5 SCOTTISH AIRPORT SYSTEM INTERCONNECTIONS: EDINBURGH, GLASGOW AND PRESTWICK

5.1 THE KEY ISSUES ADDRESSED BY THIS CASE STUDY

Although Scotland comprises a land area of nearly 80,000 km^2, its three main airports, Edinburgh Turnhouse, Glasgow International and Glasgow Prestwick are all within a 45 km radius. However, none of these airports is directly connected with the others by any form of public transport. Only Prestwick has a direct rail link; the nearest train station to Glasgow International is 2 km away and to Edinburgh Turnhouse 5 km away from the airport. All three have various bus connections.

The main focus of this case study is on the two principal airports Glasgow International (in the following simply referred to as Glasgow) and Edinburgh, while Glasgow Prestwick (Prestwick from here on) will be given less attention, mainly because it already has a rail link to Glasgow and Edinburgh. The case study will describe the current situation in more detail and give some indications how the airports could be linked with each other as well as with the cities they serve. The in-depth investigation on the potential benefits of these new links will be carried out as part of Task 4.3 and will be reported in milestone M4.5.

5.2 GENERAL DESCRIPTION OF THE CASE STUDY

5.2.1 Scotland's Population and Geography

Scotland is large, but sparsely populated: with just over 5 million people. Edinburgh is Scotland's capital and home to around 480,000 inhabitants. Scotland's largest city is, however, Glasgow with just over 584,000 inhabitants.

Most of the Scotland's main towns and cities are located in the so-called Central Belt with Glasgow in the west, and Edinburgh and Dundee on the east coast. Around 70% of the Scotland's population live in the Central Belt, including major towns such as Paisley, Stirling, Falkirk, Perth and Dundee.

Scotland's only major city outside the Central Belt is Aberdeen, on the east coast to the north. The northern Highlands are, with only 8 inhabitants per square kilometre the most sparsely populated area, although Inverness has seen rapid growth in recent years. In general only the more accessible and larger islands retain human populations, and fewer than 90 are currently inhabited. The Southern Uplands are mainly rural and dominated by agriculture and forestry.

5.2.2 Scotland's Transport System

The road system provides the core of the transport infrastructure, although only 325 km of Scotland's roads are motorways and the majority of them are in and around Glasgow, with connections to Edinburgh and south to the Scottish border. The northernmost stretch of motorway in Scotland terminates at Perth, just 50 km north of Edinburgh. Hence, most of the country can only be reached by trunk roads of very varied standards, and in the more remote areas even some A-roads only have a single lane with passing bays for traffic coming from the opposite direction.

Rail links exist between all major towns as well as to all major ferry ports in the mainland; these are indicated in Figure 5-1. However, the distances involved are large, trains stop frequently and lines are not built for high-speed travel, and so a train journey from Wick in the north to Edinburgh takes eight hours. At least for business travel flying is therefore often the only realistic option to either get to Glasgow or Edinburgh as destinations or for any onward travel from there.

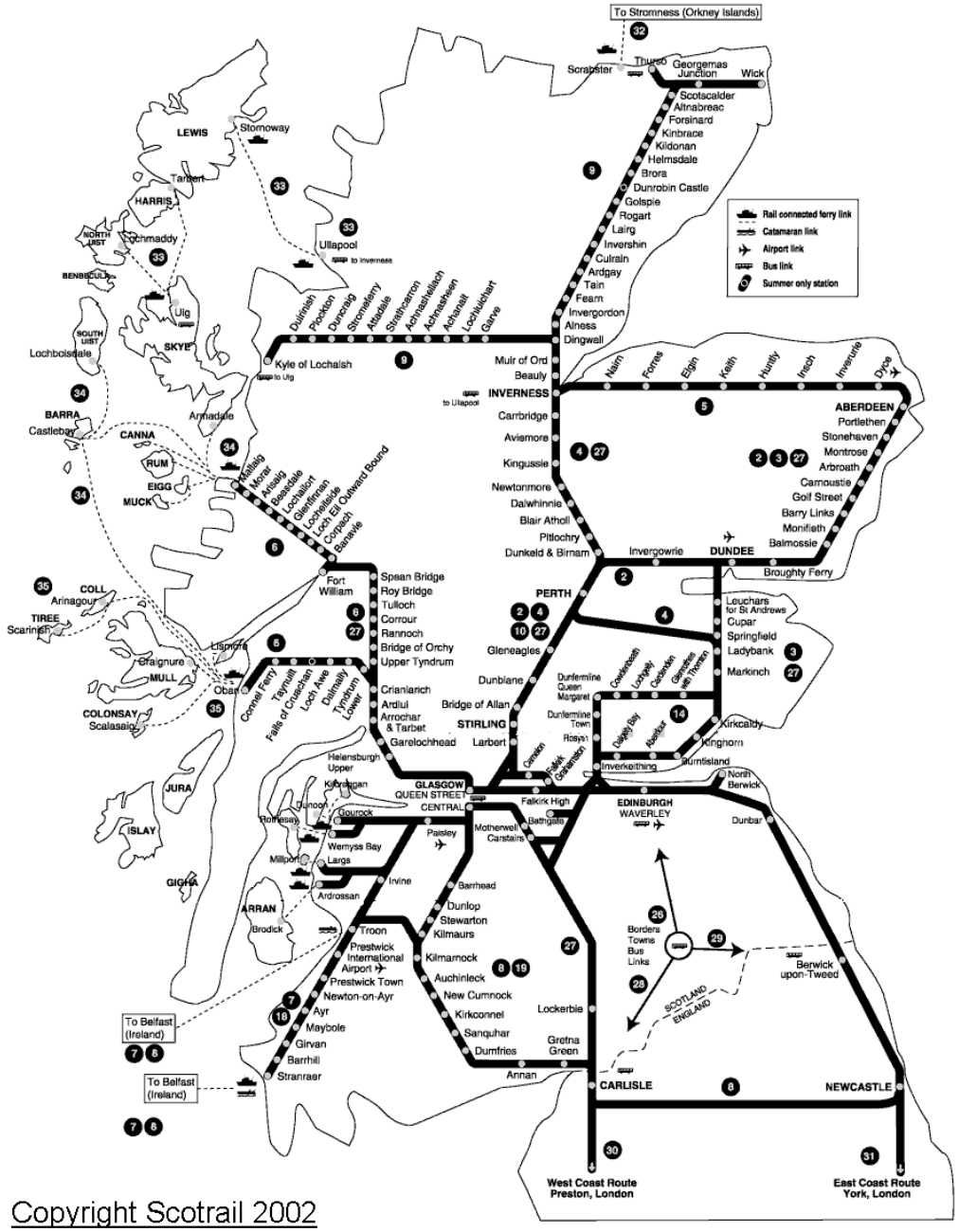
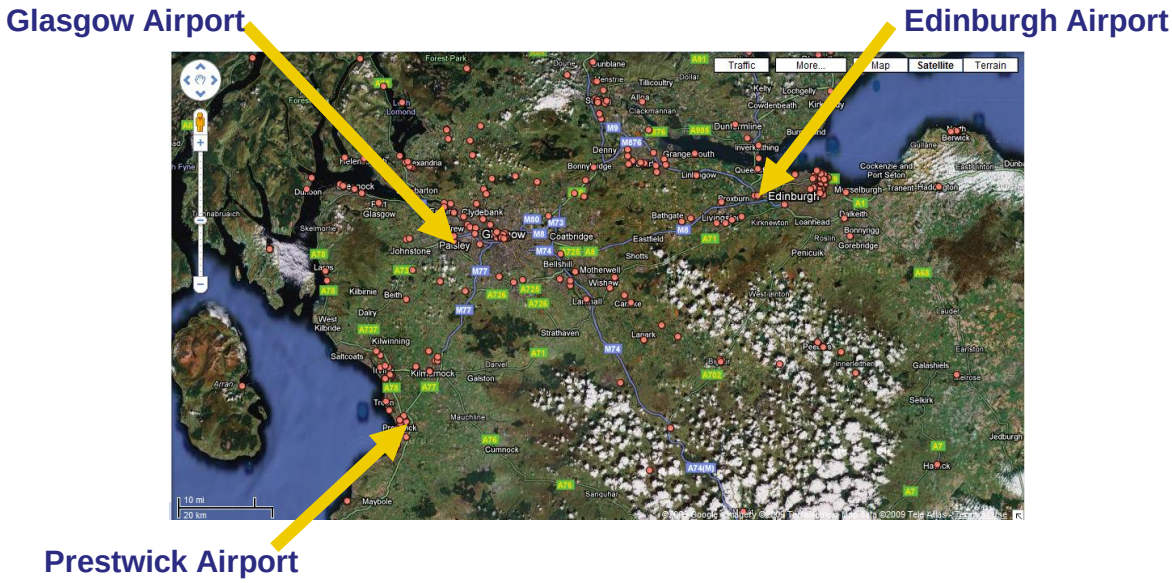


Figure 5-1 Scottish rail network

Scottish airports

Scotland's two main airports, Edinburgh and Glasgow, are only 67 km apart from each other. Prestwick, the third major airport, is just 41 km to the south-west of Glasgow (Figure 5-2).

The two other international airports are Aberdeen and Inverness, although the only international flights at Inverness are to Duesseldorf and Zuerich and some holiday charter destinations. The rest of Scotland is served by a total of thirteen mainly national airports, although Sumburgh and Kirkwall each have a flight to Bergen during the summer.



(source: google maps)

Figure 5-2 Scotland's central belt

Figure 5-3 gives some indication how these airports are distributed over the country: the blue dot without a name attached is Tiree airport, and Islay, Coll, Colonsay and Oban are not shown at all due to the scale of this map, but they are all located in the area between Campbeltown and Tiree. Some of these airports are very small and do not even have a flight on Sundays and otherwise often only one per day. One of the smallest airports, at Barra in the Western Isles, uses the public beach as landing strip and all aircraft movements have to be scheduled for low tide (Figure 5-4). Nevertheless, these airports provide lifeline services for some of the more remote Scottish communities.

The principal destination for most of these airports is either Edinburgh or Glasgow, while Coll and Colonsay only connect to Oban on the mainland, and Oban only to those two and to Tiree. This means that onward travel from Oban to Edinburgh or Glasgow is only possible by car, coach or three times per day with a 3 hour and 20 minute train journey to Glasgow and a 50-minute onward connection to Edinburgh.

(source: Wikipedia)

Figure 5-3 Scotland's airports

(source: mygazeta.com)

Figure 5-4 Barra airport

5.2.3 Glasgow, Edinburgh and Prestwick Airports

Glasgow and Edinburgh airports cater for all types of flight operators, while Prestwick focuses on low-cost airlines and holiday tour operators as well as on freight.

Edinburgh airport, with just over 9 million passengers in 2009, proclaims itself to be "Scotland's busiest airport"[14]. Passenger number increased steadily from 5.1 million in 1999 to 9 million in 2007 and remained stable around this mark during the recession in 2008 and 2009. Edinburgh airport serves 113 destinations (July 2010) with 24 scheduled airlines and 25 charter operators.

Glasgow has experienced much slower growth with an increase from 6.8 million passengers in 1999 to 8.8 million at its peak in 2006; until then Glasgow's passenger number still surpassed Edinburgh's. But since then passenger numbers have declined steadily, although with 7.2 million passengers in 2009 Glasgow is still by far Scotland's second busiest airport and is still the main Scottish airport for long-haul flights – "Scotland's busiest international gateway"[15]. Glasgow currently serves 85 destinations with 19 scheduled airlines, 26 charter operators and 4 operators who are listed in both categories.

Prestwick was Scotland's fastest-growing airport over previous years, with an increase from 900,000 passengers in 2000 to 2.4 million passengers in 2005 and projected figures of 5.7 million for 2018 and 12 million for 2033. However, passenger numbers stabilised around 2.4 million between 2005 and 2008 (holding up even in the first year of the recession), but among the UK airports with at least 1 million passengers, it was by far the worst hit by the recession in 2009 with a 25% drop in passenger numbers from 2008 to 2009. It currently serves 31 destinations (down from 44 one year ago) with 26 of them operated by Ryanair, 2 by Wizzair and 2 by charter operators. The current terminal capacity is 3 million passengers, but the Prestwick website claims that this could be "easily and cost effectively" expanded to more than 10 million passengers. In addition, Prestwick handles more airfreight than all other Scottish airports together.

5.3 SPECIFIC CHARACTERISTICS OF THE CASE STUDY

5.3.1 Modes and Infrastructure Involved

The sole mode for the long-distance leg in this case study is air travel, since connections to, from and between airports are at the core of it.

For the short-distance leg all forms of trains are the main focus. Some consideration will be even given to a Maglev system, although it is clear from the outset that that would never be financially viable. On the other end of the spectrum, the potential effect from the tram system currently under construction in Edinburgh, which will also link the city to the airport, will also be included here.

Air travel for connections between Edinburgh and Glasgow and the other Scottish airports is treated as the long-distance leg of the journey where travellers use these flights with the sole destination of Edinburgh or Glasgow. However, in many cases these flights constitute the shorter part of the journey to connect to longer flights to other UK or international destinations and are thus acting as feeder services; where this is the case, they will be considered as the "short-distance" leg, even though they are all longer than 100km, which is normally the length from which on a journey is considered to be long-distance in the context of this project.

Bus connections will only be considered in the context of existing solutions in section 5.4, but no extension of bus services will be investigated.

14 http://www.edinburghairport.com/portal/page/Edinburgh%5EGeneral%5EAbout+Edinburgh+Airport%5EEdinburgh+lowdown%5EEdinburgh+at+a+glance/647ca1a24023c110VgnVCM10000036821c0a____/448c6a4c7f1b0010VgnVCM200000357e120a____/

15 http://www.glasgowairport.com/portal/page/Glasgow%5EGeneral%5EAbout+Glasgow+Airport%5EGlasgow+lowdown/d7d4f9068b2db110VgnVCM10000036821c0a____/448c6a4c7f1b0010VgnVCM200000357e120a____/

5.3.2 Current Multi-modal Options and Intermodal and Interconnection Opportunities

Current multi-modal options, in this case study options to reach the airports, are fairly limited.

Glasgow airport is located directly on the M8, Edinburgh airport is just over 1 km from the A8, which is a dual carriageway, and both are therefore generally easily accessible by car, although peak time congestion can make travel times very unreliable. The M77 motorway turns into the A77 about 12 km north of Prestwick, but is still a dual carriageway albeit with at-grade roundabout junctions, and the A77 also connects Prestwick with the south: and also the last 2.5 km of access roads from the A77 to the airport are built as dual carriageway. Therefore car access to Prestwick is also straightforward, although due to its geographic position access times are longer than for the other two airports for most of the Scottish population.

Public transport options are much poorer. Prestwick is located directly next to the heavy rail mainline from Glasgow to Ayr and Stranraer and has its own railway station (see section 5.4.5). Apart from that, there are only bus services available (see sections 5.4.2 to 5.4.4), and none of these connect any of the airports directly with each other.

The main opportunity for improving this situation arises from the fact that both Edinburgh and Glasgow airports have mainline rail lines passing in their vicinity. In the case of Edinburgh the distance between the entrance to the check-in hall and the nearest point of the line from Edinburgh north to the Forth Rail Bridge and from there to all major northern cities is just 1.3 km and to the line from Edinburgh west to Glasgow Queen Street 1.7 km. In Glasgow, the distance between the check-in hall and the nearest point on the rail line from Glasgow Central to some of the western conurbations in the Greater Glasgow area is 1.5 km. This opens the option of extending the rail system by just a few extra kilometres of track running next to or underneath the airport and opening new rail stations within the airports. Plans to do just that for both Edinburgh and Glasgow had been at an advanced stage, when the Scottish government cancelled both of these projects, Edinburgh Airport Rail Link (EARL) and Glasgow Airport Rail Link (GARL) for cost reasons. More details about these two projects will be given in section 5.5.3 and 5.5.4.

Another option is the opening of new stations on the mainline as close as possible to the airport and to link these to the airports with a direct shuttle service. For Edinburgh, at the same time as the concept of the EARL was developed, consideration was given to a range of options for opening a new station at Turnhouse and connecting this to the airport either via a circuitous bus shuttle route or a tunnel underneath the airport runway with either a moving walkway or a driverless shuttle. However, although all of these options were cheaper than EARL (£ 114 million for the shuttle, £ 321 million for the walkway and £ 415 million for the driverless shuttle against £ 500 million for EARL), they were all dismissed in favour of EARL, mainly because the total journey time between the city centre and the airport would have been 41 minutes for the bus shuttle option, 36 minutes for the walkway and 32 minutes for the driverless shuttle instead of 16 minutes for EARL (tie 2005).

Following the rejection of EARL by the new Scottish government, a new plan for a stop on the existing rail line received the backing of Edinburgh City Council in May 2010, and the new rail station at Gogar will be directly linked to the airport by the new tram system with only one intermediate tram stop (Figure 5-5). The hope is that construction can start in autumn 2010, and the station will be finalised in autumn 2011. The question then is when the tram will be ready. The best case scenario currently is that at least the section between the airport and Edinburgh Haymarket station will be finalised at the same time, but ongoing disputes between developer and construction company also open the possibility that it might be much later.

(source: www.networkrail.co.uk)

Figure 5-5 Artist impression of Gogar Interchange

In Glasgow the nearest rail station (at Paisley Gilmour Street) is already only 2km away and that is already linked to the airport by bus. The service on this connection could be improved (see section 5.4.2), but there is no viable alternative to bus use.

5.3.3 Stakeholders Involved

Airports

Glasgow and Edinburgh are currently both owned by BAA plc, although it seems possible that BAA will be forced by the regulator to sell one of them in the foreseeable future to create competition between them. BAA plc is the world's leading airport company, and is owned by ADI Limited, a consortium led by Grupo Ferrovial.

Prestwick is owned by Infratil Limited, an investment company from New Zealand which owns Wellington airport in New Zealand and two in Europe: Prestwick and Manston in Kent.

All airports are regulated on prices by the Civil Aviation Authority (CAA) and the Competition Commission and by the UK Government and the CAA on all aspects of safety and security.

BAA has developed an Airport Surface Access Strategy (ASAS) both for Edinburgh and for Glasgow (BAA 2007, BAA 2009). For the development of theirs, Edinburgh airport worked in partnership with a range of local stakeholders, brought together in the Edinburgh Airport Transport Forum (ATF). To create such fora was a requirement for all major English airports following the 1998 English White Paper “A New Deal for Transport”, but BAA decided that this was good practice and established such a forum in Edinburgh already in 1999 and now also in Glasgow. The ATFs are tasked with overseeing the strategy to increase the mode share of public transport, agreeing and setting targets for increasing public transport use and monitoring progress towards these targets. More detail concerning the membership of these fora will be given below.

Infratil has developed an airport masterplan that also contains suggestions on how transport to and from Prestwick could be improved with a particular emphasis on the further increase in rail services.

Feedback on the draft masterplan has been sought from residents of the local community as well as interested organisations.

Rail Operators

The organisation of the railways in Scotland is much the same as it is in Britain as a whole, though with some important minor differences. Hence, the infrastructure is owned and managed by Network Rail, regulation is undertaken by the Office for Rail Regulation, and train services are delivered by a mix of franchisees. Transport Scotland, a part of the devolved Scottish government, oversees the letting of the main franchise for Scotland – ScotRail (with services wholly within Scotland) - currently awarded to FirstGroup, whilst the UK Department for Transport oversees the other franchises affecting Scotland (but with services crossing the border into England), i.e. the East Coast and West Coast Main Lines.

Network Rail has developed, in consultation with 150 stakeholders, a Route Utilisation Strategy (RUS) for Scotland, and this is available at http://www.networkrail.co.uk/browse.../scotland rus - summary & status of recommendations.pdf - 176k - 14 Apr 2010.

It can be observed, from a review of responses to a number of Scottish rail-related consultation exercises, that City of Edinburgh Council and a number of groups in the Edinburgh, Aberdeen and Glasgow areas are particularly interested stakeholders in the Scottish rail sector. In addition, Scotland has a network of Regional Transport Partnerships – collaborations amongst local authorities - who have taken an interest in rail policy as it has developed. Particularly in connection with proposed improvements of rail services between Edinburgh and Glasgow, there has been interest from the Edinburgh-Glasgow Collaboration Project and Scottish Enterprise.

Edinburgh Surface Access

The Edinburgh ATF comprises actors both from the airport and from outside. From the airport, apart from BAA, there is the Airline Operators Committee, which represents airlines and handling agents.

From the public administrations, there is representation from the Scottish Executive (Scottish government), City of Edinburgh Council and five other surrounding Councils (Stirling, Fife, East Lothian, West Lothian and Midlothian). Furthermore, there is SEStran, the South East of Scotland Transport Partnership, which is one of the eight Regional Transport Partnerships already mentioned above, that combines the above six plus two more local Councils.

From the transport operators, there are ScotRail and three bus operators:

- Lothian Buses plc. which is the main operator in Edinburgh and wholly owned by the City,
- Stagecoach, a national operator of coach and bus services, and
- E & M Horsburgh, who operate the newest bus line connecting to the airport.

Furthermore, there is the Scottish Taxi Federation and ComCab, a local taxi operator. Finally for the transport operators, there is the Confederation of Passenger Transport UK, which is the trade association for the UK bus, coach and light rail industries.

Another member is Sustrans, which is the UK's leading sustainable transport charity. Their main aim is the promotion of walking and cycling.

The interests of the local business community are represented by the Edinburgh Chamber of Commerce.

Last, but not least, there is the Edinburgh Airport Consultative Committee (EACC). According to their website their purpose “is to advise the airport’s Managing Director about issues which concern the local communities, travellers, and other users of the airport and to stimulate interest both within the airport community and local people”. EACC comprises again the same local authorities as mentioned before plus several further local and community councils. It also includes representation from the Edinburgh and Fife Chamber of Commerce and the Airline Operators Committee. Other EACC members are: the Scottish Trade Union Council, the Edinburgh Airport Amenity Group, National Air

Traffic Services, Passenger Interests, the Association of British Travel Agents, the Consumers' Association and Lothian & Borders Police.

Glasgow Surface Access

The Glasgow ATF has a similar, but not the same, composition to that in Edinburgh. From the airport, there is BAA and the Airline Operators Committee.

From public administrations there is again the Scottish Government, and Glasgow City Council and Renfrewshire Council. Furthermore, there is Transport Scotland, which is the national transport agency for Scotland and manages the trunk road and railway network and concessionary travel schemes.

Transport operators are again ScotRail, and in this case the bus operators are Arriva Scotland West, First Group and Scottish City Link. Taxi operators are represented by Glasgow Airport Taxis Ltd. The Confederation of Passenger Transport UK and Sustrans are both also on the Glasgow ATF. Traveline Scotland provides timetables and a journey planner for all bus, rail, coach, air and ferry services in Scotland on-line and by phone. Strathclyde Partnership for Transport (SPT) is a public body which is responsible for planning and co-ordinating public transport in the Greater Glasgow Area.

Local business is represented by the Glasgow and Renfrewshire Chambers of Commerce and the wider business community by Scottish Enterprise, Scotland's main economic, enterprise, innovation and investment agency.

In the case of Glasgow there is also representation of disabled people through the Paisley Disability Resource Centre. Finally, like Edinburgh (and as Prestwick and most other major UK airports) Glasgow also has its own Airport Consultative Committee (GACC), which is represented on the ATF.

5.4 SOLUTIONS ALREADY IN PLACE

5.4.1 Overview

From the six categories of solutions identified in INTERCONNECT, the key one of relevance to this case study is *Local Link Infrastructure Solutions*. The other category that needs to be considered in this direct context is *Local Public Transport Services*. From these two categories the four following solutions exist, or did exist at some stage, for at least one of the three airports:

- Regular bus services
- Express bus services
- Demand responsive bus service
- Heavy rail link

These four will be described in more detail in the following and, as far as this is possible, assessed against the performance criteria.

However, there is a whole range of other solutions from the INTERCONNECT toolkit that can be found from the categories of *Local Link Infrastructure Solutions, Improvements at the Interchange, Ticketing and Marketing* and *Regulatory and Organisational Changes* at one or more of the airports. They will only be briefly mentioned in the last section of this subchapter, since they are all outside the core issues of this case study.

5.4.2 Regular Bus Services

Problems addressed and description of solution

Linking a bus stop at the airport into the route of a regular bus service is the most basic form of providing a public transport connection. Edinburgh is served by five such services and Glasgow by one, but Prestwick is not.

Edinburgh

Of the five bus routes that include Edinburgh airport, for three the airport is a terminus, while for two others the airport is a stop en route.

The first service is number 35, run by Lothian Buses, the main operator for Edinburgh city. It starts at the airport and takes from there a rather convoluted route that includes the Royal Bank of Scotland (RBS) Group Global Headquarters, Edinburgh Park railway station and near that a major retail and business park (the Gyle), the Museum of Scotland, the Royal Mile in the Edinburgh Old Town, Holyrood Palace and the Scottish Parliament, the Scottish Government offices and ends at Ocean Terminal, which entails a retail centre, a cinema complex and Victoria quay with the Royal Yacht Britannia.

Edinburgh Park railway station is on the mainline between Edinburgh in the east and nearby towns of Bathgate to the west and Stirling and Dunblane to the north-west and thereby offers some limited interconnection opportunities. The bus from the airport to Edinburgh Park takes 5 minutes and the train journey to Edinburgh Waverley 15 minutes; adding to that the connection times does not make it faster than the 25 minute journey by express bus and considerably less convenient.

The number 35 bus operates for most of the day four times per hour and it takes around an hour and 15 minutes to Holyrood Palace and an hour and 30 minutes to Ocean Terminal. A ticket costs around € 1.40 (£ 1.20) for an adult and € 0.80 (£ 0.70) for a child whether for just one stop or the entire distance. A day ticket for the entire network of Lothian Buses is € 3.45 (£3.00) for an adult and € 2.30 (£ 2.00) for a child.

The second service, also run by Lothian Buses is the night bus N22. This also terminates at Ocean Terminal, but takes a much more direct route than number 35 via Edinburgh Park, then through Princes Street (the main Edinburgh thoroughfare and shopping street in the city centre) and past Waverley, the principal Edinburgh rail station. This service runs from Edinburgh airport every half hour between 00:47 and 04:13. It has only six stops en route and takes 28 minutes to the city centre and 39 minutes for the whole distance. A ticket, which is valid all night on all night buses costs around € 3.45 (£ 3.00).

The third service, line 64, run by E&M Horsburgh, a private operator, connects the airport via the RBS headquarters and Edinburgh Park to the north of Edinburgh. It leaves from the airport every hour from 07:50 to 19:50 on weekdays and from 08:20 to 18:20 on Saturdays, and takes about an hour for the whole distance. A ticket costs the around € 1.40 (£ 1.20) for adults and half of that for children.

The fourth and fifth service, 555 and 777, also operated by H&M Horsburgh, take in the airport on the northern segment of a circular route between Livingston, a major town west of the airport and Edinburgh Park in the east; both lines then continue further westwards to the village of Whitburn. The difference between the two routes is that one is running the circular part of the route clockwise and the other anti-clockwise. Service 555 leaves the airport on weekdays every hour between 07:25 and 21:25 and on weekends at 08:20 and hourly between 10:20 and 17:20. Service 777 leaves the airport on weekdays 06:52 and 19:52 and on weekends seven times between 08:51 and 17:51 at hourly or two-hourly intervals. The fare from the airport to Whitburn is around € 3.90 (£ 3.40) and half of that for children.

All bus stops are very conveniently located right in front of the terminal building and all have rain shelters.

Glasgow

The most important regular bus service for Glasgow airport is route 66, operated by Arriva, a major international bus and rail operator. Route 66 runs from the airport, which is on the northern edge of the town of Paisley, through Paisley town centre to a hospital in the south of the town. Apart from serving the local population, the main relevance of this service is that it stops at Paisley Gilmour Street, a rail station, which then allows onward travel to Glasgow Central in the east or a few small towns and two minor ports in the west.

Another local service, line 300, also stops both at Gilmour Street and the airport and goes from there to Clydebank. It is also operated by Arriva.

For travellers arriving at Gilmour Street, finding the bus is, however, less than straightforward. In the ticket hall there is a poster with a map of the station, which shows the position of the taxi rank, but not of the bus stop. Next to it is another poster, which says where various services can be found including a note that "the nearest bus stop can is situated on Central Walkway" but neither the map of the town on this poster nor the station map show where Central Walkway is. There is, however, an overhead sign that points to a rather dingy corridor leading to the Airport Bus Link with small pictograms of a bus and plane (Figure 5-6).

Figure 5-6 Paisley Gilmour Street station

A traveller following the sign then comes onto a road where two bus stops are in sight. The first one has a large display board on the post with the bus stop sign, but this display board is 90% empty and only contains the schedule for service 300; and although it lists the route it takes in much detail, it fails to mention the airport stop at all. Many a traveller will therefore make their way to the second bus stop without noticing that within the bus shelter there are schedules for both service 66 and 300, and these schedules do mention the airport.

Figure 5-7 Bus service 66 - Paisley Gilmour Street to Glasgow airport

The buses that serve route 66 are quite clean, but very basic (Figure 5-7).

Service 66 operates every 10 minutes for most of the day and takes 8 minutes to get to Gilmour Street, service 300 operates once per hour; the train from there to Glasgow Central takes between 11 and 15 minutes. Even without accounting of connection time between bus and rail, this is longer than the airport express bus, which runs every 10 minutes and only takes 15 minutes to Glasgow Central. With € 3.15 (£ 2.75) for the integrated train and bus day ticket it is cheaper than the airport bus, which costs € 5.20 (£4.50) for a single fare, but apart from that it is all-round much less attractive.

A third service, terminating in Glasgow airport, is route 800, operated by Arriva. It connects the airport via the centre of Paisley to a series of smaller communities in the west of Glasgow to the coastal town of Largs. However, the first three services in the morning do not access the airport at all, but only start in Paisley, as does the fifth service. Only the 09:06, then the 11:06 and from then on one service every hour until 19:06 on Mondays to Saturdays actually start at the airport; on Sundays there are no services. The total journey from the airport to Largs takes 1 hour and 21 minutes. The full single fare from the airport to Largs would be € 6.35 (£ 5.50), but Day Saver tickets are available for adults at € 3.00 (£ 2.60) in the off-peak and €3.55 (£ 3.10) during the peak; a Day Saver for children is € 1.60 (£ 1.40), which is very good value for money for a journey of nearly 50 km.

At the airport, the stops for all buses are conveniently located just across the road from the domestic arrivals exit (see Figure 5-8 in the next section).

Performance against main toolkit criteria

Cost and feasibility

The costs for the operators of those services that terminate at Edinburgh airport for extending the route from the headquarters of the Royal Bank of Scotland to the airport by approx. 3 km are minimal and will be certainly offset by the extra income generated. Similarly for service 555 and 777, all that is involved is a detour of less than 3 km in total from the A8 to the airport forecourt, and also in the case of Glasgow the extra distance to be covered for the airport connection is small; in both cases the extra income from the air passengers will, at least more or less, cover the extra expense.

From the technical and organisational point of view, there are no problems and the acceptability by users and the general public can be regarded as given. The only people who could object are

travellers on bus 555 and 777, who do not have any business at the airport and whose travel time will be increased through the detour by around 5 minutes.

Impact on users' door to door travel time, cost and convenience

The impact on travel time and cost depends on the basis used for any comparisons. Where the alternative is car use, and parking charges at the airport would be involved, the bus use could save considerable amounts of money, while the travel time saved depends on the distance between home and bus stop, the total length of the journey, the location of the car park and the connection between car park and airport. Where travellers do not own a car and the only alternative to these bus services is the use of a taxi, the bus use will be considerably cheaper, but on the other side more time-consuming and less comfortable. The situation is the same, if there is an express bus as alternative, as in the case of getting from both airports to the city centre. Overall, in most cases the bus use will save money, but add to travel time and detract from convenience.

Users' safety and security, region's prestige

The bus services do not have any specific impact on safety and security, and neither do they in any way add to the regions' prestige.

Access for people on low incomes or with physical disabilities

For people on low incomes, who do not own a car, the bus services help avoid the need for taxi use, and will therefore be very welcome. For people with physical disabilities of any description, the convenience of a taxi will in most cases, especially when heavy luggage needs to be carried, outweigh the saving made on fares, especially in Glasgow, where the distance covered by the bus is relatively small (max. 8 km).

Mode shift, congestion and GHG emission

Although there is no data available, it seems safe to assume that the number of passengers that use these buses is relatively small. So while they all make a mode shift and individually reduce their GHG emissions, they will not have any measurable impact on congestion reduction.

Transferability of findings

The findings for Edinburgh and Glasgow are transferable to all airports that are in close proximity to major conurbations; for some of the newer airports that have been built away from the cities the linking of regular bus services may be a less practical option.

5.4.3 Express Bus Services

Problems addressed

Regular bus services with frequent stops can for longer distances become very slow and add substantially to the travel time to the airport. For instance, the above mentioned bus service 35 takes more than 1 hour to Holyrood, while the airport express bus to Edinburgh Waverley takes just 25 to 30 minutes for nearly the same distance.

Description

Edinburgh

Edinburgh has two express bus services: Airlink 100 to Edinburgh and Airdirect 747 to Fife.

Airlink 100, which is operated by Lothian Buses, terminates at Edinburgh Waverley station in the city centre and has eight intermediate stops on the 12 km route. As mentioned before, the journey time is between 25 and 30 minutes. The first departure from the airport is at 04:30; from 04:50 to 06:50 departures are every 15 minutes and from then to 00:22 every 10 minutes. After that time the night bus N22 provides the connection to the city centre. The single fare is € 4.00 (£ 3.50), i.e. nearly three

times the fare for a normal bus in Edinburgh, such as line 35; the return fare is € 6.90 (£ 6.00). The buses are comfortable, with large dedicated luggage space, and free wifi access.

The Airdirect 747, operated by Stagecoach, a national train and bus operator, has the first stop just 2 minutes down the line still within the airport area, the next stop at the south access of the Forth Road Bridge, then one at Ferrytoll Park & Ride on the north side of the bridge and the final stop at Inverkeithing rail station. From Inverkeithing it is possible to get a range of trains to Perth, Inverness, Dundee and Aberdeen. The scheduled travel time to Ferrytoll is 20 minutes and to Inverkeithing 23 minutes, but the website carries a warning that at peak times the journey can take 45 minutes and travellers should allow plenty of time when they travel to the airport. There is only one fare for a single or day return ticket, and that cost € 5.20 (£ 4.50). The distance covered by the service is about 17 km, which means the fare is about € 0.30 per km. By comparison, the bus 555 or 777 to Whitburn costs € 3.90 for a distance of about 27 km, i.e. € 0.14 per km; so again the direct service carries a high premium.

A ticket office for the Airlink is located directly outside the exit from the domestic arrivals, with the bus stop right behind it. The stop for the Airdirect is next to that.

Glasgow

The fastest link into Glasgow is service 500, the Glasgow Flyer Airport Express, operated by Arriva. The stop at the airport is directly in front of the exit from domestic arrivals (Figure 5-8). (The taxi rank is located behind it and a sheltered stop for all other bus services is just across the road.)

Figure 5-8 Glasgow airport forecourt

With one interim stop in the vicinity of several major hotels, the Flyer reaches Glasgow Central station in free traffic conditions after 15 minutes, Queen Street station two stops and few minutes later and after 25 minutes Buchanan bus station, where travellers have access to a range of long-distance coaches, including coaches to Edinburgh. However, the Flyer has to use roads, motorways and bridges, which are heavily congested in peak times and since there are no bus lanes in these section gets stuck in congestion like ordinary cars. For most of the day the service runs every 10 minutes, and the single fare € 5.20 (£ 4.50) and an open return ticket is € 8.05 (£ 7.00). For this fare, the 500 offers a high quality service with new low-floor vehicles with all-leather interiors (Figure 5-9), which are even equipped with a wireless connection - a stark contrast to service 66 (Figure 5-7).

Figure 5-9 The Glasgow Flyer

The second service between the airport and Buchanan bus station is Airlink 747, which takes a less direct route and stops at a major retail and leisure park, IKEA, a local hospital, Partick rail and bus station and two more stops, and takes a total of 49 minutes to reach central Glasgow. It is operated by FirstGroup, a national operator, and runs on weekdays between 07:00 and 22:30 at 20-minute intervals until 17:00 and every half hour thereafter, on Saturdays from 09:00 to 22:30 and on Sundays from 10:00 to 22:30 with similar intervals. A single fare is € 4.50 (£ 3.90) and a return ticket € 5.75 (£ 5.00) for the 16 km trip; alternatively, it is possible to buy a day ticket for € 5.20 (£ 4.50), which is then valid on all FirstGroup buses within Glasgow until 01:00 the next morning. These prices again reflect the lower speed compared with service 500.

Service 915, the Scottish Citylink 'road to the isles' starts at Glasgow Buchanan Street and connects the airport twice a day via Loch Lomond, Glencoe, Fort William and Mallaig to Portree on the Isle of Skye. This journey takes seven hours, but goes through some beautiful scenery. A single ticket to Fort William costs €25.00 (£ 21.70) and all the way to Portree € 44.00 (£ 38.30). Return tickets are € 34.75 (£ 30.20) and € 74.50 (£ 64.80) respectively.

Prestwick

The main bus serving Prestwick is the X77 Express Service, operated by Stagecoach Western. The service runs between Glasgow Buchanan Street Station and the bus station of Ayr, one of the towns on the west coast, and Prestwick airport is one of six stops en route. The distance from Glasgow city centre to Prestwick is 50 km. The service leaves the airport in the direction of Glasgow between 06:35 and 22:53 Mondays to Saturdays and between 08:10 and 18:10 on Sundays. The frequency varies from 10 minutes in peak morning times over 30 minutes for most of the weekdays to 60 minutes in the evenings and on Sundays. The journey time is 44 minutes. Connections to Ayr have similar timings and the same frequency; this journey takes just 14 minutes. The fare to Glasgow is € 5.75 (£ 5.00) and to Ayr € 2.15 (£ 1.85), which - given the distances involved - compares favourably against the service 500, although the quality of the service is lower. Nevertheless, it still is a premium fare,

because the ticket for the full distance from Glasgow to Ayr is not € 5.75 plus € 2.15, i.e. € 7.90, but instead only € 6.05 (£ 5.25). The route from the arrivals hall to the bus stop in the direction of Edinburgh is not straightforward: travellers have to go up an escalator, then cross the footbridge to the train station (see Figure 5-10 and Figure 5-11), go down a level by lift or escalator, then go all the way to the end of the station platform and then the same length down another path back again (and neither platform nor path have any rain shelter). Nevertheless, according to the airport authority, the bus is in particular popular with travellers from abroad; one reason could be that Ryanair passengers are not used to having train services from most of the airports used by the airline, but the footbridge they have to cross together with the rail users advertises the trains very prominently (Figure 5-10): every fourth ceiling beam says “1/2 price rail travel anywhere in Scotland” and the next one “show your air ticket & pay on train.”

Figure 5-10 Interior of Footbridge between Prestwick Air Terminal and Rail Station

During the night, there are two additional services, the X99 to Glasgow and the X100 via Glasgow to Edinburgh, both operated by Dodds of Troon, a private coach operator. These are for travellers with very early departures or very late arrivals, when train services are not available (Table 5-1). The standard fare for Glasgow is € 10.35 (£ 9.00) and for Edinburgh € 19.55 (£ 17.00), but discounted tickets for on-line booking are available for € 9.20 (£ 8.00) and € 16.10 (£ 14.00) respectively.

Table 5-1 Night bus services for Prestwick airport

DEPARTS	TIME	ARRIVES	TIME
Glasgow Prestwick airport - Side of Terminal	23:59	Glasgow Buchanan Bus Station Stance 1	01:00
Glasgow Buchanan Bus Station - Stance 6	01:05	Edinburgh Waverley Bridge	01:50
Edinburgh Waverley Bridge	03:15	Glasgow Buchanan Bus Station	04:15
Glasgow Buchanan Bus Station - Stance 1	04:30	Glasgow Prestwick airport	05:15

Performance against main toolkit criteria

Cost and feasibility

The costs involved in running a dedicated frequent high-quality express service like the Airlink 100 or the Glasgow Flyer are substantial, but the income generated is also high; so they can be run profitably. Where the stop at the airport is more or less incidental, as in the case of the Prestwick X77, the costs are negligible and practically all of the income generated is a pure profit.

There are clearly no problems with either technical or organisational feasibility of any express bus service. Acceptance by users is obviously high, and there are no reasons why the public or any politicians should object to these services.

Impact on users' door to door travel time, cost and convenience

As has been shown throughout, tickets for dedicated airport services are more expensive than those for standard bus services. But users are generally prepared to pay a premium for the increased speed and convenience.

Users' safety and security, region's prestige

The express bus services do not have any specific impact on safety and security, and neither do they in particularly add to the regions' prestige.

Access for people on low incomes or with physical disabilities

Where express bus services replace regular services, this is a disadvantage for users with low incomes because of the premium fares involved.

Mode shift, congestion and GHG emission

Express bus services do attract a significant number of passengers. In 2009, 27.6% of all departing passengers, i.e. a total of 1.23 million, arrived at Edinburgh airport by scheduled bus. No breakdown between the different bus services is available, but it seems safe to assume that the vast majority of them arrived with the two express buses. Assuming a conservative 1 million express bus passengers per year, that would mean around 2,750 passengers per day or up to 300 per hour. Assuming further that they would all have come either as single passengers per taxi or with Kiss & Fly (being dropped off at the airport by somebody who then drives away again) instead, that would mean up to 300 vehicles per hour more on the access roads to the airport and a clear increase in congestion during busy times. The main road between the airport and Edinburgh city centre is already very congested both in the morning and afternoon peak, and even only 100 vehicles more per hour would have a significant impact on congestion and delays.

Arrivals at Glasgow are much more dominated by car: here they constitute 53.8% instead of 40.6% as in Edinburgh. Accordingly, the percentage of passengers arriving by scheduled bus is here only 7.9% or equating to 281,000 passengers per year or 770 passengers by day. Hence the impact on congestion here is much lower than in Edinburgh, although even 50 cars more or less can make a significant difference during the main peak.

No equivalent data is available for Prestwick.

Given that not all passengers travel the full distance of the bus services, an average trip length of 10 km seems a reasonable assumption; thus for Edinburgh and Glasgow together, and also accounting for both arriving and departing passengers with standard and express buses, 30 million person kilometres are made per year.

Assuming a car occupancy of 1.2 passengers per car and a conservative estimate of 200 g CO2 per km for a medium size used car on a busy road, these 30 million passenger kilometres would produce 5,000 tons of CO2. Some of this will be offset by the emissions of the buses, but assuming 4,000 tons per year would be produced extra if travellers took cars and taxis instead of the bus, offsetting these emissions would cost € 40,540 (£ 35,350) according to the on-line calculator of climatecare.com.

Transferability of findings

The findings for Edinburgh and Glasgow are transferable to all airports that do not have rail links for their main connections.

5.4.4 Demand-Responsive Service

Problems addressed

For people travelling to the airport from anywhere in Edinburgh, and who cannot, or do not want to, use a car, there are bus services available, but in the vast majority of cases this involves a longish walk to the bus stop and at least one interchange between buses. The alternative is the use of a taxi, which provides a very convenient door-to-door service, but is relatively expensive, especially for single travellers.

Description

In December 2006 a new service was introduced at Edinburgh airport: the Edinburgh Shuttle, operated by Lothian Buses. The Shuttle ran a circular base route, but drivers were allowed to deviate from this route within certain limits, thereby providing a door-to-door service. For travel to the airport, the service had to be booked by phone or on-line on edinburghshuttle.com, while for travel from the airport, pre-booking was not required, but encouraged. The service ran every 15 minutes, using a dedicated fleet of seven-seater minibuses.

The main hope was that this new service would attract customers who so far did 'kiss-and-fly', whereby passengers are dropped off at the airport by car, inducing two trips (one to the airport and one away from the airport without the passenger) constituting the most inefficient way of airport travel. The Shuttle maintained the convenience of door-to-door transport, but a single ticket was only € 9.20 (£ 8.00), considerably less than a taxi fare from most of the city.

Unfortunately, when the recession hit, air passenger numbers at the airport dropped for a while and certainly did not increase as forecast, and the targets set for Shuttle users could not be met. Since the recession also hit Lothian Buses, they could not afford to continue a service that was not, at least at that early stage, profitable and the Shuttle had to be discontinued to all-round regret.

Already in their last Access Surface Strategy (BAA 2007) BAA Edinburgh planned to initiate a taxi share scheme in order to reduce the number of 'empty' taxi journeys. This would of course allow even more flexibility than the Shuttle, and could offer a door-to door service anywhere in Edinburgh or other towns large enough to make it likely that more than one customer would request a trip to or from the airport at one time, while at the same time reducing the cost of the taxi use for the individual customer.

After the demise of the Shuttle, this option became even more relevant and a trial was started. Little appetite for taxi sharing was found with private customers, but an agreement between one taxi operator and one corporate client for taxi shares is now in place.

Performance against main toolkit criteria

Cost and feasibility

The Shuttle was expected to become profitable after an initial build-up phase, and it is difficult to say whether this would have proved to become true, if the recession had not reduced expected air passenger numbers.

The taxi share obviously reduces the total demand for taxi journey, but for the one operator who has the agreement with a large corporate client, this can turn out to be very profitable both through the large customer base and the fact that the combined bookings enable better plan and allow less 'empty' running.

Acceptance by users

The service was popular with users, but did not create sufficient interest to make it financially sustainable.

Impact on users' door to door travel time and convenience, access for people with physical disabilities

Since this was a true door-to-door service it was highly convenient, especially for elderly people and those with physical disabilities, in particular because it removed to need to carry sometimes heavy luggage to the nearest bus stop.

Impact on users' door to door travel cost and access for people on low incomes

At € 9.20 per ticket, the service is clearly more expensive than the use of any of the other buses on offer, but in most cases much cheaper than taxi use. Since the Shuttle did not replace any of the other existing services, nobody was forced to use it, and for people on low incomes it only allowed the avoidance of the more expensive taxi service, where no other transport options were available.

Users' safety and security, region's prestige

The service has a small beneficial impact on traveller safety, if it avoids walking to a bus stop and crossing roads with heavy luggage and small children, but no notable impact on security or the region's prestige.

Mode shift, congestion and GHG emission

The service attracted some users away from the use of cars, but overall its contribution to mode shift and reduction in congestion and GHG emissions was modest.

Transferability of findings

The possible success of a similar service in a different location depends on the passenger numbers and their geographic spread. If a significant number reside around a well defined corridor, there is no reason to believe that such a service could be financially viable.

5.4.5 Heavy Rail Link

Problems addressed

Heavy rail can carry much higher numbers of travellers than bus services, they are normally faster and, most importantly, they travel away from car traffic and therefore do not contribute in any way to road congestion.

Description

As mentioned before, the only airport out of the three that has a direct rail link is Prestwick, on the mainline line from Glasgow Central to Ayr and Stranraer. The trains are operated by ScotRail. The earliest train leaves Prestwick for Glasgow at 05:20 and early in the morning there are up to five trains per hour; from 08:50 onwards the main service runs at 30-minute intervals, although there are a few slower trains in addition that take up to 1 hour and 21 minutes instead of the usual 44 to 48 minutes. The last train leaves at 23:08. In the opposite direction, the earliest train leaves Glasgow at 06:00 and arrives in Prestwick at 06:41 and the last one leaves at 00:15 and arrives in Prestwick at 00:58.

Most rail connections from Edinburgh to Prestwick involve either a walk on foot or a bus journey between Glasgow Queen Street and Glasgow Central, and the journey then takes more than two hours; ten connections per day connect directly in Glasgow Central, but since they involve a detour from the direct route by the train, they also take two hours (for more detail see also section 5.6).

The train station in Prestwick is the only one in Scotland not owned by Networkrail, but privately, i.e. by Prestwick airport. Initially the airport received part of the train fare; now ScotRail pays a fixed access charge.

The station is connected with the terminal via a 140 m long covered footbridge (see Figure 5-11) with the terminal building at the front right and the railway station at the back) across the busy A79. For departing travellers there is an enclosed waiting area, but the platforms themselves have no shelter against rain.

Figure 5-11 Footbridge between Prestwick Terminal Building and Rail Station

The single ticket from Glasgow, as shown on thetrainline.com, is € 7.30 (£ 6.35) and there are no reduced return tickets. A ticket from Edinburgh is € 16.80 (£ 14.60). However, the airport website advertises the fact that there is a 50% discount on rail travel to and from anywhere in Scotland; this cannot be booked on-line, but requires showing the official flight confirmation and photo ID at a ticket office or, if departing from Prestwick and because there is no ticket office at Prestwick, to the train conductor. As mentioned before and shown in Figure 5-10, the beams in the footbridge alert travellers to this offer. Moreover, for the first 6 months of any new route all passengers are entitled to entirely free rail travel to and from Prestwick airport. The three routes that qualify for this during the summer of 2010 are those to Carcassonne, Ibiza and Jersey.

The above travel times mean that in this case the train is not any faster than the bus, namely the X77, which only takes 44 minutes from Glasgow Buchanan Street to the airport. But with the discounts rail travel is much cheaper, and this is an obvious reason why in 2005 21 % of travellers arrived in Prestwick by train, which is already was the highest percentage of all UK airports outside London. This percentage has grown further since then, and the airport aims at raising this number to 30%.

Performance against main toolkit criteria

Cost and feasibility

Given that the airport is located directly on an existing mainline, the costs are very low. The only elements for the investment costs are the two platforms, the covered entrance, staircase and escalator and then the covered footbridge to the terminal. The main operating costs are those for operating the escalator and general cleaning and maintenance.

But if 21% of the 1.8 million passengers in 2005 used the train, then, even with the discounted fares, Prestwick will have generated more than € 3.3 million income for ScotRail in one year.

This means that running the train station is highly profitable for the operator, even if they pay a substantial access charge to the airport. Moreover, there are also no problems with any other aspect of feasibility, be it organisational or technical. Acceptance by users is clearly very high and so is the acceptability by politicians and the general public.

Impact on users' door to door travel time, cost and convenience

The discounted fares are cheaper than bus use, and considerably cheaper than driving to the airport and parking the car there, even if the car is used by a whole family and although parking charges at Prestwick are lower than at many other airports: the cheapest car park advertised on the airport website, which is connected to the airport with a shuttle bus, costs € 28.75 (£ 24.99) for one week or € 50.00 (£ 43.49). The respective pre-book discounted prices for the long-term car park which is in walking distance from the airport are € 51.75 (£ 45.00) and € 79.35 (£ 69.00).

The scheduled travel time from Glasgow city centre is virtually the same by train and bus. The travel time from Edinburgh is at least 2 hours, depending on the connections even more, and this compares to a travel time by car, of 1 hour 35 minutes, as calculated by the AA on-line route planner, and therefore the time advantage of car use is substantial at times of free-flowing traffic. However, in the afternoon the route out of Edinburgh can become very congested, as do the M8 and M77 in and around Glasgow; and also during the morning peak, the M8 and M77 are notoriously congested. During these periods train travel from Edinburgh can become faster than car use, and it certainly much more reliable.

As far as convenience is concerned, there is not too much difference between travel by train and by car from Glasgow, but from Edinburgh, the car will be much more convenient, even for those ten trains per day that only require one train change in Glasgow; but when, as for most times of the day, also a change from Glasgow Queen Street to Glasgow Central is involved, the car will be much more comfortable and convenient.

Users' safety and security, region's prestige

Train travel is safer than car travel, and if the train would no longer be available accident numbers on the routes to and from the airport would certainly increase, although it would require detailed modelling to estimate by how much.

In contrast, the train does not have any specific impact on security, nor does it contribute to the region's prestige.

Access for people on low incomes and with physical disabilities

Given the considerations on travel costs above, the trains clearly increase access to air travel for low income groups. This has in particular to be seen in the light of the fact that the main Prestwick only handles Ryanair, Wizzair and a couple of charter flights, which are cheap in themselves.

For people with physical disabilities the advantage of the availability of the train increases with the distance they have to travel as taxi use becomes less and less of a viable alternative.

Mode shift, congestion and GHG emission

If the train attracted around 350,000 passengers in 2005, then withdrawing the train service would induce a substantial mode shift. If the train were to be replaced by a bus, and an average of 20 passengers would be on each bus, then this would still lead to 18,000 new bus journeys in the most optimistic scenario. If everybody changed to car use, and the average car occupancy were 2 (which is much higher than the average, but accounts for the fact that a majority of Prestwick users are on holiday travel as couple or families), then this would put 180,000 more cars on the road and significantly add to congestion on the routes between Prestwick and Glasgow.

Some of the passengers arriving in Prestwick will have boarded the train only somewhere between Glasgow and the airport or will have come up shorter distance from the south, but others will have made much longer train journeys and some of those might use the car for the whole length of their trip,

if they had to change to a bus in Glasgow. Therefore it seems a reasonable average to take the actual 50 km distance to Glasgow as a guide for the estimation of GHG emissions. According to the calculator on carbonfootprint.com, 1830 million passenger kilometres on the train produce 1,100 tons of CO2 (although this will vary in reality not only with the length of the train and the passenger numbers, but also depends on whether it is a diesel or electric train and, in the latter case, where the electricity is coming from), and by coach only 550 tons; so from a CO2 perspective a bus replacement could even be beneficial. However, if everybody used cars with 2 passengers instead of the train, they would produce 1,750 tons of CO2 and increase the GHG output significantly.

Transferability of findings

The findings for Prestwick are transferable to any airport, which lies directly on a rail mainline.

5.4.6 Other Solutions in Place

At one or more of the three airports there is a series of solutions from the INTERCONNECT toolkit already in place, which have little or no significance for the issues at the core of this case study. They will be listed in the following for completeness, but not undergo any further assessment:

- Local link infrastructure solutions
  - Motorway

    Glasgow airport has its own exit from the M8.
  - Park and Ride

    Airdirect bus 747 links Edinburgh airport to the Ferrytoll Park and Ride car park.
  - In-road bus lanes

    Several of the buses benefit from bus lanes on part of their route.
  - Vehicle upgrade for increased comfort

    The Glasgow Flyer Airport Express has modern low-floor vehicles with all-leather interiors and wifi access for travellers. The service was voted Scotland's 'Best Bus Service' at the Scottish Transport Awards 2009.
- Improvement of local transport services
  - Regular interval timetabling

    Several of the bus services as well as the main rail service to Prestwick run at regular intervals, even if in the case of rail additional trains are added into the schedule.
  - Provision of feeder flights

    Many passengers using the flights from the many very small Scottish airports to Edinburgh or Glasgow will have the two cities as their final destination, but for other passengers they are the "short" link to national or international flights.
- Improvements at the interchange
  - Additional, conveniently located car parks

    Edinburgh airport has recently built a new multi-storey car park directly in front of the terminal.
  - Convenient positioning of public transport services

    Edinburgh airport has recently completed the construction of a new bus terminal close to the exit from the national arrivals area. In Glasgow the whole forecourt is currently under reconstruction.
  - Convenient positioning of taxi ranks

    At all three airports the taxi ranks are very close to the main exits.
  - Provision of elevators/escalators

At all three airports elevators and escalators are available at all strategic positions.

- Multi-lingual or pictogram information

  Pictogram information is in various places available at all three airports.

- Demand management on access modes

  BAA introduced in both Edinburgh and Glasgow in the year 2003 a Public Transport Levy (PTL), which is charged on short-stay airport parking, with an average contribution of 20 pence per car. The monies raised are then used to promote use of public transport, and a significant part of it has been used for feasibility studies for direct rail links to the two airports.

  (Edinburgh has also announced plans to introduce a charge of € 1.15 (£ 1.00) for every car that is dropping off passengers in the forecourt in October 2010, but this move has been hugely controversial with all political parties, including the Scottish government, speaking out against it, so at the moment it seems uncertain whether the plans will really go ahead.)

➢ Ticketing and marketing

- Local transport ticket sales via the internet

  Tickets for the early morning and late night buses X99 and X100 at Prestwick can be pre-booked on the internet.

- Simple tariff structures

  Lothian Buses operates a flat fare system on all of their routes, and also the direct airport bus in Glasgow has a simple single and return fare.

- Integrated ticketing for local public transport & rail, multi-modal journey planner with ticketing - national

  thetrainline.com is a journey planner that also includes bus use. For a journey from Edinburgh Waverley to Glasgow airport the site sells a ticket that covers the train journey to Glasgow Queen Street, the bus to Glasgow Central, the train to Paisley Gilmour Street and the bus from there to the airport. However, the information of this planner is not always reliable. For the journey from Edinburgh it shows a train every 15 minutes for the above route plus one train per hour that goes directly from Waverley to Glasgow Central. If the planner is asked about a trip from North Berwick to Glasgow airport, which involves an extra leg by train to Waverley, then for most of the day the planner only offers one connection per hour, and that is one of the slowest: arriving in Edinburgh at 11:53 would allow catching the trains to Queen Street at 12:00 and at 12:15, taking the train from Central to Paisley at 13:30 or 13:45 and arriving at the airport at 14:00 or 14:20. But instead the planner only shows the connection by slow train at 12:25, and with that the earliest train to catch from Central would be the 14:15 and the earliest arrival at the airport 14:50, i.e. 50 minutes later than necessary for this route.

  The better journey planner is on the transportdirect website of the UK Department of Transport. They recommend walking for 1 minute from Glasgow Queen Street station across the road to the stop of the Glasgow Flyer bus 500, and on that route arrival at the airport is already at 13:38. The site also calculates the travel time by car and shows that the car journey would be the fastest, with an arrival time of 12:47, which could dissuade in particular business travellers from using public transport. In any case, this site only plans journeys, but does not sell any tickets.

- Pre-journey information about interchanges

  The Glasgow airport website simply lists all buses that depart from the airport with the number of the stop they use and tells travellers that all bus stops are in the terminal forecourt, while the Edinburgh website contains a list of the stops used by each of the bus services together with a map with the location of the terminal and the domestic and international arrivals area and the location of the bus stops. The Prestwick website does not contain any information about bus stops or the location of the train station, only the information that a covered walkway connects airport and station.

➢ Regulatory or organisational changes which might facilitate more specific solutions

- Voluntary partnerships

  The Air Transport Fora at Edinburgh and Glasgow can be regarded as some form of voluntary partnership.

Other solutions in the toolkit, like for instance “Improved maintenance and earlier replacement of infrastructure”, “higher service frequency” or “improved lighting”, have certainly been applied at the airports and their feeder services in one form or other at some stage, but are too generic to be listed above.

5.5 SOLUTIONS ALREADY ENVISAGED

5.5.1 Overview

To improve the connections from Edinburgh and Glasgow to their airports is not a new idea, but two schemes have already gone through advanced planning processes (Edinburgh Airport Rail Link - EARL and Glasgow Airport Rail Link - GARL) and one is under construction. The scheme under construction is a new tram link system for Edinburgh, which will terminate at the airport at one end, run through Princes Street, the main thoroughfare in the city centre, and terminate at the other end at Newhaven, thereby also linking Edinburgh Park, Edinburgh Waverley and Edinburgh Haymarket railway stations and Ocean Terminal to the airport.

The first large study into direct heavy rail links to Edinburgh and Glasgow airports was conducted in 2003 and since then the planning process has continuously advanced. Royal Assent to both projects had already been granted, but on grounds of cost the Edinburgh project was cancelled in 2007 and the Glasgow one in 2009.

Other solutions already envisaged that would help address the interconnectivity problems of the airports are an HSR link between Edinburgh and Glasgow and the Glasgow Crossrail project, which would ease the connection between Edinburgh and Prestwick. But since both are not directly related to the airport, their relevance for the airport connections will only be discussed in any more detail in milestone M4.5.

5.5.2 Tram Link to Edinburgh Airport

Problems addressed

The tram link to Edinburgh airport is part of a wider tram project. According to the Final Business Case for the project (tie 2007), the planning objectives were:

- To support the local economy by improving accessibility;
- To promote sustainability and reduce environmental damage caused by traffic;
- To reduce traffic congestion and encourage mode shift;
- To make the transport system safer and more secure; and
- To promote social benefits.

The Business Case does not give any specific reasons for the terminal at Edinburgh airport, but it is clear that the tram line will provide a direct connection to the airport from the north of the city and significantly improve the comfort of travel between the city and the airport. It will reduce congestion in particular on the main route between the city and the airport, because it will travel in parallel to this route and help reduce the number of buses, taxis and private cars on that route. Thereby it will also contribute to a reduction of GHG emissions. The travel time between Haymarket and the airport will, however, only be improved by not more than 5 minutes.

Description

The first formal mention of a possible tram scheme was in the white paper entitled “Scotland’s Transport Future” in 1998. Following this white paper, CEC included the development of a tram

network in the Interim Report of its Local Transport Strategy (LTS) in 1999. Later the same year City of Edinburgh Council (CEC) founded the New Transport Initiative (later known as the Integrated Transport Initiative or ITI). The ITI was aimed at making a significant contribution to meeting national, regional and local transport objectives and supporting long term economic prospects and quality of life offered by the south east of Scotland through the introduction of a congestion charging scheme with a supporting package of major transport investment. In 2000 CEC's full LTS was published, and that confirmed that a tram network was central to its transport policy.

In October 2001, CEC approached the Scottish Ministers with an "Application in Principal for an Integrated Transport Initiative for Edinburgh and South East Scotland" (the Application) setting out the underlying rationale for their ITI. Before reaching a final ministerial decision on the Application, the Minister for Enterprise, Transport and Lifelong Learning proposed that an arm's length company should be established to further review and develop the Application and the scope of the ITI and to deliver the ITI. As a result, Transport Initiatives Edinburgh Limited (now **tie** limited) was founded in 2002 and later the same year the Application was approved by the Scottish Ministers. As a result, the Scottish Executive (SE) awarded a funding grant to support the introduction of the Edinburgh Tram (Line 1) Bill and the Edinburgh Tram (Line 2) Bill to the Scottish Parliament.

A major feasibility study for the two tram lines was commissioned by CEC in 2001 / 2002 and published in 2003. This report confirmed that a tram network was the right choice for Edinburgh and concluded that the northern loop should receive the highest priority followed by the western and south-eastern lines.

As a result of these studies the Scottish Transport Minister announced in March 2003 that there was £ 375 million 'available in principle' for the Edinburgh tram lines 1 and 2.

Public consultation took place on the preferred route alignments for both lines during May to July 2003 and as a result of the consultation responses and comments, a single preferred route alignment for each line was identified and the necessary Private Bill and accompanying documents were developed. On 23 December 2003 the Edinburgh Tram (Line One) Bill and the Edinburgh Tram (Line Two) Bill were submitted to the Scottish Parliament. CEC approved its LTS 2004 – 2007 on 22 January 2004 which reconfirmed that the development of a tram network was central to their transport strategy. Thereafter, both Bills were formally introduced to the Scottish Parliament on 29 January 2004.

Both Bills received unanimous, but qualified, support to proceed to the 'consideration stage' in early 2005. They finalised this stage a year later and both Bills then received Royal Assent on late April / early May 2006.

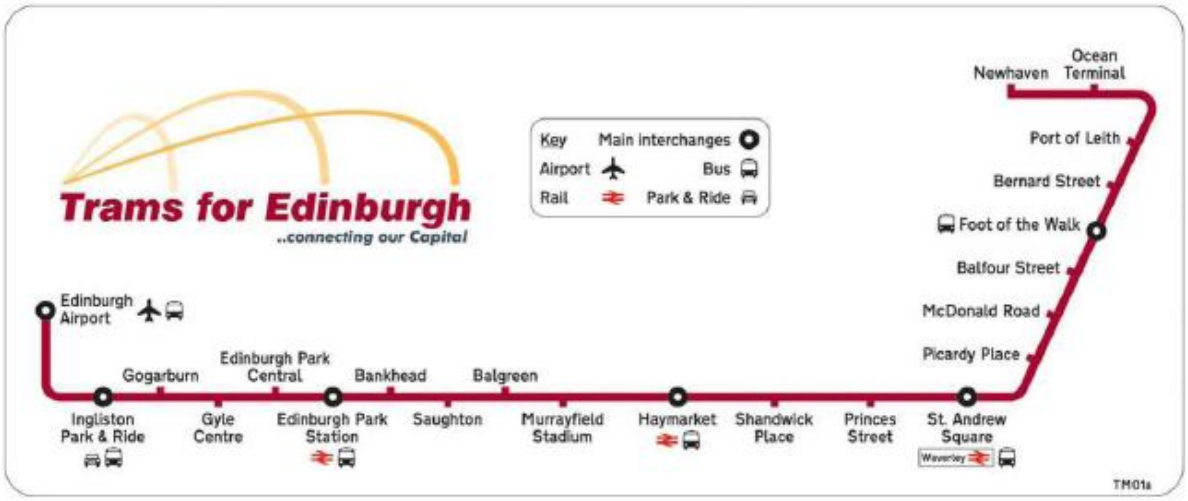
When the Scottish National Party (SNP) formed a minority government after the elections of 2007, they tried to cancel the whole project, but the other parties united and the SNP were outvoted. However, the government then capped their maximum support of the project at € 575 million (£ 500 million) and CEC is now struggling to find the necessary finance after the budget for the project has increased repeatedly. Current estimates stand at € 690 million (£ 600 million). The situation has worsened after disputes with the construction company and consideration is now given to the option of cancelling the contract with Bilfinger Berger. But the need to find a new contractor would certainly increase the delays and could lead to protracted and costly court battles for litigation.

The original plan was that the first section of line 1, from Haymarket to the airport, would become operational in July 2011 and the second and final section in 2012. As it stands by summer 2010, construction for line 1 is well advanced, but construction delays mean now that the earliest possible date for the opening of the first section is now autumn 2011 and the construction company Bilfinger Berger claims that they will not be able to finalise work before 2014, a claim refuted by tie and CEC.

Once the tram system is opened, it will be operated by Transdev, one of the largest public transport operators in Europe. Transdev group's UK division is a major passenger transport company employing over 4,000 staff and carrying over 200 million passengers a year on its bus and tram services. But since CEC recognised the importance of integrating the bus and the tram network, a new company, Transport Edinburgh Limited (TEL), has been formed, which will act as umbrella for the delivery and operation of the trams and the majority of Edinburgh's bus services. The Chief Executive

of TEL is also the Chief Executive of Lothian Buses, which carry more than 90% of all bus passengers in the city.

The alignment of the new tram route is shown in Figure 5-12 below.



(source: tie 2007)

Figure 5-12 Tram route for phase 1a

The tram will leave the airport initially every 10 minutes and after the initial build-up of patronage, there will be eight trains per hour. The target travel time to Newhaven is 44 minutes and 30 seconds. The same journey by car would take around 30 to 35 minutes in good traffic conditions, but over an hour and a half with one or slightly less with two interchanges with the current buses.

Performance against main toolkit criteria

Cost and financial feasibility

The total cost for phase 1a is now expected to be around € 690 million (£ 600 million), while the initial estimate was € 575 million (£ 500 million). The funding for these capital costs will be provided by the government and by the city of Edinburgh and is not going to be re-cooped from the revenue.

All operational and life cycle costs for the trams will be coming from TEL, and since the city is the sole shareholder of TEL, the city will also bear all the financial risks related to the tram operation. The total operating costs for 1a for 2012 was estimated to be € 16.5 million (£ 14.37 million), but allowing for savings, from the need for fewer buses in particular, the net operating costs was estimated at €3.6 million (£ 3.1 million). The original planning expected a slight operating loss for 2011 with phase 1a only, a slight profit in 2011 with 1a and 1b, and then a steady increase in profit to € 52 million (£ 45 million) in 2031. The TEL business plan does, however, not include renewal costs which will be due after about 30 years.

The total socio-economic benefit of the project was estimated at over £ 1 billion, with a benefit to cost ratio of 3.01. For line 1a only, the benefit was estimated at € 827 million (£ 719 million) and a benefit to cost ratio of 2.32. It is impossible to say how much of any of these figures relate to the airport.

Technical and organisational/legal feasibility

There are no technical or organisational problems that could not be overcome.

Acceptance by users and political acceptability

The patronage forecasts show that user acceptance is expected to be very high, in particular attracting 6.7 million passengers per year away from car use by 2031. For the same year, it is estimated that

around 400 passengers a day will board the tram at the airport during the AM peak and around 300 during the inter-peak hours; unfortunately no such numbers are published for the PM peak and the evening.

As was indicated before, the current Scottish government tried to stop the whole tram project, as they stopped the heavy rail link projects to Edinburgh and Glasgow airports, but in this case they failed, because a majority in the parliament supported the project.

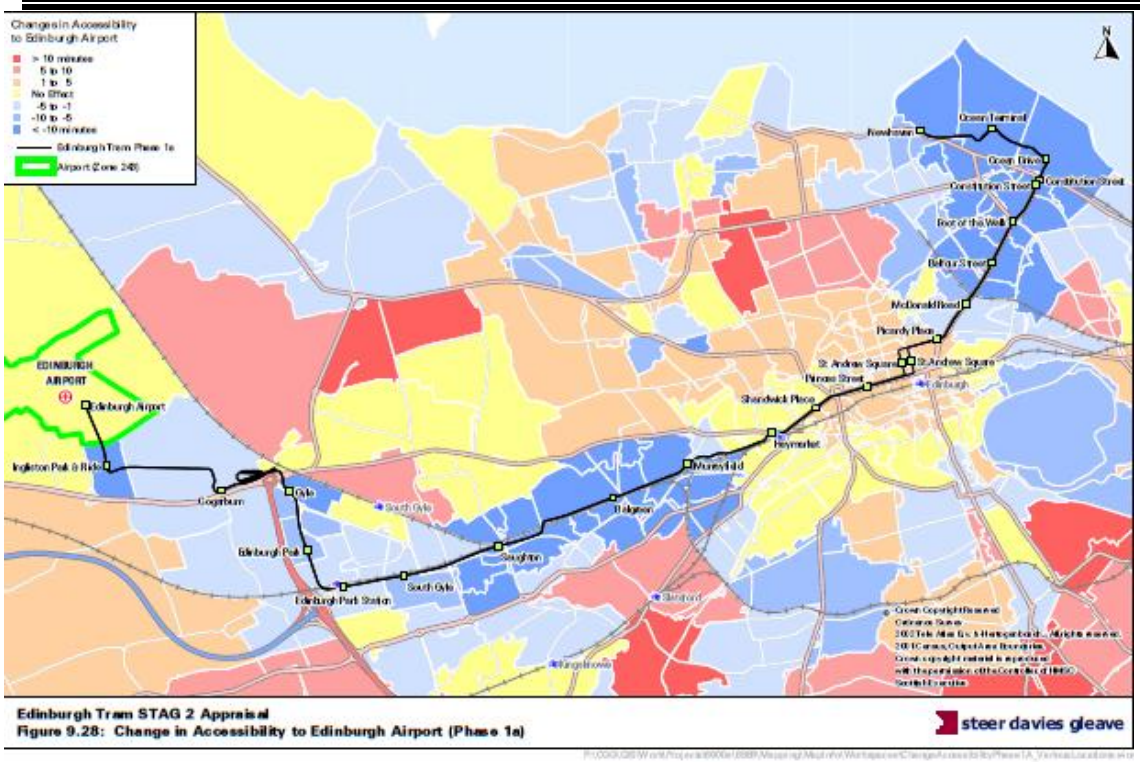
In the wider population, the value of the project is equally debated with many people regarding the project as totally unnecessary. The level of unpopularity is probably peaking at the moment for four main reasons:

- The building work has necessitated various diversions for car drivers and added substantially to car travel times in the city centre.
- The building work had made access to the shops along the construction route, in particular between Picardy Place and foot of the Walk, at times very difficult and shop owners have complained bitterly about the loss of trade.
- Along various sections of the route, the tram line will permanently reduce the number of lanes available for cars.
- There were already delays and budget overruns in the past, but a current dispute with the contractor in conjunction with already existing delays has further detracted from the credibility of the project.

It is to be expected that the trams will become more popular also by non-users once the construction is finished, the trams are running and the benefits of the trams will be felt. How far demand forecasts have been correct, and how popular the tram system will be overall, will certainly determine the chances for the two further tram lines envisaged going ahead.

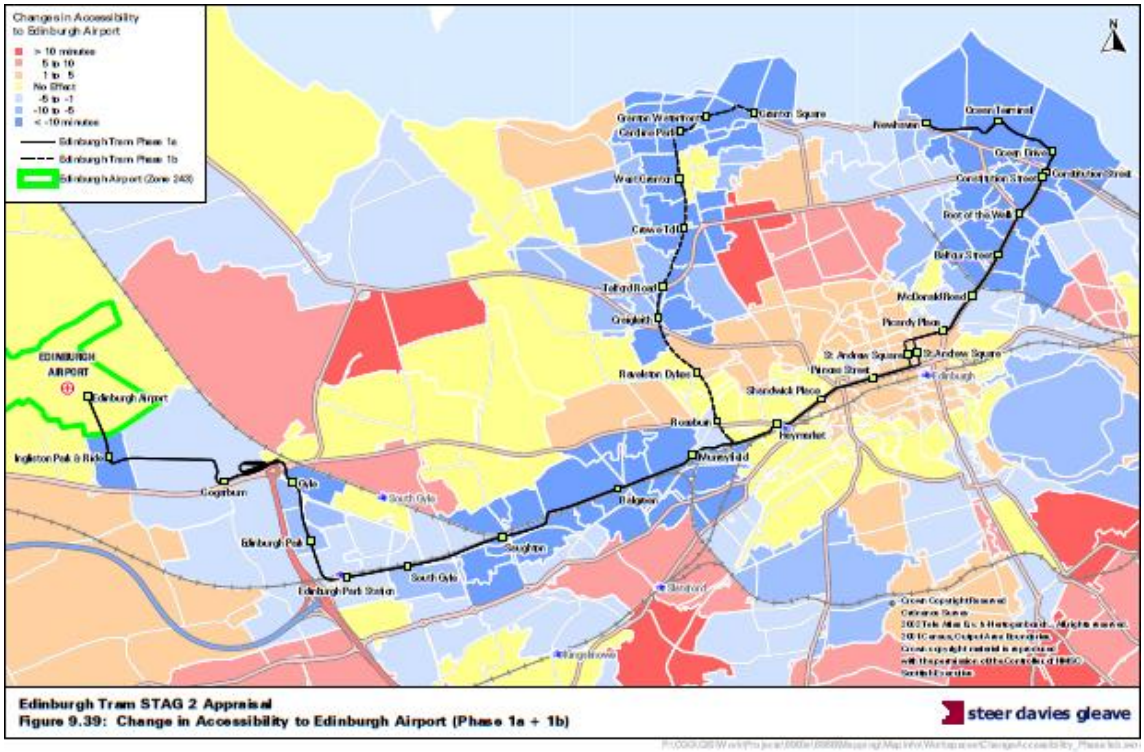
Impact on users' door to door travel time

As indicated before, the travel time over the whole distance is substantially longer than that by car, but only about half of that with buses. In terms of airport accessibility Figure 5-13 and Figure 5-14 show the tram makes the airport substantially more accessible from many areas along its route.



(source: tie 2007)

Figure 5-13 Airport accessibility for tram phase 1a



(source: tie 2007)

Figure 5-14 Airport accessibility for tram phase 1a and 1b

Impact on users' door to door travel cost and access for people on low incomes

In the same way as Lothian Buses operates currently with a flat daily fare for their whole bus network, TEL will also sell tickets which are valid all day on the trams and all buses operated by Lothian Bus. Furthermore, the current Plusbus and one-ticket scheme that are valid for all operators in Edinburgh will be expanded to include the trams. Only tickets bought on-board from inspectors will carry a premium. This means that the trams will normally not increase the door-to-door travel cost above the level of general bus fares and will be lower than the current express bus fare to Waverley.

Initial impact on comfort or convenience

The trams are furnished comfortably and run more smoothly than buses. Furthermore, they will be, at least initially, less crowded than many of the buses are during busy times of the day. The faster travel times compared with buses will add to their convenience. The only thing they will not offer is the free wifi access that is available on the Airlink 100 service.

Users' safety and security

The level of safety of trams as such will not be significantly different from that of buses, although the overall increase in traffic, together with some rerouting effects, should increase the annual number of accidents by 58 in 2011 and 20 in 2031, though 54 and 19 of them respectively without personal injury for line 1a and 1b. For line 1a only the forecast is an increase of 75 accidents, of which 70 without injury, for both years. Certainly security will be increased due to the CCTV cameras that the trams will have.

Region's prestige

In the UK every new tram project attracts nationwide publicity and carries some degree of prestige. In this case, however, the bad publicity will certainly detract from this, at least in the short term.

Access for people with physical disabilities

The trams will have a total capacity of 250 passengers and a total of 78 seats. All of this is at floor-level and therefore accessible without any steps. On top of that there are dedicated bays for people with wheelchairs.

Mode shift, congestion and GHG emission

All modelled predictions assumed that the whole of tram phase 1a and 1b would be completed in mid 2011. The expectation was that this would lead to a mode shift from car to public transport of 0.7% by 2011 and 1.2 % by 2031 for the overall Edinburgh area (tie 2007). 8.3 million passengers were expected to come from buses in 2011, rising to 17.8m by 2031, and about 21% of tram patronage (2.3m) were to be attracted as new public transport patronage in 2011, rising to 26% (6.7m) in 2031. This was, of course not to be spread evenly over the city and Figure 5-15 shows the geographic impact.

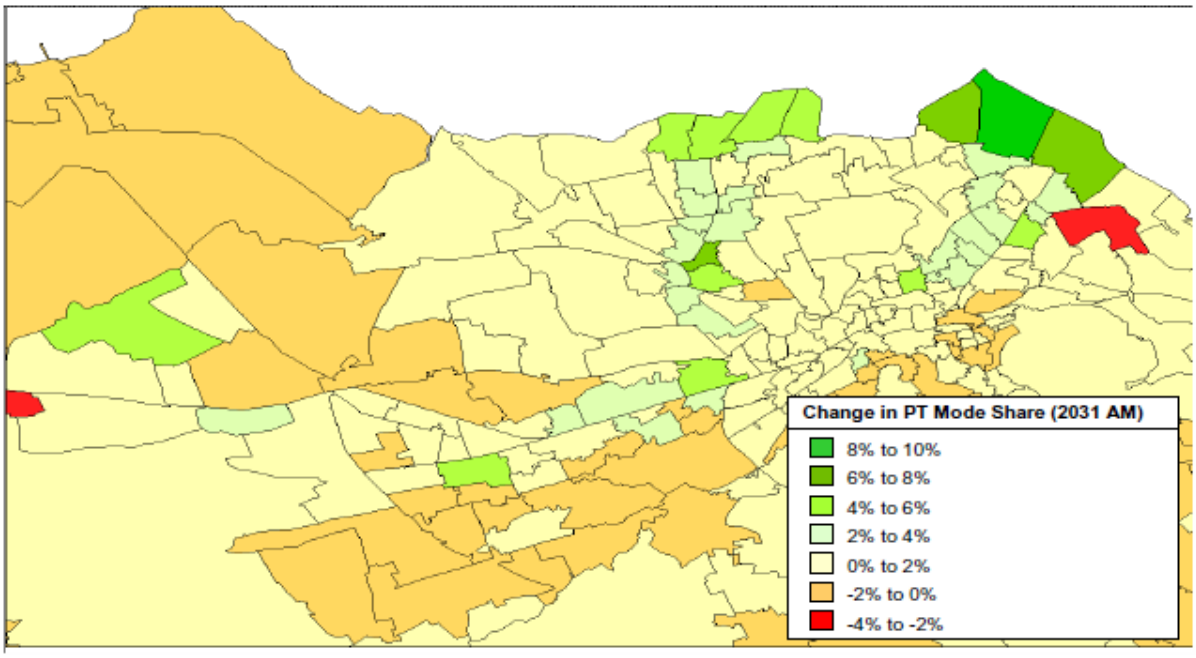


Figure 5-15 Change in mode share with tram phase 1 for the 2031 AM Peak

The impact of these modal changes on congestion is not easy to forecast, because in the tram scenario that was modelled higher development assumptions were made along the tram route, and in particular in the north of Edinburgh, so that the direct effects of the trams cannot be separated from the effect of increased land use. Overall, an increase in demand for travel was expected as a result, although demand from private cars was down on some routes, up to a reduction of 967 cars for the AM peak for Dalry Road for 2011. Given this mix of causes for changes in traffic, it is also not possible to predict the direct effect on GHG emissions, but overall an increase of CO2 of around 3% was estimated, half of which was attributed to the development assumptions.

Transferability of findings

It is difficult to transfer any findings to other sites, when it is not even known yet, whether the forecasts made through modelling will actually become true once the scheme is operational. While it is clear that delays and budget overruns are rather the norm than the exception in major infrastructure projects, this is not at the core of this case study.

In the context of this case study, it will all depend on the actual numbers of air passengers that will board the tram to get into Edinburgh. The above mentioned report on passenger forecasts does not clarify what hours are included in the 'AM peak', but a reasonable assumption would be that it would go from 7:30 to 9:30, which - given customs and passport clearance for international flights - would mean that it would include passengers arriving in average between 7:00 and 9:00. In March 2009, during this period the capacity of planes scheduled to arrive was more than 2000 seats, with many more to be expected in years to come, while the model only forecast tram patronage of 400 passengers departing from the airport during this period for 2031 and less than 200 for 2011. There is substantial room for error in these forecasts, and it will be very interesting to watch the actual passenger numbers once the tram line opens.

5.5.3 Heavy Rail Link to Edinburgh Airport

Problems addressed

As indicated already in various places, Edinburgh airport can currently only be reached by car and bus. Local rail passengers can alight at Edinburgh Park and from there take one of the four buses per hour which connect to the airport in five minutes. Passengers from the north or east have to travel into Edinburgh Waverley or Haymarket first, and from there take a train to Edinburgh Park: passengers from Glasgow have to do the same for most connections, although there a few options with a change in Polmont en route. In any case, rail passengers from most destinations in Scotland have at least

one train change plus the change to the bus to reach the airport, which makes rail use a rather unattractive option, which is chosen by hardly any passengers. Most rail passengers arriving in Waverley or Haymarket would take the Airlink 100 instead to reach the airport.

Description

In 2001, the Scottish Executive, in association with the British Airports Authority, Scottish Enterprise, the Strategic Rail Authority and the Department for Transport, commissioned a study into possibilities of linking Edinburgh and Glasgow into the existing heavy rail network. The study was conducted by Sinclair Knight Merz, in association with Mott MacDonald, ERM and James Barr, and the final report was published in February 2003. Eight alternative options were initially considered, then amended and modified to a short-list of five. The core of the final preferred option was a railway tunnel under the runway. Out of the other four, two made the airport a terminal for spurs running to the Edinburgh/Glasgow and the Fife line and the other two through-running with an airport station parallel to the runway. The "Runway Tunnel" option was eventually taken forward: although it was the most expensive one to construct, it was one of the cheaper ones to operate and had by far the highest overall benefits. Figure 5-16 shows in red the new track that would have linked the airport into the existing rail network under the proposed Edinburgh Airport Rail Link (EARL).

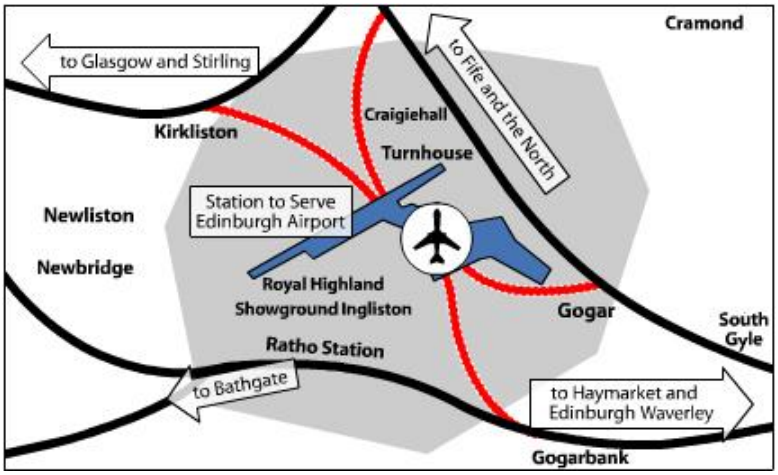


Figure 5-16 Track alignment for EARL

Figure 5-17 shows the network and the cities that would have been directly connected to the airport through EARL.

Figure 5-17 Network connected to Edinburgh airport through EARL

Performance against main toolkit criteria

Cost and feasibility

The initial SKM study set the capital costs at € 674 million (£ 586 million) while the later study, which compared the Runway Tunnel with the option of opening a station at Turnhouse, uses a figure of € 575 million (£ 500 million). The SKM study assumed that the € 674 million total would consist of a government grant of € 429 million (£ 373 million) and the remainder coming from equity and loans. The revenue generated was estimated to be €7.9 million (£ 6.9 million) at 2001 prices for 2010 and € 13.2 million (£ 11.5 million) for 2020, while the operating costs would be € 3.3 million (£ 2.9 million). Based on a "present value" costs, discounted over the lifetime of the project in accordance with the Scottish Transport Appraisal Guide (STAG), of £ 427,198,000 and a "present value" of benefits of £ 677,586,000, the overall Benefit / Cost Ratio was calculated as 1.59.

The Runway Tunnel would create some technical challenges, but plans were in place to meet these challenges. Similarly, plans were in place for the organisational structure.

EARL was initially supported by all parties and it was on grounds of total costs rather than lack of benefits that the project was cancelled. With 3.31 million air passenger trips per annum in 2020 or 9,068 air passengers per day, user acceptability was expected to be very high.

Impact on users' door to door travel time, convenience and access for people with physical disabilities

The travel time from Edinburgh would have been 16 minutes, and therefore only just over half that of the express bus, but travel time advantages would have been even bigger for passengers from the north and the west. The estimates for saved travel time and the value of this time are shown in Table 5-2. The report only contains the value of time totals for the total assessment period and the values of time per hour for travellers; hence it is not possible to reconstruct the time saved for employees and non-airport users.

Table 5-2 Time and value of time saved through EARL

	Time Saved ('000 h)	Value of Time (€/h)	Value of Time (€ million) *
Scottish business	2,388	31.2	74.5
Scottish leisure	16,025	12.0	192.3
Non-Scottish business	2,037	45.5	92.7
Non-Scottish leisure	18,807	15.0	282.1
Subtotal	**39,257**	**-**	**641.6**
Employees	-	-	8.8
Non-airport users	-	-	42.5
Total		**-**	**692.9**

* 1998 prices discounted to 1998

The values of time for Scots are lower than those for non-Scottish travellers, because it was assumed that the average of their salaries is lower than the average of those arriving here from the rest of the UK or elsewhere in the world.

The fact that leisure travel benefits so much more than business travel stems from the modes they use rather their numbers. In 2006, approximately 42% of travel at Edinburgh airport was business related and that percentage would have even been higher at the time of the study, since leisure travel has increased in Edinburgh at a slightly faster rate than business travel.

The same report assumes that the number of air passengers using the train per year is 3.31 million. Dividing the total times saved by this number over a period of 30 years leads to an average of 24 minutes saved in average by each air passenger using the service. This is already a significant saving, but given that currently 49.3 % of all passengers are coming from the City of Edinburgh (BAA 2007) and they only save a maximum of 14 minutes, this means that a large number of travellers would have had even much more substantial travel time savings, if EARL had been implemented.

Impact on users' door to door travel cost and access for people on low incomes

The train fare was intended to carry a small premium for short-distance trips, but would have been at the standard rate for longer distances. So for most travellers cost would not have been any issues at all, and even for people on low incomes travelling with a family of four a difference of around € 10 would not been an impediment for air travel.

Users' safety and security, region's prestige

EARL would not have had any significant impact on users' safety and security, nor on the region's prestige.

Mode shift, congestion and GHG emission

It was estimated in SKM 2003 that the mode share of rail for the air passengers would be 19% equating to 3.31 million trips per annum or 9,068 trips per day in the year 2020. The base demand for public transport would have been 2.84 million passenger trips per annum and the tram was to increase that to 4.59 million passenger trips. Assuming the rail link would not create new demand for travel, this means that 1.75 million rail trips would have replaced car trips and 1.56 million would have replaced bus travel.

1.75 million trips per annum equates to 4,800 trips per day. This would certainly have made a significant contribution to the overall congestion reduction in the main arterials leading to the airport.

There is no information about the length of these trips, but given that the centre of Edinburgh is 12 km away, a conservative assumption would be that the average bus replacement trip might 12 km long and the average car replacement trip 15 km. Using the same assumption on CO2 produced per kilometre as in sections 5.4.3 and 5.4.5, this would mean that rail trips coming from the bus would produce an extra 567 tons of CO2 (although the same provisos as previously described also apply here concerning the assumption of the carbon effects of the trains) while the rail trips that replaced the car would have saved 3,649 tons, which means overall a saving of 3,082 tons of CO2 per year.

Transferability of findings

The cancellation of the project is a huge opportunity lost and the construction of the Gogar interchange will only be a relatively poor replacement, but with that the chances that the EARL project will be revived in the foreseeable future by a new government are even smaller than they would have been otherwise.

The key issue is that EARL would have led to a massive modal shift from the car to the train and would have made a substantial contribution to both congestion and GHG reductions. While none of the precise figures will apply to other sites, the general principle that a train link to an airport is very popular with travellers, will be a widely transferable finding.

5.5.4 Heavy Rail Link to Glasgow Airport

Problems addressed

As described in previous sections, the only good public transport connection to the airport is the Glasgow Flyer, but even that suffers from the lack of bus lanes and therefore from slow travel times during peak periods due to congestion. Since the key bottleneck is on a complex system of motorway bridges, there is no opportunity either to add any bus lanes. Therefore, for passengers coming to the airport from most directions journey times are unreliable or, if a train is used to Paisley Gilmour Street, journeys are slow and can involve multiple interchanges.

Description

The aforementioned report from Sinclair Knight Merz covered both links to Edinburgh and Glasgow airports, but the following will, as far as possible, be based on the newer Final Scheme Development

Report for the Glasgow Airport Rail Link (GARL) submitted by Faber Maunsell Aecom to Strathclyde Passenger Transport (SPT) in December 2005.

At the core of GARL was a new double track branch line between the existing rail track and the airport from a new junction between Paisley Gilmour Street and Paisley St James stations. Initially this route was to connect the airport four times per hour with Glasgow Central, with one interim stop at Gilmour Street, but the double track left options for an expansion of this service open.

The line was to come into the airport on a viaduct and the station would have been in parallel to the terminal building separated from the terminal by the existing multi-story car park. Figure 5-18 shows the terminal building in the background, the multi-story car park in the centre and the ground-level car park that would have been replaced by the station in the foreground. The distance from the station to the terminal building is approximately 140 m. The station would have been at the level of the second floor of the car park and a new public transport interchange would have been constructed underneath it.

Figure 5-18 Location of the envisaged GARL airport station

The front part of the platform would have had elegant canopies and between the station and the terminal would have been an enclosed elevated walkway with glass windows and moving walkways on either side.

Performance against main toolkit criteria

Cost and feasibility

The calculated total capital cost of the project would have been € 144 million (£ 125 million), but the procedures for appraisal in Scotland prescribe the use of a so-called Optimism Bias, and with the inclusion of that the total estimated investment costs were € 184 million (£ 160 million). This would have included a platform extension at Glasgow Central, civil engineering work on the mainline, the new branch line, the airport station and the move of an aviation fuel farm, which is on the intended line of track, to another site. The annual operating and maintenance costs, at 2005 prices, were estimated at € 4.8 million (£ 4.2 million).

The discounted Present Value of Costs was € 265 million (£ 231 million) and the Present Value of Benefits € 339 million (£ 295 million), leading to a Cost / Benefit ratio of 1.28.

However, the expected rail revenue over the project lifetime was only € 42.5 million (£ 37 million), i.e. € 1.4 million per year. This would have only covered 30% of the operating costs and GARL would have depended on subsidies throughout its lifetime.

The rail passenger forecasts are shown in Table 5-3. The largest passenger share does not come from air passengers, who only constitute the second largest user group, but from non-airport related trips. Nevertheless, 828,000 air passengers in 2030, or 2,270 passengers per day is still a very significant number, which indicates that high user acceptance was anticipated, but nothing like the acceptance of EARL.

Table 5-3 Annual GARL patronage for 2009 and 2030 ('000)

Source	2009	2030
Air passengers	456(*)	828
Employees	94(*)	150
Non Airport related trips (Paisley to/from Glasgow)	838	871
Change in the number of trips on the existing services on the Paisley Gilmour Street to Glasgow Central Route	-573	-628
Total extra trips on rail	815	1,222
Total trips on GARL	1,388	1,849

From a technical and organisational perspective, there were a number of problems that had to be addressed, such as rail capacity problems and the effects of the subsequent platform extension on parking provision at Glasgow Central and the scheduling of the new trains could all be adequately addressed through the project plans.

Impact on users' door to door travel time and convenience

The FMA report does not spell out what the actual travel times with GARL would have been, but it is clear that service would have made rail travel to the station considerably more convenient and comfortable than the current Gilmour Street service. How it would have compared with the Glasgow Flyer would have largely depended on the origin of the trip.

Impact on users' door to door travel cost and access for people on low incomes

For the modelling exercise a single fare of € 3.80 (£ 3.30) and a return fare of € 5.75 (£ 5.00) were assumed. This would be a premium over the current single integrated rail and bus anytime day ticket of € 3.15 (£ 2.75), but considerably cheaper than the single or return fare of € 5.20 (£ 4.50) respectively € 8.05 (£ 7.00) for the Flyer. But these differences are not large enough to have any impact even on travellers with low incomes.

Users' safety and security and access for people with physical disabilities

Being able to avoid the tunnel in Gilmour Street (Figure 5-6) and avoid the wait at the bus stop there would increase passenger security, but there would not have been a significant impact on safety or on people with disabilities, since Gilmour Street has a lift down from the platform to the ground level and a ramp to bypass the steps showing in the photo.

Region's prestige

GARL would not have made a significant direct contribution to Glasgow's prestige, although the interchange at Gilmour Street does certainly not leave a good impression with travellers.

Mode shift, congestion and GHG emission

828,000 passengers per annum by 2030 translate into 5.4% of all expected air passengers, which is nowhere near the mode share of EARL, but still a significant number, and 2,270 trips fewer by bus and car would have made some contribution to congestion reduction. However, the figures in Table 5-3 show that more passengers would have been non-airport uses and also many airport employees, The table also shows that 1.2 million trips were new trips on rail, and this constitutes the overall modal shift. However, with this mix of user groups involved, it is impossible for this case study to estimate how many passenger kilometres would have been saved on other modes and therefore also to make any estimate on the effect of GHG emissions.

Transferability of findings

As with EARL, GARL would have been an attractive option to many travellers, although the geographic location of the airport in conjunction with the poor connectivity within Glasgow would have made its mode share uncharacteristically low.

5.6 PROBLEMS STILL TO BE SOLVED

The solutions described in the previous chapter would help to better connect Edinburgh and Glasgow airports to their cities and also to connect Glasgow city with Edinburgh airport. However, they do not directly link the city of Edinburgh with Glasgow airport. All current train services from Edinburgh to Glasgow terminate in Glasgow, there are no through services via either Glasgow Queen Street or Glasgow Central stations.

Figure 5-19 shows the location of Glasgow Queen Street and Glasgow Central rail stations. On the main line Glasgow Queen Street is the terminus for the flagship services from Edinburgh Waverley via Falkirk High, which runs every 15 minutes during the day with a journey time of approximately 50 minutes. Queen Street station is also the terminus for the main train services from the north – from Oban and Mallaig, from Stirling and, Perth, Inverness, Dundee and Aberdeen.

The Airdrie-Bathgate link currently under construction will add another route between Glasgow Queen Street and Edinburgh. Bathgate is currently linked with Edinburgh with two trains per hour during the day and a journey time of 30 minutes, while Airdrie is linked to Glasgow Queen Street (low level) with three trains per hour during the day and a journey time of 25 minutes. The additional 16 miles of the new link will add to journey times, already not competitive with the 45 to 50 minutes on the flagship route to Queen Street via Falkirk High. It is anticipated this route will have four trains per hour in each direction and, as a low level train service, it will allow through services from Edinburgh direct to points west of Glasgow, though not to either Glasgow or Prestwick airports.

Other services from Edinburgh are using Glasgow Central:

- ScotRail's Edinburgh to Glasgow via Shotts line (every half hour between 09:00 and 19:00, journey time mostly between 1 hour 15 minutes and 1 hour 30 minutes, fastest service 1 hour 8 minutes). This takes a different route from the Queen Street service, with many intermediate stops.
- Trains operated by EastCoast and trains operated by CrossCountry, which come from London Kings Cross (and other points on the east coast main line) via Edinburgh. These take yet another different route, via Carstairs junction and stopping at Motherwell. These services are infrequent, with approximately 10 each weekday, but at irregular intervals, sometimes with over 2 hours between trains. The journey time ranges from just over 1 hour, to 1 hour 30 minutes.
- Two services per day operated by ScotRail from North Berwick to Glasgow Central, also using the Carstairs/Motherwell route. Even with a limited number of stops the morning train service (departing Edinburgh at 08:38) has a journey time of 1 hour and 21 minutes; the evening service, departing Edinburgh at 18:26 has more stops and a journey time of 1 hour and 27 minutes.

All main line train services from London Euston via Carlisle terminate at Glasgow Central as do the services London Kings Cross and Newcastle that come via Edinburgh.

Glasgow Central is also the terminus for an extensive commuter rail network, serving the southern part of the city and surrounding areas of south-west Scotland. Thereby Glasgow Central is also the terminus for the service from Prestwick airport.

Both Glasgow Central and Queen Street have "low-level" stations, essentially a "station within the station" that serve local commuter services – these low level services are through-routes, but they are local and not relevant to a discussion of train services from Edinburgh to Glasgow and onward.

Figure 5-19 Walking distance between Glasgow Queen Street and Glasgow Central

To get from one station to the other, there is a 500 metre walk as shown in Figure 5-19. Alternatively, there is a bus, but only during the core daytime hours. In spite of this poor connection between the two stations, the flagship service (every 15 minutes and with 50 minute journey time, 63 services each way on weekdays, as well as being the flagship service with priority from ScotRail in terms of marketing and operation) that arrives at Queen Street is often still the best option to make an onward connection from Glasgow Central.

Table 5-4 shows what thetrainline.com, an on-line journey planner and ticket sales facility, suggests as a public transport solution for a trip from Edinburgh city centre to Glasgow airport: a two hour trip involving two trains and two buses (the arrival and departure times are shown for the same minute for both Glasgow Queen Street and Paisley Gilmour Street, but trip duration shown indicates that this accounts for walking from the train to the bus stop and waiting for the next bus). As already indicated in section 5.4.6, transportdirect.com shows a better connection by using the Glasgow Flyer instead of the onward train connection from Central, but many, if not most, regular train users would go straight to the trainline.com without checking any other websites.

Table 5-4 Travel from Edinburgh city centre to Glasgow airport

Depart	Arrive	Travel by	Train company	Duration
16:30 Edinburgh Waverley	17:21 Glasgow Queen Street	Train	SCOTRAIL	00h 51
17:21 Glasgow Queen Street	17:55 Glasgow Central	Bus	n/a	00h 34
17:55 Glasgow Central	18:05 Paisley Gilmour Street	Train	SCOTRAIL	00h 10
18:05 Paisley Gilmour Street	18:30 Glasgow Airport	Bus	n/a	00h 25

Source: www.thetrainline.com

Moreover, although Prestwick airport has a direct rail connection, travel times from Edinburgh are not any better (Table 5-5).

Table 5-5 Normal travel from Edinburgh city centre to Prestwick airport

Depart	Arrive	Travel by	Train company	Duration
16:30 Edinburgh Waverley	17:21 Glasgow Queen Street	Train	SCOTRAIL	00h 51
17:21 Glasgow Queen Street	18:00 Glasgow Central	Bus	n/a	00h 39
18:00 Glasgow Central	18:47 Prestwick Int. Airport	Train	SCOTRAIL	00h 47

Source: www.thetrainline.com

As mentioned before, ten times a day there is a "direct" connection from Edinburgh to Glasgow Central, but even this does not shorten the travel time by much, because these trains have to take a very indirect route via Carstairs (Figure 5-1) to reach Glasgow Central, which adds around 20 minutes to the travel time between the two cities. (The same would apply for travel to Glasgow airport.)

Table 5-6 "Direct" travel from Edinburgh city centre to Prestwick airport

Depart	Arrive	Travel by	Train company	Duration
16:56 Edinburgh Waverley	18:09 Glasgow Central	Train	SCOTRAIL	01h 13
18:30 Glasgow Central	19:18 Prestwick Int. Airport	Train	SCOTRAIL	00h 48

Source: www.thetrainline.com

The aforementioned connection from Edinburgh to Glasgow via Shotts is not offered in any of the suggestions made by the trainline.com.

As Table 5-4, 5-5 and 5-6 indicate, even if there were a more direct rail link between Edinburgh city and the Glasgow airports, the total travel time would still be over an hour and the travel time between the three airports would not be substantially less than an hour.

5.7 POTENTIAL SOLUTIONS

The first solution to be investigated in the Edinburgh / Glasgow test bed, and to be reported in milestone M4.5, is full direct rail connections between all three airports. This involves a combination of EARL and GARL together with a variant of the Crossrail project for Glasgow. Crossrail would provide a direct and frequent connection between Edinburgh and the north on one side and Glasgow west and Ayrshire on the other side. Such plans were considered in the early stages of the GARL project, where consideration had been given to linking Glasgow airport to both Glasgow Central and via a parallel line also directly to Edinburgh, but they were not followed through any further. Detailed plans for such a link exist, together with a full socio-economic analysis, for the Crossrail project in 2008, but these plans would not allow linking GARL into Crossrail. Therefore in the test bed the potential benefits of linking GARL with a modified form of Crossrail as well as with EARL will be assessed. However, it should be noted that the analysis of the necessary track alignment and of the question how such a service could be scheduled in the wider context of the Scottish rail network is beyond the scope of the INTERCONNECT project.

At the core of the investigations for milestone M4.5 will be High Speed Rail (HSR) connections between Glasgow and Edinburgh. Where HSR links were introduced in Europe, they were taken up by travellers very quickly. This is true for both business and holiday travellers, but the latter are less willing to pay a premium for the increased speed. Given that Prestwick only serves Ryanair, two Wizzair flights and two charter services, it seems safe to assume that the majority of passengers would not be willing to pay a premium for increased speed on the connection to the airport. Moreover, an HSR link to Prestwick would only serve the relatively low number of travellers on the Glasgow to Stranraer route, while an HSR link between Edinburgh and Glasgow would serve a substantially larger clientele. For these reasons, in the test bed, consideration to HSR services will only be given to the links to Edinburgh and Glasgow airport, while an HSR upgrade of the link to Prestwick will not be investigated.

What will also be excluded from the investigations for the M4.5 is a dedicated HSR link to any of the airports. Given the much greater demand for such a link on the route between the two cities and the general difficulties in getting from Edinburgh to the Glasgow airports and from the western side of Glasgow to Edinburgh airport, leaving these links as they are and then just adding an HSR link from one of the main rail stations to one of the airports, would not make any sense and, even if considered, would not provide any substantial benefits.

The fastest link of all would be a Maglev system. The suggestion to introduce one between Edinburgh and Glasgow airports, so that they could effectively operate as two terminals of the same airport, has been vented before. Some consideration will be given in the milestone M4.5 to the potential benefits of such a solution, although it is abundantly clear from the outset that this would never be financially viable and that such a route would cause any number of technical and environmental problems.

From the solutions outlined above, the investigation of Maglev is a purely theoretical exercise, but also none of the rail based solutions will be realised in the foreseeable future, and therefore the airports are looking for alternatives that could be implemented soon to improve their surfaces access. When Edinburgh airport developed their Surface Access Strategy (BAA 2007) they were still expecting EARL to go ahead and hoping that that would allow the airport to become a public transport hub. Furthermore, at the stage the Edinburgh Shuttle was still in operation. Without both of these, the new tram link will be the main means of increasing the public transport share, but the access strategy is outlining a number of other options, most notably an interchange facility for the buses that run along the nearby A8 and a taxi share scheme. Prestwick, in their Airport Master Plan, envisage the rail station and the bus stops to develop into a public transport interchange, possibly including a Park & Ride facility, as well as suggesting increased rail services.

BAA Glasgow has, following the failure of GARL, which had been the cornerstone of their access strategy (BAA 2009), commissioned a Strategic Transport Network Study from consultants MVA. The report for this study will become available in November 2010, but it will oncly contain an analysis of the problems and not yet suggest any solutions. Therefore only the relative merits of the solutions just outlined for Edinburgh and Prestwick can be discussed in M4.5, although they will not be assessed at the same level of detail as the larger rail projects mentioned before.

5.8 SUMMARY OF CONCLUSIONS

The main conclusions from this case study will be drawn in M4.5, when the Edinburgh and Glasgow airports have become test beds for new solutions. This will also include the consideration of airside aspects, more specifically of the routes all three airports serve (which ones are unique to one airport and which destinations are served by more than one of the airports) and for Edinburgh and Glasgow also a spare capacity analysis, which will allow some discussion of the flights that could be saved, if these two airports were better linked to each other. The data obtained so far shows that in practice, the potential for this is small, because the percentage of transfer passengers is very small at both airports, but consideration will also be given to the theoretical potential for the case where passenger numbers coming in from the other Scottish airport were larger.

From the solutions already in place, the two main ones that constitute good practice are the train connection to Prestwick and the high-quality express bus services to Edinburgh and Glasgow. All three attract large passenger numbers, which makes them highly profitable for the operators. Out of these, the Prestwick train service is, with a mode share of 35%, the most effective, which is certainly helped by the fact that rail passengers with an air ticket get a 50% discount for travel throughout Scotland, and if they come from certain new routes, can even travel for free on the train.

The links into regular bus services can attract some travellers. There are passenger numbers for each of the services in the public domain, but it only takes a brief period of observation at both Edinburgh and Glasgow to see that passengers are queuing for the Airlink and the Glasgow Flyer, and to a lesser extent for the Airdirect, while only very few passengers, if any, board the other services on offer. Somewhat surprisingly, the bus service from Prestwick to Glasgow also attracts some, mainly foreign, travellers in spite of the rail competition.

It is unfortunate that the demand-responsive Edinburgh Shuttle had to be abandoned in a tough economic climate, because it could not build up a client base quickly enough to make it profitable.

The taxi share that had been offered on a trial base could not attract any private customers, although one of the taxi operators does offer a taxi share to a corporate client.

From the solutions already envisaged, the one who would have attracted by far the highest number of travellers was the Edinburgh rail EARL link with 9,000 passengers per day in 2020, even though it would not have quite reached the modal share of the Prestwick train. The high passenger numbers would have also meant the EARL would have made an operating profit, even if the initial infrastructure investment had to be heavily subsidised.

Full-day passenger forecasts are not available for the Edinburgh tram system, but with 400 passengers expected to board at Edinburgh airport during the AM peak in 2031 and 300 during the interpeak, the numbers per day will not come anywhere near those for EARL. The cancellation of EARL was therefore a huge opportunity lost for Edinburgh airport, and although the tram link and the envisaged rail interchange at Gogar will certainly improve the current situation considerably, they are not in any way a like-for-like replacement of EARL.

The Glasgow airport rail link GARL would have struggled to attract sufficient passenger numbers in order for the revenue to cover at least the operating costs. The chances to attract more passengers would have been much greater, if the service had not just connected to Glasgow Central, but also to Edinburgh and the north of Scotland. The potential for this option will be considered in milestone M4.5.