

Benefits to Airlines From Using High-Speed Train Services on Routes From a Hub Airport

In general, the air transport industry does not seem to promote the idea of aircraft/train substitution. The airlines in particular do not do so, despite the fact that when rail infrastructure is provided at airports, airlines make use of that infrastructure. This is understandable considering the market share high-speed train services (hst) gain on routes where they compete directly with the airlines. Policymakers fail to recognize the difference between two forms of mode substitution: one that results in competition between the modes (and operators), and another that leads to complementarities between the modes (and operators). Policymakers usually support just the mode substitution that leads to competition between the modes. The air transport industry also fails to make this distinction, and, since the mode substitution that leads to competition dominates, does not advocate and promote the development of high-speed trains. This paper's objective is to show that airlines can benefit from mode substitution, provided it is done as air/rail integration.

By Moshe Givoni

A railway station at an airport could be similar in many respects to additional runway capacity, provided it allows for efficient air/rail integration. In a hub-and-spoke (h&s) operation, services do not have to be operated by aircraft only, as train services could also be used, provided the airline and the rail services are integrated and the infrastructure to accommodate all of this is in place. Rail services

from the airport, offered by airlines, could go to destinations that, until then, were not served by the airline, or to destinations that were already served by the airline, but, now, mode substitution takes place.

The current situation at London Heathrow airport

London Heathrow (LHR) is estimated to contribute a substantial part of

the benefits the air transport industry provides the UK with (estimated at 1.4% of GDP and 480,000 jobs in total). This economic argument dominated the public inquiry which recommended the construction of a fifth terminal (T5) at LHR. LHR's economic contribution to the UK is very much associated with its position as a hub, which is a view that was accepted in the inquiry.

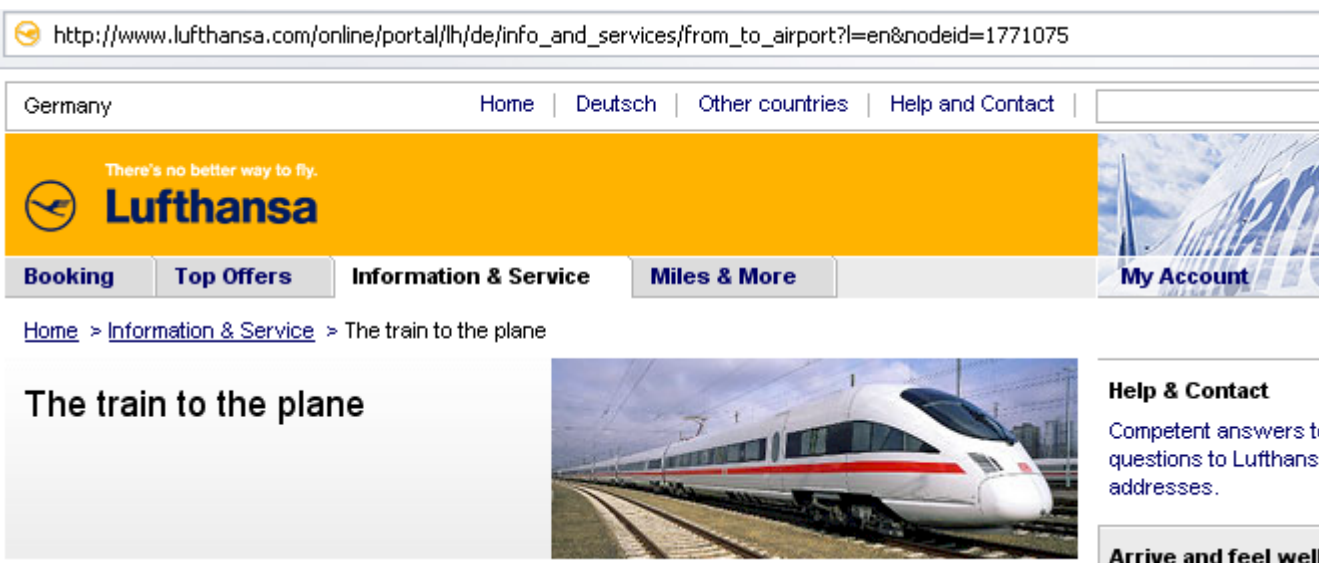


Figure 1: Lufthansa actively promotes air/rail integration, for example on the Internet. Courtesy of Deutsche Lufthansa AG.

In 2000, 21.9 million passengers, which is 34% of LHR passengers, were transfer passengers. At LHR's main competitors, the corresponding figures in 2000 were: 58% (27.9 million) at Paris (CDG), 50% (24.5 million) at Frankfurt and 41% (16.1) in Amsterdam. LHR's position as a hub airport relies very much on British Airways' (BA) h&s operation, which, due to lack of capacity at LHR, had to be scaled down. At the same time, Lufthansa (LH) and Air France (AF – still not AF-KLM) were moving in the opposite direction, strengthening their h&s operation. Lack of capacity also meant that BA could not schedule 'waves' of incoming and outgoing flights next to each other to allow passengers a range of connecting opportunities at the hub airport in a relatively short time. While AF scheduled 52 departures in 55 minutes at CDG, KLM scheduled 63 departures in 75 minutes at Amsterdam airport and LH scheduled 68 departures in 105 minutes at Frankfurt, BA scheduled about 18 departures in every hour at LHR (Doganis, 2002).

Operations at LHR are concentrated on the

trans-Atlantic long-haul routes. This comes at the expense of serving the domestic market, which, in turn, is captured by other hub airports like Amsterdam. In 2003, Amsterdam has served 16 regional airports in the UK, and Paris and Brussels served 11 and 8 regional UK airports respectively. LHR's list of destinations has included only 8 regional airports in the UK, not all of these destinations were served by BA. Passengers from destinations without connection to LHR who wish to connect to long-haul services will therefore usually do so through other European hubs and airlines. For example, on the route from Birmingham to Amsterdam, 52% of the passengers connected to KLM services, and on the route from Birmingham to Frankfurt, 53% were

connecting passengers to LH services. Provided there was a direct rail link between Birmingham and LHR, many passengers would probably have preferred LHR and BA.

To improve the position of LHR and the British airlines against their European competitors, a third runway at LHR was proposed in the consultation leading to the UK White Paper on air transport. The proposal was for a short runway that could be used only by smaller narrow-body planes, i.e. for short-haul services. However, in the White Paper, the government recommended the construction of a new runway at Stansted airport instead and a third runway at LHR was kept as an option to be considered later "only if stringent environmental limits can be met".

Despite the size and reputation of LHR, it offers only limited railway services, unlike its main rivals in Paris, Amsterdam and Frankfurt.



These include express services to downtown London, a connection with London's underground system and a connection with some regional rail services through a bus transit. At Frankfurt, CDG and Amsterdam, national and international rail services, including hst services, are provided. These services are utilized by these hub airlines to substitute and complement air services.

The benefits for airlines of operating air/rail integration

Airlines are expected to incur operating costs following mode substitution, but this is expected to be more than compensated for by benefits of freed runway capacity and network economics.

When looking at the London to Paris route, it was found that although per seat-km the hst is cheaper to operate (€0.057 compared with €0.069 for a service flying an Airbus A320) it is more expensive when the distance each mode covers is taken into account, which is usually much longer for railways. In seat units, the operating costs of a flight between LHR and CDG were estimated to be €26.41 compared with €29.89 for a journey by hst. Even after taking into account local air pollution and climate change impacts imposed by each mode on a journey from London to Paris, and assuming the operators bear the full cost of damage imposed by these impacts (estimated at €2.85 per seat for the aircraft and €0.81 per seat for the HST - see Givoni, 2007 for details), mode substitution does not lead to operating costs savings.

The potential for mode substitution very much depends on the potential for travel time savings when using

the hst and not the aircraft. For passengers transferring at LHR, and passengers preferring LHR as their origin (over the downtown railway stations or other London airports),

it was found that on 5 routes only, a hst journey will be faster than an aircraft service, and on an additional 5 routes using the HST will lead to only minor travel time penalties (table 1), but potentially to other benefits such as a longer uninterrupted journey.

What is more important than the number of routes is the runway capacity used to serve them. Considering the routes from LHR on which travel time savings can be expected, about 10% of the airport capacity could be freed (45,552 atms). At LHR, BA and, to a lesser extent, bmi through its alliance with LH, operate some form of h&s strategy, and these are the airlines that are likely to adopt integration, if the

Table 1: Potential travel time advantage for the hst and the potential for BA and bmi to benefit from freed runway capacity following aircraft and hst substitution at LHR

Destination	HST time saving (min.)	BA			BMI		
		daily one way service ¹	annual two way services	1% of LHR capacity ²	daily one way service	annual two way services	% of LHR capacity ¹
Manchester	48	8	5,824	1.2%	7	5,096	1.1%
Leeds/Bradford	45	--	0	0.0%	4	2,912	0.6%
Brussels	39	6	4,368	0.9%	7	5,096	1.1%
Newcastle	23	4	2,912	0.6%	--	0	0.0%
Paris	8	9	6,552	1.4%	5	3,640	0.8%
Cologne	-6	3	2,184	0.5%	3	2,184	0.5%
Glasgow	-11	10	7,280	1.6%	8	5,824	1.2%
Amsterdam	-12	6	4,368	0.9%	8	5,824	1.2%
Edinburgh	-14	8	5,824	1.2%	8	5,824	1.2%
Düsseldorf	-16	4	2,184	0.5%	5	3,640	0.8%
Total		58	41,496	8.9%	55	40,040	8.6%

¹ Based on runway capacity of 466,554 atms in 2002.

infrastructure was available. BA's level of service on the routes found suitable for mode substitution amounts to 8.9% of LHR's runway capacity in 2002. Most of the freed capacity would come from mode substitution on the routes to Glasgow, Paris, Manchester and Edinburgh. Bmi could benefit from over 40,000 freed slots per year at LHR (table 1).

There are additional benefits to airlines from mode substitution. For BA, for example, this includes the ability to serve Leeds/Bradford, where bmi currently dominates the market, while other passengers who require a hub connection to reach their destination probably choose another European hub. Mode substitution can also allow BA to increase the service frequency on routes such as LHR to Newcastle. In addition to the benefits from mode substitution, air/rail integration would allow airlines to increase the number of destinations in their network by offering (hst) rail services to destinations not served before, due to lack of capacity. At LHR, this can include cities like Liverpool, Blackpool, Cardiff and Birmingham.

Conclusions

LHR provides an important contribution to the British economy, a contribution that is very much through the operation of British airlines at LHR, and mainly BA. In this respect, LHR and BA are almost synonymous.

At LHR, Terminal 5 is under construction and the UK White Paper on the Future of Air Transport (DfT, 2003) has rejected proposals for a new hub airport. In this situation, any airport development in the London area outside LHR will only undermine its international position by further fragmenting London's runway capacity and will undermine BA's h&s operation. Since plans for a third runway at LHR have been postponed, air/rail integration seems the only viable alternative for development at LHR.

Current railway plans for LHR will only preserve its poor railway connections. In London, the Crossrail project is in the advanced planning stages after receiving the go-ahead from the appropriate authorities. The project encompasses the development of an east-west rail line across London, but the plans to make LHR a station on the line have changed to

include an option to serve it through a branch line. The current plans for Crossrail include stations at Stratford and at Ebbsfleet, which the hst services to Paris and Brussels will serve. Before the demise of the Strategic Rail Authority (SRA)¹, initial discussion began on a future south-north hst line in the UK. In this discussion, the SRA proposed a branch line that will connect LHR to the hst line. This would have meant that for passengers to have enjoyed the services on the new hst line, they would have had to use a service to a station on the hst line and transfer there. Such connection would have undermined any advantage a railway station at LHR could have brought to the airlines. LHR handles more than 40 million non-transfer passengers per year, which, together with employees and visitors, can generate demand for railway service equivalent to a large city. No such city would ever be bypassed by the (hst) railway network.

Also, the UK government seems to be blind to the idea of air/rail integration. The potential benefits for the UK, LHR, and especially for BA from air/rail integration are clear. Yet, no serious consideration was

given to this option when discussing and deciding in 2003 on the UK air transport policy for the next 30 years.

In general, it is clear that airlines would benefit from air/rail integration especially at congested airports since it provides them with additional capacity that is not attached to an airport runway. It offers them many strategic advantages, namely network benefits from higher frequencies and more destinations served from the hub airport.

In general terms, Doganis and Dennis (1989) define two types of hub models: the 'hinterland' and the 'hourglass' hubs. The hinterland hub (A in figure 2) feeds short-haul connecting traffic to long-haul flights, while the hourglass hub (B in figure 2) is operated with flights from one region to points, broadly, in the

Policymakers now strongly support further improvements and development of the conventional and hst railway networks, especially in Europe. For the airlines and the air transport industry this should be seen as an opportunity. It is an opportunity to ensure that the development of the rail network includes the airports. For example, the European hst network must include stops at the major European airports if the EU goals of (beneficial) mode substitution and integration between the transport modes are to be achieved. Given the nature of the planning system and the nature of planning and developing the rail network, the air transport industry (airlines and airports) must act now to promote the inclusion of the airports in the rail network. Once the rail network is constructed, it would (almost) be impossible to turn back

passengers per air transport movement (atm) was 136 at Heathrow, 105 at Frankfurt Airport, 96 at Amsterdam Schiphol Airport and 94 at Paris Charles de Gaulle.

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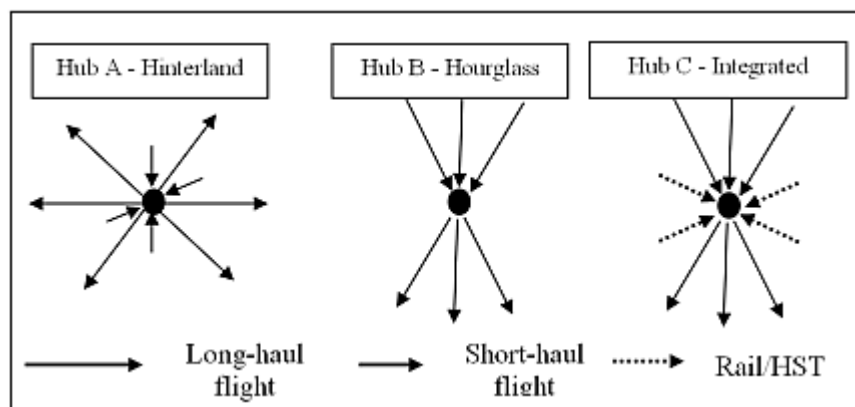


Figure 2: Models of hub airports in a hub & spoke system. Source: Givoni and Banister (2006).

opposite direction. LHR's pattern of h&s operation resembles the hourglass hub more, while the hinterland model is adopted at CDG. The differences are attributed mainly to the capacity available for the hub airlines at LHR and CDG. Air/rail integration can be used to adopt a new model of h&s, the integrated model (hub C in figure 2). In this model, hst and conventional rail services are used as feeder services to long-haul flights and it combines the benefits of the hourglass model (e.g. efficient use of the runways by relatively large aircraft) and the benefits of the hinterland model (e.g. short-haul feeder services).

time. A good place to start is the case of LHR. Considering the institutional separation between rail and air transport planning in the UK, it is not hard to imagine a future hst line from London to the North that passes by, and not through, LHR.

Footnotes:

¹ The public sector body responsible (prior to the publication of the Air Transport White Paper) for setting the strategy for the development of the UK railways.

² London Heathrow is already using its runway capacity more efficiently than its rivals. In 2002, the average number of