IARO report 13.10

Can the Hong Kong - Shenzhen inter-airport

high speed rail link work?

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Our mission is to spread world class best practice and good practical ideas among airport rail links world-wide.

Contents

Introduction

The concept behind a direct high speed rail connection between Hong Kong International Airport (HKIA) and Shenzhen Airport is simple.

Hong Kong is a major international airport with an excellent range of air services to destinations world-wide.

Shenzhen is a domestic airport serving a wide range of destinations in mainland China, but with only limited international service.

A high speed rail connection between the two would allow passengers to fly from their local airport in mainland China to Shenzhen, then transfer by rail to HKIA and benefit from the wide range of international flights there.

More recently, the original inter-airport concept appears to have become diluted, with the railway seen as helping development of the region between the two airports as well as connecting them.

This report examines some of the issues raised by the original idea – which currently has no parallels anywhere in the world.

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

Andrew Sharp

Director General

Abbreviations and acronyms

Amtrak	National Railroad Passenger Corporation
BART	Bay Area Rapid Transit (San Francisco)
BSP	Banking and Settlement Plan
CaHSR	California high speed rail project
CDG	Paris Roissy Charles de Gaulle Airport
DB	Deutsche Bahn (German Railways)
Fraport	Flughafen Frankfurt AG - Frankfurt Airport Company
GDS	Global Distribution System
HKIA	Hong Kong International Airport
IARO	International Air Rail Organisation
IATA	International Air Transport Association
ICE	InterCity Express - German high speed train
Km	kilometre
LCC	Low Cost Carrier
mppa	million passengers a year
OAG	Official Airline Guide (timetable and data provider)
PRD	Pearl River Delta
SANDAG	San Diego Association of Governments
SAR	Special Administrative Region
SBB	Schweitzerische Bundesbahnen – Swiss Federal Railways
SNCF	Société Nationale des Chemins de Fer Français (French National Railways)
US or USA	United States of America
WEL	Western Express Line (between the airports of Hong Kong and Shenzhen)
XKL	IATA code for Kuala Lumpur Sentral station
XRL	The Guangzhou - Shenzhen - Hong Kong Express Rail Link

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.

Genesis and status

Introduction

The Hong Kong International Airport - Shenzhen Airport high speed rail project, now known as the Western Express Line, was one of the "Ten Major Infrastructure Projects for Economic Growth" outlined in his 2007-2008 Policy Address by Donald Tsang, Chief Executive of the Hong Kong Special Administrative Region (SAR), on 10 October 2007.

He noted that Hong Kong International Airport ranked among the busiest in the world in terms of both passenger and cargo traffic; and that Shenzhen Airport handled significantly more domestic flights. A rail connection could encourage complementarity between the two. A direct rail link would forge closer ties than the present ferry connection.

The accompanying policy agenda discussed closer cooperation between the two airports and a feasibility study of a direct rail link between them.

In the annual government work report given in March 2009, the link was also listed by Chinese Prime Minister Wen Jiabao as one of the three cross-border infrastructure projects whose construction would be expedited.

Background

The plan to connect Kowloon, Shenzhen and Guangzhou by high speed rail ante-dates the inter-airport link, but that plan involves connecting city centres rather than airports (see section on page 9 below). It is likely that only in China would there be simultaneous consideration of two separate high speed rail links so close together.

Both projects are part of the 9+2 philosophy aimed at binding together the regions in the Pearl River Delta (PRD) – the nine provinces in mainland China and the two Special Administrative Regions of Macau and Hong Kong. This philosophy will benefit the population of the regions, and assist with economic development.

The PRD is served by a number of airports – in particular Hong Kong International, the new Guangzhou Baiyun, Shenzhen's Bao'an, Zhuhai, and Macao. Some are restricted by runway length: some are congested, or are likely to be within the next 10 years.

Hong Kong International Airport is a hub for Cathay Pacific, a prominent Oneworld carrier. Guangzhou is a hub for China Southern, a leading member of the Skyteam alliance. The Star Alliance hubs of Shanghai, Beijing and Chengdu are well served by Air China and Shanghai Airlines in particular: they are also relevant in considering transport supply and demand for the region – as, of course, are China's impressive plans for high speed rail development.

The original plan

The original plan was for a high speed rail link connecting the two airports. This would enable them to act as part of a seamless journey between domestic airports in mainland China and international destinations served from Hong Kong International Airport.

Because of the local geography, much if not all of the line would have to be underground – or under water. For example, a 7-kilometre cross-harbour tunnel between Hong Kong International Airport and Tuen Mun will be needed: a shorter tunnel is likely to be needed under Shenzhen Bay to access Bao'an Airport.

This will affect the cost of the project, but will facilitate creation of a reasonably straight route.

Half of the line – 25 kilometres – is likely to be on each side of the border between mainland China and the Hong Kong SAR: the Hong Kong side is likely to include a 9 kilometre spur to the New Territories town of Hung Shui Kiu in Yuen Long.

In the original concept, the line was wholly airside. All passengers would pass through Hong Kong but legally would not enter it: they would move directly between mainland China and their final destination.

Subsequent modifications

While the original plan was to connect just Hong Kong International Airport and Shenzhen Airport, some later maps have shown the railway extended to Guangzhou Baiyun Airport as well. The status of this extension is not known, although it could just be a link with the regional rail network in the Shenzhen area which would enable a service to Guangzhou to be operated.

A change of function to a multi-purpose line, with a branch into the New Territories, has recently become apparent.

In the latest (2009-2010) Policy Agenda, one of the ongoing initiatives is, "Continuing to foster closer co-operation between the Hong Kong International Airport and Shenzhen Airport, including further planning of the Hong Kong-Shenzhen Western Express Line as a multi-purpose railway which complements the planning and development of Qianhai, Shenzhen and north-western part of the New Territories and exploits the synergy from the complementary strengths of the two airports."

It was explained in the documentation that Shenzhen Airport served 70 cities in mainland China while Hong Kong International Airport served 40 – and 110 overseas destinations. The Hong Kong government and the Shenzhen municipal government had formed a task group in December 2007 to take forward the concept of closer cooperation, including the proposal to establish a rail connection between the two airports.

The pre-feasibility study, completed at the end of 2008, showed that it was technically feasible.

In August 2009, the two governments signed an agreement to take forward its planning: it was recognised that the changes to the purpose of the link would greatly affect factors like its alignment, functions and operational requirements.

A paper to the Legislative Council Panel on Transport (October 2009) says that, "To reflect its many functions in supporting the future developments of the two airports, Qianhai and the Northwest districts of the New Territories, the rail link is now named the 'Hong Kong - Shenzhen Western Express Line' (WEL)."

By implication, the line will both serve the two airports and the area between them. Conceptually, for example, it could carry airport-based employees to and from their places of work. It has certainly been described as part land-side, part airside.

This, of course, would help with the financial case for the railway (although, as was noted on page 7 above, the project is justified by its impact on local economic development rather than its operating profitability).

It would also add to the technical complexity. Airside passengers (travelling directly between mainland China and international destinations through Hong Kong International Airport) would have to be kept separate from landside passengers - people like airport employees and air passengers travelling from the New Territories to Hong Kong or Shenzhen airports who were not yet checked in. The stations would need to be built to accommodate the two types of passenger; and it would probably prove too difficult to have both types on the same train.

Hence there would have to be two distinct services - the airside inter-airport high speed trains, probably stopping only at Qianhai for airside passengers; and landside trains with different stopping patterns, probably using different platforms and different entrances and exits at common stations.

There has also been a suggestion that the line might have a connection to West Rail (which connects Kowloon and Tuen Mun).

The Guangzhou - Shenzhen - Hong Kong Express Rail Link

The Guangzhou - Shenzhen - Hong Kong Express Rail Link (XRL) connecting the city centres has always had a higher priority: the 2009-2010 Policy Agenda papers expressed the hope that work on the Hong Kong section of this would start in 2009 for completion in 2015.

The start attracted local controversy because of fears of disruption to the lives of local residents as well as concerns over funding.

The line – which will cut travel time between the two cities from over 2 hours to 48 minutes – is seen as more important: until issues surrounding this are resolved, it is unlikely that the inter-airport link will make significant progress.

Precedents

Introduction

There are no precedents anywhere in the world for a system like this, where high speed rail acts as an inter-airport transfer service – a kind of inter-terminal shuttle on a large scale.

The concept has been suggested for three places in the United States and in Central Europe, but there are no examples actually in operation today.

It could work informally in Tokyo, where Haneda Airport is almost exclusively domestic and Narita almost exclusively international (although, with the opening of a fourth runway at Haneda forecast for October 2010 and plans for a fifth being announced in early 2010, this is likely to change). There is a train service, the Airport Taikotu, connecting the two, which opened in November 1999. Trains of the Keihin Express Electric Railway run four times a day, taking 106 minutes for the 85 km.

Improvements to this rather unappealing service are planned. New infrastructure north and east of the city means that the Narita – Tokyo link is to be accelerated by 20 minutes from 2010: a Japanese government plan issued in 2001 said that this link would also be connected to Haneda Airport.

There is a similar situation in Shanghai. Pudong Airport is largely international and long haul, Hongqiao Airport largely domestic. Currently there is only a bus link between the two. There are plans to extend the Pudong – Long Yang Road Maglev to Hongqiao (and beyond): the current status of these plans is uncertain. There are firm plans to extend the city's subway system to connect both airports, but this of course would not be a high speed link.

Other airport pairs which are directly connected by rail include London's Gatwick and Luton, Paris's Charles de Gaulle and Orly, and San Francisco International and Oakland International.

No doubt there are journeys in other places where an inter-airport transfer is optimal in terms of journey time. These would be in the kind of situation above, where two airports had very different functions but both had good service frequencies and good high speed rail connections giving optimal connections.

The significant downsides are examined in the next section (see page 14).

California

A linkage by high speed rail between some or all of the airports of San Diego, Los Angeles, LA/Palmdale and LA/Ontario has been suggested, as a solution to the shortage of capacity in both San Diego Lindbergh Field and Los Angeles International Airport.

Trains could connect these to either or both of the inland airports – in the recent past renamed from just Palmdale and Ontario to include the LA/ prefix to help establish their position as part of the Los Angeles airports system. If this was done, it would be possible to use these as short-haul domestic airports and concentrate longer distance and international flights at the major airports of Los Angeles and San Diego: passengers interlining between domestic and international flights would do so by rail.

Another proposal to relieve San Diego Airport involves extending the planned California High Speed Rail (CaHSR) network beyond San Diego to the Mexican border. Just across the border is Tijuana Airport. A proposal put forward by SANDAG, the San Diego Association of Governments, would create a footbridge between a new station north of the border and the airport terminal south of it. It is likely that this railway would connect both airports, and again it is possible that some passengers would use it to interchange between the two.

The status of these ideas is uncertain, although it is virtually certain that the initial 28 stations on the CaHSR network will be in downtown areas and not at airports. This is in the interests of urban regeneration. Hence with the possible exceptions of San Francisco, Palmdale and Ontario, it is unlikely that there will be stations at airports at least in the first phase.

The situation is likely to become clearer especially as the California High Speed Rail project moves forward over the next few years.

Chicago

There are proposals for an airport at Peotone, some 30 km from the city of Chicago. This could be connected to Chicago O'Hare Airport by rail, allowing transfers between the two.

The traffic value of Peotone is disputed, although it could relieve the congested Chicago O'Hare of some short-haul flights. A high speed rail connection between the two – many years off – could help.

Chattanooga - Atlanta

There are plans for a high speed rail connection – possibly using magnetically-levitated (maglev) technology - between Chattanooga Municipal Airport and Atlanta Hartsfield-Jackson Airport. As in the case of Chicago, this could encourage airlines to use the less congested Chattanooga Airport and use the railway to transfer passengers to connecting flights from Atlanta.

Again, the plans are a long way from fruition.

Central Europe

The concept has also surfaced in Vienna, whose airport is close to that of Bratislava and likely to be connected to it by high speed rail at some point.

Bratislava Airport is, like Shenzhen, very much dominated by short and medium haul traffic, with a significant presence of new entrant carriers (LCCs).

Vienna Airport, like Hong Kong International Airport, is much more of a longer distance hub for eastern Europe and central Asia (especially since it is the home base of Austrian Airlines).

The idea has also been suggested for Istanbul. This has two airports – Ataturk and Sabiha Gökçen – which are likely to be connected by metro by 2013. The possibility of then using the two airports as part of an integrated system was suggested by the Head of Airports for GMR International, a member of the joint venture which modernised and now manages Sabiha Gökçen.

Paris – Brussels

Rail serves both Paris Charles de Gaulle Airport and Brussels Airport.

Air France/KLM code-shares with French Railways (SNCF), who carry all of their Brussels – Paris passengers. However, this system is for passengers travelling between Brussels and Air France's international destinations through its CDG hub: trains only serve Brussels Midi station and not Brussels Airport.

A parallel service was operated between Paris and Brussels Airport at one time on behalf of SN-Brussels (now Brussels Airlines). Trains ran from Paris Gare du Nord, north of central Paris, and Brussels Airport to provide a feed into SN-Brussels' long-haul network.

So while both airports are rail connected and both have been used as part of an air-rail code share, these were conventional city to airport air-rail code-shares and not like the one being suggested in Hong Kong.

Rail-air cooperation

There are other examples of cooperation between air and high speed or regional rail services, where rail acts as a short-distance feeder to medium and long-haul air services. This provides an efficient end to end journey.

The examples are described in full in IARO's report 11.08, "Case studies in cooperation between air and high speed rail" published in October 2008.

In these cases, air provides the long or medium haul part of the journey and rail the short-haul element. Examples can be found at

• Frankfurt, where Lufthansa code-shares with German Railways (DB) between Frankfurt Airport and Köln (Cologne): DB carry Lufthansa's passengers, who then inter-line between train and plane at Frankfurt Airport

- Newark Liberty International Airport, where Continental Airlines code-shares with Amtrak, who take their passengers between Newark and Philadelphia, Wilmington (Delaware) and Stamford and New Haven (Connecticut)

and a number of other places.

Why has the concept not been used before?

Passenger perception

A major reason is likely to be the belief among airlines in particular that passengers do not want it. The average passenger dislikes having to change terminal as part of a long distance flight: to have to change airport too is seen as even worse.

It also has to be remembered that the travel trade sells flights off GDS screens. These conventionally display flights between requested city pairs with the shortest journey time first. Flights with long connections are effectively penalised by being pushed down the list. Flights not on the first screen are unlikely to be chosen.

If the transfer is seamless – if it really does feel like no more than an inter-terminal transfer – it could be acceptable, but so far the concept is untried.

Lack of suitable rail connected airports

The number of airport pairs directly connected by high speed rail is very small, so there have been few opportunities to make it work.

In the California examples quoted in the previous section, new rail links would be needed to connect either Los Angeles or San Diego to LA/Ontario or LA/Palmdale airports and San Diego to Tijuana so that they could act as part of the larger airports.

Air traffic patterns

Another issue is the pattern of air traffic at the two airports.

Southampton and Birmingham airports are connected by a regional rail service, but neither has the kind of air service which would encourage interlining by rail between the two.

Cologne/Bonn and Frankfurt airports are on the same high speed rail line, but it was thought that little demand would arise for interlining between the two so there are very few direct trains between the two airports.

> Frankfurt is the major hub for Lufthansa while Cologne/Bonn is more served by regional and new entrant carriers like Air Berlin. Carriers like this are unlikely to cooperate, unless there was really strong demand.

> As mentioned above (on page 12), Lufthansa, German Railways (Deutsche Bahn) and Frankfurt Airport (Fraport) entered into a Strategy of Cooperation to encourage people to access Frankfurt Airport by rail.

Among the initiatives were code-shares between rail and air on the Stuttgart – Frankfurt, Cologne – Frankfurt and Bonn – Frankfurt services. All flights have now been withdrawn between Frankfurt and Cologne/Bonn.

Fraport wanted more people to use Frankfurt Airport, and more of them to reach it by high speed rail. The strategy succeeded. Fraport's interest in cooperation with Cologne/Bonn Airport is limited.

Düsseldorf Airport and Cologne/Bonn Airport are directly connected by rail: the alternate-hours Berlin - Cologne/Bonn Airport ICE trains serve both airports with a 45 minute journey time. As with Frankfurt and Cologne/Bonn, the two airports are to a degree rivals and are unlikely to cooperate in sharing traffic in a system like this.

London's Luton and Gatwick are connected by a regional train service taking 80 minutes: the pattern of air services at the two airports is such that there is unlikely to be significant interlining. The same is true for Paris's Charles de Gaulle and Orly. Oakland has been proposed as a reliever airport for San Francisco, with a better air traffic distribution between the two, but the BART subway connection - taking about an hour, plus a 20 minute bus shuttle - would not be particularly attractive.

How far do these disadvantages apply to Hong Kong - Shenzhen?

Passenger transfer arrangements

How seamless could the journey be for, for example, a passenger travelling London - Hong Kong International Airport - Shenzhen Airport – Quanzhou?

Hong Kong Chek Lap Kok is a big airport. It is not obvious where in the airport complex on Lantau Island the new station would be.

Two possible areas have been suggested – in the area south of the AsiaWorld Expo, immediately in front of the terminal buildings complex; and to the east of that, where the planned bridge between Hong Kong, Macau and Zhuhai would reach land on the Hong Kong side of the Pearl River Delta.

The latter would need border facilities anyway, and it could be optimal to co-locate them with those needed for the proposed railway. It has also been suggested that there should be a railway station here, to encourage people driving across the bridge to park and ride the train into Hong Kong.

A passenger arriving at one of the more remote gates at Hong Kong International Airport – those numbered in the high 60s, used by Cathay Pacific, for example – would need to use the inter-terminal transit. It is assumed that if necessary this would be extended to the new station (whichever location is chosen): it has already been extended to serve the new SkyPier. The minimum time between aircraft doors opening and last passenger arriving at the station is estimated at 45 minutes.

The inter-terminal transit is, of course, airside.

The flight time of long haul flights is not particularly predictable – they are as likely to be half an hour early as half an hour late – so the train service would need to be frequent: it would not be practicable, for example, to have reserved seats on a specific train for a specific passenger making a specific transfer.

Assuming the trains run every half hour – the minimum acceptable frequency - the average wait time would be 15 minutes and the maximum 29.

A 10-minute frequency with 8-car 600 seat trains has been mentioned, but this seems unlikely to be justified by inter-airport volumes (volume forecasts are briefly discussed on page 19). However, local trains plus inter-airport trains could well run at that frequency.

The journey time between the stations at the two airports has been quoted at 17 minutes (or, subsequently, about 20 minutes or 26½ minutes). Twenty minutes is taken as the actual journey time: there is a discussion of speed and journey time on page 22 below.

> There has been a suggestion that the airport trains would stop only at Qianhai, the new financial services and business hub for Shenzhen, and that this station should have in-town check-in.

This poses a range of questions in itself. Would Qianhai passengers be airside? In both directions? Where would border formalities and Customs examinations take place?

Clearly, if the same trains were to be used for non-air passengers and have additional stops, journey time is likely to be longer. However, it would be less complicated to have airside trains using dedicated airside platforms and landside trains using dedicated landside platforms.

Passengers are likely to be able to go direct from train to gate at Shenzhen. Airlines are unlikely to be happy with a time of less than 30 minutes for this transfer.

Hence the absolute minimum connect time between a flight arriving at Hong Kong International Airport and one departing from Shenzhen Airport is just over 2 hours (125 minutes). 150 minutes gives some leeway.

This makes no allowance for the need for baggage – and owner – to clear customs: for this, see page 23 below.

180 minutes is, incidentally, the minimum connection time within Shanghai Pudong Airport.

Border crossing formalities

This also assumes that border formalities can be completed at some point within the transfer process.

They could be done at either airport or on the train.

Existing land border crossings between Hong Kong and mainland China - like the one at Lo Wu – are geared up to the movement of high volumes of people.

For Hong Kong or China residents, the formalities are easy and electronic validation of status is possible. However, China requires some visitors to have visas, and these would take longer to check.

There are precedents for border controls to take place on a moving train. This was done until quite recently on the Eurostar trains between London and Paris or Brussels; but it used to be common practice in Europe generally before the Shengen Agreement and its predecessors, allowing free movement between specified countries.

It would probably be possible to segregate those able to go through the process quickly and those needing more detailed scrutiny.

This would allow two different groups to go to two different – and segregated – parts of the train.

Those needing visa examination could be directed to one part of the train and have their documentation examined in transit.

Those with Hong Kong or China residency or its equivalent could go to a different part and be subject to no further attention.

This second part of the train could also possibly be used by non-air passengers.

However, there could be a need for special arrangements for non-air passengers needing visas or other more complex documentation. It would be more efficient to run separate trains for airside and landside passengers – and, with the envisaged half-hourly inter-airport service, there would be plenty of line capacity.

Any necessary segregation could be done by simply locking off the two parts of the train from each other. Alternatively, the train could be formed of (for example) two 4-car units with no access between the two – if, for example, two Airport Express trains were coupled together, it would be physically impossible for passengers to move between the two trains.

A technique sometimes used where trains use stations which are too short to accommodate the entire train is selective door opening. Here, some doors of the train – those not in the platform – cannot be opened so passengers are not exposed to the potential danger of alighting where there is no platform.

The same technique could be used here if necessary to ensure that border formalities can be completed. The train could arrive at the destination airport: the doors could open in the carriages reserved for passengers not needing documentation checks. The doors in the other part could remain closed (if necessary) until border checks had been completed for all passengers.

A drawback of this option is that it may cause excessive turn-round or platform occupation time if there are unexpectedly large numbers of people on a train needing detailed documentation checks.

A German company has developed mobile screening units. Their concept was that these could be installed in a bus. Passengers would board at one end, then pass through a normal security arch while their bags went through an x-ray machine: they would reach the other end of the bus scanned and screened.

The Canadian government ordered some of these units for the 2010 Winter Olympics so that passengers could be screened on their way to airports: other uses are for overspill screening or for screening last-minute transfer passengers. If there was a need, this system could be deployed on this route, but on trains rather than buses.

Clearly, this would only work if the border authorities were willing to allow it, and if staffing and passenger volumes were matched: the train journey time is forecast to be about 20 minutes, rather than the two hours plus on the Eurostar journeys.

As on Eurostar, provision would need to be made for the detention on the train and then the return of those passengers without proper documentation.

An unpublished study reported on in the South China Morning Post (of 5 October 2009) was said to have forecast a daily traffic flow between the two airports of 7,000 by 2020, the earliest date the line could be completed. It made no forecasts of other traffic.

7,000 passengers a day equates to 3,500 a day each way: over an assumed 18 hour day with a half-hourly train service this equates to an average of 100 air passengers on each train.

In the unlikely event of all of them needing (and having) visas, and examination of each one taking two minutes, border formalities would take 200 minutes. Doing this on a 20 minute journey would need 10 people.

Complications likely to be caused by the possible stop at Qianhai are briefly discussed on page 16.

Lack of rail connected airports

The second reason for the lack of precedents, the lack of rail connected airports, clearly does not apply here. It is fundamental to the design of the system that the train will connect the airports of Hong Kong and Shenzhen – and just possibly that of Guangzhou too.

Air traffic patterns

Would the pattern of air traffic at the two airports support such a system?

Hong Kong International Airport has an excellent range of international services. London, for example, is served by five carriers of four nationalities: not all offer daily flights but one of them, Cathay Pacific, operates four flights a day. This level of service is just not available yet anywhere in mainland China: both Beijing and Shanghai have twice daily London services each by two carriers.

Also of significance is the number of places served direct from Shenzhen but not Hong Kong – and certainly those where the frequencies from Shenzhen exceed those from Hong Kong.

The number of arriving flights each week at Hong Kong and Shenzhen from different airports is shown in the annex on page 33.

There are relatively few (16) places served frequently from both airports – Beijing, Changsha, Chengdu, Chongqing, Dalian, Fuzhou, Giulin, Hangzhou, Kuala Lumpur, Kunming, Nanjing, Nanning, Ningbo, Shanghai (although the main service from Hong Kong is to Pudong Airport whereas the only service from Shenzhen is to the domestic Hongqiao), Xiamen and Xian. The only international destinations served from both are Bangkok, Ho Chi Minh City, Kuala Lumpur, Singapore and Tokyo – most with low frequencies from Shenzhen.

Airport capacity implications

This analysis shows that there may be some scope for combining flights. With high speed rail connecting the two airports, will there still be a need for nearly 200 flights a week from Shenzhen to Beijing and nearly 150 from Hong Kong to Beijing, for example? How many slots could be saved by implementing this project and combining flights?

Hong Kong International Airport is of course a congested airport, with plans for a third runway.

The reaction of airlines

The reaction of airlines to this concept is uncertain. The fact that there are no precedents will not encourage them.

There are places where airlines and train companies cooperate on an air-rail code-share – where an airline uses a railway to provide short-haul feeder "flights". This proposal is not precisely the same – in scope or content.

For Shenzhen Airlines, for example, it would be valuable. It would encourage people to use their network. They are the country's fifth largest airline by seat capacity.

Many of the other carriers in the region are already aligned with one or other of the three major airline alliances – Star Alliance, One World and Sky Team. Carriers in one of these alliances are unlikely to favour the project. They are likely to want to feed domestic passengers to and from the long haul hubs of their own alliance partners: that is the whole purpose of an alliance. So One World carriers like Cathay Pacific would want passengers to fly with their partner Dragonair direct to Hong Kong, and Sky Team airlines like China Southern would want people to connect through their Guangzhou or Beijing hubs.

The issue is further complicated by the presence of cross shareholdings between Cathay Pacific and Air China (a Star Alliance member) and the recently proposed takeover of Shenzhen Airlines by Air China.

It could be argued that, if there was a significant demand for flights between Hong Kong and specific destinations in mainland China, these flights would already be provided.

It is apparent that this is the case to some extent, and the process is continuing. In an interview with China Daily on 25 March 2010, the Chief Executive Officer of Cathay Pacific is quoted as saying that he plans to expand its service across China by increasing frequencies and adding new routes.

Under this argument, there is no need for this project.

It can be concluded that, were this system to be implemented, it is likely to be used by

people travelling between airports in mainland China poorly served by direct flights from Hong Kong and international destinations and

people whose valuation of the frequency of flights from Hong Kong International Airport was sufficient to outweigh the disadvantages of a multiple transfer (which would be either plane –> train –> plane or plane -> people mover –> train –> plane).

It is possible that the second type of passenger would face the disadvantage of a higher fare. It is likely that fares for flights within an alliance would be less than those crossing an alliance (so Chengdu – Beijing – Frankfurt on Star Alliance partners Air China and Lufthansa would be cheaper than Chengdu – Shenzhen - Hong Kong – Frankfurt on Star Alliance member Air China and One World member Cathay Pacific).

The system could also be used by local passengers, although these would be landside and probably on separate trains.

The reaction of airports

The planning of air traffic in this way – by implication, giving Hong Kong International Airport all of the international traffic and leaving Shenzhen Airport with the domestic traffic from the region – may be controversial among the airports involved too.

Shenzhen has limited international traffic.

Losing all of it would simplify the operations of the airport – all passengers would be domestic, so there would be no need for border controls.

However, it would have implications for the earning power of the airport. Airports make substantial amounts of money from sales of duty free and tax free goods: these can only be sold to people leaving the country for an international destination (or, in some cases, arriving from another country).

The reduction in – or complete removal of – flights between Hong Kong International Airport and mainland China destinations would relieve some of the pressure on the airport. It is, however, uncertain that it would remove the need for additional investment there.

The impact on the Hong Kong economy of the withdrawal of flights to mainland China is also uncertain, but is unlikely to be positive – even with the network of high speed rail lines being constructed in China.

There are firm plans for a major increase in capacity at Guangzhou Baiyuan, with a third runway giving it capacity for 70 mppa.

The interaction of this project and the various expansion plans is complex.

Speed

When assessing the minimum connection time (see page 16 above) there was a reference to the various journey times which had been suggested in various sources. Twenty minutes was taken as the actual time – and this is likely to be the minimum. The rational for this is as follows.

The line is reported as being 50 km long. Assuming that the trains run non-stop at full speed for all but the 2½ km at each end (and ignoring the time taken for this 5 km), the journey would take 15 minutes at 180 km/h, 13½ minutes at 200 km/h, 12½ minutes at 220 km/h or 9 minutes at 300 km/h.

Air resistance in tunnels is a major factor at speeds in excess of 200 km/h, so assuming that this is the maximum speed, a 20 minute journey time gives a reasonable allowance for acceleration and deceleration – the final 2½ km at each end.

These figures, incidentally, show the small impact a large increase in speed makes over this kind of distance. At 180 km/h, journey time is 20 minutes (15 minutes plus 5 minutes acceleration and deceleration time). Increasing the speed by 40 km/h to 220 km/h changes the journey time by just 2½ minutes (to 17½ minutes - 12½ plus 5).

It can be assumed that any stop will add about five minutes to the inter-airport journey time – 90 seconds station stop time, plus deceleration and acceleration.

Baggage

Introduction

The calculation on page 17 above showed that the absolute minimum connection time for passengers would be just over two hours. Would this work for baggage too?

The aviation industry is reasonably well geared up to carrying bags through multiple transfer points: certainly the legacy carriers and especially those in the United States are fully able to tag and transfer bags on journeys like Memphis - Chicago O'Hare – Heathrow – Newcastle, for example. So tagging a bag Heathrow - Hong Kong - Shenzhen – Chengdu is feasible, and bag sorting staff and sortation equipment would no doubt be able to direct a bag to a specific area of Hong Kong or Shenzhen airports if it needed to transfer between the two.

Customs

One issue is likely to be the need for bags – and owners – to clear customs. Where will this be done? If it could not be done at the final destination in mainland China – and it is unlikely that it could – then it would need to be done at Hong Kong or Shenzhen. Time would need to be allowed for this within the minimum connection time.

This issue will influence the design of the baggage transfer facilities – bags will have to be moved

> directly from plane to train to plane, or

> from plane to customs to train to plane or

> from plane to train to customs to plane.

This kind of arrangement works – although with less complex logistics – in the United States. Inbound international passengers have to clear customs and immigration at their port of entry. So a passenger travelling between London and, say, Memphis will fly direct to Houston or Dallas – Fort Worth airports, pass through US customs and immigration there, and then transfer to the flight on to Memphis as an ordinary domestic passenger. They are required to take their hold baggage through customs in person, even though it is tagged through to the final destination in the United States. Once through border formalities, they go to a separate transfer area and hand the hold baggage back to the airline or ground handling staff for loading onto the second plane.

Good communications are essential for this system to work.

This arrangement is certainly feasible for a Hong Kong - Shenzhen transfer, especially since this would be a new system which could be specifically designed for this. The limited precedent of the airside ferries between Hong Kong International Airport and Pearl River Delta ports would no doubt also be useful.

The totally new part of the system – the train and its terminal stations – can be built with the transfer procedure in mind. The existing part, the baggage handling system at the airports, is likely to need changes. These are likely to entail both extending the baggage handling belts geographically and accelerating them to achieve acceptable transfer times.

This will cost money: one key question is who will meet the additional costs? Admittedly these will be trivial compared with the construction cost of a 50 kilometre high speed railway with two major water crossings, but the question needs to be answered.

Particularly at the moment, airlines are very unwilling to shoulder any new costs. They may consider that these are associated with a rail project of no particular benefit to them, and therefore object to the costs coming out of aviation money (for example from the airport, since the landing fees they pay are one of the airport's primary sources of income).

Kuala Lumpur in-town check-out

A case study of the long-planned in-town check-out system at Kuala Lumpur may be instructive. The parallel is not exact, but it will give a flavour for the complexities which can arise.

The new Kuala Lumpur International Airport was built more or less in parallel with KLIA Ekspres, the dedicated Airport Express service connecting city to airport (although the airport was completed first: it opened in August 1998).

The railway – and especially the downtown station – was built with in-town check-in and in-town check-out in mind. Kuala Lumpur Sentral station – which has the IATA code XKL – was built with two baggage reclaim belts in its arrivals area, as well as offices for Customs and the Narcotics Inspectorate: passengers clear immigration at the airport.

In-town check-in was implemented for a limited number of carriers with the opening of the railway in April 2002, with some other airlines joining later. So passengers on these airlines can check-in their bags at Kuala Lumpur Sentral station to their final destination.

However, at the time of writing it has not been possible to implement in-town check-out, so passengers cannot check their bags from (say) New York JFK Airport to Kuala Lumpur Sentral station.

The first problem was the airport baggage handling system, which needed a significant upgrade to ensure that the last bag off a plane would reach downtown Kuala Lumpur on the train on which its owner was travelling – or at worst the next one, 20-30 minutes later. There were delays in implementing this upgrade, especially since there was only one bidder for the work which led to political complications.

As well as the hardware issue, there were software issues which needed to be resolved.

The railway company, KLIA Ekspres, was reluctant to use integrated air-rail ticketing because tickets issued through a Global Distribution System (GDS) attract a GDS charge which is the same for each sector travelled. The Frankfurt Airport - Kuala Lumpur International Airport sector can bear this charge (of around US$4): the Kuala Lumpur International Airport - Kuala Lumpur Sentral sector cannot – there would be no revenue left for the railway company!

So – with assistance from IARO - KLIA Ekspres negotiated a change to IATA Recommended Practice 1780e, the Intermodal Interline Traffic Agreement. The alteration provided that bags could be checked through to specified destinations beyond the airport to which a passenger was ticketed. The specified "beyond" destinations at the time only included Kuala Lumpur Sentral.

Incidentally, bags in both directions are regarded as airside (although bags checked in at the downtown station are screened at the airport). Passengers, by contrast, are all landside.

Another problem was that of lost or damaged bags. Airline agreements provide for the "final carrier" (the carrier performing the last part of the carriage) to be responsible for the track and trace work - for completing and dealing with the lost baggage report and following through with other airlines and airports involved to try to reunite bag and owner. This is not going to be as much of a problem in the Hong Kong - Shenzhen case, since the railway will not normally be the final carrier. However, it will need to participate in the track and trace process.

There are also issues of insurance – of both passengers and bags – which need resolution.

Airline Conditions of Carriage tend to follow a standard model and among other things provide that, when part of the journey is made by a surface mode of transport, the Conditions of Carriage of the surface carrier apply to that sector of the journey.

However, some airlines insist on compensation to intermodal code-share passengers being the same whichever mode of transport they are travelling on. This is difficult for the railway companies since their share of the journey – and therefore of the revenue – is likely to be significantly less than for the airline.

They also implicitly or explicitly include provisions relating to the place where any legal action arising from a claim may be taken. This has proved to be a major stumbling block for railways involved in intermodal agreements of this kind.

For example, under the agreement between Finnair and Swiss Federal Railways (SBB) to carry passengers by rail between Zürich Airport and three major cities in Switzerland, it would be possible for a US citizen to buy travel between the US and one of these cities. If they or their baggage was delayed or damaged, they could take legal action against SBB in the United States. This would be a major logistical challenge to SBB.

An additional complication is the unwillingness of the Swiss government, owner of SBB, to give a higher level of compensation to some passengers than to others – a possible outcome of taking action in the US rather than in Switzerland. The result in this case was that SBB took out special insurance, but it is understood that the option is unlikely to be available to any other railway.

Sales and Distribution

Introduction

In general, the promotion, adverting and sales of rail services serving airports has historically tended to be managed locally as a stand-alone offering, just like any other train service serving any two points.

However with airport rail links there is a common denominator, often underutilised in promotion and marketing of airport rail services even though they share the same customers – the airlines.

Airlines fly rail passengers or potential rail passengers in or out of airports. However there has often been too little discussion between railway operators serving airports and airlines or airline standard-setting bodies on the processes which could improve sales or distribution through aviation sales channels.

Intermodal selling issues

The whole integrated rail/air concept has not yet been widely factored in to airport railway marketing strategies to improve sales through Global Distribution Systems or Supplier Direct Sites. Discussions on promoting rail services through airlines often start after their launch.

Hence intermodal ticketing is usually in the form of on-board ticket sales rather than an integrated part of the total journey sales and marketing process.

As a result very few passengers are currently informed about rail options at the time they buy their air ticket, even though with some advanced distribution planning and sales system design this would be possible - especially for Airport Expresses and regional rail connections.

For this to improve, the railway sales and inventory systems would have to be designed to optimise the opportunities for integrated sales. To extend awareness of their services, promoters of airport rail projects need to consider the options for sales through IATA based systems in their initial sales system design along with low cost carrier needs.

Even after launch, when the airport railway's sales and inventory system has become part of the legacy infrastructure, there are still opportunities to improve the information flow to air passengers. This can be done through established timetable providers - like OAG - as a timetabled service between two points, or as part of the connection between city centre and airport or airport and airport. This information goes regularly to hundreds of airlines and would allow them to advertise and include rail services as part of a booked itinerary for passengers.

The data could include frequencies, journey times, ticketing information and station directions.

As cities and airports compete for connecting passengers or as airports and the cities they serve are looking to promote themselves as being easy to get to, modern travellers look at their end to end service online at the time of their initial enquiry rather than searching several individual sites. So getting intermodal information out into the electronic sales environment will become a key component to attracting and winning travellers.

Airport rail operator services should also consider advanced marketing techniques using emerging developments in internet-based systems to promote their own online sales portal through the travellers online itinerary. An example of this is where airlines now link their online check-in to GDS online itineraries (for example, Travelport's Viewtrip). This alerts travellers when online check-in is open, and takes the traveller direct to the next self service part of their journey. This same concept can apply to airport rail services.

With very few exceptions, integrated intermodal information is not common, but it could be managed through Global Distribution System (GDS) providers like Travelport and Amadeus.

GDSs have had to show rail options for journeys between city pairs where rail could be an option since March 2009, under European Law. This also includes rail/air interlining possibilities. So even for this kind of journey, it is clearly good practice.

Selling tickets and sharing revenue

There is a need to ensure that tickets can be sold as part of a through journey, and that the revenue can reach the railway operator.

The rail segment between Hong Kong International Airport and Shenzhen Airport is likely to be treated as a separate part of the overall journey. This will need consideration of issues like coding, the inventory of fares and times, settlement, and distribution provider contracts and charges.

Presumably the rail journey will be coded between HKG (IATA code for Hong Kong airport) and SZX (IATA code for Shenzhen). That should not pose a problem: additional codes for the two railway stations are unlikely to be needed. However, if a Qianhai stop is added, a code for this station might be needed.

The carrier – the railway operator – will need a 2-digit IATA carrier code. An example is 9G, owned by Heathrow Express and used by them, Arlanda Express and City Air Train Vienna for integrated air-rail ticketing.

Fares and times will need to be loaded into an inventory so that intermodal journeys can be constructed and be sold through GDSs. Once done, this will just need updating from time to time. This could be managed by specialist inventory organisations such as Travicom. On the assumption that there will be no reservations and no capacity limits - airlines and travel agents can sell an unlimited amount of tickets, on a Freesale basis (where tickets can be sold until the carrier stops the sale) - this should not be onerous.

Banking and settlement for transactions could be dealt with by a ticket consolidator airline such as Hahn Air, as is done for sales using code 9G. Hahn Air is an airline which is in business partly to deal with settlement for smaller operators: it has arrangements with Banking and Settlement Plans (BSPs) all over the world and can therefore deal with the complexities of (for example) a Chilean travel agent getting paid for selling an internal flight in Australia.

The alternative is for the railway to become an IATA BSP member.

GDS providers levy a charge for each sector sold. This is normally a flat rate, but there are circumstances where this is negotiable.

A GDS distribution contract will also be required.

Finally, things like fuel surcharges and local taxes and duties will add to the amount paid by the passenger – although it is unlikely that any of these will be added to the rail fare.

The money-go-round

In this case, the money-go-round will be as follows.

- A travel agent sells a ticket between an airport in mainland China and another in, say, Europe through Shenzhen and Hong Kong. The customer pays by credit card.

- The agent is entitled to a commission (or equivalent) on the full amount of the sale, as is the credit card administrator.

- The three carriers (two airlines and one railway) receive part of the fare paid, in agreed proportions.

- Each of them have to pay a GDS charge based on their agreement with their provider.

- The settlement organisation will deal with the spread of money through IATA's banking systems, and will itself take a commission on the fare (as will IATA).

Conclusion

There are solutions to the challenges and opportunities of selling and distributing rail services through airlines. Once resolved, they enable railways to market and promote their services to any IATA airline and to sell their services globally.

Air cargo

Concept

Could the proposed line carry air cargo too?

Especially if the cargo comprised express parcels and small consignments in containers, the answer is possibly yes.

Issues

The line is being built from new, so it could be constructed with dedicated extensions or branches to serve the cargo areas of the three airports – and, of course, anywhere else on the route.

Air cargo would need dedicated loading and unloading points and dedicated trains consisting of vehicles with airline-style roller-bed floors. That technology is already used for containerised hold baggage on Airport Express Hong Kong checked in at Hong Kong and Kowloon stations.

There would certainly be capacity on the line – half-hourly inter-airport and local trains would take about 20% of the line's total capacity.

The line could be built with a loading gauge to fit the most common airline containers and pallets.

Potential traffic

Guangzhou is the FedEx hub for Asia Pacific, and the largest outside Memphis. Jade Cargo International is based at Shenzhen, and Hong Kong is a major cargo airport too.

Much air cargo is trucked to or between major hubs, but environmental pressure may lead to use of a more efficient mode – like rail.

Hong Kong International Airport's cargo handler HACTL (Hong Kong Air Cargo Terminals) has a wholly owned subsidiary which trucks cargo between the airport and various points in mainland China, mainly in the Pearl River Delta region. Their involvement in the plans would be invaluable.

Where does Guangzhou come into this?

Guangzhou Baiyun Airport is shown on some maps as the northern terminus of the new railway – so the railway could connect Hong Kong International Airport, Shenzhen Bao'an Airport and Guangzhou Baiyun Airport.

The rationale for, and status of, this addition is unknown. It is likely that the Guangzhou connection is just a connection between Shenzhen airport and the regional railways in the area: while these would allow a connection to Guangzhou airport, it is unlikely to be an important function of the line.

If there was to be a direct high speed connection to Guangzhou airport, this would be likely to damage originating traffic at Shenzhen Airport – passengers could get a better service by going to Guangzhou in one direction or Hong Kong in the other.

This would reduce the attractiveness of the project to Shenzhen Airport and Shenzhen Airlines.

With plans for expansion – a third runway – at both Hong Kong and Guangzhou airports, the traffic demand situation under that scenario would be complex. Shenzhen airport, planning a second runway, would need to develop an attractive niche in order to compete.

Conclusions

The question this report attempted to answer – can the Hong Kong - Shenzhen inter-airport high speed rail link work? – is not an easy one.

The answer is that it probably can, but it will be a complex task to make it work.

It will involve creating a system with no parallels – something which has both advantages and disadvantages.

Marketing will be a major challenge, although if the system is well designed, passengers will be persuaded to use it by its perceived advantages to them – if and only if it is better than their alternatives. People will need reassurance that the system will work reliably, and will work for them. Some railway systems do not have a good name for punctuality and reliability, but fortunately Hong Kong's MTR Corporation is widely seen as the world's leading urban railway: if they were given the job of managing the railway, it would add an invaluable level of credibility to the operation.

They, with Hong Kong International Airport, also have significant expertise in the field of rail-air baggage transfer. Not only does Hong Kong have one of the few in-town check-in facilities currently in operation, it is also the most complex (with two downtown check-in points) and the longest-running.

A system designed to achieve an acceptable minimum connection time will be a major challenge, especially when considering border controls (customs and immigration issues).

Physical issues – in particular the location of the station at Hong Kong International Airport and the logistics of the border control area – will be complex.

Separate airside and landside trains would ease some of the cross-border complications: there is likely to be ample capacity on the line for this. There is unlikely to be enough inter-airport traffic to pay for the line.

Demand is difficult to forecast, which will mean that scoping the size of all of the facilities needed (trains, stations, baggage handling and border control) will be difficult.

The reaction of the aviation industry (airports and airlines) – as well as booking systems like travel agents and web booking sites – is uncertain, and may well influence the success of the project.

Finally, baggage transfer poses significant hardware and software challenges.

Annex - Arrivals at Hong Kong and Shenzhen airports each week

Shenzhen	Hong Kong	Origin	China?
	7	Adelaide	
	4	Amman	
	14	Amsterdam	
	5	Atlanta	
	28	Auckland	
	7	Bangalore	
7	106	Bangkok	
1		Baotou	y
7		Beihai	y
196	147	Beijing	y
	23	Bombay	
	14	Brisbane	
	6	Cairns	
21	2	Changchun	y
2		Changde	y
67	20	Changsha	y
14		Changzhou	y
126	22	Chengdu	y
	7	Chicago	
86	10	Chongqing	y
	11	Colombo	
32	10	Dalian	y
4		Dandong	y
	6	Denver	
	14	Detroit	
	5	Dhaka	
	7	Doha	
	35	Dubai	
	17	Frankfurt	
	14	Fukuoka	
29	14	Fuzhou	y
2		Ganzhou	y
	18	Guangzhou	y
22	21	Guilin	y
35	1	Guiyang	y
82	15	Haikou	y
108	41	Hangzhou	y
	15	Hanoi	
33	2	Harbin	y
	53	Heathrow	
27	3	Hefei	y
	7	Helsinki	
3	42	Ho Chi Minh City	
17		Hohhot	y
56		Hong Kong	y
2		Huangshan	y
7		Huangyan	y
	2	Islamabad	

Shenzhen	Hong Kong	Origin	China?
	4	Istanbul	
	29	Jakarta	
45	7	Jinan	y
7		Jingdezhen	y
4		Jinggangshan	y
	13	Johannesburg	
	54	Kaohsiung	
	5	Karachi	
	7	Kathmandu	
21	55	Kuala Lumpur	
	4	Kuching	
52	20	Kunming	y
	1	Lahore	
15		Lanzhou	y
2		Lianyungang	y
14		Lijiang	y
4		Liuzhou	y
	14	Los Angeles	
2		Luoyang	y
3		Luzhou	y
28		Macau	y
	100	Manila	
	2	Meixian	y
	30	Melbourne	
	4	Moscow	
1		Mudanjiang	y
	9	Munich	
	17	Nagoya	
26	4	Nanchang	y
56	25	Nanjing	y
32	13	Nanning	y
7		Nantong	y
4		Nanyang	y
	28	New York JFK	
36	24	Ningbo	y
	8	Okinawa	
	29	Paris	
	7	Phnompenh	
	14	Pusan	
49	14	Qingdao	y
3		Qinghuangdao	y
21		Quanzhou	y
3		Quzhou	y
	6	Riyadh	
	28	San Francisco	
43	20	Sanya	
147		Shanghai Honqiao	y
47	234	Shanghai Pudong	y
	7	Shantou	y

Shenzhen	Hong Kong	Origin	China?
35	7	Shenyang	y
8	2	Shijiazhuang	y
10	104	Singapore	
	5	Surabaya	
	46	Sydney	
20	2	Taiyuan	y
	6	Tel Aviv	
34	7	Tianjin	y
7	69	Tokyo Narita	
	21	Toronto	
18		Urumqi	y
	18	Vancouver	
28	6	Wenzhou	y
83	17	Wuhan	y
21	7	Wuxi	y
3	2	Wuyishan	y
4		Wuzhou	y
46	34	Xiamen	y
57	11	Xian	y
4		Xiangfan	y
2		Xingyi	y
7		Xining	y
7	2	Xuzhou	y
1		Yangon	
9		Yantai	y
7		Yibin	y
16		Yichang	y
7	2	Yinchuang	y
11	4	Yiwu	y
3		Yuncheng	y
4		Zhangjiajie	y
7	2	Zhanjiang	y
54	4	Zhengzhou	y

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.

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

Planned workshops and conferences

Please note that in future, it is planned to have IARO events around May and November each year

2010

- July – Regional meeting, Hong Kong

- October – Lyon, with a site visit to the LesLYS express tram to the city

- November/December – Far East study tour (with AREMA)

2011

- April - Dubai

- June – Amsterdam, with a site visit to the HSL-Z high speed line

- October – Madrid

2012

- June – Berlin

2013

- June - Salt Lake City

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.