, "Agreement reached on extending Sound Transit's light rail to airport"

A new station – now the only one on the extension – was to be built at the airport. For some time it would be the terminus of the service, but ultimately the line would go on to South 200th Street. The date for this further extension was uncertain. The airport service was to have 8 – 10 trains an hour by 2015. The airport station was further north than in the original plans, and 400 metres from the terminal: it would be linked by walkways through the parking garage.

Capital cost was likely to be \$245m, plus associated roadway changes of \$60m, to be funded by the Port of Seattle and Sound Transit. Annual operating and maintenance costs for the 35 km link excluding the airport section (Northgate – Tukwila) in 2015 were forecast at \$55m: the 2.7 km airport section would add \$3m³⁶³.

The Sound Transit Board approved plans in July 2005 for moving forward with the extension of light rail to the airport. This was to be implemented by December 2009, in time for the 2010 Winter Olympics. By 2020, it would be carrying over 45,000 riders daily between downtown Seattle and the airport³⁶⁴.

On 8 December 2005 Sound Transit approved the purchase of four additional 30 metre long low floor light rail vehicles to serve the airport at a cost of \$13.9m from a Kinkisharyo/Mitsui joint venture. They were to be built in Osaka and fitted out in the US³⁶⁵.

In March 2007, it was reported that only one bid had been received for the airport station on Seattle's Sound Transit light rail system. The bid was for \$95.3m, about twice the estimated \$51.8m, and was thought unlikely to be accepted. The organisation would put the bid out again, or break it into smaller pieces³⁶⁶.

Rumours in September 2008 that the airport station had been delayed until the second quarter of 2010 were denied by Sound Transit, who said it would open on 29 December 2008. The entire link was forecast to be completed for \$140m below the \$2.44bn budget³⁶⁷.

It was opened to Tukwila International Boulevard on 18 July 2009, with a bus shuttle to the airport³⁶⁸.

³⁶³ Airport Link Environmental Assessment documentation, May 2005
(www.soundtransit.org/newsroom/releases/pr_20050613_1.asp)

³⁶⁴ www.soundtransit.org/newsroom/releases/pr_20050715_1.asp?style=print, printed 18 July 2005. Press release “Sound Transit Board adopts plan for airport light rail extension”

³⁶⁵ www.soundtransit.org/about/ceo printed 12 December 2005

³⁶⁶ Rail Transit On Line 15 March 2007

³⁶⁷ Rail Transit On Line 10 September 2008

³⁶⁸ <http://www.soundtransit.org/Riding-Sound-Transit/Schedules-and-Facilities/Central-Link-Light-Rail.xml>, accessed 21 August 2009

Under the Proposed 2010 Transit Improvement Plan³⁶⁹, the South Link project extended the line on elevated guideway south from airport to South 200th Street. After that there would be a 7.7 km extension to South 272nd Street: this section would have 2 stations. Baseline budget for the Airport Link was \$269.1m: for the extension to South 200th, \$22.772m (up to 2014) and on to South 272nd, \$35.098m (a small amount after 2014). Revenue service to South 200th was planned for 2020.

In October 2009, it was said that there were 1,400 riders/day on the airport bus shuttle, which was running 20 hours a day.

The airport station was to have overbridges to the exit walkways – one to the local community, and one serving the main terminal building. 2-car trains were running now: 4-car trains were possible. The station was to have FIDs³⁷⁰. In mid 2009 it was reported that the airport station was to open on 19 December 2009. The airport segment and station cost \$268m.

Trains stop on an upper central platform, covered but exposed to the weather. FIDs were to be installed in January 2010. There was a 400 metre walk to the terminal, across the skybridge and through the multi storey car park³⁷¹.

A 2010 report³⁷² noted that the 2.6 km extension south from the airport could be completed by 2016 if \$34m in additional funding could be found by next Spring. The \$300m line would terminate at South 200 Street and International Boulevard South. This segment was originally part of the line, but was postponed because of budgetary issues – originally to 2020-2022.

In summer 2011, it was reported that the extension to South 200 Street was now to be completed by September 2016, four years earlier than planned. Cost was forecast to be \$383.2m – most of which would come from locally generated funds but \$30m would come from a TIGER grant³⁷³. A \$169m design-build contract was let to PCL Civil Construction in October 2012³⁷⁴.

Description of the service

When approaching landside baggage reclaim, there are signs to Link Light Rail and Public Transit Buses, each with slightly different route.

The station is a six minute walk from the terminal. In places the route is covered, rather than completely protected from the elements. Signage is consistently to Link Light Rail.

³⁶⁹ October 2009

³⁷⁰ Ron Lewis, Sound Transit, at IARO's Vancouver conference, "Successful light rail to airports", on 19 October 2009

³⁷¹ Seattle Times on line 17 December 2009 accessed 18 December 2009, "Airport rail station opens Saturday" by Mike Lindblom

³⁷² Tramways & Urban Transit October 2010 p392

³⁷³ Rail Transit On Line 10 August 2011, "South Link extension accelerated"

³⁷⁴ Railway Gazette International November 2012 p22

The airport station is on an impressive elevated structure, as is much of the route (although some is ground-level, on street, and some in tunnel). There are relatively long distances between some stations, enabling trains to get up quite a speed³⁷⁵.

Issues

- There are no countdown indicators and no indication of how long it will be until the next train
- Signage at the terminals end is sometimes unclear about the shortest route to check-in for specific airlines
- “Link Light Rail” is not an obvious synonym for “trains to city”
- There is a relatively long walk between station and terminal, with limited weather protection
- Maximum car parking time is 24 hours on ST
- Baggage trolleys were initially available at \$4

Vancouver

History

In 1994, it was noted that a line was being planned to serve the airport³⁷⁶.

In 1998, it was reported that Vancouver International Airport Authority was considering an automated rail system to handle passengers and cargo³⁷⁷.

A cost benefit analysis report was due in January 2001 on a rapid transit line between downtown Vancouver and Richmond: a branch would serve the airport. This had been part of state planning policy since 1980, but growth at the airport had been faster than forecast. Funding mechanisms were being investigated – DBO, for example, was possible³⁷⁸.

In March 2002, it was reported that a subway in the Cambie Street corridor from Richmond to Vancouver serving the airport would cost C\$1.9bn. It would be 34 km long with 17 stations, serving 107,500 riders by 2010³⁷⁹.

In June 2002, it was reported that the City of Vancouver had agreed to contribute to a C\$3m study for a Skytrain link between Central Vancouver and the airport via Richmond³⁸⁰.

³⁷⁵ Notes of visit 31 March 2012

³⁷⁶ La vie du rail 2438, 23 March 1994 page 20, “Le Skytrain de Vancouver” by Michel Chlastacz

³⁷⁷ UITP Express December 1998 page 1, “Improving public transport connections to airports”

³⁷⁸ Rail Transit On Line 1 March 2001

³⁷⁹ Rail Transit On Line 15 March 2002

³⁸⁰ Tramways & Urban Transit June 2002 p224

In December 2002, a high capacity rapid transit line connecting Canada Place in downtown Vancouver with the airport and Richmond was being promoted. A federal contribution of C\$450m was sought. The goal was to have it running in time for the 2010 Winter Olympics. A private sector partner would build and operate the line. Two alternative routes were possible - Arbutus (with existing CP tracks which could be used) and Cambie St. (faster and more attractive)³⁸¹.

In January 2003, a request for expressions of interest for companies or consortia willing to join a long term public private venture to finance, build, operate and maintain a Vancouver - Richmond rapid transit system was issued. This would include an east-west segment linking in the airport³⁸².

A discussion document issued in March 2003 said that the cost would be C\$1.5bn – C\$1.7bn. Ridership was forecast to be 26m-38m by 2010 and this would cover operating costs “in certain configurations”. A 25 minute journey time was forecast, and it should open in 2009³⁸³.

In early 2003, it was reported that a 19.5 km rapid transit line from Vancouver to Richmond with a spur to the airport was under development. Funding was expected to come from the Federal government (C\$450m), and the province, airport and transit operator (C\$300m each). The rest would come from the private sector. This would be for a 35 year franchise: then, the main line would revert to TransLink and the province, and the airport spur to the airport. Annual operating costs were forecast at C\$28m – C\$36m³⁸⁴.

In July 2003, the Federal government said it could only offer C\$300m and not C\$450m, and therefore work could not start³⁸⁵.

In September 2003, public funding was agreed on the basis that the private sector would contribute 20% - which it was thought might be unrealistic. C\$1.2bn would come in equal parts from federal and British Columbia governments, the airport and Translink. Completion was scheduled for 30 November 2009 (just before the Winter Olympics). Four consortia were interested – Bombardier/AMEC/Bouygues, Alstom/Ledcor/Connex, Fluor/Siemens/First/Aecon and SNC-Lavalin/Serco. Proposals were due on 23 December 2003³⁸⁶.

In May 2004, the Board of Translink voted against the planned PPP to build the RAV line. Staff were asked to come up with a cheaper solution which could be implemented by the Winter Olympics in 2010³⁸⁷.

³⁸¹ Canada.com news (printed from <http://www.canada.com/components/printstory/printstory.asp?id=EFF80425-F4C1-470>, 16 December 2002)

³⁸² Rail Transit On Line 1 January 2003

³⁸³ Richmond.Airport.Vancouver (RAVP) rapid transit project discussion document, March 2003 p7

³⁸⁴ Rail Transit On Line 15 March 2003

³⁸⁵ Rail Transit On Line 1 July 2003

³⁸⁶ Rail Transit On Line 1 September 2003

³⁸⁷ International Railway Journal June 2004 p8

Later that month, it was reported that the C\$1.5bn, 19.5 km project might be revived. The Premier of British Columbia announced on 10 June that the province would be willing to assume responsibility and financial risk for the line, which was originally conceived as a PPP with the private sector contributing about 20% of the cost and making certain the work would be finished on time and within budget³⁸⁸.

On 18 June 2004 the Board of Translink voted against a proposal to revive the original scheme despite the province of British Columbia offering to assume responsibility and financial risk for the project.

The rejection reportedly resulted from the province's transportation minister saying that Translink were probably not capable of bringing the project to fruition by the end of 2009, and no-one would want to invite the world to a massive construction site. On 23 June, Translink's chairman called another Board meeting for 30 June because some Directors had changed their minds: the following day the airport authority announced its support for the scheme as being vital to its employees and passengers and to help handle future growth³⁸⁹.

In January 2005 it was reported that the favoured bidder for the 19.5 km city centre – airport line was the SNC-Lavalin – Serco consortium (InTransitBC). However the cost was C\$300m above the C\$1.5bn estimate, which might require the project to be scaled back³⁹⁰.

Construction was expected to start in September 2005 for completion by the end of 2009. A 35 year finance, design, build, operate, maintain concession was signed that month with the InTransitBC consortium³⁹¹. In 2005 the cost was forecast at C\$1.9m in 2003 prices – up from the \$1.72bn previously thought. C\$419m was to come from the Canadian government, C\$235m from British Columbia, C\$321m from Translink, C\$245m from Vancouver Airport and C\$27m from the City of Vancouver. The rest was to be raised by InTransitBC.

The line would run underground from the Waterfront terminus to 63rd Ave, then on viaduct and bridge to Richmond. The airport branch would diverge at Bridgeport and would be mainly at ground level³⁹².

Agreement was reached in July 2005 on a fixed price fixed date contract. There would be a 25 minute journey time to the airport, with trains running every six minutes³⁹³. Translink would own the infrastructure, set the fares and take the ridership risk³⁹⁴.

³⁸⁸ Rail Transit On Line 15 June 2004, "Vancouver — RAV Returns"

³⁸⁹ Rail Transit On Line 1 July 2004

³⁹⁰ Tramways & Urban Transit January 2005 p23

³⁹¹ headed by SNC-Lavalin and including BC Investment Management Corporation and Caisse de depot et placement du Quebec

³⁹² Railway Gazette International September 2005 p523, "Vancouver contract signed"

³⁹³ Metro Report 2006 p49, "Canada Line opens in November 2009" by Meirec Preece

³⁹⁴ Tramways & Urban Transit October 2005 p407

Light rail vehicles were to be accessible to wheelchairs, strollers and bikes, and would have passenger silent alarms and emergency intercoms. It was forecast that 3.7m people would use the line to get to the airport by 2010³⁹⁵.

At the end of 2005 it was announced that the line to the airport was to be known as the Canada Line. Cost was forecast at C\$1.9bn for the 19 km 16 station automated system. The project was expected to offer the equivalent of 10 major road lanes of traffic capacity³⁹⁶.

In January 2006, Rotem was asked to supply 20 x 2-car sets, 41m x 3m. Maximum speed was 80 km/h. There were to be 44 seats in each vehicle³⁹⁷. Trains would have places for 334 passengers, with space for four wheelchairs and two bikes in each set³⁹⁸.

Six months later, a Transport Canada press release³⁹⁹ announced the start of tunnel boring, on 12 June. 25% of the tunnel was to be bored: the rest would be cut and cover. The twin bored tunnels were to be 2.5km long. The first one was to be completed in April 2007 and the second by March 2008. The release confirmed that the Canadian government was funding C\$450m, and the province C\$435m.

In December 2007, it was reported that train capacity was 400 passengers (seated and standing) in a 2-car unit. Cars were being built in Korea. They were powered by 750v DC 3rd rail (covered in passenger areas) – the top contact system leading to some weather issues⁴⁰⁰. The line had 2-car trains from opening: stations were built for 3-car trains.

A March 2006 report on the airport's Link Building – new, between the existing domestic and international terminals, and with a connector bridge to the light rail station – said it would have CUSS and express bag drop facilities as well as direct pedestrian connection to the international terminal. The airport station is on a constrained site⁴⁰¹.

There is free travel between Templeton (a potential new parking area for the airport) and the two airport stations, Sea Island Centre and YVR-airport⁴⁰².

A press release in March 2009 said that the total cost was C\$2.054bn: C\$450m came from the federal government, and C\$435m from the Province⁴⁰³. Presumably this was at current prices.

³⁹⁵ YVR Air Mail December 2005

(<http://www.yvr.ca/authority/airmail/index.asp?id=541>, printed 22 December 2005)

³⁹⁶ Aviation Now web-site, 14 December 2005

³⁹⁷ Email from InTransitBC 7 January 2008

³⁹⁸ Railway Gazette International January 2006 p9, "Canada Line cars ordered"

³⁹⁹ Transport Canada press release H049/06, "Tunnel boring begins on Canada Line in Vancouver" www.tc.gc.ca/mediaroom/releases/nat/2006/06-h049e.htm 12/6/06, accessed 15/6/06

⁴⁰⁰ Fact Sheet updated 14 December 2007: "The Canada Line vehicle"

⁴⁰¹ Don Erenholz, Vice President Engineering, Vancouver Airport Authority at the 10th Passenger Transport World conference in Paris in March 2006

⁴⁰² "Stories from along the Canada Line", 30 November 2006

⁴⁰³ Government of Canada press release 27 March 2009

The line was to open at 13:00 on 17 August 2009 for half a day of free rides: full service started on 18 August⁴⁰⁴.

IARO held a conference in Vancouver in October 2009 with a number of local speakers, where much valuable information was exchanged. Some of this is in the paragraphs which follow.

Canada Line funding (in 2003 dollars) was C\$1.247bn from the federal government, British Columbia, the airport and Translink and C\$57m debt.

Protrans is the operating company, wholly owned by SNC-Lavalin. They are remunerated by fixed-fee payments with penalties and incentives related to quality of service, availability and volume of traffic.

Ridership was 83,000 a day on average – heaviest on Fridays, lightest on Saturdays and especially Sundays. Airport station sees around 12,000 a day – fairly constant across the week, although Saturday and Sunday are higher. The evening peak is more intense than the morning peak⁴⁰⁵.

There is much meeter/greeter traffic especially at weekends. There are three spare trains which can be injected into the service as required. There are electronic passenger counters at stations. The operator has no revenue responsibility or fare-setting power: they do random checks to ensure that passengers have tickets⁴⁰⁶.

58% of Canada Line riders are airline passengers, 20% employees, 16% meeters and greeters and 6% sightseers. 63% of the airline passengers are on domestic flights. 13% are not Canadians: 49% are from the metro Vancouver area⁴⁰⁷.

The line achieved a 15% mode share of airport passengers. 62% of its riders connected from transit, 30% walked, 6% were kiss&ride, and 2% had other access modes⁴⁰⁸.

Increasing customer demand prompted Canada Line to inaugurate a more frequent service while expanding peak hours by 90 minutes. Beginning on 10 August 2011 the number of trains in operation increased from 14 to 16, with full service beginning at 6:30, 30 minutes earlier than previously, and continuing an hour later until 19:00. The increase was planned in the operating contract between TransLink and InTransitBC. Average daily ridership from Richmond and Vancouver International Airport to downtown Vancouver was approximately 107,000⁴⁰⁹.

⁴⁰⁴ Press release (undated, but very early August 2009)

⁴⁰⁵ Marc Devlin, SNC-Lavalin, at IARO's Vancouver conference 19 October 2009

⁴⁰⁶ Stephan Mehr, SNC-Lavalin, at IARO's Vancouver conference 19 October 2009

⁴⁰⁷ John Lenahan, Vancouver airport at IARO's Vancouver conference 19 October 2009

⁴⁰⁸ ENO Brief June 2010 p2. Steve van Beek reporting on the APTA Rail conference in Vancouver in June

⁴⁰⁹ Rail Transit On Line 24 August 2011, "Vancouver Canada Line Expands Service"

In March 2012, it was reported that Canada Line had a 17% mode share of airport passengers, compared with the forecast 9%⁴¹⁰.

Description of the service

The light rail line is at ground level near the airport, elevated in the suburbs but underground in the city. The depot is on a very constrained site, but has two exits for the running lines in each direction⁴¹¹.

There is infra-red intrusion detection for the guideway and its walkway.

Issues

- After opening, there was a fare policy change: there is now a premium fare for travel from (but not to) the airport

Zürich

History

Proposals were published in August 1998 for a 17 km 3-line light rail network in the north of Zürich. The first section would include services to the airport from Oerlikon in 2005. Total cost was forecast to be SFr 386m, with another SFr 134m for rolling stock. There would be a seven minute service. A referendum was to be held in 2001⁴¹².

In July 2000, it was reported that the Glattal tramway serving the general aviation centre at the airport was likely to open in 2005/2006. VBZ would operate it until 2008, then a full operating contract was to be awarded by competitive tender⁴¹³.

In mid 2001, a report said that, "The transport authorities in the Greater Zurich area (Verkehrsbetriebe Glattal - VBG), not content with one of the best (most regular, most punctual, most easily interchangeable) transport systems in the world, are looking at ways to improve even that. A light-rail system is now being planned to link several important places in the Glattal region, which is gradually being built up. The system will connect the centres of the northern part of Zurich (Oerlikon and the city's Exhibition Centre) with Wallisellen and Stettbach to the east and Glattbrugg and Zurich Airport to the north with a future planned extension to Bassersdorf.

There would be three routes, partly using existing lines, with 12.7 kilometres of new build:

- Oerlikon station to the General Aviation Centre (GAC): 7 kilometres, 14 stops;
- Oerlikon station to Stettbach: 8 kilometres, 16 stops;
- Stettbach to GAC: 11.5 kilometres, 19 stops.

⁴¹⁰ Tramways & Urban Transit March 2012 p110

⁴¹¹ Notes of visit October 2009

⁴¹² Railway Gazette International August 1998 p504

⁴¹³ Tramways & Urban Transit July 2000 p266

In addition to the new track, 20 stops were to be built with an average of 620 metres between each. Frequency in peak hours would be 10 minutes, with 15 minutes in off-peak.

The cost for the construction of the system was computed in 1998 to be SFr 546.6m excluding rolling stock, workshops and garages. It was hoped that passenger revenue would cover 65% of the costs, 10% higher than that of Zurich's ZVV. Work could begin in 2003 to be completed in time for the time-table change in late 2005⁴¹⁴.

Tendering was expected to get underway in mid 2002. At the end of January 2002 the federal and cantonal governments approved a SFr555m public contribution towards the infrastructure works. Up to SFr80m would have to be raised from the private sector to fund the stations and depots.

The initial line with 20 stations would connect with 10 S-Bahn routes at six interchanges. VBG hoped to have the first section from Messe/Hallenstadion to Auzelg open by the end of 2005 at a cost of SFr100m. The SFr218m second phase would follow two years later, to Zürich Airport freight terminal, whilst the third phase would add an Auzelg - Wallisellen - Stettbach line for SFr237m⁴¹⁵.

In March 2003, voters in Zürich approved the construction of a new SFr650m T-shaped LRT line serving the north-eastern Glatttal region. Construction would start in 2003 with the Oerlikon - airport section due to open in 2008 and the Stettbach branch in 2010⁴¹⁶.

Zürich regional administration approved SFr 268m towards phase 2 of the Glatttalbahn in April 2005. Work was to start on this in 2006 for completion between the airport and Glattbrugg early in 2008⁴¹⁷.

Construction of phase 1, between Messe and Auzelg, started in September 2004, as an extension of tram route 11. Phase 2, to the airport, was to open in 2008, as an extension of route 10: it would go through the passenger terminal area to the operations centre and the cargo area. Phase 3, from Stettbach station to Auzelg, to be opened in 2010, would provide a direct service between Stettbach and the airport. Construction of the 5.3 km airport section was to start in mid 2006 for completion in late 2008⁴¹⁸.

The first part of the system opened on 10 December 2006⁴¹⁹.

A study for stage 4 of the Glatttalbahn was to be launched in 2007. This would connect the airport line via Kloten, Bassersdorf and Dübendorf to Stettbach and thus complete the circular line⁴²⁰.

⁴¹⁴ UTI May/June 2001 P10, "Swiss to improve even more"

⁴¹⁵ Railway Gazette International March 2002 p117, "Glatttal light rail go-ahead"

⁴¹⁶ International Railway Journal March 2003 p10, "Zürich votes in new LRT line"

⁴¹⁷ Railway Gazette International April 2005 p185

⁴¹⁸ Tramways & Urban Transit May 2005 p184, "Zürich" by Andrew Moglestue

⁴¹⁹ Tramways & Urban Transit January 2007 p28

⁴²⁰ Tramways & Urban Transit May 2007 p185

Line 10 opened on 14 December 2008 (and Line 12, to Stettbach, was to open in December 2010). Trains ran every 15 minutes (every 7.5 in the peaks)⁴²¹.

The first trams were delivered on 2/3 October 2008: the first tram reached the airport on 13 October 2008⁴²².

SFr 650m was approved in February 2003, with SFr 266m coming from the Federal government. The line is operated by VBZ (operator of Zürich's trams) but owned by Glattal bus coordinator VBG. It was opened fully in December 2008 as an extension of route 10 from Messe: route 12 (from Stettbach) was to open in December 2010⁴²³.

Description of the service

Light rail with much on-street running, partly along reserved tracks.

Issues

- Some hotels abandoned their hotel shuttles when the tram started, and urged passengers to use the tram instead. Anecdotally, this was not universally popular among hotel guests

⁴²¹ VBG Glattalbahn leaflet December 2008

⁴²² Tramways & Urban Transit January 2009 p30

⁴²³ Tramways & Urban Transit April 2009 p142, "Trams for a new city" by Andrew Moglestue


IARO's Air/Rail conferences and workshops

Copies of the published reports of the earlier workshops and other research reports are available price £250 (free to IARO members). See www.iaro.com/publications.htm. Papers presented at more recent workshops may be available on CD-ROM or USB flash drive at the same price.

Workshops are very focused, dealing in detail with a restricted number of key issues, and complement the regular Air Rail Conferences. Workshops and conferences (with site visits) have been held as follows.

- 1993 - Zürich
- 1994 - Paris
- 1996 - London (Heathrow Express, Stansted Express)
- 1997 - Oslo (Airport Express Train)
- 1998 - Hong Kong (Airport Express Line)
 - Frankfurt (with the AIRail station and the Cargo Sprinter)
- 1999 - Workshop 1: Berlin (the Schönefeld link)
 - Copenhagen (the Øresund Link)
- 2000 - Workshop 2: Milan (Malpensa Express)
 - Paris (plans for CDG Express)
 - Washington (Baltimore-Washington International Airport)
- 2001 - Zürich airport: Air rail links - improving the partnership
 - Workshop 3: Madrid (and its airport rail links)
 - London Heathrow (Heathrow Express)
- 2002 - Workshop 4: Amsterdam, for railways serving airports but not as their main job - "Help - there's an airport on my railway".
 - New York (the Airtrain projects)
- 2003 - Workshop 5: Barcelona. Today's design and funding issues for airport railways
 - Frankfurt (The AIRail project)
 - Workshop 6: Newark. Practical air rail intermodality
- 2004 - Workshop 7: Oslo. Leisure passengers - a market for airport railways.
- 2004 - Brussels (Thalys:Air France code-share)
- 2005 - Chicago (Chicago's future in an era of successful air-rail intermodality)
 - Shanghai study tour
 - Workshop 8: Edinburgh. Security on airport railways.

- 2006 – Workshop 9: Baltimore (BWI). Security on airport railways.
- Regional meeting 1: Stockholm
 - Workshop 10: Marketing and ticketing innovations (e-air-rail) Düsseldorf
 - Regional meeting 2: Kuala Lumpur
- 2007 –
- Los Angeles: Air/Rail East/West
 - Baltimore: The seamless journey
 - Vienna (Wien): Communications
- 2008 -
- London Gatwick. One-day conference on ticketing
- 2009
- Hamburg, with site visit to the new S-Bahn
 - Vancouver: light rail to airports
- 2010
- October – Lyon, with a site visit to the LesLYS express tram to the city
 - November/December – Far East study tour (with AREMA)
- 2011
- October – Venice
- 2012
- September – Berlin



Planned workshops and conferences

Please note that in future, it is planned to have IARO events around May and November each year

- 2016
- Denver

Details are available from IARO, or on www.iaro.com: you can sign up for details of future events in different parts of the world on www.iaro.com/events.htm

Future plans are, of course, subject to change.