Community Observatory on airport capacity

An aviation stakeholder's view on intermodality

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This document is not a European Commission working document.
It reflects the balanced views of Working Group 3 members.

Foreword

This Living Document is based on the work plan of Working Group 3 (WG3) of the Community Observatory on Airport Capacity[1] and constitutes WG3's main deliverable. It contains information collected during working group meetings, in particular presentations from members and invited experts[2], discussions and study visits. On the basis of this work, the working group members reached a common understanding of what intermodality at airports actually means, and is likely to bring to the airport capacity crunch currently faced within the largest European hubs.

The aim of this document is not to present an exhaustive description of all intermodality issues, but simply to serve as a common basis for future policy discussions on intermodality concerning the aviation sector, where aviation stakeholders intend to play an active role.

This living document has been finalised and delivered at the end of the mandate of the Observatory (November 2013) and it includes a set of recommendations to the European Commission, as the main policy initiator.

[1] http://ec.europa.eu/transport/air/airports/observatory_en.htm
[2] See the annex for a list of WG3 members, meeting dates and invited speakers.

Executive summary

Intermodality at airports, especially high-speed train connections and other forms of (public) transport can help to accommodate part of the projected demand that at current airport expansion plans cannot be served in Europe. This potential is limited as better train and other connections also increase mobility. However, increasing passenger choice is a very valid reason to pursue increased intermodality.

Another good reason are the environmental constraints of the aviation sector, especially regarding local air quality. Landside access accounts for some 50% of airport emissions; better (public) transport connections are therefore crucial in improving local air quality. Since most slots that will be freed by intermodality will immediately be taken up to serve growing demand, noise pollution is not a reason to pursue increased intermodality.

For some business models in the aviation sector, competition from high-speed trains is a real issue. In general, aviation stakeholders feel that regulators treat aviation unfairly, especially compared to rail. Aviation is a net contributor to budgets, whereas rail is heavily subsidised.

However, in general, aviation stakeholders feel that better intermodality at airports should be pursued in the interest of the passenger and to further seamless travel; they do feel that some conditions should be met to improve intermodality:

- funding for intermodal nodes should be a top priority for EU funding (both under the Connecting Europe Facility and under Regional Funds). This is especially important for physical integration of modes at airports;
- integration of public transport facilities in the airport building, a density of modes, and density of schedule of public transport modes are key to successful intermodality;
- all modes should provide access to data in the way the aviation sector does: access to open data to make easy price and schedule comparisons possible for the passengers;
- the liability issues inherent in intermodal travel and ticketing should in a first step be made transparent for passengers, and subsequently be resolved;
- passenger rights across modes should be harmonised, most urgently between high-speed rail and aviation;
- information provision to passengers on intermodal options at the airport should be improved, as well as information provision in inbound and outbound travel. Such information should be provided apart from in the home language, at least in English
- Create a brand name for seamless air and rail connection points, in order to promote their existence and enable travellers to plan their journeys accordingly

Introduction

Europe will most likely see a 50% growth in aviation by 2035 compared to 2012[3]. This is seen by many as an opportunity for economic growth. This additional demand cannot be accommodated at certain of Europe's airports with current development plans. The situation is especially urgent at the largest European hubs.

Even though authorities and industry are working hard on mitigation measures to soften the effect of a lack of capacity, physical airport capacity[4] will need to be increased at certain points to meet demand, in addition to other measures to mitigate the projected shortfall in capacity. However, building airport capacity is not easy in the European Union due, among others, to environmental constraints and protests by communities affected by nearby airports.

It is not necessarily impossible to marry the viewpoints of those that regard additional demand for aviation as opportunity and of those that see it as a threat. Timing of measures and honest communication will be essential to reconcile the two viewpoints.

The European Commission 2011 White Paper on Transport "Roadmap to a Single European Transport Area[5]" clearly states that 'curbing mobility is not an option'. The White Paper insists on multimodal travel as a key part of the strategy for the future of transport.

This paper aims at being a contribution to the discussion on the mitigation of unaccomodated demand for air travel by means of increased and accelerated intermodality at airports. The most important consideration of the aviation stakeholders gathered in this group has been that intermodality will only work when the passenger benefits from it.

New technologies have led to changing passengers' expectations towards tailor-made seamless travel products where switching from one mode to the other is as easy as possible. This is another important reason for the debate on intermodality in the aviation sector.

The paper is based on contributions given by experts during the Working Group meetings and on literature. References to both sources and a list of working group members can be found in the annex.

A number of different viewpoints were openly discussed during the various sessions. It has not been possible to reach consensus on all issues covered during the period of work of the group, but barriers to mutual understanding have been removed. This paper constitutes a balanced common view from all the participants of the group.

[3] Eurocontrol, Challenges of Growth 2013, http://www.eurocontrol.int/articles/challenges-growth
[4] Physical capacity is often defined by the addition of infrastructures: runways, terminals and even additional Air Traffic Management capacity
[5] http://ec.europa.eu/transport/themes/strategies/2011_white_paper_en.htm

1. Benefits of intermodality at airports

Improving intermodality at airports has obvious benefits by freeing up slots on short to medium haul destinations, by greening landside access and by enhancing the passengers' journey towards the much sought after seamless travel experience.

For some players in the aviation sector there are also downsides, as mainly high speed rail competition can compromise their competitive position.

Definition of intermodality

When reviewing the existing literature on intermodality, one can find a number of definitions for intermodality. The differences between these are certainly very useful in certain contexts, but the Working Group has chosen to use in the framework of this paper the following definition of intermodality:

Intermodality: the coordinated/organised usage of more than one transport mode for a journey. This means that there is a scheduling/ticketing/commercial agreement between the interested transport operators. For freight it is the segment of multimodal transport that applies to unitized (e.g. container) freight.

An important factor in successful intermodality is that passengers experience the complete journey as a seamless one. This paper will mostly focus on rail-air intermodality, because rail, especially high-speed train (HST) is the major competitor on short haul distances. As described in the Eurocontrol Challenges of Growth 2013 study: "Operating at high speeds, the train can offer comparable transport times for distances up to 800km[6]. It can also successfully attract passengers by providing in some cases a lower risk of delay, less security hassle, shorter distance to the city centre. HST can sometimes also be perceived as more comfortable (new trains) and more 'green' means of transport and possibly other aspects depending on personal preferences of travellers (loyalty programmes)."[7] However, other modes such as car, coach or boat are also relevant, especially the recent development of city (airport) to city (airport) coach services.

See annex 4 for definitions of other terms used in this document.

Reasons for reflecting on intermodality in the aviation sector

The intermodality debate is of great importance in the European context, as it can contribute to providing answers to challenges for the aviation sector which act as constraints on its continued growth:

- the lack of physical capacity at airports
- environmental constraints of the sector.

[6] Eurocontrol, 7-year forecast update, Flight movements 2010-2016. Eurocontrol Statfor, September 2010
[7] See footnote 3

Thus both physical capacity and environmental constraints are critical factors in the development of Europe's capacity to accommodate predicted aviation growth. Air-(high speed)rail intermodality is a possible option as it could release slots at airports when air city pairs are replaced with train city pairs. In addition, it can relieve environmental problems by greening landside access to airports by replacing private car use by use of other modes.

An additional issue, which makes working on intermodality timely, is the changing expectations of passengers, who are ever better informed through web based services and expect tailor-made seamless travel products where switching from one mode to the other to be as hassle-free as possible.

European policy context of the intermodality debate

2011 Transport White Paper

The European Commission, in its 2011 White Paper on Transport, takes on the challenge of coping with a forecast strong growth of transport while at the same time supporting mobility and reducing noxious emissions by 60%. It defines as the EU's headline goals for 2050:

- No more conventionally-fuelled cars in cities.
- 40% use of sustainable low carbon fuels in aviation; at least 40% cut in shipping emissions.
- A 50% shift of medium distance intercity passenger and freight journeys from road to rail and waterborne transport.
- All of which will contribute to a 60% cut in transport emissions by the middle of the century.

It states that "Curbing mobility is not an option[8]". The actual transport system is vulnerable. There is an urgent and growing need to make the transport system more resilient to external shocks (natural disasters, extreme weather, terrorist acts, etc.) through a higher degree of interoperability i.e. the facility to switch from one transport mode to another in case of need. The April 2010 ash crisis with large sections of European air space closed for traffic for many days, and the complete inadequacy of fall-back options to other modes, drove this message home forcefully. The White Paper continues to say:

"Better modal choices will result from greater integration of the modal networks: airports, ports, railway, metro and bus stations, should increasingly be linked and transformed into multimodal connection platforms for passengers. Online information and electronic booking and payment systems integrating all means of transport should facilitate multimodal travel. An appropriate set of passengers' rights has to accompany the wider use of collective modes."

This need for more resilience increases the importance of the connection of airports to the European (high speed) rail network, and to other transport modes.

The vision of the White Paper on the subject of passengers' experiences is that passengers should be delivered a coherent service with simplified interchanges, through information and

[8] 2011 White Paper on Transport, page 5, paragraph 8

hassle-free ticketing. It states as one of ten headline goals: 'By 2020, establish the framework for a European multimodal transport information, management and payment system'.

European research objectives for 2050

At the initiative of the European Commission, a High Level Group of key stakeholders from the aeronautics industry, air traffic management, airports, airlines, energy providers and research came together in 2011 to develop a vision for Europe's aviation system and industry by 2050, Flightpath 2050[9]. The group focused on two main challenges: meeting the needs of our citizens and the market as well as maintaining global leadership.

The aims formulated for aviation research were translated by the Advisory Council for Aviation Research and Innovation in Europe (ACARE) in its Strategic Research and Innovation Agenda (SRIA) for European Aviation which formulates the following objectives to reach the Flightpath 2050 aims:

- European citizens are able to make informed mobility choices
- 90% of travellers within Europe are able to complete their journey, door-to-door within 4 hrs.
- A coherent ground infrastructure is developed
- Flights land within 1 minute of the planned arrival time
- An air traffic management system capable of handling 25 million flights a year in Europe

The achievement of these objectives not only relies on the presence of sufficient physical capacity and respect of environmental constraints, but also on a successful and coherent intermodality policy.

Importance and structure of the aviation sector

Economic and social benefits of aviation to society

Aviation plays a fundamental role in the European economy both for EU citizens and industry. By supporting 5.1 million jobs and contributing €365 billion or 2.4% to European GDP[10], it makes a vital contribution to economic growth, employment, tourism, people-to-people contacts as well as the regional and social cohesion of the Union.

As set out in the Commission's 2011 Transport White Paper, aviation is and will remain essential for connecting Europe with the rest of the world, and for connections within the European Union. Over the last two decades, by removing historic barriers, the EU has transformed and integrated fragmented national aviation markets into the single largest and most open regional aviation market in the world.

The main air hubs in Europe not only play their role of gateways to the world but also continue to leave the door open to connections from peripheral, "secondary" destinations in cases of islands or remote regions where rail services are physically impossible or

[9] http://ec.europa.eu/transport/modes/air/doc/flightpath2050.pdf
[10] The EU's External Aviation Policy - Addressing Future Challenges, COM(2012) 556 final

economically or logistically unviable. Liberalisation of the aviation market has enabled substantial growth outside of capitals around some of the regional airports in the EU, a development frequently driven by the arrival of low-cost carriers (LCC) at regional airports and, often, not a contributing factor to the current capacity constraints at airports. They do, however, contribute to congestion in Europe's skies.

Differentiation in the aviation sector

The European aviation market comprises a variety of actors, with different business models, addressing various economic segments of the market, serving different geographical areas, while sometimes competing for the same traffic. There is not one single model of airport and there is not one single model of airline.

The European Union counts over 400 airports with scheduled flights and 253 commercial airlines. The top 10 airlines transport nearly 53% of Europe's passengers each year, whereas the top 10 airports process 31% of Europe's passengers[11].

The airline sector comprises network (or 'legacy') carriers, regional carriers, charter airlines, low cost carriers, business and general aviation. Nearly all of these segments show considerable growth, at least in seats.

The liberalisation of the aviation sector since broadly 1992 has fundamentally changed the sector. Among others, LCC's have been able to enter the market and change its appearance radically. They now have a market share of nearly 50% in Europe. Liberalisation of the sector has brought many more routes (including a significant increase in direct services between regions), many more players on those routes and lower prices. Lower fares have been accompanied by a general increase in living standards, with a resulting phenomenal increase in people flying.

The various airlines' business models look at intermodality differently

These various business models support the need for mobility, but do not integrate intermodality with the same mind-set.

For the network airlines, the fundamental business model involves a hub-and-spoke system using one or more central hub airports, where a mix of short, medium and long-haul services interconnect. Through coordination of schedules, convenient transfer facilities and a product package which includes through pricing, ticketing and baggage checking, the airline aims to provide as near seamless an interchange as possible.

Individual routes to and from the hub carry a mix of point-to-point and connecting traffic, and it is entirely possible that either of these, in isolation, could not sustain the operation. Networks are dynamic in nature; each new spoke strengthens all the others in the system, not only those to which it connects directly. Conversely, each spoke removed or downgraded weakens the entire network. Each spoke city of an appreciable size will be part of several competing networks.

[11] ACI Europe, Competition study, December 2012

A spoke could be operated by an intercity rail service to the airport, provided that there is a broad parity in travel time with an air link. But to maintain passenger amenity, the elements of a seamless transfer as outlined above should all be in place.

A city-centre to city-centre high speed rail link, on the other hand, could have a negative effect on the hub. It would take some of the point-to-point traffic away from the air link – perhaps to the point where the air link is no longer commercially sustainable. However, it would not offer a convenient alternative for transfer traffic, nor for point-to-point traffic whose origin/destination were served more conveniently by the respective airports than the city-centre rail stations.

There is considerable latent capacity in parts of Europe at secondary and regional airports. This could be used to take some of the pressure off congested main airports, particularly hubs, for point to point traffic, which does not need to connect with other flights. This would require much reduced capital investment, focusing rather on improved landside access and public transport links to the secondary and regional airports in question.

However, while greater use of secondary and regional airports for point to point traffic and better ground-transport links to them are important in developing an overall European transport system, these measures by themselves will not solve the critical shortfall of capacity at some hubs. Also, the latent capacity in regions can be exploited only in so far as demand can be moved. This is not necessarily a real constraint for point to point traffic, should the recommended improvement in public transport links materialise.

The perception of intermodality by the various segments can be summarised as follows:

		Legacy carriers	Major Hubs	Regional carriers	Low cost carriers	Most Regional Airports
HST intermodality	HST between city pairs					
	HST at the airport					
Other intermodality	Maximisation of regional hinterland landside access, rail and other modes					

Crucial
Non crucial

It would be erroneous to conclude that “big players” support HST intermodality and that other players support other types of intermodality. If the HST reaches the city centre, then there is a need to transport the passengers up to the airport, and as such all players will support better landside access. There are also examples of hub airports that need improved landside access to relieve road congestion such that passengers can access the airport easily, car parking demand can be met, or that should improve public transport access for environmental reasons.

The demand for intercontinental connectivity

Any attempt to look at airport capacity in the European Union should take into account the transport flows within and outside the European Union. The capacity challenges that the air transport sector will face in the coming years are linked to the travel demand outside the European Union.

Demand from outside the European Union to be handled at EU airports is expected to grow until 2025 from Africa and Asia (+5.8% per annum), the Middle East (4.6% per annum) and Northern America (2.7% per annum) while in Europe the growth is slower (1.8% per annum).[12]

The demand for slots at hub airports operating at capacity is such that regional air links have declined by 11.1% over the past 10 years – as shown in the diagram below. These have been replaced by mostly non-EU airlines flying to non-EU destinations.

Source: ERA, EBAA

The capacity problem

Physical capacity

In 2007 the European Commission published the Communication "An action plan for airport capacity, efficiency and safety in Europe"[13]. This document aimed to address the problems posed by airport capacity shortages at a growing number of European airports, itself the result of the steep growth in air transport in the recent past and predicted for the future.

The Commission's action plan included the following issues: optimising use of existing capacity; improving planning methodologies; improving decision-making to reduce delays;

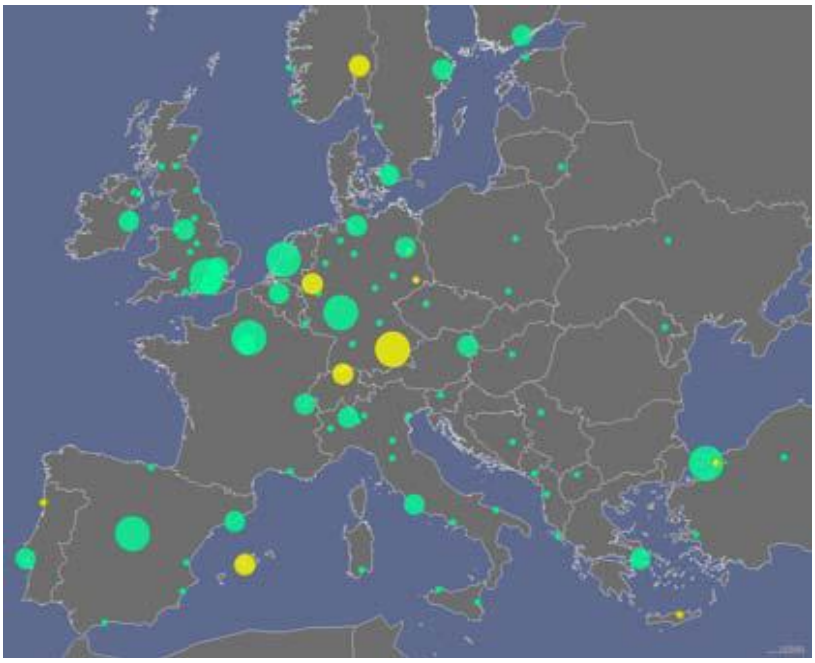
[12] Wettwerbsfahighkeit des Luftverkehrstandortes Deutschland, DLR, November 2008
[13] COM (2006) 819 final

whilst also strengthening and implementing common safety standards at airports. The action plan also explores means of improving intermodality, improving airports' environmental performance and the use of new technologies.

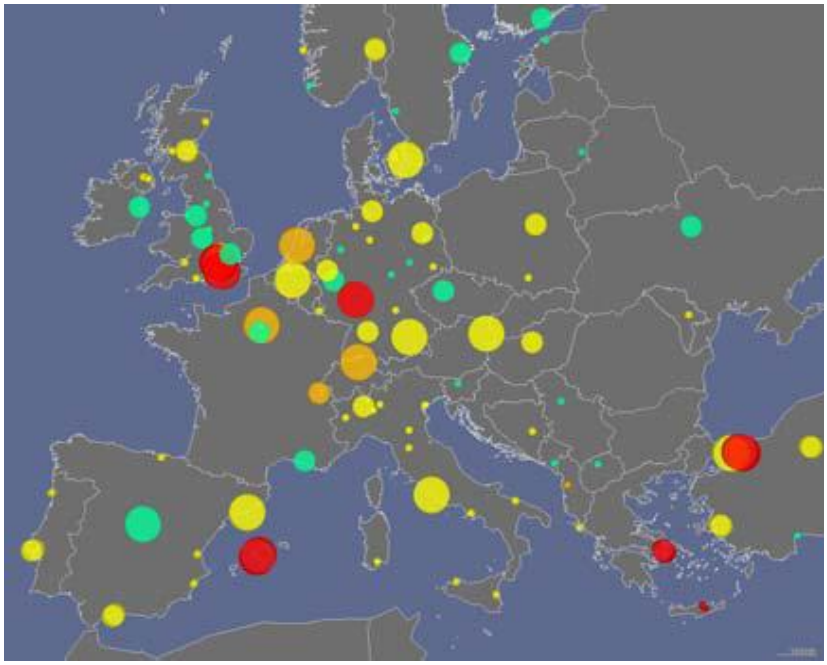
This Communication led both to the publication by the Commission of the Airport Package, with legislative initiatives on slots, ground handling and noise which are now in the process of adoption by Council and Parliament and to the establishment of the Community Observatory on airport capacity. Eurocontrol carries out the technical work on the capacity issues in European aviation to support long-term planning decisions. The work carried out on Challenges of Growth in 2004 and 2008, has been updated in 2013. The horizon chosen is 2035.

A key focus of the Challenges of Growth 2013 update is "unaccommodated demand": the difference between demand for air travel, and the flights that can be accommodated given airports' plans for capacity. This is based on a new survey of airports, which shows that the economic downturn has led to a sharp reduction in expansion plans: airports only report a planned 17% increase in flight capacity compared to five years ago when they reported increases of 38% in total. The combination of a lower forecast and reduced airport expansion plans is that in the most-likely scenario unaccommodated demand is expected in 2035 to occur on a similar scale to that previously forecast for 2030: around 1.9 million unaccommodated flights (12%). Of course, some of this will be met by airports reinstating expansion plans but, nevertheless, intermodality can contribute to meeting some of the shortfall. For Europe as a whole, the most-likely Scenario of Regulated Growth is 14.4 million flights in 2035, 50% more than 2012. That is 1.8% average annual growth, or around half the typical rate observed in the 40 years to 2008. Compared to the forecast published in 2010, the starting point is lower due to the economic downturn (no growth between 2009 and 2013) and the rate of growth is also lower, due to weaker economic outlook and reduced airport capacity plans.

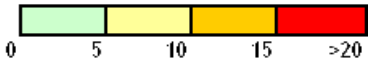
The figures below illustrate the projected delay problems in the European network; an increase by a factor 5 from 1 min/flight currently to 5 to 6 min/flight in 2035.



Situation 2012



Situation 2035



Increasing number of airports with Summer delay from 2012 to 2035 (in minutes/flight).

Source: Eurocontrol, Statfor, Challenges of Growth 2013

Caveat: The figures above represent indications of the projected delay problems in the network. It is not a one on one translation of physical capacity problems, but only an

approximation. It is used here, because capacity plans of Europe's airports beyond 2015 are to a large extent confidential.

The lack of airport capacity will be most acute in Turkey, the United Kingdom, the Netherlands, Bulgaria, Hungary, Germany, Poland and Italy, but it will have severe repercussions throughout Europe. In particular, delays and congestion will be increasing with a factor 5 throughout the airport network, with average delay per flight rising from current levels of 1 min/flight to 5-6 min/flight.

Despite plans aimed at adding capacity at airports by 2030, demand will not be met. Out of the 400 plus commercial airports of the European aviation network, such plans include 5 new airports, 29 new runways and airside (taxiways, apron) or landside (terminals) extensions at 106 airports, increasing capacity by just 17% by 2035.

Already constrained airports will have to start refusing ever more flights with unpredictable knock-on effects for the whole EU network. One consequence might be that hub activities will be increasingly displaced to nearby regions, where capacity problems do not exist, or where major capacity expansion is planned.

Environmental constraints

The aviation sector is working hard to reduce the environmental footprint of aviation. Airports, airlines and the manufacturing industry are taking measures to make flying more environmentally friendly. More can be done, with big improvements possible through the realisation of the Single European Sky, as well as by spreading best practice in local initiatives.

The key environmental issues are emissions and noise. Emissions contribute to climate change and to local air quality. Aircraft engine technology has led to significant reductions in emissions per passenger, but further measures will be needed to reduce them in the future.

Local air quality limits in Europe also force operators to reflect on how to perform air and ground operations more efficiently, to still allow for growth in traffic. In this context, landside access to airport is a key determinant, as it is responsible for 50% of local air quality impacts.

Noise has a big impact in communities around airports. Noise per aircraft movement has reduced significantly in the past years, but this has been partly balanced by increases in the number of movements. The development of single sector, direct region-to-region services, bypassing hubs, offers improved environmental performance, aircraft being less environmentally efficient during take-off and landing.

However, in the EU 2.6 million people are subject to noise levels above 55dB caused by aviation[14]. Local noise measures are a matter for member states although the EU requires Noise Action Plans under the Environmental Noise Directive. At a number of airports limits have been set at levels below the physical capacity to reduce the noise impact. 224 EU

[14] This compares to 12 million people in Europe affected by railway noise of above 55 dB, and 9 million people affected by night time rail noise of above 50 dB.

airports have operating restrictions, 116 have curfews, 52 have noise limits, 51 restrict Chapter 3 aircraft, 38 have noise quotas and 7 have noise budgets[15].

Intermodality helps to address physical and environmental constraints

Intermodality can free up slots; it fosters mobility

Successful inermodality leads to the absorption of some demand for slots by another mode, normally high speed rail, although the current development of city to city coach services should not be forgotten. The demand for a shorter haul flights (normally up to 400 – 500 km) could be completely or partly replaced by another mode if population density, ground topography, economic viability and private investors make substitution cost-effective from a financial and social standpoint; in that case the slots become available for other destinations, be they short haul without intermodality options, or medium to long haul. We see at all hub airports that such slot vacancies are immediately absorbed by aviation demand growth, which would otherwise not have been possible.

This is extremely important for those European airports which are capacity constrained where airlines will then grow their traffic on other routes which are not served by other modes.
Policy intervention can also determine substitution of shorter-haul flights by other modes of transport, for instance in France where flights between Strasbourg and Paris have been stopped from April 2013.

In addition to serving as means to alleviate capacity problems, intermodality adds to passengers' choice. Available experience and studies all point to the fact that a new (high speed) rail link increases the use of a city pair: more passengers between the same cities. This demonstrates that markets are best served by choice and this trend contributes to increased mobility of European citizens, which is a EU policy goal. It does represent a challenge for airlines.

'For example, in Western Europe, most customers have the choice of travelling by air, high-speed rail or highways — either by car or express bus — to a wide area of destinations. To some extent as well, online travel agencies support customer choice not only for the same destination, but also among different destinations. In other words, for a given budget, the key question for a customer is whether he will drive to destination A, fly to destination B or travel by train to destination C. Using one means of transport over another is mainly based on the consumer's choice, based on out-of-pocket costs, not indirect costs.

Focusing only on one means of transportation is particularly restrictive in an environment where information for the traveller is not only widely distributed via various media, but also inexpensive to acquire using the multiple pricing search engines flourishing on the Web — assuming that the air-rail-road infrastructure supports such comparison.

One could argue that this situation is only applicable to a few markets, like Europe, which is partially true. However, more and more countries, including China, Russia and Argentina, are massively investing in high-speed rail infrastructures.[16]

[15] Directive 2002/30/EC on noise operating restrictions. For more details:
http://ec.europa.eu/transport/modes/air/environment/aircraft_noise_en.htm

Landside access

Landside access to airports is a key part of aviation infrastructure. An airport with sufficient runway, terminal and airspace capacity may not be able to be fully used if landside access is inadequate. Better landside access to the airport is an important part of the competitive position of airports and of airlines. Most major European cities have recognised this and provided adequate highway and rail access but, as the demand grows, landside access capacity constraints may reappear. In planning future landside access to airports, account should be taken of the needs of different types of passengers, such as business and leisure, inbound or outbound, and of the fact that transfer passengers require no landside access at all, whereas it is vital for point to point passengers.

See annexes 1 to 3 for details on landside access arrangements at Europe's largest airports.

London's Gatwick Airport is potentially constrained by its access arrangements, as road access to central London is poor and rail capacity to London is being progressively switched to serve non airport demand.

Airport workers

An important additional reason to further intermodality at airports, and especially rail connections, is that it increases the choice of residence for airport workers. Airport workers by themselves are an important reason for the improvement of public transport access to airports, as the following example illustrates:

In Washington DC, the Metropolitan Washington Airports Authority is constructing the Dulles Corridor Metrorail Project a new 23.1-mile Metro line connecting the Dulles Airport areas of Fairfax County to the regional Metrorail system. The projected costs are 2 billion $; the cost-benefit analysis has shown a 3 billion $ return over a 15 year period. An important factor in this viability is the fact that workers at Dulles will be using the new metrorail.

Earning a licence to grow - examples

As up to 50% of the local CO_2 emissions may be related to surface access, providing good public transport will assist in keeping the impact of airports within limits.

Stockholm's Arlanda Airport operates under a CO_2 cap (the only airport in the world to do so) and it is vital that low carbon rail access be expanded, otherwise the Arlanda Airport would not be permitted to grow.

At Zurich Airport, the Swiss government laid down the following condition for the permit for the 5th expansion program in 1999: 42% of all airport users travelling by public transport to the airport by end of the expansion program. This goal was achieved in 2003.

[16] C. Ritter, Sabre "Revenue management in era of multimodality – Ascend 2012, Volume 2

Competitive pressure affects intermodality options

The creation of the internal aviation market is making its influence increasingly felt on airports and on airlines. It has enabled the access of European citizens to aviation services. Nearly two thirds of Europeans live within 2hrs travelling of at least 2 airports[17].

This implies that the landside access (hence intermodality) is becoming a crucial tool for the airports in attracting passengers. Airports have to work hard to retain both airlines and passengers. Therefore, they diversify their offer, continuously seeking to improve air-side operations, where possible create airport cities and work on landside access to retain or enhance their competitive position. The creation of airport cities is an issue outside the scope of this paper, but is important for the intermodality debate.

Entry barriers[18] for airlines are lower than for airports, as they have mostly moveable assets. Airlines can more easily respond to market opportunities where they see them and can very quickly decide to drop an airport from their schedule when passenger demand falls, notwithstanding the investments made or the incentives given. This changing nature of the sector is illustrated by the fact that in 2011 airlines launched nearly 2,500 new routes, dropping close to 2,000 existing ones in Europe.

Thus, airports work hard on attracting passengers, airlines and other airport users. A good intermodal mix is an important factor in this respect.

Limits to what intermodality can achieve

Rail links are by no means the only solution to the airport capacity challenge. High speed rail in particular is very expensive and difficult to justify purely on aviation grounds and will only serve the catchment area around its stations. A regional rail service, light rail or metro may be more appropriate and, for some routes, coaches may be the best (public) transport solution.

One of the main issues concerning intermodal travel is the so-called "Last Mile paradox". The most difficult part of a journey is often the first mile from the traveller's doorstep to the first public transport (say a metro station or bus stop from airport to downtown) as well as the last mile from the last public transport to the final destination. Very often a taxi or private car is used on the whole landside journey instead of public transport because of the perceived discomfort of the first/last mile.

Of course, while intermodality may result in slots becoming available, these are normally taken by other routes. It is also possible that improved accessibility by rail will increase demand at the airport, but this is in line with the EU agenda of facilitating mobility for EU citizens.

[17] ACI Europe, Competition study, December 2012

[18] Entry barriers are defined as economic, regulatory or technological factors that obstruct or restrict entry of new firms into an industry or market. http://www.businessdictionary.com/definition/barriers-to-entry.html

Conclusion

This chapter has shown that aviation in Europe, which has significant economic and social value, is constrained by physical capacity and environmental considerations. Better intermodality can accommodate some aviation demand and can improve local air quality around airports (due to more landside access possibilities away from the private car). It does not help addressing noise problems around airports. Very importantly, it can contribute to EU mobility objectives and increases passengers' choice.

Given the structure of most European rail networks which are mainly focused on capitals and big population centres, rail is of less use in improving region to region direct connectivity. Other modes, such as bus, express bus, and ferries can be better options at such airports.

2. Air-Rail Intermodality

This chapter considers how air-rail intermodality can help to address the issues identified in the first chapter – the shortage of capacity at congested airports and the potential for environmental improvement. The chapter starts with a reference to the Eurocontrol Challenges of Growth 2013 study, then considers when high speed rail should serve airports, then looks at the substitution of flights by city centre to city centre trains, considers some of the differences between air and rail, and looks briefly at the discussion around emission profiles of both modes before reaching conclusions.

2.1 The potential of air-rail to help meet the shortage of airport capacity

The Eurocontrol study 'Challenges of Growth' looks ahead at 2035 and 2050 and based on airports' information on capacity plans, evaluates the shortfall between expected passenger growth and airports' physical capacity.

Due to more passengers opting for high-speed train instead of travelling by air, the 'unconstrained' demand for flights (in principal short-haul) will be reduced by somewhat of 0.6% overall in total Europe by 2035 in the most likely scenario. The HST network does not develop in all parts of Europe to the same extent. Even if the HST network is cross border, the countries with more projects in the pipeline are likely to see stronger reduction in demand for flights by 2035, such as France and Spain (-2.5% each) or Sweden (-3%).

The reduction in demand for flights does not directly translate in a reduction of operated flights. Increasingly, the high-speed train connects the major urban areas and notably where the airports are highly congested. This could result in easing the pressure on airports, freeing some capacity at strategic bottlenecks within the network, thus reducing the level of unaccommodated flights.

The Eurocontrol study[19] analyses a number of approaches for mitigating the challenges of airport congestion. In the most likely scenario of regulated growth, the reduction potential in unaccomodated demand (nearly 2 million flights by 2035) of the following measures is thus:

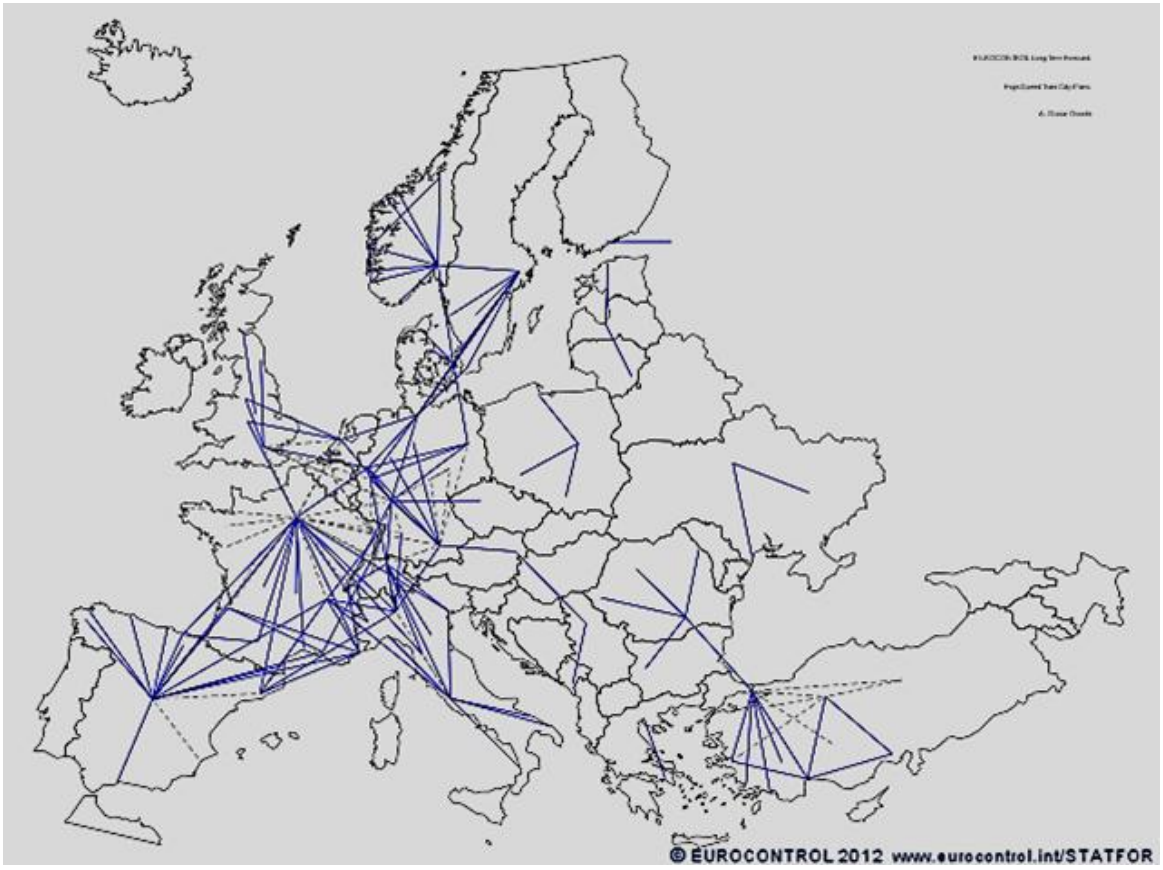
- use of local alternatives around major cities: 21%
- schedule smoothing (filling up the quieter hours at airports): 20%
- airport and air traffic management improvement through SESAR: 19%
- use of larger aircraft 15%
- additional HST, i.e. a doubling of current length (6830 km in 2011): 11%
- increase in benchmark capacity for smaller airports 10%

Gains from different types of mitigation cannot simply be added up and Eurocontrol estimates that the best solution in combination reduces unaccomodated demand by 42%.

The reduction potential of additional investment in HST of 11% compares with a figure of 5% in a previous version of this study in 2008. Eurocontrol identified those city pairs with more than 20 flights/day in 2035 and a great circle distance under 500 km. In the baseline 2035 forecast, the HST network connects 61 cities with 97 links. Doubling the current HST

[19] http://www.eurocontrol.int/articles/challenges-growth

network would lead to an extra 75 city pair links by 2035 and a network that connects 115 cities in total.



Eurocontrol recognises that the cost associated with a doubling of HST is not justifiable purely on aviation grounds, but states that there is political momentum behind continued expansion. The mitigation effect is evenly spread throughout Europe.

The members of the group have doubts as to the feasibility of a doubling of the HST network for reasons of costs, the ability of HST services to match the frequency of flights and the ability of the rail industry to innovate at the same rate as aviation, and thus its capacity to attract passengers.

2.2 High speed rail at airports

Member states that choose to invest in high speed rail have done so for variety of reasons. Some are seeking to upgrade old infrastructure, some are building additional capacity and others are looking to shift demand from road and air, which requires additional capacity and which may have greater environmental impacts. In some cases this leads to direct competition between air and rail, in others the roles are complementary.

In **Spain**, the building of high speed lines was very successful in attracting passengers away from air on certain routes. This was certainly in part due to the fact that the non high speed rail infrastructure in Spain dated in great part from the nineteenth century and was sinuous and slow.

In **Great Britain** the HST programme focusses primarily on providing additional rail capacity to meet growing demand on the classic rail lines. London's Heathrow Airport will not be directly served by the first phase of HS2 and the business case for a later extension will depend on whether the airport can grow beyond its current capacity.

To determine if it is appropriate for a HST to serve an airport, the following need to be considered:

- Airport size: The size of the airport's catchment area and the number of flights, particularly long haul. Given that the number of seats on a HS train is 500-1000, whereas the number of seats on short haul aircraft is 100-200, there have to be enough passengers to make a rail service viable at a reasonable frequency (eg. hourly), otherwise it will not be attractive to air passengers.

- Geography: The location of the airport relative to the route likely to be taken by a HST in the absence of an airport. It is difficult to justify a HST service only for an airport, but airports can be served as a stop on a HST between cities, provided the route does not detour excessively and cause additional journey time for non airport passengers

- Travel time: The ability of HST to compete in journey time with a flight. If the rail journey time is in excess of 3 hours, it will not be attractive compared with a short haul flight of 1 hour.

A 2013 study by the largest operators in Germany (DB AG, Airports Fraport/FMG/FDG, Lufthansa, DFS) is a new quantification of the benefits of intermodality and pricing of efficiency gains for passengers/the economy. The figures reinforce the case for air-rail intermodality: benefits of modal shift from road to rail have gone up 200%, avoided CO_2 emissions are now factored in, time gains in getting to the airport have double monetary benefits, employment benefits are quantified and so are the gains of a direct connection to the airport. This has immediate effects for the viability of for instance the direct connection of Munich airport.

Reasons for success of Frankfurt as an intermodal hub

Geography: Frankfurt Airport is ideally situated in the heart of the rail and road German/European network. There are three stations: a High Speed Train Station, with 174 trains per day (2010) and 5.6 Million passengers (2012), a Regional train station, with 223 commuter trains per day (2010), of which 40 are regional trains, 3.5 Million passengers (includes traffic to city centre) (2008) and a Rail Air Cargo Station, offering services like Cargo Sprinter (1996-1999) and Air Cargo Express/ACE: planned for 2011 (Leipzig - Frankfurt).

Strategic decisions: In Germany there is now an overall calculation of the potential of substitution of short haul flights to HST traffic. From the perspective of Frankfurt Airport there are two cases:

(1) The shift from flight to HST as a strategic decision of the hub carrier (Lufthansa) in direct combination with the AIRail Service project: this has lead to shifting all flights to HST on the Cologne-Frankfurt link, where the distance between the 2 airports is only 136 km.

(2) Considering pure competition, confronted with the success of HST, air carriers have to decide whether to fight back through aggressive pricing policies or reduce frequencies or even close some routes altogether.

AVE HST in Spain

AVE HST in Spain serves only a point to point market (the cities of Madrid, Barcelona and Seville) with a very high market share. However, despite excellent urban transport to Barajas Airport, AVE is not used as a feeder to flights, not being directly linked to the airport and there being no agreement between RENFE, the rail company, and air carriers.

The Netherlands

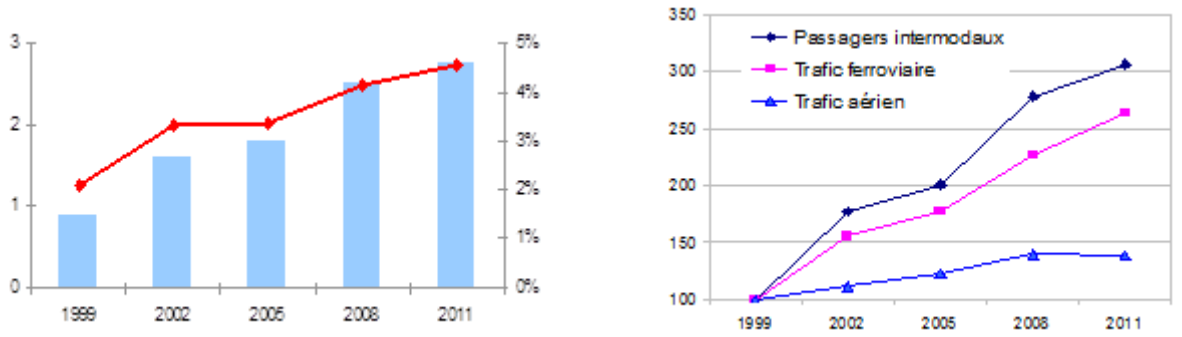
The size of the country is relatively small and there are few domestic flights. It is expected that HST will capture some market share between Brussels and Amsterdam once the problems with the Fyra trains will have been sorted out and a regular service between these cities will have been reinstated. Thalys HS trains from Paris via Brussels to Amsterdam have served Schiphol Airport for some time and have had an impact on flights from Paris and Brussels.

France

The development of air-rail intermodality is an essential part of French transport policy, especially considering the potential to free up airport slots for international links and the reduction of emissions.

Aéroports de Paris has provided high quality access to the HST station at CDG Airport. SNCF has developed the TGV'Air product (including check-in at railway stations) and commercial deals with airlines, notably Air France, to pre-process air passengers at Paris-CDG. Passenger surveys demonstrate that passengers are happy with this way of travelling, especially the single air-train ticket. HST-rail has further potential, especially when the air leg is long-haul, as the train ride may last up to 3 to 4 hours. However, at Lyon-St-Exupéry Airport, it has been difficult to develop HST services as the airport serves mainly short and medium-haul destinations.

Intermodal traffic reached nearly 3 million passengers in 2011; it tripled at Paris-CDG from 900.000 passengers in 1999 to 2.8 million in 2011. It is growing quicker than global traffic at CDG[20]. An example of the evolution of the HST service at Paris CDG airport railway station is that the number of destinations served by HST links increased from 40 in 2009 to 58 in 2012.

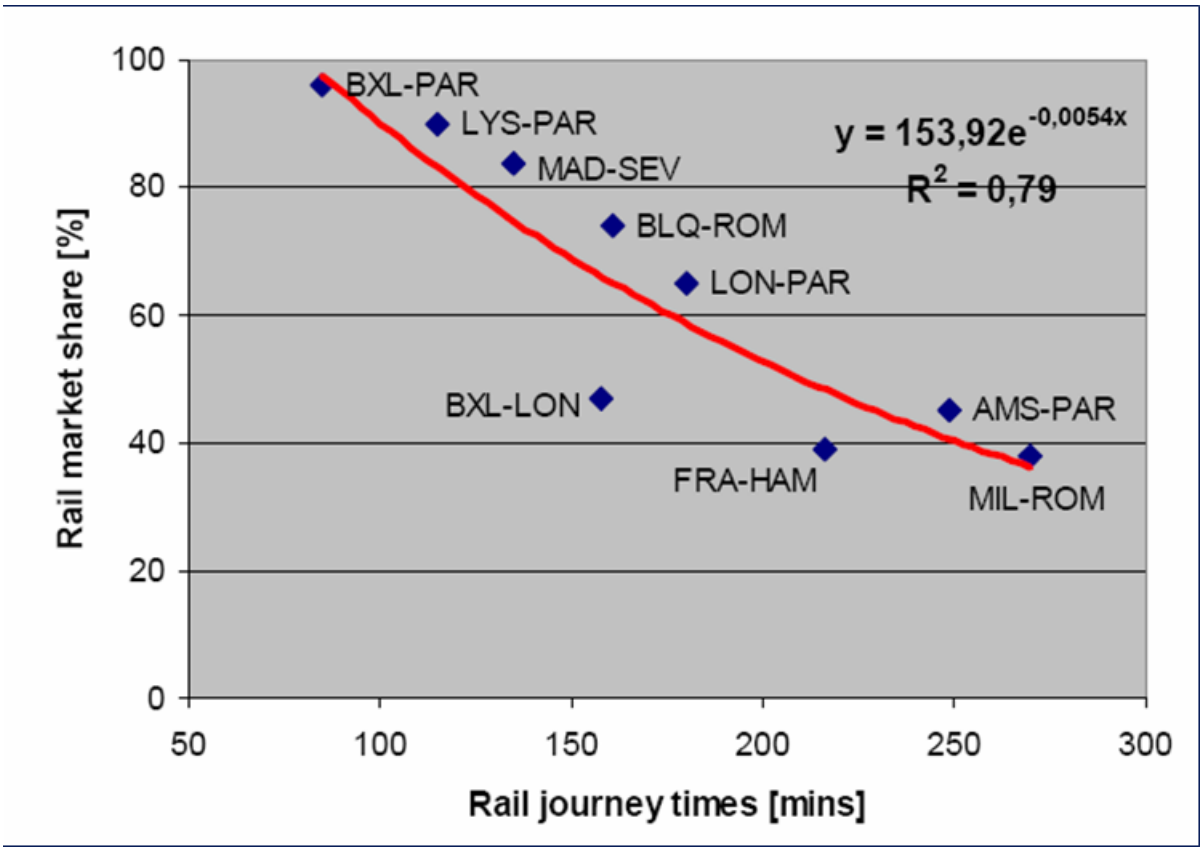


Paris-CDG : number of HST-air passengers and % of total traffic of the airport. Base 100 = 1999

2.3. Substitution of air by city centre to city centre rail

A new HST between city centre stations can replace flights between airports, either completely or with a reduced frequency of flights. The graph below shows the relationship between rail market share and rail journey time. The point at which the market share is 50/50 is around 3 hours, which generally equates to around 500 km for high speed rail. For very short distances, the rail share is usually 100%.

[20] Source : DGAC;"Enquête complémentarité modale TGV-Avion : Paris-CDG et Lyon Saint-Exupéry » -2011 http://www.developpement-durable.gouv.fr/Enquetes-sur-la-complementarite.html

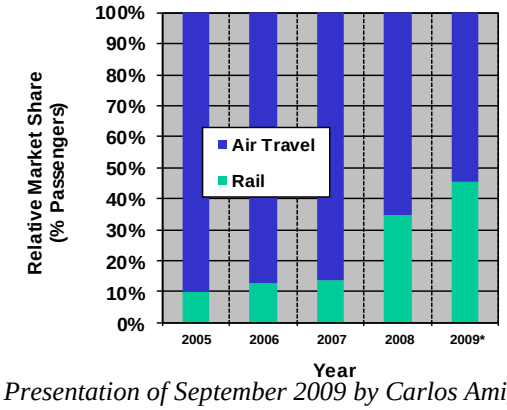


Source: EUROCONTROL CARE Innovative Action Project, "Innovative Route Charging Schemes" WP3 "Analysis and modeling of passenger choice between air and rail transportation modes", Final Report January 2004, University of Trieste, University of Padova, Air Dolomita SpA

Spain

The introduction of efficient AVE HST services on the Madrid-Seville line (~ 400 km) has changed the air/rail modal split from 75% air 25% rail in 1990 to 20/80 just three years later.

The chart below shows that, on the Madrid-Barcelona Line (~ 500 km), the penetration of rail is slightly less, due both to the longer distance and the extremely high competition from air transport, with tickets often priced at lower levels than rail, illustrating the high price-elasticity of the transport market.



Presentation of September 2009 by Carlos Amigo, Inceo

The completion of the Spanish HST network is expected to have an impact on airport traffic of an estimated 8.1% annual loss for mainland Spanish airports, if competitive HST frequencies are set.

France

Since the start of TGV services (1981: Paris-Lyon) and the progressive introduction of numerous high-speed rail connections (Paris-Lille : 1987, Paris-Nantes :1989, Paris-Marseille : 2001, Paris-Strasbourg : 2007, Paris-Mulhouse : 2012), air traffic between Paris and the rest of France has stopped growing (17 million passengers in 1989 ; 16.7 million in 2011) and has fallen considerably at Paris-Orly. Some air services have stopped altogether (Paris-Lille and Paris-Strasbourg), and others reduced and regrouped on Paris-CDG for international connections (Nantes). Paris-Brussels flights have reduced significantly following the introduction of Thalys HS trains but, although they have reduced, there are still a significant number of flights between Paris and London.

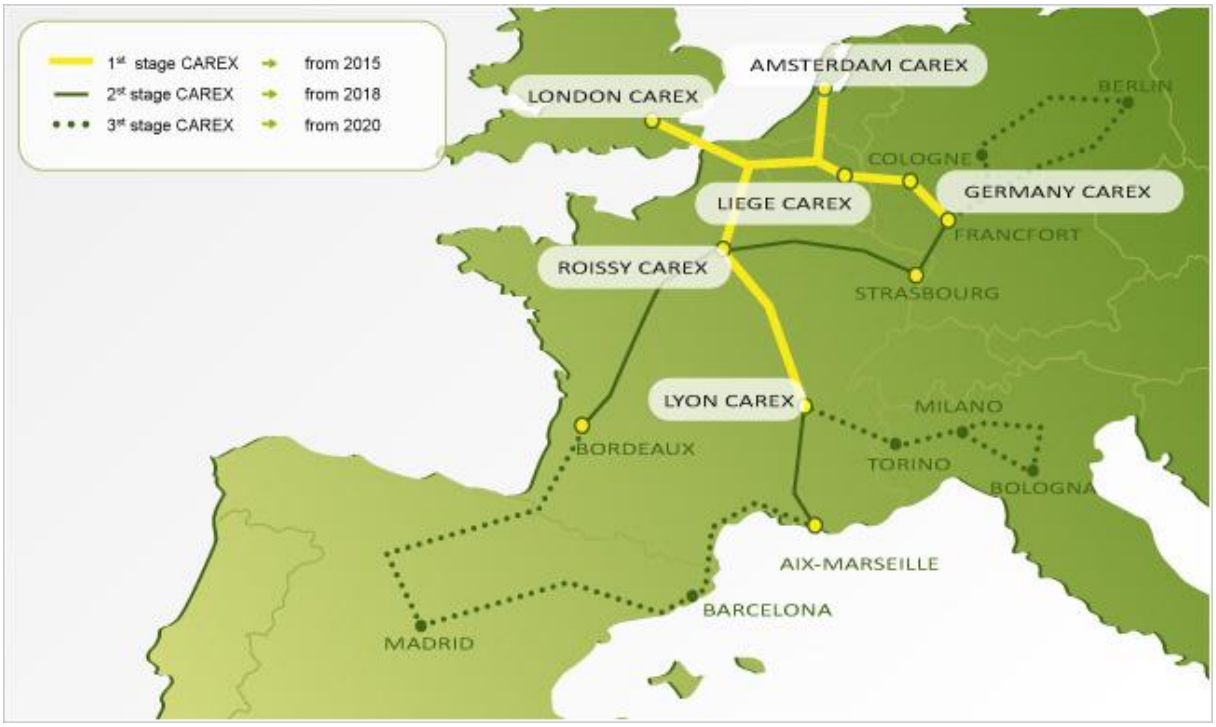
United Kingdom

The shift from air to rail travel in the UK market is revealed by figures from the Association of Train Operating Companies (ATOC) released in April 2013 that show train use on domestic air routes has jumped almost 60 per cent in the past six years. An analysis of the 10 busiest domestic air routes, mainly between the south of England and Scotland, shows that rail's market share increased from 29 to 46 per cent between 2006 and 2012. This is mainly due to the way that Train Operators now sell advance tickets, similar to the airlines' advance pricing, and to specific rail discounts for younger and older passengers.

Cargo

Even though this paper concentrates on passenger traffic, a few words can be said about cargo, where high speed rail may have promising potential.

The same advantages which we have seen for passenger air-rail intermodality could apply to freight. This is the idea behind EURO CAREX, a forthcoming European freight service on the existing high speed rail network. It would enable the modal shift of airline freight, currently transported by trucks or short and medium haul flights, to special high speed trains which will circulate at night and will be capable of transporting air cargo pallets. During a first phase that runs until 2015, the EURO CAREX rail service will link the airports of Amsterdam-Schiphol, Liege, Lyon-Saint-Exupéry, Paris-Roissy-CDG, the London area and Germany (Cologne or Frankfurt). In future, the network will be extended as far as Italy and Spain.



The stakeholders consider that there is strong long term growth potential for rail express freight activity, also because air carriers face increasing restrictions due to the reduction in the number of night slots available in Europe. However rail cargo, for instance in Germany travels mostly during the night. Other elements which favour the usage of HST for freight are the fluctuation of the oil price, road congestion, speed limits imposed on trucks, and in some cases limits or payments imposed on road transport for environmental reasons.

The stakeholders claim that CAREX trains have 35 times less carbon emissions compared to trucks and planes currently in use. This assertion obviously is open to discussion, depends on the kind of electricity used to propel the trains and loses all or some of its validity as trucks and planes get cleaner.

The success of EURO CAREX will depend on its customer base, the availability of adapted rolling stock and slots, and on the development of a truly European rail area where national controls, papers and formalities at borders like switching tail lights will have been abolished. Its customer base will also depend on regulatory measures such as road pricing, noise restrictions, environmental limits and the resulting competitive advantage or disadvantage of rail/road/air.

2.4. Differences between rail and aviation

As this report is an aviation stakeholders' view of intermodality, it is necessary to point out the differences between air and rail that are an obstacle to successful intermodality. Examples of these are as follows:

- The definition of high speed rail varies and, although the top speed is 300 km/hour, not all lines enable this to be achieved and the average speed depends on the number of

stops. However, the important issue is not the speed, but the comparable journey times between origin and destination, including the access to the airport or station.

- While train operators are increasingly adopting 'airline' methods of marketing, there is not the same openness of data, making it difficult for airlines to co-operate with train operators. Train ticket distribution, which is a way to compete, is not open. Rail operators are very reluctant to give access to their data, especially pricing data. Experience from the air sector shows that competition, especially in concentrated markets, is only effective when there is third-party fare comparison and distribution, and where third-party distributors are able to compare a full range of fares, not just selected fares. For example, the lowest Eurostar fares are not shown on Global Distribution Systems[21] (GDS).

- While for rail journeys in certain markets (e.g. Germany), reservations are not compulsory, seat reservations are the standard in the airline environment and thus also in the GDSs. At railway level there are two separate "worlds": SABRE which is based on place reservation, and DB which is an open system with no reservation. This difference creates great technical problems.

- There are major differences in passengers' rights, with rail passengers having far lower delay compensation provision than air, and a lower level of support for multi-carrier rail journeys.

- There are differences in the definition of 'child' between train operators, as well as with airlines.

- Domestic rail competition is limited, even in the UK where higher fares make market entry attractive. With fixed infrastructure, it is much more difficult to enter (and exit) the rail market than it is with aviation.

- Train operators supply very little information about trains outside their boundaries, although passengers are able to access information using web based services.

- Verification that a passenger has travelled by rail is not required, but it is by air. This may lead to a requirement for a coupon to be exchanged for a ticket.

- Taxation of air and rail is different, and indeed there are differences between countries in terms of taxation of both air and rail. Although taxation is, of course, a highly sensitive issue, there is no doubt that the variety of taxes makes intermodal pricing difficult.

- Public sector financial support for rail is, of course, very much greater than the support available to air transport. There may be valid reasons for such support, but it must be considered when seeking to arrange intermodal travel solutions.

The European Commission is addressing some of the issues above through its 4th railway package adopted in January 2013, which is destined to introduce competition on domestic

[21] GDS refer to the reservation tool travel agents use when making an air, hotel, car or other travel service booking. There are three main GDSs: Amadeus, Sabre and Travelport.

markets, speed up authorisations for new companies and rolling stock, and separate the infrastructure managers from railway companies to increase competition. Other issues are addressed through the work on standards by the European Railway Agency. Others, like access to data, still need addressing.

For instance, the European Railway Agency has drafted a technical specification for interoperability (TSI) for telematics applications for passenger services (TAP). TAP TSI will allow the harmonisation/standardisation of procedures, data and messages to be exchanged between the computer systems of the railway companies, of the infrastructure managers and of the tickets vendors in order to provide reliable information to passengers and to issue tickets for a journey on the European Union railway network, in accordance with Regulation 1371/2007 on rail passengers rights and obligations. Agreement was reached in early 2013 to deploy TAP TSI by 2018, some parts even only by 2020

2.5 Local rail access

This report has focused mainly on longer distance rail travel, particularly by high speed trains, to and from airports or as substitutes for flights. But local rail access is also an important element of intermodality for the much larger numbers of passengers from an airport's local catchment area, in particular the city which it primarily serves. The previous chapter noted that local rail access can help to use airport capacity better by easing congestion on access roads, and the next chapter will include some examples of improvements that have been made to local rail access.

2.6 Emission profiles of rail and aviation

During a presentation on a comparison in emission levels between different modes of transport, it was made clear that it is extremely difficult to get recent figures on the topic.

There is an "inherent belief" in large parts of public opinion and at different authorities that rail is less polluting, but there is a need to assess the actual situation. For a valid comparison between modes, comparison should be done on a route by route basis, on the basis of transparent and reliable data. However, this is extremely difficult to achieve because of the unavailability of figures, of impacts of construction of infrastructures. Construction of HST infrastructure is never taken into account, should it be, HST would be a less environmentally friendly option than air. In addition, there are data available in the air sector, that do not even exist in the rail sector: impact of maintenance and load factors for trains for instance.

The environmental profile of HST obviously differs also per country, whereas France relies mainly on nuclear, other countries use more coal, gas or renewables with different emission profiles.

There is a paradox in aviation in that long haul flights are not environmentally efficient (as the fuel for the long haul needs to be carried in the flight). Banning short haul flights below 1000 kilometres would only cut CO2 emission down by 13%. While on some routes the environmental benefit of shifting from air to rail is substantial, on others the effect is only marginal. This is the reason why an individual route analysis is needed for truthful comparison.

2.7 Regulators' behaviour – presumption in favour of rail

The stakeholders from the aviation sector pointed out that their sector is a net contributor to Member States' budgets. In general, aviation is more or less heavily taxed[22].

The same cannot be said for rail, which is a heavily subsidised mode of transport in every Member State. This might stem from history where rail was primarily used for reasons of national unity, whereas aviation has a natural international dimension. It is also related to rail's better penetration and denser networks.

It is fair to say that aviation stakeholders feel discriminated against by regulators, who appear to see rail as a more virtuous mode of transport than aviation**.** There is no fair and open competition between the two modes.

Conclusion

As aviation stakeholders, our conclusions on the analysis and examples in this chapter are that, in general, rail, in particular high speed rail, has the potential to ease the airport capacity shortfall while providing good passenger service and demonstrating improved environmental impacts, but only on local air quality around airports. Some scope exists for substitution of air journeys by rail, but these tend to be restricted to capital-city-centre to capital-city-centre journeys.

There are a number of issues which must be addressed if this potential is to be realised, including:

- The objectives of new high speed rail developments should be clear. Are they to provide rail capacity, reduce road traffic, or improve passengers' travel experiences?

- If there is to be competition between rail and air, then it must be fair and open

- It is better to let the market determine the share between modes than to try and manipulate it, even though some policy intervention will always be there, for instance for local air quality reasons.

Competition between air and rail is real on some routes; however, rail-air intermodality can be useful because of capacity and environmental constraints of the aviation sector and for passenger choice. Both modes can be complimentary under the right conditions.

The next chapter discusses under which conditions intermodality at airports can better develop.

[22] It is fair to add that aviation is free from tax on its fuel, kerosene.

3. How to optimise intermodality at airports

This chapter focuses on the factors that contribute to successful intermodality at airports starting with funding, then looking at improving landside access for all modes such that there are good choices and frequencies of service, the role of check-in and the integration of information provision and ticketing to passengers. Some of the challenges in providing these factors are discussed.

The most important precondition for success of intermodality is that passengers benefit from it. The intermodality debate in the aviation sector tends to focus on high speed rail-air, because of its substitution potential. However, when focusing on airports all modes of transport are crucial. Increasingly coaches or other modes provide services where high speed rail is not a viable option.

3.1 Physical integration of modes at the airport: funding

There is a need for intermodal business planning: investment should be directed to those airports which have a good business case for an intermodal HST station and related intermodal services. The business case should consider the administrative, technical, operational, service and sales aspects of air, rail and other modes integration.

Funding will limit the investment in intermodal facilities and the number of HST city pairs particularly in the current economic circumstances but, even in better economic conditions, the return on rail investments is very long.

For this reason, the leverage effect of the European Transport policy and TEN-T funding is crucial in making intermodal solutions become reality. The new TEN-T policy will primarily focus on the passengers and goods rather than different modes of transport. This is the best way to bring intermodality and interoperability into focus. The different modes of transport then jointly have to tackle how to best provide the seamless journey from door to door in a sustainable way.

Most of the TEN-T budget under the Connecting Europe Facility (CEF) is earmarked for the Core Network, which replaces the current Priority Projects approach. Investing in intermodal nodes, especially at airports, is vital for the cohesion of the European transport network.

3.2 Improving landside access

The Working Group received a number of presentations on this subject and examples are described in the boxes below.

Zurich Airport

Zurich Airport's success as an intermodal hub depends on the following factors:

- **Density of modes**: The airport is served by several modes: national and regional trains, buses and trams, allowing a large number of destination to be served.
- **Density of schedule**: High frequency services: there is a public transport departure every 37 seconds at peak hours. This allows for real flexibility and seamless travel. When missing the connection for onward public transport means that passengers have to wait a long time for the next connection, passengers will be lost to public transport.
- A **single ticket system** for all modes
- **Luggage check-in** available at 56 train stations in Switzerland, plus delivery at 30 train destinations
- **Integration of the public transport facilities** in the airport terminal (no more than 5 minutes walk from public transport to the airport). Airport check-in desks directly above the train station and ticket vending machines and train departure information in the baggage reclaim hall.

The success of the intermodal policy is also key for the operations of the airport: avoiding road congestion that would prevent passengers to access the airport, and creating additional revenues from the integrated retail facilities, although these do compensate the loss of parking fees. Smart public transport enhances passengers' travelling experience and the critical mass of users goes beyond just passengers and staff. The environmental benefits of a true intermodal hub can be significant (at Zurich airport a reduction of 1% of car traffic results in savings of 1,600 t CO_2/year and a reduction of 7.6 million km driven).

A 2006 study on landside access to major European airports by the French Institut d'Aménagement et d'Urbanisme notes that bus and coach services are flexible and can increase and diversify airport links. It also suggests that transport customer service at bus and train stations is an important factor.

However, private transport usually remains the most popular access mode to airports. This contributes to the saturation of nearby road traffic often already under severe pressure, and to deterioration of local air quality, where strict EU and national/local regulations have to be respected.

Marseille-Provence Airport

With 8.3 million passengers in 2012, mp Airport has grown by almost 1 million passengers since 2011. 2012 was also a particularly good year for public transport which, for the first time, carried over one million passengers. Particularly noteworthy is the volume of passengers travelling to or from the airport by regional train (TER) in 2012: 120,000 passengers, an increase of 84%.

Landside accessibility of Schiphol Airport

The elimination of traffic bottlenecks and the improvement of public transport facilities are crucial in ensuring the airport's long-long term accessibility. In 2011 the completion of new peak-hour lanes and extra traffic lanes has reduced the amount of congestion on motorways leading to the airport. This had as immediate result that the percentage of public transport users declined from 41% in 2010 to 40.5% in 2011. Among Schiphol workers the use of the private car rose to 64% in the same year.

Source: Annual Report 2011

3.3 Check-in

Check-in or baggage drop at a rail station can add to the intermodal experience by making it more convenient for passengers using rail. These days check-in (without baggage drop) is available at home, with a mobile device, or using a check-in kiosk, as well as at a manned desk at the airport. For passengers with hand baggage only, kiosks can be provided at city centre rail stations as at Vienna and Stockholm, and at remote stations such as Cologne and Stuttgart. However, it is baggage drop that can provide an improved service that can enhance the experience.

Baggage drop for rail passengers can be at one of two locations: at the origin station or at the airport station. In Switzerland, baggage can be checked in at over 50 rail stations for Swiss, Lufthansa and certain other airlines 24 hours before take off, for 22 Swiss Francs per item. Baggage can also be delivered to any Swiss rail station within one or two days for 22 Swiss Francs per item. It is understood that this service is loss making and the number of users is declining.

Baggage drop off at the origin station has been provided in other countries in the past. In Germany, a service used to be provided at Cologne and Stuttgart for Frankfurt passengers and, in the UK, baggage check-in was at one time available at London Victoria Station for Gatwick Express and at London Paddington Station with Heathrow Express. All of these services have now ceased, in part because of the difficulty of meeting security requirements, but also because of the costs involved.

Baggage drop off at the airport rail station enhances the intermodal experience because it enables passengers to drop their bags sooner. Therefore, some aviation stakeholders believe that it is worth investing in check-in and baggage facilities for certain types of passenger in order to provide a door-to-door service such as provided by air freight integrators. At Frankfurt, baggage can be dropped at the AiRail terminal just outside the long distance rail station. However, these facilities are subject to peak demands as trains arrive and then are less used between train arrivals.

Airlines and airports seek to provide check-in and baggage drop facilities in order to attract more passengers to the intermodal services, but the business case may be difficult as the costs per passenger are generally much higher than for other methods of check-in and baggage drop. There are only a few airports combining off airport check-in with HST-long distance traffic (CDG, ZRH, FRA), with limited corridors and only a few stations included in the service. Often airlines do not participate because of their alliance strategies, or because of security issues.

Lufthansa AIRail Service at Frankfurt Airport

The essential service elements of Lufthansa's AIRail Service comprise check-in at off airport main stations (Cologne, Stuttgart, Bonn) in combination with baggage drop at Frankfurt airport, integrated ticketing, seat reservation and special service on the train.

Demand is growing continuously, though sometimes slowly. On the Cologne-Frankfurt route, rail attracted enough market share to enable Lufthansa to end all flights in 2007. However, on Stuttgart-Frankfurt, flights remain along with train services.

3.4 Integrated scheduling and ticketing – European Commission initiatives

A stated goal of the 2011 White Paper is to establish, by 2020, the framework for a European multimodal transport information, management and payment system. Passengers should be provided with a coherent end-to-end service with simplified interchanges, on-the-spot/on-the-go information and hassle-free ticketing.

This implies integrated provision of travel information and booking opportunities regardless of travel mode, with the ability to purchase tickets for the whole journey. To achieve this it will be necessary to create framework conditions which promote the development and use of intelligent systems for interoperable and multimodal scheduling, information, online reservation systems and smart ticketing.

European multi-modal travel planning and information services (integrated scheduling)

The European Commission seeks to enable the emergence of competitive multimodal travel planning and information services. This falls in the framework of the Intelligent Transport Services Directive (2010/40/EU). The ITS Directive's number 6 priority action for which the specifications (be they operational, functional, service provision related or technical) will be adopted by the Commission as delegated act. These specifications are expected by the end of 2014.

In line with the 2011 White Paper, adopting a step-wise approach seems logical: the information side will be addressed first; ticketing will follow (see below). There are many liability issues to be resolved, among others dealing with incorrect information.

Example of a functioning multimodal journey planner – Czech Republic and Slovakia

IDOS (CZ/SK). Transport companies (all modes, except air) are obliged by legislation to provide timetables to an authority. This authority checks correctness of and validates the data. The data are put into a central information registry. The authority tendered out the provision of the information, which was won by CHAPS. This is the only company to have access to the data. They developed a website and generate income through advertisement on the website. They are now integrating air and are starting selling tickets. They also start to provide real time information and have a pilot running.

The Commission is not looking at developing a European standard for multimodal journey planning or having one single platform, rather it will seek to enable providers. The Commission will most likely describe what the service should look like, or contain as a minimum, for example that all Member States should have all modes participating. The Commission might leave details/technicalities and solutions for some of the inherent questions to the Member States, although this is not clear at the time of writing.

One of the challenges to be resolved is the willingness of providers to give access to data, especially pricing, which is currently limited. Questions related to access to transport data are likely to be tackled by a separate instrument, going beyond the aforementioned specifications.

Providing correct up-to-date information

Most rail operators provide good train information when the trains are operating normally. The challenge arises when there is disruption, possibly when the passenger is on board the train. It is difficult to send specific messages to train passengers, unlike airline passengers who are individually registered. It may therefore be necessary for such information to be provided through the airline reservation system.

There is also sometimes a language difficulty, with non-standard information (ie. during disruption) being given in the home language only.

Integrated ticketing

In April 2013 DG MOVE launched a study to develop and validate the feasibility of a multi-modal, passenger transport information and booking service that could be applied on a pan-European basis. It aims to support, if and where necessary in addition to market actions and developments, the connection of existing local, regional, national and international traveller information systems as well as to offer the international public information and the possibility of purchasing tickets through a single, multilingual interface. Its objectives are:

- The creation of a European transport information interface which would be easy to access and provide passengers with real-time data for any trip in Europe and for any transport mode; this interface could also provide some information on passenger rights and the environmental footprint of each trip (CO_2 emissions, fuel consumption, etc.) so as to allow a comparison between transport modes,
- The creation of an online booking tool which would facilitate travelling through Europe, as well as a journey planner, a journey pricing tool, an availability requests management tool and a ticket integration tool,
- The connection of international traveller information systems.

The study will assess the need for public support and for intervention in the implementation of EU-wide multi-modal traveller information and ticketing services and notably those key bottlenecks that would hinder such an implementation.

Particular emphasis will be given to the delineation of innovative business models and system approaches that, on one hand, ensure the long-term economic and social sustainability of such services and, on the other hand, cater for the increasing pace of technological innovation. This would include consideration of the following four major aspects:

- A comprehensive study of the traveller information and ticketing services markets providing a blueprint of the relevant market structure and business segmentation, including the identification of the key drivers and barriers that shape their current development and the trends that might condition their expected evolution;
- The delineation of potential scenarios that could facilitate the emergence and support the subsequent consolidation of market-sustainable pan-European traveller information and ticketing services – cf. "how to deliver the vision". These could include notably the extension of local or regional services towards a nation-wide or cross-border-scale, the aggregation under a common branding or service of disparate

modal-oriented services … as components of a stepwise process that ultimately would lead to the fulfilment of the stated EU-wide goals;

- The consideration of other value-added services – e.g. inclusion of retail or marketing content, of comparative environmental footprint indicators (GHG emissions, fuel consumption), or of content of a regulatory nature (e.g. passenger rights and obligations) - that could eventually add towards guaranteeing the overall economic soundness of such concepts;
- Finally, the trialling and validation of 'proof-of-concepts' in terms of business models, operations and/or specific technologies that are considered as critical for market delivery and successful penetration.

The study is being done by Amadeus IT Group between April and December 2013. The final report will be similar to an impact assessment and will map current initiatives and evaluate key drivers, barriers and bottlenecks for the implementation of EU-wide multi-modal traveller information and ticketing services that cater for the pace of technological innovation.

Where appropriate, the inclusion of legislative proposals to overcome market failures in aspects such as ensuring access of private service providers to travel and real time traffic information could be contemplated. Liability issues, responsibility in the event of disruption and security of data will also need to be addressed.

From a customer perspective a first important step that could be taken today towards integrated ticketing would be to provide for the integrated distribution of tickets. Such initiatives are already in hand through mutual agreements between airlines and rail operators and should be encouraged and expanded. It is important to include public transport operators since most air passengers have their final destination within areas served by public metropolitan service providers.

Complexity and costs of distribution systems

GDS system providers have identified significant complexities with myriad sub-classes and resultant cost implications when seeking to link the distribution systems of air and rail. A further obstacle lies in the very limited interface of rail distribution systems with each other; rail companies preferring to keep their lowest fares accessible only by their own system. Moreover there are numerous legal implications concerning responsibilities, security issues relating to full multi modal ticketing that needs to be understood and agreed. In the interests of containing the disproportionately high cost to interface with other carriers' CRS systems, a number of low cost airlines sell single sector point to point journeys, which do not offer the facility of interlining with other air carriers or even with other flights operated by the same airline.For rail operators, distribution costs can represent up to some 25% of the cost of the ticket to the passenger. This is totally disproportionate in terms of cost-benefit to the consumer.

More pragmatic options, identified in the course of the Working Group's discussions, include more sales of rail tickets to/from city centres on board the aircraft, better virtual signage, or the availability of preferential tariffs for air passengers, able to be purchased at stations upon proof of an air sector in the itinerary. This is the mechanism used by UK rail operators feeding passengers to Eurostar services. On presentation of the Eurostar ticket/reservation, a lower fare with greater flexibility is offered for the rail sector, connecting to the Eurostar service.

Conclusion

The conclusions of this chapter relate to funding, landside access, check-in and integrated information and ticketing. For all these issues the key objective is to ensure that the passenger benefits.

To avoid a fragmented industry approach funding is an important starting point and the EU's TEN-T programme should include projects which enable intermodality to be achieved and, in particular, should include intermodal projects at medium and large airports.

Examples of landside access improvements demonstrate the importance of key factors, such as the range of modes (including other public transport besides rail), the frequency of service offered and the integration of public transport at the airport. The stakeholders gathered in this group consider that physical integration of (hst) rail and public transport platforms in the airport building is an important precondition for successful intermodality at airports. To provide real benefit to passengers, this has to be contingent on coordination of scheduling of rail services to connect with waves of departing and arriving air services at the airport. Density of schedule is crucial for attractive intermodality; this needs to be stimulated by a combination of actions by authorities and airport managers.

Check-in and baggage drop arrangements can make intermodal journeys easier, but there are limited applications because of the cost and security implications.

Apart from density of schedule, possibly the most significant improvement in intermodality is the provision of integrated information and ticketing. EU projects seeking to provide multi modal journey planning systems will help to achieve this objective, but there remain significant cost and commercial challenges in achieving integrated sales and ticketing. Intermodal distribution and ticketing requires robust infrastructure, which translates in significant capital investment by operators and distributors.

Liability issues inherent in intermodal travel and ticketing should be resolved. In a first step they should be urgently made transparent for passengers. Taking out insurance against chinks in the intermodal chain should be an option for passengers.

Initially, more limited but pragmatic solutions should be implemented by agreement between airlines and rail operators.

4. Conclusion and general recommendations

The members of WG3 believe that air-rail intermodality has interesting potentialities and are willing to support a number of initiatives to be coordinated and implemented under the auspices of the European Commission.

In a static environment, with no increase of the demand for travelling, intermodality could lead to the substitution of a mode to another, but in the real world, it should be acknowledged that the first benefit of intermodality is to increase mobility for European citizens. Hence, the first goal of policy makers should be to integrate both modes, in a way that is mutually beneficial.

The members of WG3 believe that intermodality at airports is a reservoir of capacity and mobility because:

- Substitution of short haul flights by rail or other services will release runway capacity, albeit limited;
- More passengers could be brought to hub airports for long haul flights;
- More passengers could be brought to hub airports allowing for the use of larger and better performing aircraft by airlines;
- More passengers could be brought to hub airports, and regional airports through public transport, resulting in less congested roads and less emissions at airports.

EU actions for intermodality should start with short-term actions …

- Firstly, it must be recognized that the aviation sector is already much more integrated internationally than the rail sector;
- Secondly, public transport and landside access to airports should also be considered as part of the intermodal solution;
- Comprehensive and fully efficient intermodality will require time and heavy investments. "Quick wins" are therefore needed in the short term;
- There is a need to identify and promote the good practice: where does intermodality work, and why?
- Good practice should be recognised by the promotion / accreditation of “intermodal airports”;
- Where rail connections already exist at an airport, rail and air schedules should be aligned. Where there is no rail access, bus or coach shuttles to nearby rail stations should be provided;
- Costly and complex options, which offer no proportionate benefit to the passenger (who will ultimately have to fund their cost) should not be pursued.

… and a long term reflection is required to set up the basis of durable intermodality, profitable to all actors

- A financial study is required to provide an overview of all existing integrated ticketing projects and journey planners and identify potential gaps.
- In order to improve efficiency and effectiveness of intermodal distribution and ticketing efforts, all Commission-funded and/or –supported initiatives should be coordinated, ideally through the TAP-TSI Steering Committee and Governance structure which has already been functioning for considerable time.

- Air-rail intermodality should be considered by the industry as a tool with a high potential to develop and improve.
- The current issues faced by air-rail intermodality need to be solved by:
    - Funding through research with a specific action plan (see specific annex);
    - Creating an appropriate legislative framework;
- Appropriate funding and resources will need to be allocated.

ANNEXES

Annex 1 Air-Rail Intermodality at EU airports above 15 Million passengers

Ranking	airport	HST available	Normal Train	Other rail modes[23]
1-LHR	London Heathrow	NO	NO	Airport Express and Metro
2 CDG	Paris CDG	YES	NO	RER
3 FRA	Frankfurt	YES	YES	S-Bahn
4 MAD	Madrid Barajas	NO	NO	Metro
5 AMS	Amsterdam Schiphol	YES	YES	NO
6 FCO	Roma Fiumicino	NO	NO	Regional Train
7 MUC	München	NO	NO	S-Bahn
8 LGW	London Gatwick	NO	YES	Airport Express
9 BCN	Barcelona	NO	NO	RENFE R2
10 ORY	Paris Orly	NO	NO	Orlyrail to RER
11 DUB	Dublin	NO	NO	NO
12 PMI	Palma de Mallorca	NO	NO	NO
13 STN	London Stansted	NO	NO	Airport Express
14 CPH	København	NO	YES	Metro
15 MAN	Manchester	NO	YES	NO
16 VIE	Wien Schwechat	NO	NO	Airport Express
17 MXP	Milano Malpensa	YES	NO	Airport Express
18 BRU	Bruxelles	NO	YES	NO
19 ARN	Stockholm Arlanda	NO	YES	Airport Express
20 DUS	Düsseldorf	YES	YES	Tram
21 ATH	Athens	NO	Suburban Rail	Metro
22 BER	Berlin (Brandenburg)	YES	YES	S-Bahn

Airport Express: a dedicated train service between airport and city centre.

[23] Of course all airports have taxi and bus services.

Annex 2: Airport accessibility by rail at 30 largest airports in the European Economic Area + Switzerland (2008)

Source: DLR compilation / passenger numbers based on ACI-Europe.

Rank	Airport	Country	Passengers in millions (2008)	Long-distance trains - no. of daily services	Short-distance trains - no. of daily services	Short-distance rail journey time to city train station	Short-distance train fare - single ticket to city train station	Underground/ Metro access	Underground/ Metro journey time to city train station	Underground/ Metro fare - single ticket to city train station
1	London Heathrow	United Kingdom	67.1	-	73	00:23	20.38 €	x	00:40	5.56 €
2	Paris Charles de Gaulle	France	60.9	62	142	00:29	8.50 €	-	-	-
3	Frankfurt	Germany	53.5	167	214	00:10	3.80 €	-	-	-
4	Madrid	Spain	50.8	-	-	-	-	x	00:22	2.00 €
5	Amsterdam	Netherlands	47.4	377	294	00:16	3.70 €	-	-	-
6	Rome Fiumicino	Italy	35.1	-	101	00:31	14.00 €	-	-	-
7	Munich	Germany	34.5	-	116	00:40	9.60 €	-	-	-
8	London Gatwick	United Kingdom	34.2	-	80	00:30	18.77 €	-	-	-
9	Barcelona	Spain	30.2	-	37	00:19	3.00 €	opening 2012	-	-
10	Paris Orly	France	26.2	-	Indirect connection to the RER regional train system by an automated people mover					
11	Dublin	Ireland	23.5	-	-	-	-	planned	-	-
12	Palma de Mallorca	Spain	22.8	-	-	-	-	-	-	-
13	London Stansted	United Kingdom	22.4	-	76	00:46	24.45 €	-	-	-
14	Zurich	Switzerland	22.0	116	185	00:11	4.68 €	-	-	-
15	Copenhagen	Denmark	21.5	40	182	00:13	4.63 €	-		
16	Manchester	United Kingdom	21.4	-	171	00:16	4.69 €	-	-	-
17	Vienna	Austria	19.7	-	126	00:16 / 00:31	3.60 € / 10.00 €	-	-	-
18	Oslo	Norway	19.3	32	156	00:19 / 00:26	13.92 € / 21.51 €	-	-	-
19	Milan Malpensa	Italy	19.2	-	39	00:36	11.00 €	-	-	-
20	Brussels	Belgium	18.5	2	114	00:20	5.10 €	-	-	-
21	Stockholm Arlanda	Sweden	18.2	-	76	00:20	29.46 €	-	-	-
22	Düsseldorf	Germany	18.2	45	332	00:06	2.30 €	-	-	-
23	Athens	Greece	16.4	-	17	00:50	6.00 €	x	00:42	6.00 €
24	Berlin Tegel	Germany	14.5	-	-	-	-	-	-	-
25	Lisbon	Portugal	13.6	-	-	-	-	opening 2011	-	-
26	Helsinki	Finland	13.4	-	opening 2014	-	-	-	-	-
27	Hamburg	Germany	12.8	-	110	00:25	2.75 €	-	-	-
28	Malaga	Spain	12.8	-	70	00:12	1.25 €	-	-	-
29	Prague	Czech Republic	12.6	-	-	-	-	opening 2014	-	-
30	Geneva	Switzerland	11.4	31	58	00:07	2.26 €	-	-	-

All values in €. Non-€ currencies were converted into € with the exchange rate of 29th June 2010.

Annex 3: Comparison of travel times and costs for the access modes at the 30 largest airports

Source: DLR compilation

Rank	Airport	Airport distance from city centre (road distance in kilometres)	Reference point City Centre (central transport hub)	Shortest travel time airport-city centre by rail hh:mm	Kind of Railway Service	No. of interchanges rail journey	Costs of a oneway rail journey airport-city centre	Shortest travel time airport-city centre by bus hh:mm	Bus arrival station (if another than the cities' central transport hub)	Costs of a oneway bus journey airport-city centre	Travel time airport-city centre by car/taxi	Oneway taxi fare airport-city centre
1	London Heathrow	29.6	Waterloo Station	00:58	London Underground	1	5.56 €	00:40		6.17 €	0:39	80.27 €
2	Paris Charles de Gaulle	21.2	Gare du Nord	00:28	RER	0	8.20 €	01:13		9.40 €	0:22	50.00 €
3	Frankfurt	15.3	Hauptbahnhof	00:11	S-Bahn	0	3.80 €	00:43		3.80 €	0:16	35.00 €
4	Madrid	16.0	Atocha	00:49	Metro	3	2.00 €	00:30	Avenida de America	1.00 €	0:17	25.90 €
5	Amsterdam	20.6	Centraalstation	00:17	Train	0	3.70 €	00:56		2.40 €	0:21	46.15 €
6	Rome Fiumicino	41.0	Termini Station	00:30	Train	0	11.00 €	01:10		9.00 €	0:50	40.00 €
7	Munich	38.3	Hauptbahnhof	00:40	Train	0	9.60 €	-		9.60 €	0:36	64.00 €
8	London Gatwick	45.5	Waterloo Station	00:42	Train	1 or 2	18.77 €	01:05	Victoria Coach Station	9.26 €	0:59	117.32 €
9	Barcelona	13.4	Sants	00:17	Train	0	3.00 €	00:30	Plaça Catalunya	5.05 €	0:19	20.00 €
10	Paris Orly	23.2	Gare du Nord	00:37	Metro+Orlyval	1	13.50 €	00:30	Denfert-Rochereau	6.60 €	0:32	50.00 €
11	Dublin	13.1	Heuston Station		No Railway Access			00:45		6.00 €	0:20	25.00 €
12	Palma de Mallorca	9.7	Plaça Espanya		No Railway Access			00:31		2.00 €	0:12	12.14 €
13	London Stansted	59.5	London Waterloo	01:06	Train+Metro	2	29.39 €	01:45	Victoria Coach Station	12.35 €	1:02	122.26 €
14	Zurich	10.3	Hauptbahnhof	00:11	Train	0	4.86 €	00:29		6.20 €	0:13	42.00 €
15	Copenhagen	13.2	Central Station	00:13	Train	0	4.63 €	00:41		4.63 €	0:16	26.86 €
16	Manchester	15.5	Piccadilly Station	00:14	Train	0	4.69 €	00:20	Central Coach Station	5.06 €	0:19	30.87 €
17	Vienna	21.7	Südbahnhof	00:25	S-Bahn	0	3.60 €	00:44		3.60 €	0:23	31.00 €
18	Oslo	50.1	Sentralstasjon	00:19	Train	0	13.92 €	00:43	Oslo Bus Terminal	22.77 €	0:41	77.17 €
19	Milan Malpensa	50.6	Centrale	00:49	Train+Metro	1		00:50		7.50 €	0:46	70.00 €
20	Brussels	13.7	Centraal	00:20	Train	0	5.10 €	00:53		5.00 €	0:17	35.00 €
21	Stockholm Arlanda	42.0	Central Station	00:20	Arlanda Express	0	29.46 €	00:30		12.52 €	0:33	49.97 €
22	Düsseldorf	10.3	Hauptbahnhof	00:06	Train	0	2.30 €	00:27		2.30 €	0:22	20.00 €
23	Athens	40.8	Larissis Station	00:42	Train	0	6.00 €	-		-	0:39	35.00 €
24	Berlin Tegel	11.4	Hauptbahnhof		No Railway Access			00:20		2.10 €	0:18	25.00 €
25	Lisbon	7.5	Santa Apolonia		No Railway Access			00:39		1.45 €	0:14	10.00 €
26	Helsinki	19.3	Main station		No Railway Access			00:35		5.90 €	0:21	35.00 €
27	Hamburg	11.4	Hauptbahnhof	00:25	Train	0	2.75 €	-		-	0:22	17.50 €
28	Malaga	10.2	Maria Zambrano	00:12	Train	0	1.25 €	00:20		1.10 €	0:15	15.21 €
29	Prague	18.7	Hlavni Nadrazi		No Railway Access			00:30		1.74 €	0:28	25.16 €
30	Geneva	6.3	Gare de Cornavin	00:07	Train	0	2.26 €	00:19		1.51 €	0:10	26.40 €

All values in €. Non-€ currencies were converted into € with the exchange rate of 29th June 2010.

Annex 4 WG3 Definitions:

These definitions constitute the reference terminology for the work of the group.

Intermodality: the coordinated/organised usage of more than one transport mode for a journey. This means that there is a scheduling/ticketing/commercial agreement between the interested transport operators. For freight it is the segment of multimodal transport that applies to unitized (e.g. container) freight.

Co-modality: the use of different modes of transport on their own or in combination, aiming to obtain an optimal and sustainable utilization of resources. Therefore a co-modal journey may also be uni-modal.

Multimodality: the mere fact of using more than one transport mode for a given journey.

Integrated ticketing: the possibility to obtain all the necessary travel documents for an intermodal journey through a single desk.

Integrated scheduling: the mutual consideration and adaptation of each others' transport activities from transport operators of different modes. Example: coordination of rail timing, frequencies, etc. in order to connect efficiently with arriving and departing flights at a given airport.

Airport capacity: The classic measure is the maximum number of passengers which could be handled in one year, considering all restrictions. More technically, there is a huge number of ways to measure airport capacity including, for example, the maximum number of luggage which can be handled in one hour, or the maximum number of car parking places.
Within this document we refer to:
Landside capacity i.e. the maximum number of passengers which can use airport landside services, from car parking places and train stations up to check-in desks. The other references used in this document will be:
Airside capacity i.e. the maximum number of flight movements (takeoffs and landings) which an airport can handle in a given time (usually a year),
Physical capacity: runways, terminals and additional Air Traffic Management capacity

Landside accessibility: The degree of difficulty which an average person (passenger, staff, etc.) has in reaching the airport frown any given point. The more options there are (High Speed and regional trains, metro, short and long haul buses from various origins, taxis) the higher the landside accessibility is. The location of the airport (in the middle of the desert or at the heart of the rail and highway network) is obviously crucial!

GDS: A Global Distribution System (previously Computer Reservation system or CRS) is a computerized system used to store and retrieve information and conduct transactions related to air travel. Originally designed and operated by airlines, CRSes were later extended for the use of travel agencies. Major CRS operations that book and sell tickets for multiple airlines are known as global distribution systems (GDS). Airlines have divested most of their direct holdings to dedicated GDS companies, who make their systems accessible to consumers through Internet gateways. Modern GDSes typically allow users to book hotel rooms and

rental cars as well as airline tickets. They also provide access to railway reservations in some markets although these are not always integrated with the main system.

HST: High speed Train- There are a number of different definitions for high-speed rail in use worldwide and there is no single standard; however, there are certain parameters that are unique to high-speed rail. UIC (International Union of Railways) and EC Directive 96/58 define high-speed rail as systems of rolling stock and infrastructure which regularly operate at or above 250 km/h on new tracks, or 200 km/h on existing tracks. However lower speeds can be required by local constraints.

Annex 5 Meetings, composition and contributors to Working Group 3

Brussels= ARC Headquarters, rue Du Luxembourg 3

N.	Date	Place	External speaker(s)[24]
1	23 April 2009	Brussels	Stratagem
2	30 June 2009	Brussels	Noord Holland Region + Travelport
3	15 September 2009	Madrid Barajas	Embraer
4	25 March 2010	Frankfurt Airport	Munich Airport + FRA regional Planning
5	10 June 2010	Paris CDG	AdP + CAREX
6	7 September 2010	Brussels	
7	19 January 2011	Brussels	Ekonsult + EC DG RTD
8	14 April 2011	Brussels	SNCB Europe
9	30 June 2011	Brussels	SEA Milan Airports
10	21 September 2011	Brussels	IAU-IDF+European Passenger Federation
11	19 December 2011	Brussels	
12	16 March 2012	Brussels	EC, DG MOVE + SNCF
12	26 June 2012	Brussels	Transport and Environment + Zurich Airport
13	16 October 2012	Brussels	Fraunhofer Institute + ACARE network
14	18 December 2012	Brussels	
15	14 March 2013	Brussels	
16	17 May 2013	Frankfurt	

[24] See page below on External Contributors for details

Composition of the working group

ORGANISATION	**Representative** (names of former or inactive members are in *italics*)
ACI – Airports Council International (Europe)	*Philipp Ahrens, Hans Fakiner,* **Chrystelle Damar** **Murielle Schmit (AdP – Paris Airports),** **Peter Pfragner (Fraport- Frankfurt Airport)**
AEA – Association of European Airlines	*Athar Husain Khan, Marie-Caroline Laurent,* **David Henderson**
ARC – Airport Regions Conference (chair)	*Bengt Christensson, Roger Jones***,** **Léa Bodossian**
BMVBS – German Transport Ministry	**Heinz Decker**
DfT – UK Department for Transport	*Frank Evans, Lucy Ashman,* **Rosie Snashall**
DGAC – Civil Aviation Administration – FR	*Sokhetra Josset, Elisabeth Bouffard-Savary* **Philippe Ayoun, Thibaut Lallemand**
EC – European Commission (secretariat)	*Giuseppe Rizzo,* **Katrien Prins**
ELFAA – European Low Fares Airline Association	**John Hanlon**
ERA – European Regions Airlines Association	*Simon Mc Namara,Andrew Bray, Sandra Anani,* **Leonardo Massetti**
ETTSA – European Technology & Travel Services Association	**Christoph Klenner, David Classey**
FARE – Regional European Airports' Forum	*Andrea Sarto,* **Paolo Stradi**
IARO – International Air Rail Organisation	*Andrew Sharp,* **Paul Leblond**
IATA – International Air Transport Organisation	**Mike Muller**
INAC – Transport Ministry – PT	**Maria Luz Antonio**
Ministerio do Fomento – Transport Ministry ES	*Jesùs Iglesias Cuervo* **Miguel Angel Jimenez Espada**
MINVENW – Transport Ministry - NL	*Jetske Verkerk, Daniel De Groot,* **Hugo Gordijn**, **Rob Morsink**
Transportstyrelsen – Transport Ministry - SE	*Kerstin Hansdotter Sköld*

External contributors to WG3 work

Organisation	Speaker	Subject
Stratagem (Consultant)	Bouke Veldman	Quality of Life in Airport Regions (ARC Study)
Noord Holland Region	Ine Kuipers	
Travelport	David Classey	Integrated ticketing
Haarlemmermeer Region	Jan Jaap Kolpa	QLAIR Study update
Embraer	Erika Adriane Spoljaric	Air and Rail development forecasts
Munich Airport	Stefan Meyer	Planning to connect MUC to the rail
Frankfurt Regional Planning		Frankfurt Regional Planning
AdP	Stèphane Garnier	Intermodality at Paris Airports
CAREX	Yanick Paternotte	The Euro Carex freight project.
AdP	Sebastien Pichereau	Transport infrastructure developments around Paris Airports
European Commission DG RTD	Stéphanie Stolz	EU Research in the transport sector
Eckard Kuhla	Ekonsulting GmbH	Intermodal freight and energy for transport
Paul Geyssens	SNCB Europe	Rail issues vis-à-vis intermodality
Massimo Corradi	SEA Milan Airports	Intermodality at Malpensa
Danièle Navarre + M; Meyere	iau-idf	Study on ground accessibility to large European Airports
Trevor Garrod	Chairman, EPF	The passenger's perspective on intermodality

Marie-Christine Renaudie	SNCF	TGVAir product
European Commission DG MOVE	John Berry	Integrated scheduling and ticketing
Tim Johnson	Director, Aviation Environment Federation	Emission profiles of rail and air
Emmanuel Fleuti	Head of Environment, Zurich Airport	Zurich Airport: a true intermodal hub
Joachim Kochsiek	Fraunhofer Institute for Materialflow and Logistics	Reducing railway noise pollution
Christoph Schneider	ACARE network Munich Airport	ACARE - Strategic Research & Innovation Agenda for European Aviation

Annex 6 Passenger Air-Rail Intermodality Bibliography & web links

Amadeus

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