Appendices

‘Fairness’ in resource allocation

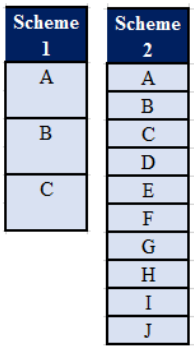
Differing aims and ideals result in different choices and outcomes. *Units or size of box refer to relative resource allocated*

Regions	Scheme 1	Scheme 2
	Units	Units
A	2	3
B	2	3
C	6	3
Totals	10	9

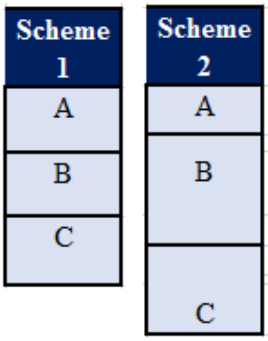
Following the notion of the greatest good for the greatest number we could end up with the choice between distributive schemes 1 and 2 where Scheme 1 delivers the overall Greatest Good, whilst Scheme 2 allows a greater number of regions to benefit and with more equal sharing

Regions	Scheme 1	Scheme 2
A	5	4
B	5	4
C	5	3
D	1	3
E	1	3
Totals	17	17

In this example Scheme 1 ensures a greater number of regions benefit more, whilst Scheme 2 puts more value on greater equality of shares



Scheme 1 offers greater good per region, whilst Scheme 2 offers greater total good but less per region.



Scheme 1 though achieving equal minimum shares also delivers smaller total good, whilst Scheme 2 offers greater good for greater number; but A may fall below some legislative minimum. If a compulsory minimum is prescribed, scheme 1 is preferred.

Regions	Scheme 1	Scheme 2
A	1	3
B	1	3
C	5	4
D	5	4
E	6	4
Totals	18	18

Given that A & B get the prescribed minimum shares in this next set of options, Scheme 1 delivers the greatest good to the greatest number of regions whilst Scheme 2 has the attraction of a more nearly equal distribution.

Regions	Scheme 1	Scheme 2
A	7	6
B	7	6
C	7	6
D	4	10
E	4	12
Totals	29	40

Scheme 1 ensures greatest number get more and smaller deviations from average, but Scheme 2 offers greatest good distributed; wider deviations from average Therefore there is a choice between more equitability and much greater good.

Regions	Scheme 1	Scheme 2
A	5	9
B	6	1 (min)
C	10	12
Totals	21	22

Scheme 1 ensure much more equitability; slightly smaller good Scheme 2 deliver slightly more good; greater overall number benefit but less equitability. Therefore there is a choice between more equitability on the one hand and greater good for the greater number on the other.

Appendix 2 – Routes, Frequencies and Timetables

The intra Scottish air services have all been subjected to review over the years, but this information need to be updated and collated under the same format for ease of understanding.

Air Service Timetable

Figure 1: This 2013 Western Seaboard PSO summary covers only the publicly supported PSOs.

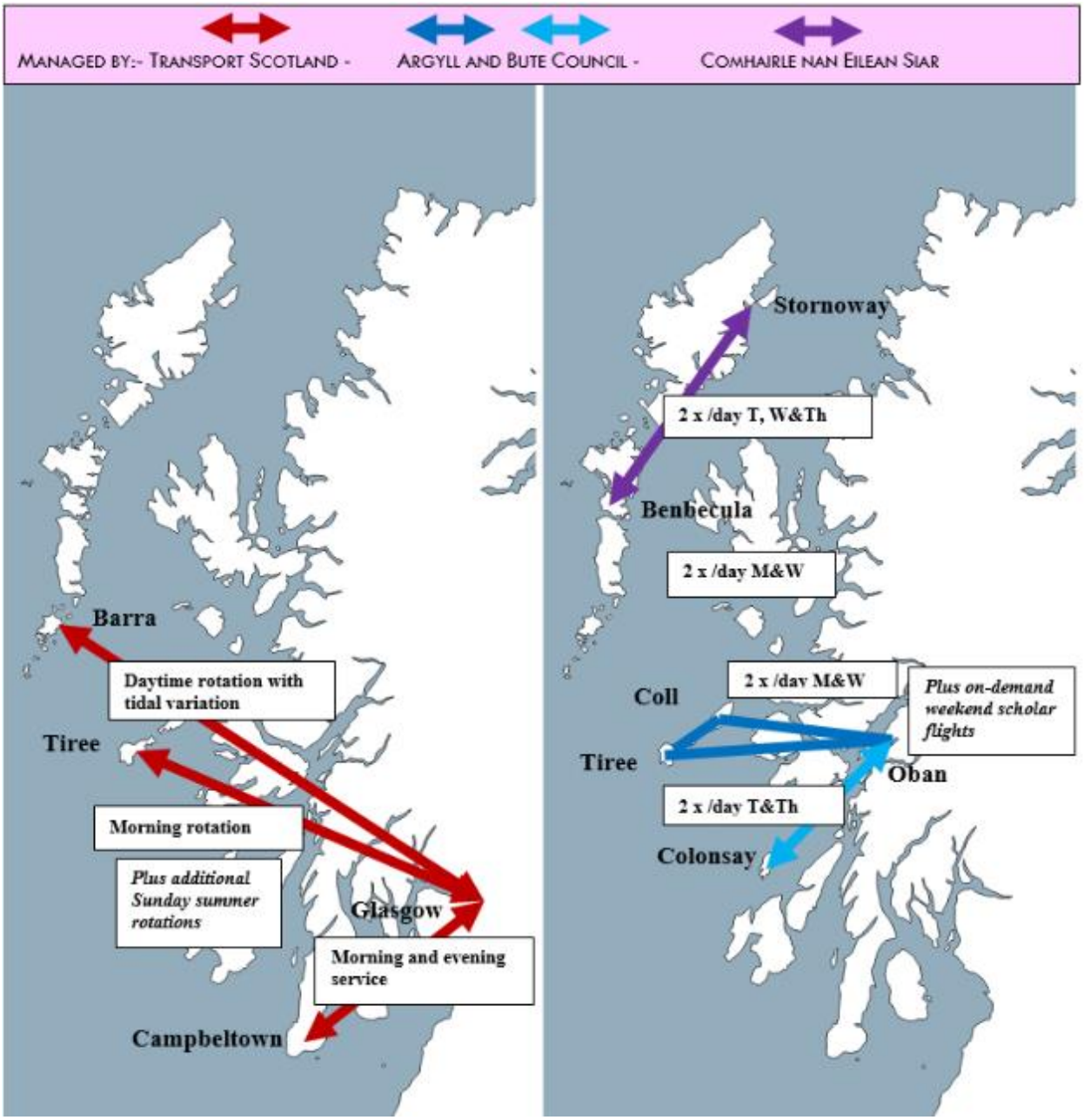


Figure 2: Orkney and Shetland Inter Island Air Service Routings (2015)

Frequencies vary by day and season.

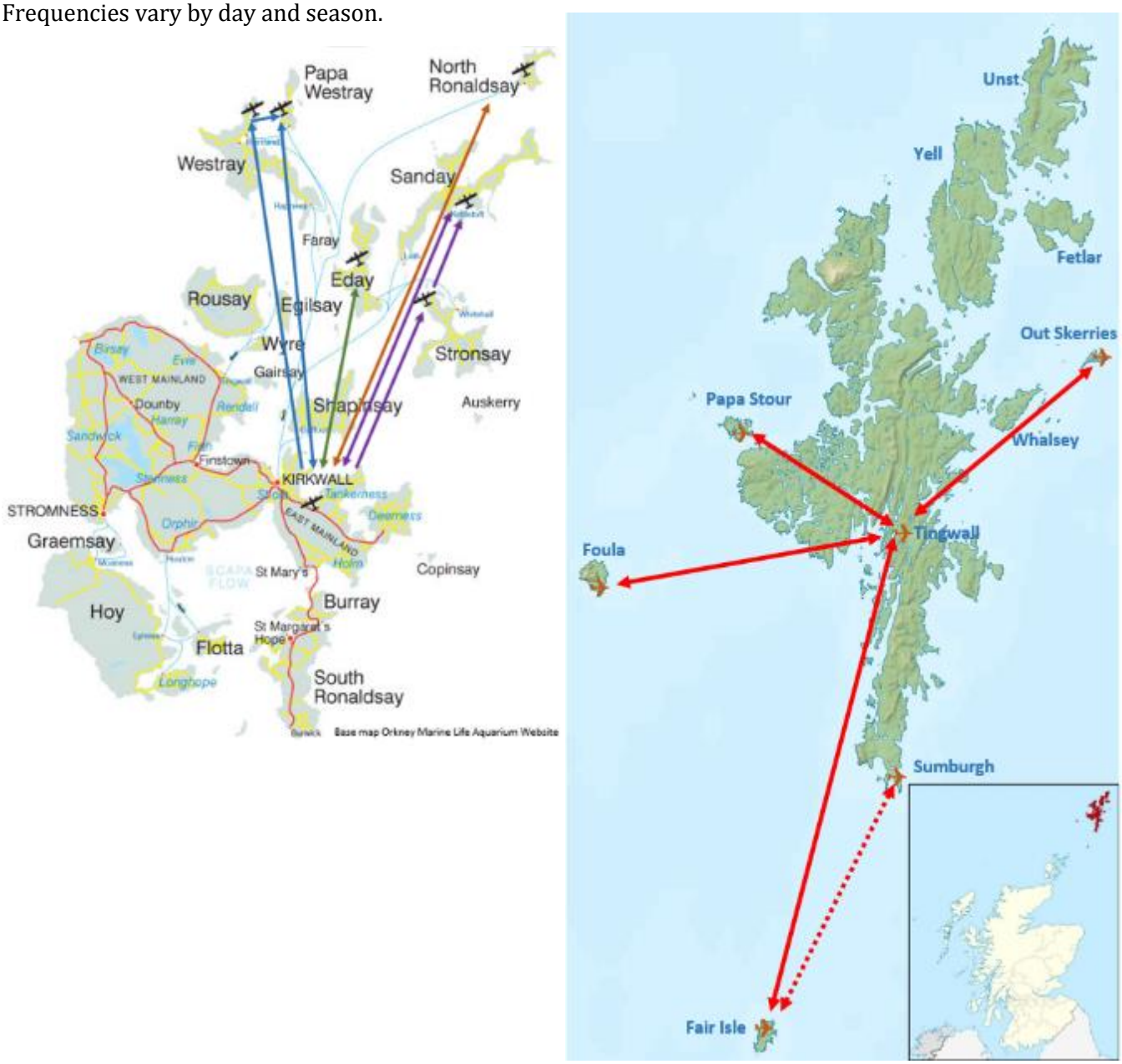
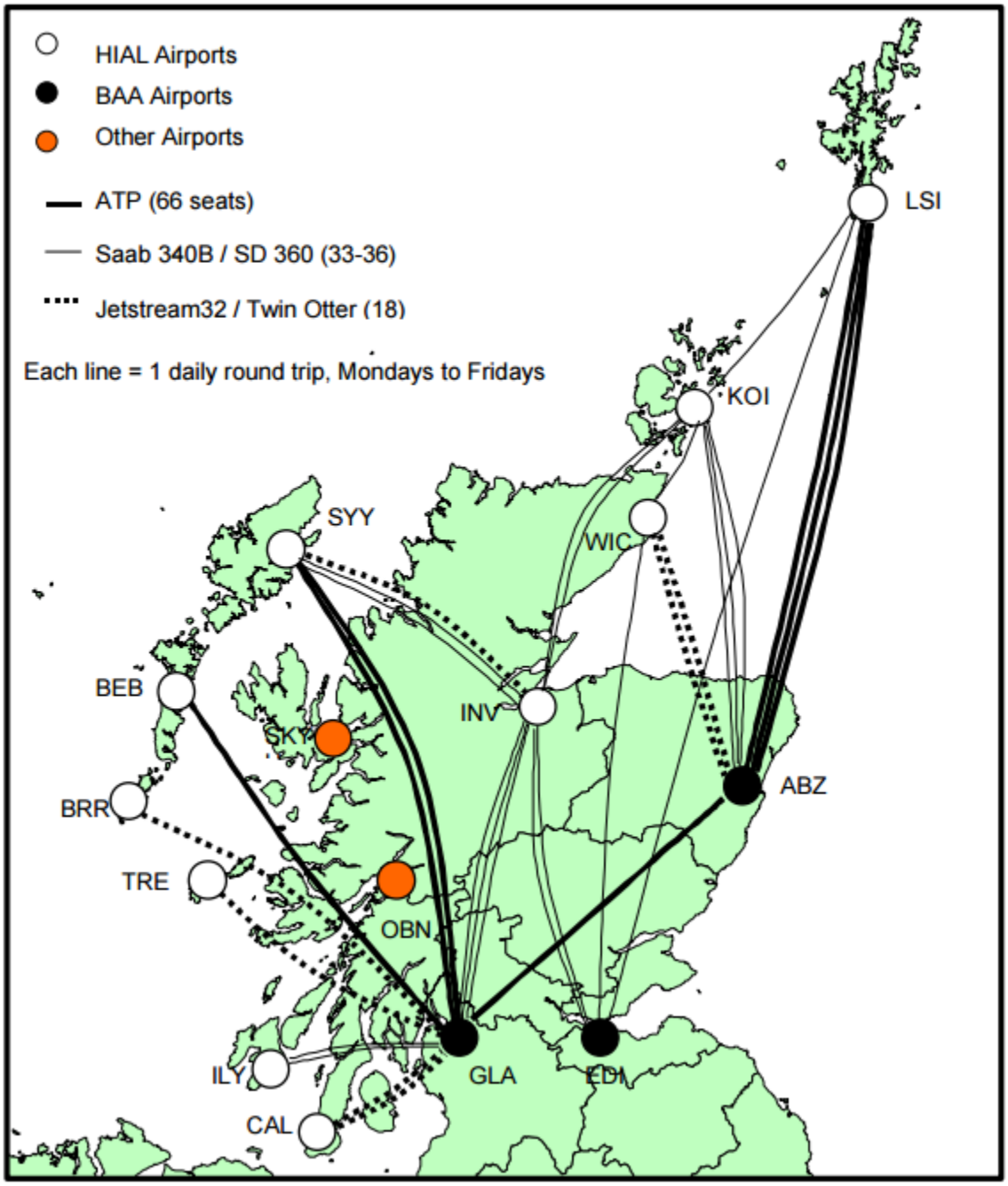


Figure 3: Island to Mainland scheduled air services operated in Nov 2001



The recent draft *Appraisal of Inclusion of All Business Travel Within the Air Discount Scheme* work examined frequency and timings on the main intra Scottish routes with a particular emphasis on their utility for business use.

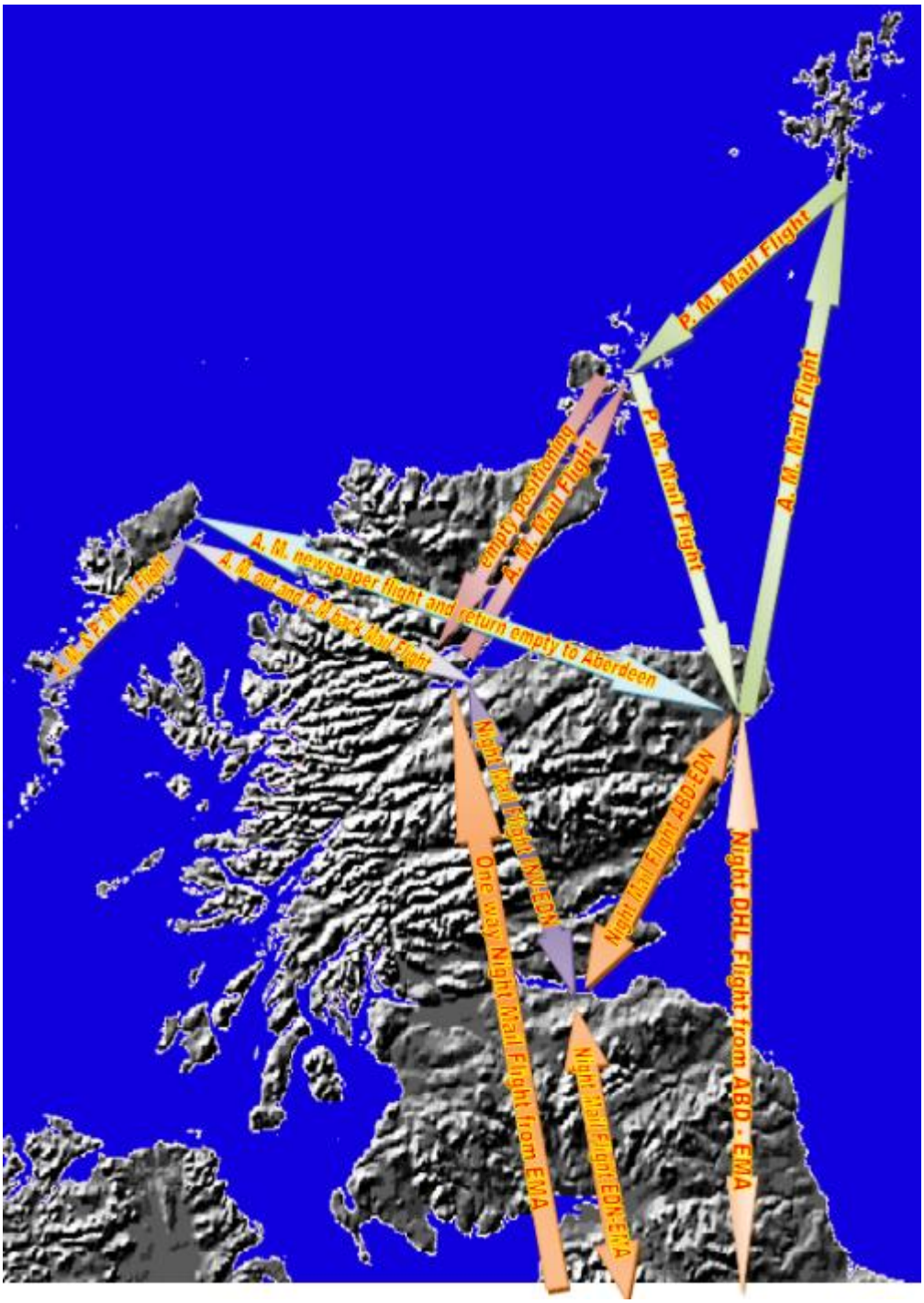
TABLE 3.1: ADS ELIGIBLE ROUTE TIMETABLES: JUNE 2016			
	Number of Days Operation	Weekday Frequency (Direct Return Flights)	Weekday Day Trip Possible (at least 5 hours before return flight)
Shetland			
Aberdeen	7	4	✓
Edinburgh	7	3	✓
Glasgow	7	2	x
Inverness	7	2	✓
Kirkwall	7	1-2	✓
Bergen	1	0	x
Orkney			
Aberdeen	7	3-4	✓
Edinburgh	7	3	✓
Glasgow	7	1	x
Inverness	7	1-2	✓
Shetland	7	1-2	x
Bergen	1	0	x
Outer Hebrides-Stornoway			
Aberdeen	5	1	x
Edinburgh	7	1-2	✓ (except Friday)
Glasgow	7	4	✓
Inverness	7	2-3	✓
Outer Hebrides-Benbecula			
Glasgow	7	2	x
Inverness	3	2	x
Caithness and North Sutherland			
Aberdeen	5	2	✓
Edinburgh	6	1	x
Islay			
Glasgow	7	2	✓

Consistency and contemporaneousness of data collection and presentation is required.

Air Cargo

This 2012 summary of H&I airfreight services needs updated because of loss of W. Isles newspaper delivery and possible other changes.

Figure 4: Scheduled Air Cargo Flights 2012



Appendix 3 - Airfields Overview- from various sources

Table 1: HIAL and ABC Airports

Airport name	Council area	ICAO	IATA	Rwy (m)	Surface
HIAL Airports	-	-	-	-	
Benbecula Airport	Na h-Eileanan Siar	EGPL	BEB	1,836	Asphalt
Barra Airport	Na h-Eileanan Siar	EGPR	BRR	846	Sand
Campbeltown Airport	Argyll and Bute	EGEC	CAL	3,049	Asphalt
Inverness Airport	Highland	EGPE	INV	1,887	Asphalt
Islay Airport	Argyll and Bute	EGPI	ILY	1,545	Asphalt
Kirkwall Airport	Orkney Islands Council	EGPA	KOI	1,428	Asphalt
Dundee Airport	Dundee	EGPN	DND	1,400	Asphalt
Stornoway Airport	Na h-Eileanan Siar	EGPO	SYY	2,200	Asphalt
Sumburgh Airport	Shetland Islands Council	EGPB	LSI	1,426	Asphalt
Tiree Airport	Argyll and Bute	EGPU	TRE	1,472	Asphalt
Wick Airport	Highland	EGPC	WIC	1,825	Asphalt
Argyll and Bute Managed					
Coll Airport	Argyll and Bute	EGEL	COL	500	Asphalt
Colonsay Airport	Argyll and Bute	EGEY	CSA	501	Asphalt
Oban Airport	Argyll and Bute	EGEO	OBN	1264	Asphalt

Table 2: Orkney Islands Airfields - All the outer island airfields are now owned by OIC.

Airport	Runway	Length in metres	Surface
Eday	07 / 25	527	Graded Hardcore
EOI - EGED	18 / 36	518	Grass
Sanday	03/21	527	Graded Hardcore
NDY - EGEJ	11/29	426	Grass
	17/35	386	Grass
Stronsay	02/20	515	Graded Hardcore
SOY - EGER	06/24	411	Grass
	10/28	404	Grass
Westray	09/27	527	Graded Hardcore
WRY - EGEW	13/31	421	Grass
	01/19	291	Grass
Papa Westray	04/22	527	Graded Hardcore
PPW- EGEP	07/25	334	Grass
	18/36	343	Grass
North Ronaldsay	10/28	527	Graded Hardcore

NRL - EGEN	10/21	330	Graded Hardcore
	14/32	376	Grass
Kirkwall	09/27	1428	Asphalt
KOI - EGPA	14/32	680	Asphalt

Table 3: Shetland Island Airfields

Airport	Shetland Runways by length	Role	Licensing
Sumburgh	15/33 1,426m / 4678 ft asphalt	A divert airport for inter-island air service and supports Saturday service to Fair Isle in summer and communicates with Islander ref. local traffic	HIAL – EASA Certificate required by 2017
Scatsta	06/24 1360m / 4462 ft asphalt	A divert airport for inter-island air service and communicates with Islander ref. local traffic	BP Exploration Operating Company Limited – EASA Certificate required by 2017
Tingwall	02/20 – 764m x 18 m asphalt	Hub of inter-island air service and provides Flight Information Service and base for operations	SIC - CAA License – EASA Certificate currently not required
Unst / Baltasound	12/30 – 640 meters /2099ft - asphalt	Closed and no role	Unlicensed and out of service
Foula Airstrip	18/36 - 548m / 1699ft - gravel	Air ground advisory service	Unlicensed but used with operator dispensation
Fair Isle	runway: 06/24 - 508x22m - gravel/dirt. runway has a distinct 'hump' in the middle which is about 6 feet higher than both runway ends.	Air ground advisory service	National Trust - CAA License – EASA Certificate currently not required
Fetlar	01/19 - 481m / 1578ft - gravel	Closed and no role	Unlicensed and out of service
Whalsay	runway: 02/20 - 460m /1500ft - The landing surface, which is 18 metres (59 ft) wide is constructed from rolled gravel.	Little ground support	Unlicensed but used with operator dispensation mainly to support Out Skerries service
Papa Stour	runway: 02/20 - 440m /1450ft - gravel	Air ground advisory service	SIC - Licensed– EASA Certificate currently not required
Outer Skerries	runway: 09/27 - 365m /1200ft – gravel (rough)	Little ground support, and shortest runway in system	Unlicensed, but used with operator dispensation

Appendix 4 - Airfield Issues

Introduction

A wide range of airport issues were identified in the consultation exercise HITRANS and Zettrans held to underpin the 2010 *Review of Air Services in the Highlands and Islands*. The majority of them related to aspects of cost, many of which are imposed upon the airport operators by other Government Agencies.

A large number of improvements was sought, most of which had significant cost implications, both capital and revenue and were not therefore seen as deliverable at that time.

Government-imposed costs

A large proportion of the operating costs of airports and airstrips in the region are necessary to meet standards laid down by central Government, and there is significant concern that many of these standards are far more exacting than a 'fit-for-purpose' requirement would be. The standards are laid down to meet the needs of major airports such as Heathrow, and then adapted to suit smaller airports and airstrips.

Examples of this are as follows:

National Airport Security Programme (NASP). In recent years, expenditure levels at airports have risen dramatically, following a large number of aviation-related terrorism incidents worldwide. While the majority of the planned increases in expenditure make sense at major airports, where large aircraft are regularly operated, it becomes less obviously necessary when local flights using small aircraft are operated from regional and local airports and airstrips such as in the Highlands and Islands.

Examples quoted at the consultations included the necessity for a security fence to be constructed around the airport on Tiree "to protect it from terrorists already present on the island"[1]. While it is not denied that somewhere along the continuum between Heathrow and Tiree a security fence will become essential such costs when compared with the average throughput of ten departing passengers a day at Tiree are very difficult to justify when – between them – airlines, passengers, the local authorities and the Scottish Government themselves have to foot the bills.

If the UK Government insists that these are proportionate measures to protect national security, then there is surely some justification for the nation as a whole to bear the costs, just as it already does for security policing undertaken on roads, railways and ferries. These costs are seen as an unfair burden on lifeline routes using 'local' aircraft, and put the industry at a competitive disadvantage where it competes with 'insecure' ferries and land modes of transport.

Civil Aviation Authority (CAA). There is no dispute concerning the CAA's application of global rules concerning the runway lengths, safety areas and surfaces concerning the safe operation of aircraft to and from even the smallest airstrip. The main associated difficulty occurs when the CAA has already allowed a derogation for a particular airfield (such as not requiring a full-length Runway End Surface Area – RESA), and changes are proposed which effectively lengthen the

[1] A Review of Air Services In the Highlands & Islands Mott MacDonald 2009

runway. The CAA may then terminate the derogation which effectively negates the point of extending the runway.

Of more concern are the application of Rescue and Fire Fighting Standards (RFFS) at small airstrips which are seen to be disproportionate to the requirement. Examples quoted include the need for two or three firemen to meet every scheduled Islander flight at even the smallest of outer island airstrips. On islands such as Foula with a total population of around 40, finding qualified part-time firemen to meet the six weekly flights is in itself a difficulty, apart from the extra cost that this implies. However, if the flight is declared to be a charter flight rather than a scheduled flight, the firemen are not deemed necessary. Either it is necessary to protect the lives of up to nine passengers, or it is not – the nature of the ticket purchased is not seen as a logical determinant.

Secondly, the number of firefighters required is determined partly by the length of the aircraft fuselage, not the number of seats on board. It is anticipated that if the Cessna Caravan replaces the Islander aircraft, its very slightly longer fuselage will necessitate the category of firefighting equipment and number of firefighters to rise, as the aircraft length puts it in RFFS Category 3 rather than RFFS 2, despite both aircraft carrying a maximum of nine passengers. On a more prosaic level for instance it is difficult in certain island locations to easily employ able bodied personnel who can confidently pass medical and associated tests.

70 seat buses, 40 seat coaches, up to 1,000 seat trains and varying sizes of ferries are all required to have fire-fighting equipment on board – as are aircraft – but not to have trained firefighters at their en-route stops or their terminals, although they possibly exist at major rail stations and ports. The CAA requirements are that firefighters should reach an incident on the airport or airstrip within three minutes, although there is no such requirement on the local firefighting service if the aircraft should land just outside the airport boundary.

This would not matter, were it not for the fact that firefighting equipment and the payments to firefighters form a major part of the total airfield and airstrip costs.

Many of those consulted in the HITRANS / Zettrans study were in agreement that the safety costs at all airports should be 'fit-for-purpose' and be reasonable when compared with all other risks taken by travellers, notably on travel to and from the airport. It was stated that no passenger had been killed in an accident at any Scottish airport or airfield since the Second World War, although no information was available on the number of lives that may have been saved by the firefighters.

National Air Traffic Services (NATS). NATS increased its rates significantly in 2009/10 as it seeks to redress under-recovery in earlier years. In addition, NATS has been discussing the concept of moving from an en-route charge based loosely on the weight of the aircraft (and benefiting the small aircraft that fly in the region) to a flat per-movement fee for navigation service charges – that is, a Saab SF340 requiring assistance from NATS being charged the same rate per mile as a B747 or an A380.

NATS, in association with the CAA, are also responsible for determining which landing aids should be permitted for UK aviation. The standards of accuracy now available through the use of GPS or GNSS (Global Navigation Systems) ought to be able to bring down the cost of necessary aids at airports for use by aircraft in poor weather conditions or at night. Such usage is commonplace in many advanced nations, and the CAA is slowly permitting its use, initially at General Aviation airfields. For the moment, airlines are still dependent on Instrument Landing Systems (ILS) at major airports such as Inverness and Kirkwall, but the expense of installation is prohibitive. GPS is

more accurate than the non-directional beacons (NDBs) available and used at all airports. There is scope for significant reduction in airport costs once GPS becomes accepted.

It should be recognised that NATS for the most part is now a private monopoly Air Navigation Service Provider (ANSP). As such the regulatory oversight should ensure that it does not abuse its position, particularly in areas such as the Highlands and Islands where its charges have a disproportionate adverse impact.

Many parts of the world allow commercial charter and scheduled operations to operate into airfields without any formal ANSP / ATC (Air Traffic Control) cover. In some cases the requirement is for procedural radio calls. In others a reduced level of ATC cover is provided through Flight Information Service (FISO) or even Air-to-Ground radio services (AG). This latter FISO and AG provision is prevalent with UK CAA agreement at a number of UK airfields, including the acceptance of FISO cover at Barra for the scheduled Twin Otter operation. With a FISO service, there is a trained Officer in the Tower who provides pilots with known information on weather, wind speed and traffic. Such a service cannot however instruct a pilot on a particular course of action or issue a Clearance to land or take off. That authority is only vested with a qualified Air Traffic Control Officer (ATCO). It does however mean that at airports with very low traffic throughput, the basic information that pilots need to depart or arrive safely can be given but the final authority remains (as in the final analysis it always does) with the pilot, but at a much lower cost.

This system could be extended to other parts of the Highlands and Islands region or at specific low traffic times. This would be assisted if it could be ensured that all parts of the region could offer positive radar cover down to say 5000 feet, allowing for the prevailing terrain, and also that the impending carriage of Mode S transponders (which assist in Terrain Collision Avoidance System or TCAS alerts) was made mandatory in the region for all aircraft types, not just commercial and most GA.

Airport runway capabilities.

Runways - current operations. Of the various airports throughout the region, there are few that are not suitable for the current operations. **Out Skerries** in the Shetland Islands suffers from having a gravel and asphalt strip of only 381 metres: as a result, it is often unable to accept a fully-loaded Islander, with the result that some of the four weekly flights from Tingwall have to make a technical stop at the 457 metre strip on Whalsay, and ferry passengers to and from Out Skerries three or four at a time. It is believed that there are no firefighting capabilities on Whalsay at such short notice.

Runways – proposed operations. The main concern is that, if the Islanders are to be replaced by the nine-seat Caravan, many of the island runways will require to be lengthened to around 600 metres to allow fully-loaded aircraft to take off on warm, airless days with wet runways. The runways that will need to be lengthened if at all possible will be:

Shetland Islands – Out Skerries (381 metres), Papa Stour (538 m), Foula (454 m), and Fair Isle (486 m). The runway at Lerwick-Tingwall is sufficiently long at 764 m. Other airports on the Shetland Islands not currently used by scheduled services are Unst (630 m), Fetlar (481 m) and Whalsay (457 m). It should be noted thast the Out Skerries service is currently discontinued owing to lack of fire cover at the destination.

The **cost and availability of aviation fuel** is also an issue across the Scottish airfield system.

Figure 5; *Lerwick-Tingwall*

Orkney Islands – apart from Kirkwall, all current scheduled airstrips would need to be lengthened: North Ronaldsay, Papa Westray, Westray, Sanday and Eday are all currently at 467 m, and Stronsay at 515 m. Further detail can be provided by the Orkney Islands Council airfield superintendent.

Figure 6: North Ronaldsay

Argyll and Bute – Coll and Colonsay have recently been re-constructed at 500 metres, and would need lengthening.

The cost of such lengthening need not be unduly expensive – what is needed in most circumstances is the provision of extra clearway, a level area with a reasonably firm surface such as grass or gravel. However, the specific location of some of the airstrips, such as at Out Skerries, make such lengthening expensive or impossible.

Other airport capabilities.

Runway Lighting. One of the major problems with the operation of scheduled air services in the Highlands and Islands is the very short operating day available in winter (with a minimum of fractionally over six hours in the Shetland Islands) unless aircraft are able to be operated at night and airstrips are lit. All the current aircraft in operation in the region are able to operate at night, and it is expected to be a relatively short time before the Caravan aircraft types are also permitted.

All the HIAL airports are provided with sufficient lighting to enable night flights to be made apart from Barra – it could be a lengthy process before the CAA would sanction the use of the tidal airstrip at night if lighting were to be provided.

It is still to be determined when or whether the CAA is likely to permit the use of lit water aerodromes for scheduled air services, even though such practices currently exist overseas, but the initial expectation is that it will be some time before such practice is allowed in Scotland.

The important point to notice is that not all airstrips need to be provided with the necessary night landing facilities for a whole region to benefit. For example, in the **Shetland Islands**, providing the high frequency service to Fair Isle with lighting would enable improved morning and afternoon schedules to be operated to the other three airstrips. Unst already has a lighting system in place which may need to be upgraded if services are re-commenced.

The timetable was enhanced from 2013 to permit a longer day at North Ronaldsay, even in the winter, because of the Precision Path Approach Lights that were installed at the airfield, which permits Loganair to undertake VFR night flying. However in the winter the standard procedure is that if the weather looks like it will be above limits (which are lower, according to Loganair's procedures, during night-time as opposed to daytime VFR flying) then the service is brought forward to 14:00. It should be noted that not all night flights from North Ronaldsay are automatically brought forward to 14:00 – services can operate to North Ronaldsay at 16:00 on 26 October to 10 November timetable (based on 2015) without affecting other services and 14:00 on 11 November to 18 January and then back to 16:00 on 19 January to 14 February. Unfortunately, in deep winter this has proved to be an apparently increasingly frequent occurrence. It should also be noted that Hebridean (another BN2 operator) do not change their performance limits for day and night time flying.

From figures supplied, it appears that over the three years charted, this occurred frequently. The 2014/15 season was particularly windy but the statistics appear to demonstrate that the occurrence progressively worsened over the sample period

If weather cancellations even of the afternoon flight and no patronage flights are also included, reliability reduces to 21%; 27% and 41%. This high level of disruption has had two effects. On many days in the winter, the effort to extend the day has resulted in a curtailed day, as other timetable commitments have made the previously enjoyed later afternoon daylight slot being now unavailable. This causes disruption to teachers and others who have to leave earlier than they would prefer. The underlying ambition to achieve a full time day's work at either end of the route was an attempt to extend the realistic daily commuting reach of the mainland for outer island residents.

Is this an example of the best being the enemy of the good? This initiative has only been partially successful and the numbers actually adopting a commuting lifestyle are anecdotally very few. As a result some are now requesting that the last flight be brought forward to daylight hours again, which unfortunately would have a negative effect on the timetables to other destinations by bringing them forward also, and would also nullify the considerable investment already made in the lighting equipment installed at North Ronaldsay.

In the **Orkney Islands**, the island of North Ronaldsay is capable of taking night flights following the introduction of lighting which has increased the timetable for the whole network. In **Argyll and Bute**, the provision of lighting at Coll would solve one of the major problems of this area – taking scholars to and from Oban High School – and would benefit from joint operations with Tiree, which is already lit. Runway maintenance such as white lining at Argyll isles strips can be a real challenge. There may be potential for better trans Scottish sharing of the hire or purchase of very expensive airfield maintenance processes or equipment.

Specific Airport Issues - Shetland Islands

The following issues were identified in the 2010 Review with respect to specific airports in the Shetland Islands.

Sumburgh. The airlines commented on: severe constraints posed by the restricted opening hours; the high cost of aviation fuel; the security costs and high number of security personnel; overmanning generally; the inability to operate the airport with just FISO cover; and the need for Scatsta to be accepted as a diversion airport. The passengers commented on the 'poor' bus service to Lerwick, although the cost is low. An X-ray screening facility is required for cargo if growth in that market is to be encouraged. No major problems were raised that require capital expenditure, although opening the airport for longer hours would probably require additional revenue support.

Fair Isle. Loganair cancelled its series of flights from Kirkwall when persistent fog for several days caused the airline to have to compensate its passengers under new EU rules regarding flight cancellations. Residents are also concerned about the prevalence of strong crosswinds affecting regularity of service. There were no complaints regarding the lack of winter early morning and late afternoon flights – this is regarded as 'part and parcel' of island life.

Out Skerries. The operational difficulties caused by the very restricted runway length are discussed above. It may not be feasible to increase the runway length to even 450 metres for the Islander let alone the 600 metres needed for the Caravan, unless an alternative location can be found.

Foula. The difficulty of finding sufficient firefighters was discussed above.

Shetland Island Airfield Accountable Management was identified as a key issue in the 2016 inter island Transport review

The current use of unlicensed airfields and local airport trusts is probably unsustainable in the longer term and SIC should prepare a coordinated migration plan for those airfields that are considered for long term retention in service. Foula and Fair Isle seem secure – Papa Stour and Out Skerries need to be confirmed as holding that status.

SIC should consider rationalising the management and licensing of all the airfields in the inter island system (apart perhaps from Fair Isle which NTS have the organisational resources to run), and relieving the island trusts (where applicable) of their accountable management responsibility.

Airfield licensing is a current and pressing consideration and it is recommended that this issue begins to be attended to with a medium term strategy towards full licensing of all selected airfields.

Additionally Rescue and *Fire* Fighting Services (RFFS) was explored in some detail. Both Out Skerries and Foula have had human resource issues connected with their RFFS teams, and the fire tender in Foula suffered from lack of garage protection. The other islands although recently more robust could also face similar challenges in the future. Recruitment, in service training and retention all present challenges. A Shetland wide approach may prove appropriate.

If SIC takes overall responsibility, they could design a 'career' path for island firefighters that perhaps could be combined with other roles to deliver a reliable job that was valued and sought by

islanders. Unfortunately this may require additional resourcing in terms of pay and conditions, or a redesign of key council functions on islands to solve various responsibilities in new ways. It is not satisfactory that island air services which have been supported by significant historic and current investment, are then suspended owing to lack of local RFFS cover.

Shetland Island Airport Infrastructure is in need of investment. In Orkney for instance all the outer island airports have a similar airport terminal design which consists of a combined watchroom, office, waiting area, unisex toilet and small garage for lockers and tools, but not large enough to house the fire tender.

They have now committed to an upgrade where a new garage is being built in North Ronaldsay with the intention to roll this out across the six airfields. Once completed this will allow the old building to be reconfigured with the aim that eventually the watchroom / office will be segregated from the passenger area, with more modern WCs and heated lockers for staff Personal Protective Equipment (PPE) (to dry them). The cost of the current garage being installed at North Ronaldsay is £279,000, although this will vary from island to island because of logistical variations to support the build.

The situation in Shetland is much more mixed. Tingwall has a significant terminal building with the intention to upgrade facilities for both staff and passengers, and upgrade its functionality with a watchtower. The other airfields have little or nothing beside the runway, and because they are often essentially in isolated spots the need for infrastructure at the airfield itself is not necessarily critical. However a check list of key requirements will include a garage for the fire tender and heated PPE storage, and ideally a place where passengers can wait in comfort particularly, when there are delays. This could be at the airfield, or a very short drive away.

Another key issue currently under review is an update on the cost and utility of running the inter island PSO service from Tingwall, or a possible move to Sumburgh. This review is prompted by the imminent need to spend significant sums on Tingwall (runway resurfacing, Watch Tower installation and the looming requirement for a Terminal upgrade). All the issues are being reviewed before committing to this investment. This issue was considered in 2012 which was informed by a Community Survey which strongly favoured the continued use of Tingwall, because essentially of its proximity to Lerwick. Nonetheless it seems that there are financial and other attractions in a move to Sumburgh and the Council will need to decide on this potentially contentious issue in the coming year.

Specific Airport Challenges – Orkney Islands

Some recent work on the Orkney inter island Air Services has been undertaken and can be found on the HITRANS website at http://www.HITRANS.org.uk/Corporate/Research/Air.

Kirkwall. Extended opening hours were requested, especially on Friday and Sunday evenings to attract inbound weekend break tourists, requiring an increase in revenue support. No other problems were raised, following the introduction of ILS and the greatly improved terminal building. Kirkwall would also benefit from having X-ray cargo screening equipment to allow the Saab 340B to be used for cargo flights to the mainland.

North Ronaldsay. The experience of introducing runway lighting at North Ronaldsay has not led to a very positive outcome (see box above). A new garage (for fire tender) is being built in North Ronaldsay with the intention to roll this out across the six airfields. Once completed this will allow the old building to be reconfigured with the aim that eventually the watchroom / office will be

segregated from the passenger area, with more modern WCs and heated lockers for staff Personal Protective Equipment (PPE) (to dry them). The cost of the current garage being installed at North Ronaldsay is £279,000, although costs will vary from island to island in Orkney because of logistical variations to support the build.

Papa Westray. The identical needs of Papa Westray in 2010 suggested a similar lighting solution to North Ronaldsay would potentially provide an improved set of winter schedules to all islands. With these two critical airstrips so equipped it was then speculated that it should not be necessary to provide lighting at the other five islands, all of which are better served by ferries. Subsequent experience causes reason to doubt this optimism and this way forward.

Specific Airport Challenges – Argyll and Bute

Tiree. The requirement for a security fence has already been mentioned. No other problems were raised.

Oban. Although the runway length is adequate for the region's needs, the airport might still benefit from improved navigation aids and lighting, although the need for a curved approach to avoid high ground makes each of these difficult to achieve. It may also be required to erect a security fence if larger aircraft are to be permitted to use it. It is recognised that Argyll and Bute Council have limited funds and are already burdened by a 20 year loan for its recent airfield improvements. Although it was noted that there are no cargo facilities, there was as yet no obvious requirement.

Coll. Islanders are disappointed that the runway is not long enough to cope with the air ambulance aircraft. There would also be a benefit from lighting to permit scholar flights in winter to take place shortly before and after school hours in Oban. The cost of such equipment would in all liklihood be similar to that of North Ronaldsay.

Colonsay. The same runway length issued was also raised here.

Specific Airport Issues – Highland

Skye. There have been several studies into reintroducing scheduled passenger flights between the Central Belt and Ashaig Aerodrome, Broadford. The current range of options would appear to be:

- To partially upgrade the Broadford airstrip to accept Grand Caravan aircraft with 13 seats or the Twin Otter with 18;
- Fully upgrade the airstrip to 1,300 metres to accept 30-50 seat aircraft;

Appendix 5 - Punctuality and Reliability

Based upon data on reliability supplied by Loganair and data on punctuality (time off chocks) supplied by HIAL we have been able to prepare the following analyses. Reliability refers to whether the flight was operated, delayed or cancelled, and Punctuality refers to the difference between the flight's scheduled departure time and the flight's actual departure time.

Table 4: 2014 & 2015 Punctuality Statistics for each HIAL Airport (Delays of 15 mins+)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
PERCENTAGES		0-5		6-10		11-20		21-30		31-40		40+	COLOUR	KEY
Barra	25%	12%	21%	32%	14%	19%	12%	28%	23%	42%	24%	33%	23%	2014
Barra	78%	19%	32%	33%	25%	29%	17%	20%	15%	35%	38%	20%	28%	2015
Benbecula	16%	14%	16%	14%	12%	22%	21%	15%	20%	19%	15%	40%	19%	2014
Benbecula	41%	20%	21%	17%	23%	25%	22%	19%	26%	29%	34%	28%	25%	2015
Campbeltown	7%	8%	2%	2%	1%	13%	5%	10%	6%	16%	8%	19%	8%	2014
Campbeltown	21%	10%	17%	19%	10%	21%	10%	20%	9%	24%	37%	15%	18%	2015
Inverness	19%	11%	15%	10%	11%	18%	21%	16%	20%	15%	25%	33%	18%	2014
Inverness	31%	18%	21%	17%	20%	19%	23%	21%	25%	25%	30%	10%	23%	2015
Islay	17%	13%	15%	10%	13%	28%	16%	17%	19%	31%	18%	33%	19%	2014
Islay	41%	13%	25%	31%	26%	24%	25%	23%	18%	19%	36%	29%	25%	2015
Kirkwall	17%	11%	24%	12%	20%	26%	19%	15%	20%	15%	11%	34%	34%	2014
Kirkwall	25%	14%	30%	19%	16%	16%	21%	20%	23%	20%	19%	15%	20%	2015
Stornoway	16%	6%	12%	15%	14%	23%	19%	19%	20%	15%	14%	37%	18%	2014
Stornoway	33%	17%	22%	16%	19%	22%	22%	19%	25%	24%	32%	17%	23%	2015
Sumburgh	25%	20%	18%	22%	25%	34%	30%	18%	23%	28%	22%	45%	26%	2014
Sumburgh	37%	23%	28%	23%	20%	26%	29%	16%	24%	26%	32%	19%	25%	2015
Tiree	13%	25%	0%	15%	30%	21%	24%	24%	10%	31%	16%	29%	20%	2014
Tiree	34%	21%	19%	23%	15%	33%	17%	25%	21%	45%	32%	40%	27%	2015
Wick	7%	8%	15%	18%	21%	25%	26%	38%	46%	22%	14%	20%	22%	2015
Wick	30%	17%	31%	15%	12%	20%	32%	12%	38%	10%	8%	0%	20%	2015

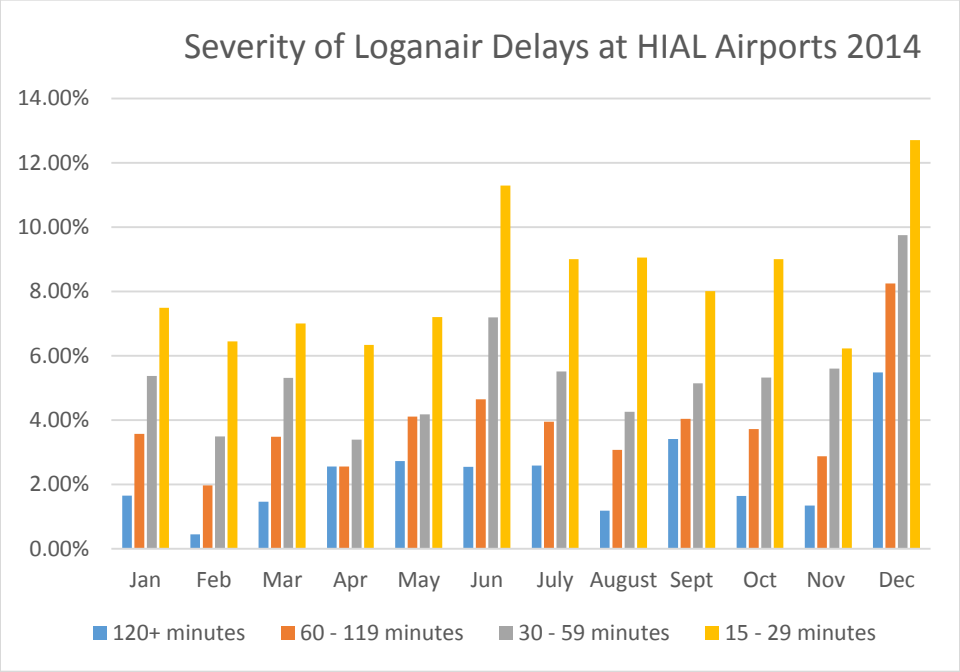
NB: December 2015 statistics are not fully complete. Eastern's performance of ABZ-SYY and ABZ-WIC was not included in this snapshot.

This data does demonstrate a significant amount of timing delays (exact length not covered here) over a cut off of 15 minutes. The table illustrates in some detail the punctuality of Loganair's flights at HIAL airports. Seven of the ten airports reported an increase in delays of 15 minutes or more in 2015 compared to 2014, with Kirkwall, Sumburgh and Wick the few airports reporting an increase in on-time flights.

Nevertheless airlines should be aiming for 95%+ punctuality dispatch rates. Some caution is required in interpreting HIAL figures as these may refer to departure times rather than off chock times, and aircraft can often be held by ATC outside of the operator's own control.

A delay of 15 minutes is not too serious as onward connections and business plans should not be compromised. However it is the longer delays that are most disruptive and concerning and these will tend to be more closely associated with technical problems and typically take more time to rectify, and sometimes involve a replacement aircraft being deployed. We were able to analyse HIAL data for 2014 and 2015 with the following picture emerging.

Figure 7: Severity of delays 2014



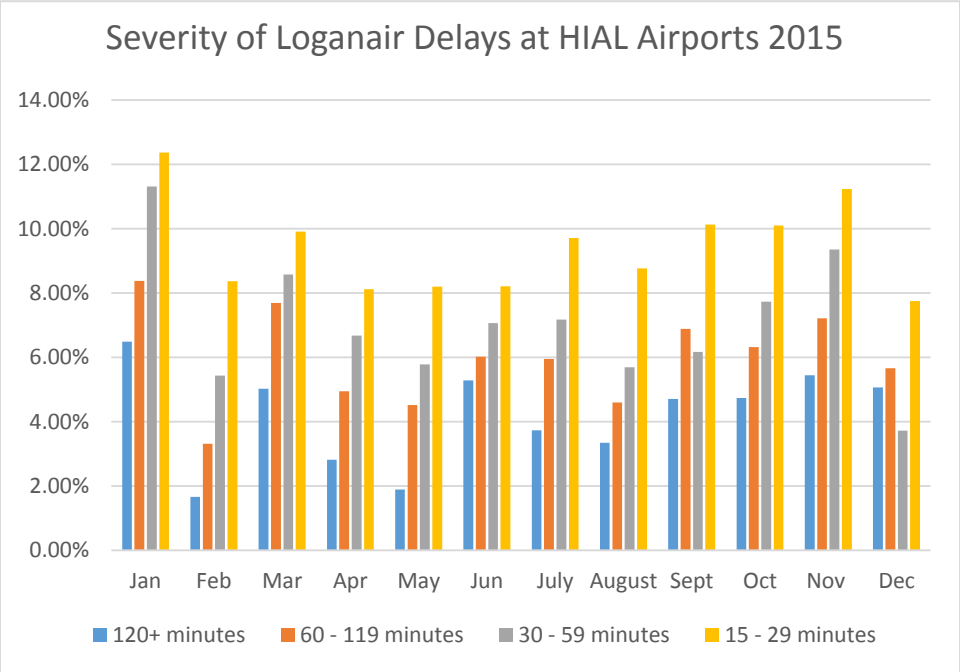
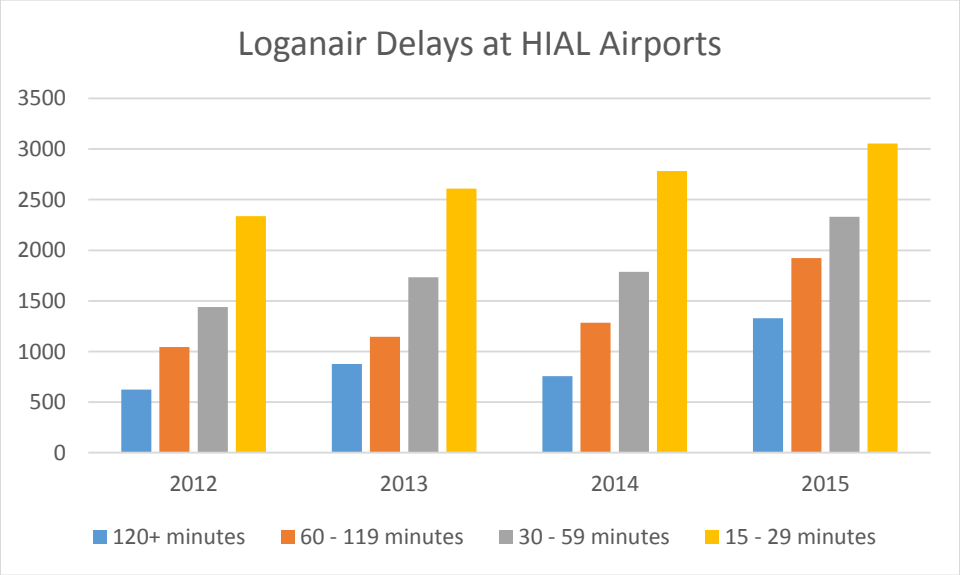


Figure 8: Severity of delays 2015

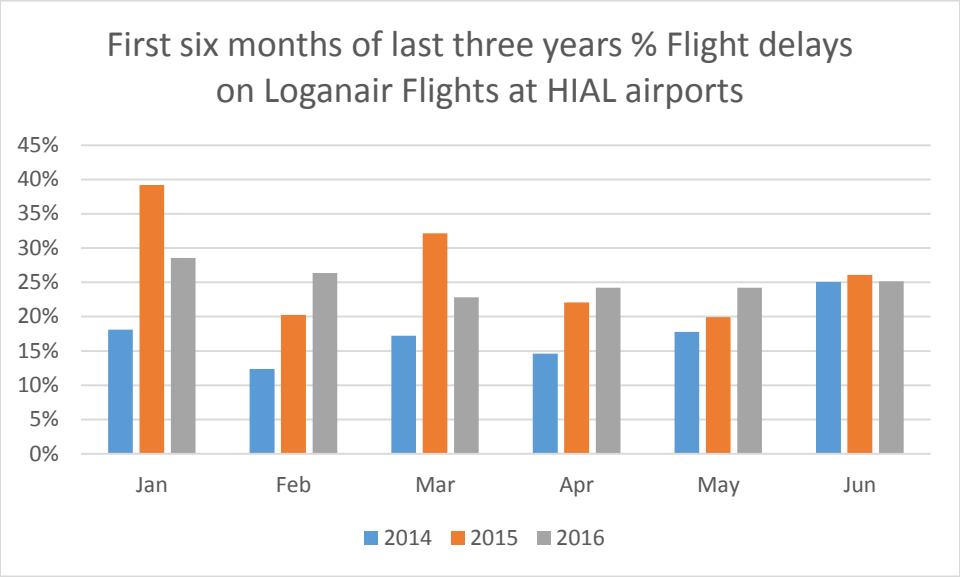
No clear picture is apparent, except that longer delays appear to have increased in 2015 over 2014. However another analysis (averaging the year's delays by severity) captures an apparently clearer picture, suggesting that all delays have increased in number and severity over the survey period. Once again caution with what HIAL figures are actually measuring is required, but prime facie the trends do not look positive.

Figure 9: Delays over last four years



As this report was being finalised some more recent punctuality data was able to be analysed which covered the first six months of 2016. The point of interest was what trends in punctuality were doing. The high level comparison of the first six months of the last three years seems to indicate that the worst winter punctuality was experienced last year whilst spring punctuality is the same or slightly worse than previous years – a mixed picture. However this high level percentage does not dig into the severity of the delays or the reasons thereof.

Figure 10



By sampling two months (January and June) we can gain further insight into the severity of the delays.

Figure 11

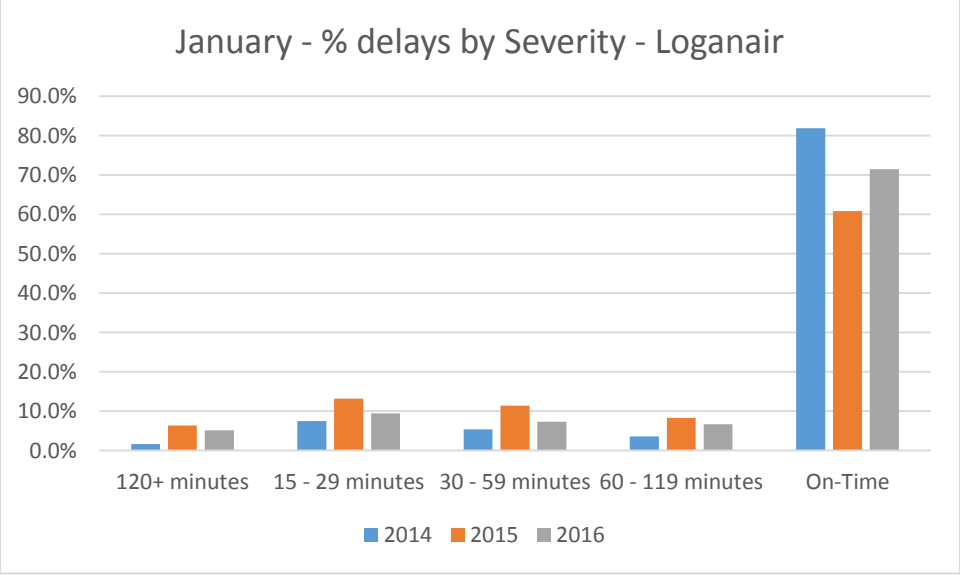
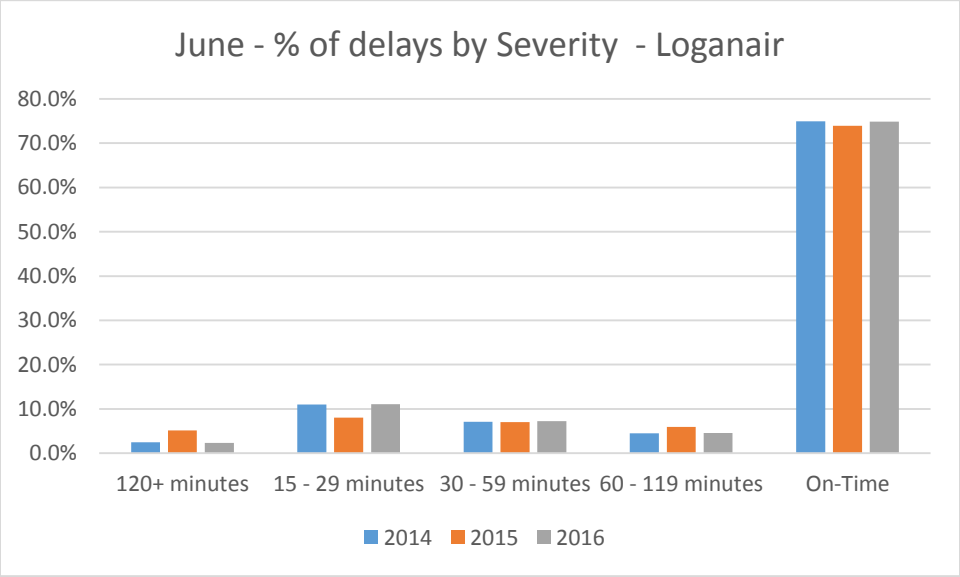


Figure 12:



The general impression was that 2015 was the worst year for delays, but 2014 appears the best and 2016 somewhere in between. Possibly a dip and then partial recovery.

Please note that consistent Punctuality and Reliability data has not been collected in an accessible way on the Scottish BN2 Island inter island PSOs.

Appendix 6 - Perceptions

Islands Air Connectivity Survey – undertaken by SCDI between 10th December 2015 – 3rd January 2016

Many of the issues identified in the report relate to the airline operators. However, there are also questions raised over what more can be done to improve the operation of air services. The earlier de-icing of island runways could improve the punctuality of morning services, and greater flexibility and customer engagement at our larger mainland airports could improve the customer experience for passengers.

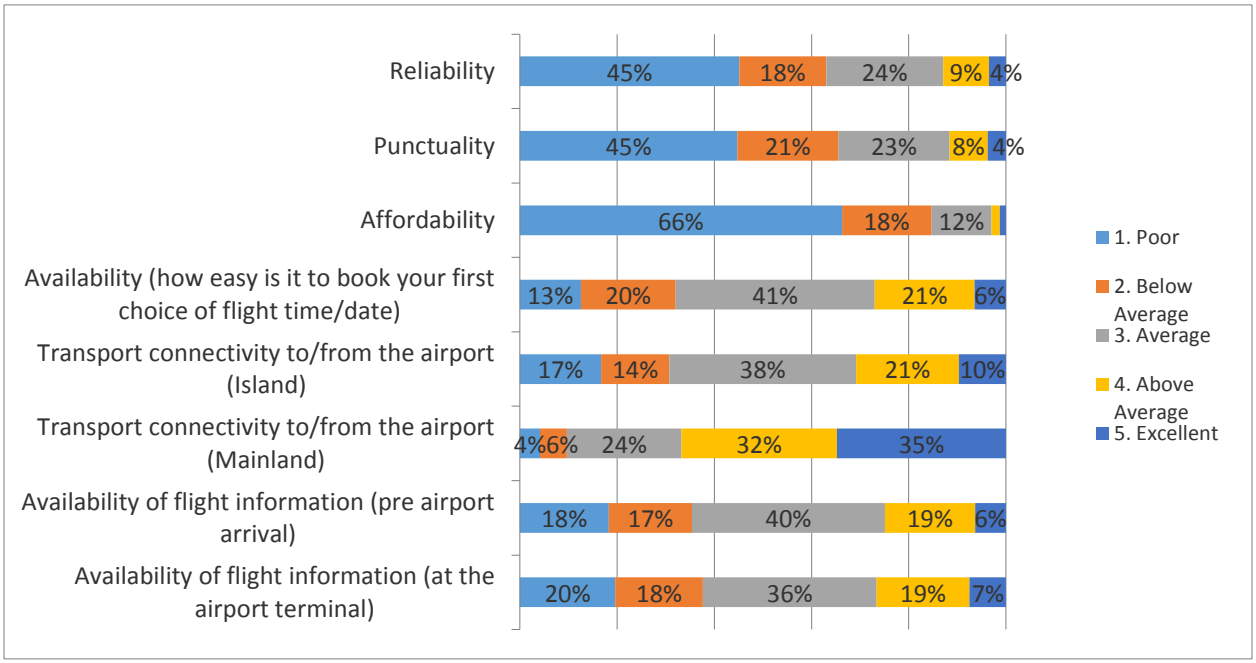
Many of the respondents to the survey highlighted the challenge of missed hospital appointments and extensive delays to treatment as a result. Whilst air service reliability is a key part of this, there seems a clear need for greater flexibility to be shown on the part of hospitals towards island patients.

Numerous respondents commented on the helpfulness and commitment of airline and airport staff, but there was clear frustration over communication with passengers and how the flow of information makes its way to passengers, and it was welcomed to hear that this is an issue that has been taken on board.

Whilst this survey is just a snapshot of user experiences taken at a particular time, the hope is for the results to feed into wider discussions over the importance and value of these air services, ensure their lifeline nature is recognised

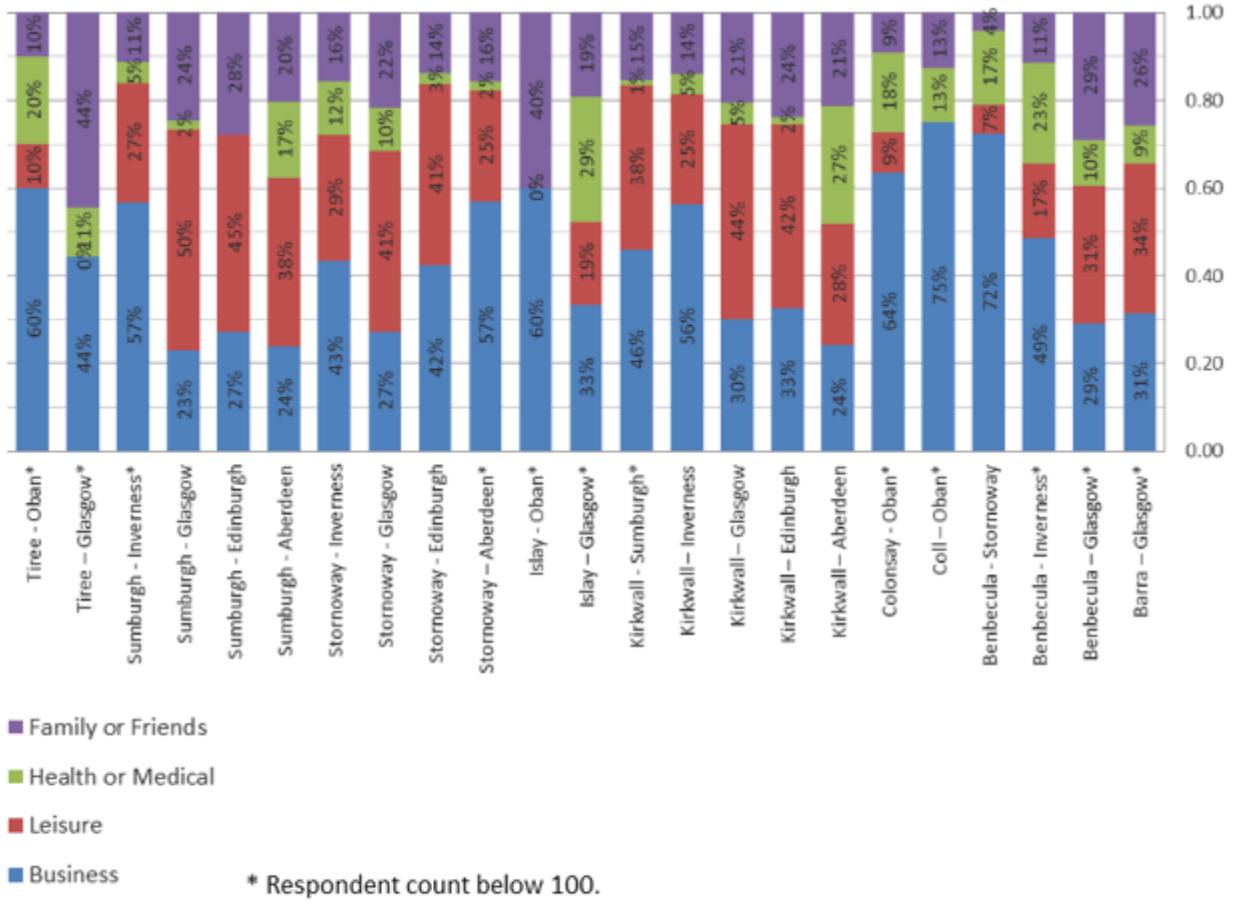
We select two of the most interesting results to inform this scoping exercise.

Q. Thinking about the route you've used most often over the past 12 months how would you rate your overall experience from 1-5?



Reliability, punctuality and affordability do show up as three major concerns.

Q. Which Air Routes have you used in the last 12 months?



It is apparent that business use is very important on many routes – higher than typical arteries on more major UK spinal routes.

Table 5: Typical domestic business leisure mixes

Other airports business leisure split on domestic routes CAA 2013		
	Business	Leisure
EDI	45%	55%
GLA	43%	57%
INV	31%	69%
NCL	33%	67%

The importnance of Health, Leisure and VFR also underlines the social inclusion, lifeline and tourism aspects that are often also used to justify public support.

Appendx 7 - Affordability and Funding

Introduction

One of the frequent refrains reflected both in the responses to the questionnaires and during the consultations held for the 2010 *Review of Air Services in the Highlands and Islands* is that fares for passengers (and rates for cargo) are far too high for a region of Scotland with below average incomes and a heavy reliance on air (and sea) transport.

The causes are many and well-rehearsed, but in summary they are:

- poor utilisation of expensive airport assets
- poor utilisation of expensive aircraft assets
- insufficient demand to deliver economies of scale savings
- the use of small aircraft with high seat-mile costs
- a lack of both airline and airport competition, including fuel provision
- high fixed airport costs to meet regulatory standards

This situation is recognised by the Scottish Government and the various regional bodies, and as a result, a variety of subsidies has been designed to mitigate some of this exceptional cost.

These subsidies are variously paid direct to the airports, to the airlines and to the passengers. In the case of Airport Passenger Duty, the UK Government provides a subsidy by not charging certain passenger groups.

Because of this variety, it has been found necessary to analyse the fares and charges problems by several route categories:

- Public Service Obligation (PSO) routes
- Air Discount Scheme (ADS) routes
- Route Development Fund (RDF) and other subsidised routes
- Unsubsidised routes
- Air Passenger Duty

plus further categories concerning:

- Cargo rates and charges
- Competing with the ferries

Public Service Obligation (PSO) routes

There are currently five separate Public Service Obligation (PSO) schemes in operation throughout the Highlands and Islands:

- Shetland Islands Council for Tingwall to Fair Isle, Foula, Papa Stour and Out Skerries, plus a summer weekend service between Sumburgh and Fair Isle (currently awarded to Directflight, Islander)

- Orkney Islands Council for Kirkwall to Sanday and/or Stronsay and/or Eday and/or Westray and/or Papa Westray and/or North Ronaldsay (currently awarded to Loganair, Islander)
- Western Isles Council for Stornoway to Benbecula (currently awarded to Loganair SAAB 340)
- Argyll and Bute Council for Oban to Colonsay, Coll and Tiree (currently awarded to Hebridean Air Service, Islander)
- The Scottish Government for Glasgow to Campbeltown, Tiree (both Argyll and Bute) and Barra (Western Isles) (currently awarded to Loganair, Twin Otter)

As a general rule, the franchises require the tendering airlines to provide their own aircraft, but in the case of the Shetland Islands, the local council provides the aircraft and asks airlines to bid for their operation, and ion the case of the 'Southern Isles' PSO the two frontline Twin Otters are provided by the Scottish Government.

The level of subsidies to be provided by each of the awarding authorities does vary slightly from year to year, and there is uncertainty as to its future level at contract renewal. The airline costs should also be combined with the airport / airfield subsidies received. HIAL for instance is subsidised by the Scottish Government by a budgeted £35.4m in 2016/17 and £39m in 2017/185 which covers both operational and capital investment provisions. The local councils are responsible for determining the level of grant aid they may make to their own airstrips. The one PSO airport that is not subsidised is Glasgow, while Fair Isle is also independently operated although it receives a grant from Shetland Islands Council.

It should be noted that the report by the Aviation and Travel Consultancy (A&TC) in 2004 recommended the wholesale adoption of the PSO scheme for all domestic routes operated to or from airports in the Highlands and Islands, with the aim to effect a one-third decrease in the cost of air fares, with a then estimate of a maximum cost to the Scottish Government of around £12 million pa. This scheme was rejected in favour of the Air Discount Scheme, which is discussed below. There were some responses to the Consultation still in favour of this concept of wholesale intervention, albeit perhaps affecting a reduced number of the originally specified routes.

With the Scottish Government departments estimated as providing more than 50% of the cost of air services revenue in the region both as users (health boards / doctors / patients, for education, or other Government / community purposes), and via subsidy to HIAL and local authority airports and via the ADS / and PSO programmes.

Consequently it appears important to periodically review the utility of the scale, frequency, network, schedules and prices charged and operated across the Highlands and Islands air service network in relation to the efficiency of delivery of all publicly funded programmes. As previously mentioned the Scottish Government and Shetland Islands Council have also ventured into aircraft acquisitions to ensure more modern fleets are available. The Scottish Government and the communities served need assure themselves that they are receiving optimal outputs from this expenditure in terms of services, network, schedules and fares.

When compared with the free market routes, very few adverse comments were received regarding the level or structure of fares on PSO routes. However issues arising from the operation of PSOs include:

- Airlines struggle to justify investment in new aircraft for fear of being undercut at the next tender round by a competitor offering an older compliant aircraft. Currently four years is the maximum length for an award of a PSO, which is often impractical to fully depreciate a 'new' aircraft asset.
- Some routes which could be suitable for PSOs would involve two or more different Councils, for example Kirkwall to Wick or Fair Isle, and Oban to Barra.
- Differing concepts of the role of, and subsidy levels available for PSOs make it difficult for Councils to work together on inter-Council routes.
- Funding challenges cause downward pressure on service renewal specifications, particularly when spending is portrayed, or perceived, as being spending that could be directed to other Council programmes.

Air Discount Scheme (ADS) routes

The Air Discount Scheme was introduced by the Scottish Government in May 2006 for a trial period initially until March 2008. A detailed study of the Scheme by Halcrow reported in late 2007 and the ADS scheme has since been extended.

The Scheme meets the requirements of the EU's 'Aid of a Social Character' mechanism. Its main aim is to make air services affordable for remote communities in the Highlands and Islands, improve connectivity to Scotland's key population centres and facilitate accessibility and improve social inclusion. It was originally open to business users, a user category which was subsequently withdrawn.

The ADS now provides a 50% discount (rate progressively raised since its introduction to this maximum permitted ceiling) on the applicable air fare on eligible routes for signed-up members whose permanent/main residence is in Colonsay, Orkney, Shetland, the Western Isles, Islay, Jura, Caithness and North-West Sutherland. In addition, registered Third Sector organisations who have employees/volunteers that have their permanent/main residence in an eligible area can take advantage of the Scheme. The ADS is applicable to scheduled flights to and from any airport within the eligible areas to one of the four main Scottish airports – Glasgow, Edinburgh, Aberdeen and Inverness – as well as to other airports within the eligible areas.

The ADS does not apply to people who work, but do not live, in the eligible areas. National Health Service funded trips are also excluded. Some routes are not included as they are served by PSO air services, and the avowed aim is to avoid 'double funding'.

The Halcrow study found that some 143,000 single flights were made by the 67,000 registered members of the scheme, and calculated that around 18,000 of these journeys had been generated by these lower fares, and a further 48,000 journeys were estimated as having been diverted from surface modes, (in most cases, ferries). The overall increase in air journeys by this subset of passengers was therefore from some 77,000 to 143,000, or an increase of 85%. The maximum loss of traffic by the ferry operators was estimated as 8% on the routes from the mainland to the Orkney and Shetland Islands.

The Halcrow report recommended a continuation of the scheme, but decided against increasing the eligibility criteria of the scheme to a wider market such as relatives of scheme members, all Scottish residents, or even all travellers; it also decide against including additional routes, or increasing the

level of discount. The only negative aspect of the scheme highlighted was the low take-up of membership in Islay and Jura, and in Caithness and Sutherland, which it was suggested could be addressed by more effective marketing.

Despite the majority of respondents being enthusiastic about the merits of the scheme, time and again similar comments were raised. The inability of the scheme to be available to friends and relatives on the mainland who wished to visit the remote areas, or indeed all potential travellers, as this could positively impact inbound tourism and business travellers. This then would be similar to the RET scheme being trialled on the ferries (see below). However, it was accepted that this would put greater pressure on the high load factor peak flights, and there would be no guarantees that additional capacity would result, although it would be expected that a dramatic increase in demand would engender a response from operators which might include using larger aircraft with lower costs per seat.

Many felt that the PSO schemes were generally fairer – a mainland Scotland passenger to Barra would pay a noticeably lower fare than one flying to Benbecula, whereas a resident of the Outer Hebrides would pay more for their Barra-Glasgow ticket than for one from Benbecula.

It is acknowledged that, to be affordable in both directions would probably require a reduction of the discount available to residents in the remote areas and this would probably not be welcomed.

Other comments compared ADS unfavourably with PSO, in that PSO routes and frequencies are guaranteed, but there is no such guarantee around those vital routes offering only ADS. Others suggested that a fairer way of administering the ADS scheme would be to increase the subsidies to HIAL (allowing a reduction is user charges) so that all passengers would benefit, albeit to a lesser amount.

Some observations were made about the lack of low fares being available for non-Members, with many having to pay the full fares, particularly on busy flights. A full return fare from Edinburgh to Kirkwall or Sumburgh is estimated as approaching £400.

One respondent was concerned about the impact the ADS scheme was having on the economics of ferry services, notably that linking Kirkwall with Aberdeen, while another asked if a similar scheme could be made available for air cargo exports from the same remote locations.

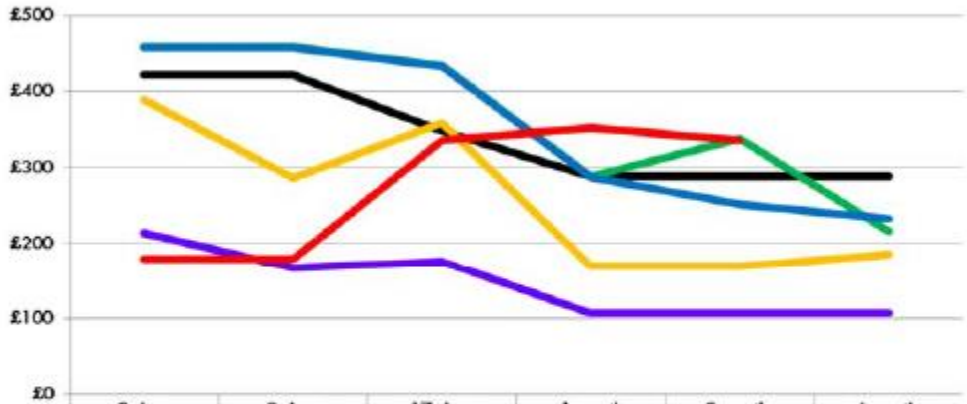
The scheme withdrew eligibility to non-private users in April 2011, but then permitted a reinstatement for Third Sector and charity organisations in July 2012. Communities argue that business users should also benefit, but there are state aid concerns. There has been a recent increase of the ADS rate from 40% to 50% of the eligible element of fares (excluding charges and taxes) from April 2016.

The Minister for Transport and the Islands, Derek MacKay MSP, announced in February 2015 that the Scheme was to be extended until 31 March 2019. Scottish Government's Empowering Scotland's Island Communities Prospectus also confirmed that the *"Scottish Government notes the wishes of the Island Councils for the scheme to be extended to include certain types of business travel"* and *"invites the Councils to produce a costed and legally compliant business case for consideration by the Scottish government".*

Research is currently being undertaken to explore the case for business user eligibility. This report (seen in draft form) has produced some interesting analysis on cost of tickets based upon advance booking. Some charts are extracted from the report without explanation and comment (which are

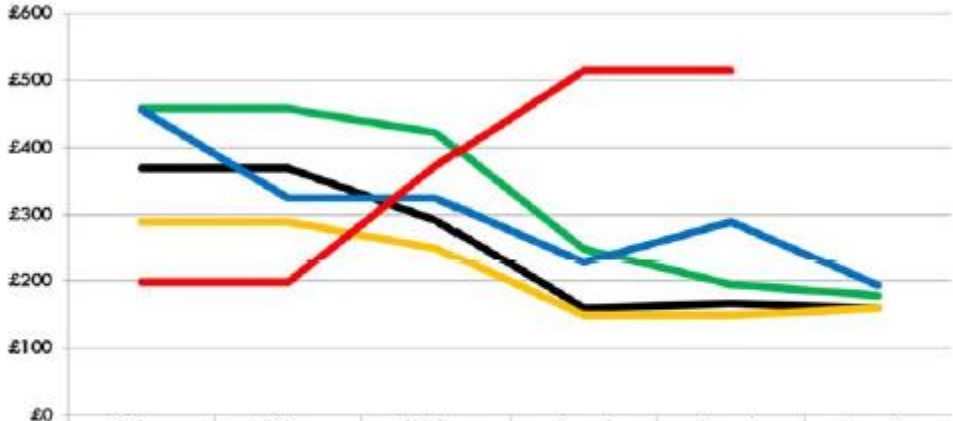
required to better understand), but they underline how a consistent analysis across PSO and ADS qualifying routes would be helpful in appreciating how affordable intra Scottish air services are.

Figure 3.5: Cheapest Available Fares By How Far Booked in Advance: Shetland



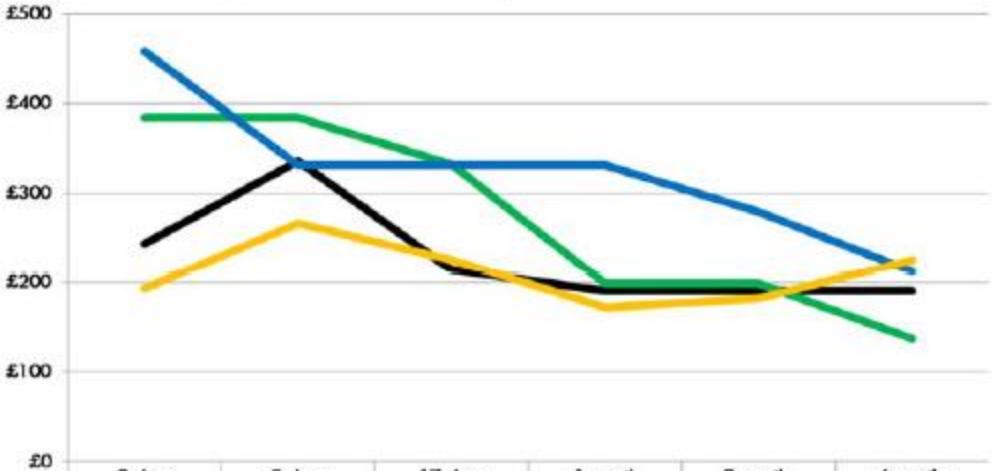
	2 days	8 days	17 days	1 month	2 months	4 months
Aberdeen	422	422	348	288	288	288
Edinburgh	458	458	434	288	337	216
Glasgow	457	457	433	287	251	233
Inverness	389	287	359	169	169	185
Kirkwall	214	167	176	106	106	106
Bergen	179	179	336	353	336	

Figure 3.6: Cheapest Available Fares By How Far Booked in Advance: Orkney



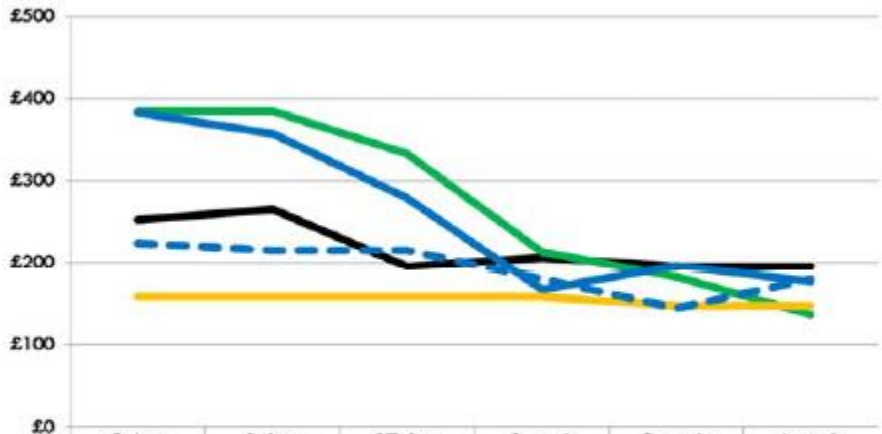
	2 days	8 days	17 days	1 month	2 months	4 months
Aberdeen	370	370	292	159	167	159
Edinburgh	458	458	422	248	195	178
Glasgow	457	325	325	229	290	193
Inverness	291	291	251	149	149	159
Bergen	199	199	374	515	515	

Figure 3.7: Cheapest Available Fares By How Far Booked in Advance: Stornoway



	2 days	8 days	17 days	1 month	2 months	4 months
Aberdeen	244	336	214	190	190	190
Edinburgh	384	384	332	198	198	137
Glasgow	458	331	331	331	279	212
Inverness	192	267	225	171	182	225

Figure 3.8: Cheapest Available Fares By How Far Booked in Advance: Benbecula, Wick and Islay



	2 days	8 days	17 days	1 month	2 months	4 months
Wick-Aberdeen	253	266	196	207	196	196
Wick-Edinburgh	384	384	332	213	183	137
Benbecula-Glasgow	383	357	279	167	197	177
Benbecula-Inverness	158	158	158	158	148	148
Islay-Glasgow	224	215	215	180	145	180

The ***Appraisal of Inclusion of All Business Travel Within the Air Discount Scheme Report*** examines the effect on both private sector and public sector business and makes an estimate of both the potential cost to Transport Scotland (c. £3.4m) of extending the scheme to business, and also explores justifications / mechanisms, whereby this could be achieved in a state aid compliant way. The data and insights produced by this study, which was supported by an extensive business consultation exercise, could become one of the scenarios that a bespoke intra Scottish forecasting model could incorporate, especially as estimates of price elasticity were produced. A subsequent

value for money, or cost benefit calculation could then be made if this derivative workpackage was included in the proposed scope of the research.

Air Passenger Duty (APD)

Airport Passenger Duty (APD) increased from £10 per round trip for domestic and European flights to £11 in November 2009 (and is now £13 / pax). Since March 2016, children of 16 years and below are exempt from APD providing they are travelling in the lowest class. Currently it is not payable on flights *from* any airport in the Highlands and Islands, nor is it payable on any aircraft with less than 20 seats (including the Twin Otter and the Islander) but it is still payable on Saab 340 flights *to* the region from other airports, notably Aberdeen, Edinburgh and Glasgow.

Appendix 8 - Aircraft and Air Operator Issues

Introduction

The main issues relate to the aircraft type providing the bulk of the passenger services in the region, the Saab 340B, operated by Loganair on the bulk of the regional services throughout the Highlands and Islands ('the Saab')

Other aircraft currently used for passenger services in the region are:

- the Jetstream 41 operated by Eastern Airways from Aberdeen to Wick and Stornoway, and
- the SAAB 2000
- Dornier 328
- Twin Otter, Islander,
- BN2 Islander, etc

In addition, Loch Lomond Seaplanes operates a Cessna Caravan in amphibious mode on charter flights from its bases on the River Clyde and the Isle of Skye, and the Scottish Ambulance Service uses a Beechcraft King Air B200C for its service throughout the nation. Loganair also deploy 3 SAAB 340A freighters in the region.

A variety of other, larger aircraft operate to and from Inverness Airport (Flybe's Q400, BA & easyjet's A-319s, and KLMs Embraer jets), predominantly to destinations beyond Scotland. The introduction by British Airways of their Inverness - Heathrow fights commencing in May 2016 will at last re-introduce this route after it being cancelled by BA in 1997. Heathrow serves over 130 destinations throughout the world. Island air services can also access the rest of the UK through regional hubs of Aberdeen, Glasgow and Edinburgh.

The Saab 340B / 2000

The Saab is the workhorse of the Highlands and Islands. Loganair currently operate 13 Saab 340B passenger aircraft with 33 or 34 seats, and three Saab 340A freighter aircraft. The current fleet was built between 1987 and 1993. The airline believes that there is scope to continue operating their Saab 340 aircraft for at least the next ten years, and probably even 20. The airline has invested heavily in the operating infrastructure for the 340 aircraft including base maintenance facilities at Glasgow, a key consideration when operating older aircraft. This increasing self-sufficiency in the type means that Loganair is more likely to be able to prolong the life of the aircraft to a greater degree than an operator which outsources maintenance.

Although the Saab production line ceased in 1998, there are a large number of used Saab 340 aircraft on the market, and Loganair is examining the possibility of replacing, or adding to, the existing fleet using Saab 340B Plus aircraft being retired by American Eagle and Mesaba – these are 1997-1998 late build models.

Saab 2000

Loganair recently acquired four 50-seat Saab 2000 aircraft, which provides obvious benefits given commonalities with Saab 340, and has similarly low ownership cost (compared to newer aircraft types such as the ATR range). This is significant as the Saab 2000 provides an easy 'step-up' from the Saab 340 on routes where there is sufficient demand, with faster speed / shorter sector times on the longer routes. It is used on some of the busier routes including Glasgow-Stornoway and Aberdeen-Sumburgh, as well as Loganair's routes linking Glasgow and Inverness with Manchester. The Saab 2000 is also the 50-seat aircraft of choice for Eastern Airways, and is used to provide charter services between Aberdeen and Sumburgh/Scatsta for the oil industry.

Dornier 328

The Dornier 328 provides similar capacity to the Saab 340B but offers greater performance and higher cruise speed, making it more suited to longer routes. Over recent years Loganair – through its acquisition of Suckling Airways (ScotAir) absorbed Dornier 328s into its fleet in 2013, and the aircraft is used on the Dundee- London Stansted PSO service as well as other routes across their network. Suckling were also very active in the air charter market, which Loganair continues, but it can also use the aircraft on its scheduled fleet for operational performance, back-up or other reasons.

The Jetstream Family

The British Aerospace Jetstream 31s as operated by Highland Airways (with 18 seats) before their demise in 2010, were built at Prestwick in the mid 1980s, and the Jetstream 41s currently operated by Eastern Airways (with 29 seats) were built in the early to mid 1990's. They are essentially of the same vintage as the Saab SF 340 aircraft, and their production has also been discontinued.

Jetstream 31

Jetstream 41

There are thus no immediate replacement problems, although the maintenance costs of these aircraft will inevitably increase over time. There will probably be sufficient Jetstreams and similar aircraft in the future to enable these fleets to be replaced or augmented for at least the next ten years.

The J31 is a pressurised aircraft has a normal cruising speed of 240 knots and can achieve a maximum altitude of 25,000 feet. With a full passenger load it has a range of just under 500 nautical miles making the J31 ideal for regional flying for both business or leisure.

The only current UK operator of the J31 (Links Air) recently lost their AOC, although efforts are being made to re-instate it. They had operated the Welsh Cardiff - Anglesey aircraft with this type. There are some substantial European operators such as AIS (currently Croatian PSOs under ACMI arrangements), DirektFlyg who operate some Swedish PSOs and Avies of Estonia who operate a proto PSO to Estonian offshore islands, and have operated PSOs in Sweden and Finland.

The Jetstream 41 is usually presented in a 29 seat aircraft. It cruises at an impressive 295 knots. Eastern Airways has operated the aircraft type for several years and it is worth noting that Eastern have used it recently on a French PSO service – a departure from the traditional pre-delectation for business and oil routes.

For the sake of comprehensiveness any detailed review should include the 19 seats Fairchild Metroliner III, the unpressurised Casa 212 and Let 410 all of which have the potential to serve in the Scottish environment, and the Metro III and Let410 currently provide cargo services in the region and have served on the Cardiff Anglesey PSO.

Other 30-50 seat aircraft options

Currently there are no new-technology turboprops in the 30-40 seat range being developed or confirmed, while all the current competitors, such as the Dornier 328 and Dash 8-100/200 are also all out of production. However there have been suggestions that both the Saab 340 and Dornier 328 (for example suggestions of a US/Turkish joint venture to develop a new production of the 30-seat Dornier 328 in both turboprop and jet versions) could be resurrected in some future joint venture, and these possibilities should be followed with interest. The prospect of more modern D-328s is significant as Loganair already operate D-328s alongside the SF340.

However new aircraft will be too costly for the H&I market unless bought / subsidised by Government, probably until reasonably priced second hand aircraft (of the new variety) become available. That would not be likely before 2030. Until then there will be a reliance on 1980s/90s aircraft suitably refurbished and maintained for 30-seat operations – unless there is either a move across the network up towards 50-seats or down towards 9-18 seats.

The nearest in-production aircraft to the 30 seat market is the ATR42-600 configured with up to 50 seats (usually 48). Although currently too large for the majority of the region's routes, it could offer a successor to the Saab 2000 in future years. At one point the 37 seat Embraer 135 jet was thought to be the natural successor for the Saab 340. However, the subsequent increase in fuel costs since the aircraft was designed in the late 1990's has militated back towards use of more fuel-efficient turboprop aircraft, especially on short routes where the extra speed of the jet is not transformative.

Whilst Loganair can continue to acquire used Saab 340B aircraft for around $2 m per unit, there is no incentive to acquire more modern aircraft at between $6 m and 10 m per unit. Lower ownership costs of the current aircraft type are estimated to more than outweigh the lower operating costs of more modern aircraft. Above 50-seats the choice and availability of aircraft improves considerably, including the previously mentioned Saab-2000 plus the ATR42/72 range and Bombardier Q-3/400. These aircraft provide lower per seat operating costs, which should translate into lower average fares (assuming adequate load factors), but require greater consistent passenger demand in order to be viable. It is not inconceivable that with some growth over the next few years, the busiest H&I routes could progress to the point where they can be operated entirely by such larger aircraft providing benefits to both operators and passengers.

One problem which was raised during the SCDI consultations was the inability to use the Saab 340 for stretchers for non-urgent medical cases when the air ambulance service could not be used, whereas the (now replaced) 64-seat ATP had such a capability. It should also be noted that elderly and infirm passengers can have difficulty with gaining aircraft access to both the BN2 Islander and the Saab. This aspect is further considered below.

DHC-6 Twin Otter

> Because the Scottish Government has recently acquired two new DHC-6 Twin Otter, some form of standardisation using this aircraft type might offer some attractions in Scotland.

The aircraft has good STOL[2] performance, is now being manufactured again by Viking of Vancouver (albeit it largely unchanged from an early design) and can carry 19 passengers.

The DHC-6 Twin Otter is a Canadian 19-passenger aircraft. It was developed by de Havilland of Canada. The first six Twin Otter aircraft produced were designated Series 1, indicating that they were prototype aircraft and first flew in 1965. In 1969, the successful series 300 was introduced. Over 600 were made before production ended in 1988.

In 2006 Viking Air announced its intention to offer a series 400 Twin Otter. In the following year they announced that, with 27 orders and options in hand, they would be restarting production. Their first new aircraft was delivered in July 2010.

The aircraft does have undercarriage adjustments that permit water operations. In some parts of the world, the Twin Otter 400 is offered with floats in either amphibian or seaplane configuration with the amphibian option being heavier and more expensive. The amphibian option allows the aircraft to land on both land and water. Owing to the time required to undertake the conversion it would not be practical to keep changing the aircraft between landplane and seaplane mode, and seaplanes as a category are considered separately below.

However there are challenges in say replacing the Bn2 Islander with the Twin Otter, and the following illustrative observations were made in reference to the current Orkney inter island PSO review:

- Though the DHC-6 Twin Otter is billed as a STOL aircraft and does indeed have very good performance, in order to operate to Commercial Air Transport standards, many of Orkney's airfields would need lengthening, and possible widening. Most out isle airfields would require some extension by an estimated 100 – 150m (exact dimensions would be subject to a very detailed analysis), plus other infrastructure improvements such as RFFS CAT3 (applicable at all operating locations).

- Presuming the home base of the Inter Island Service remained as Kirkwall, the hangar would be large enough to accommodate Twin Otter.

- Passenger demand for an aircraft of greater capacity exists for North Ronaldsay and Papa Westray, but may well provide too much capacity for the other destinations.

- The drawbacks associated with turbine engines apply to the DHC-6, A very significant drawback to operating a turbine engined aircraft on the Scottish Inter Island service is the very short sector times. Turbine engines suffer fatigue related to the number of cycles (starts and shutdowns) they perform rather than in relation to the total time they are running which is the case with a piston engine. Overhaul costs for turbine engines are around 5 – 6 times those of piston engines. This problem could be mitigated to a degree in an installation with propeller brakes, which allow the turbines to stay powered whilst the propeller is stationary, but no such installation exists for a BN2T. The turbine would still need to be shut down whilst refuelling and the cyclical costs would still be much higher than a piston engine in an equivalent power range. However the DHC-6 it is equipped with reversible propellers and is thus more suited to the task.

- The systems which accompany turbine installations, generators, hydraulic pumps, controls etc are also more sophisticated and hence expensive than piston engine technology. The maintenance costs of a turbine Islander are estimated at at least twice that of a piston BN2.

[2] Short take-off and landing

Jet fuel is cheaper than gasoline, but the increased fuel consumption of a turbine negates these savings.

- The airframe is very expensive to purchase either used or new (a 1979 model still commands over $2,500,000 and a new version [Viking DHC-6-400] costs around $7,300,000 plus delivery charges etc. It is also an expensive airframe to maintain with costs estimated to be around 3-4 times that of a BN2. The direct operating costs are therefore proportionately higher.

- A further direct operating cost would probably be that for the second pilot. The aircraft is certified as a single pilot aircraft, but both current UK operators (Loganair and Isles of Scilly Skybus) operate them with two pilots for sound reasons. Multi-crew operation may well be held to be preferable, the present pilots could potentially be dual rated on the BN2 and the DHC-6 or solely on the DHC-6. However, there would inevitably be a need to recruit additional pilots.

The 2013 Regional Air Service Development Opportunities Study for HITRANS also examined the limitations of the aircraft from the point of view of being unpressurised and slow. Some of that analysis is reproduced below.

Unpressurised and Noisy Cabin

Because the Twin Otter is unpressurised the aircraft cannot fly above a height that would cause discomfort or debilitation of passengers or aircrew. In practice this usually limits the aircraft to a ceiling of approximately 10,000 feet. This limitation means that the aircraft is not able to fly 'above the weather' to the same extent as a pressurised aircraft.

The high wing arrangement with under-slung engines delivers excellent Short Take Off and Landing (STOL) Performance, but the arrangement also results in a relatively noisy cabin experience for passengers.

The consensus amongst those consulted was that journeys over one hour in length would become uncomfortable. Many air operators offer earplugs or ear defenders as an option to passengers to ameliorate this feature of the aircraft.

Turbulence

Slower aircraft tend to be more prone to turbulence. This is because they have relatively large wings which are subject to greater gust loads.

Wind speed at cruise level, over areas of the Highlands & Islands, may affect passenger comfort on the Twin Otter. This is shown at ***Table 6****.*

Table 6:

TABLE 6: TWIN OTTER PASSENGER COMFORT AT VARIOUS WIND SPEEDS	
Wind Speed (knots)	***Passenger Experience***
30-40	*Uncomfortable*
40-60	*Very uncomfortable*
More than 60	*May be extremely uncomfortable*

Note that these are wind speeds at cruise altitude which will normally be 10-30 knots faster than those at the surface. Therefore, surface winds of 30 knots may result in extreme discomfort for passengers at height. Flights remaining substantially over the sea are likely to avoid the worst turbulence found over the mountains.

In turbulent wind conditions (quite likely in winds of 40+ knots) the aircraft may have to reduce speed by 25 knots for safety reasons, further increasing flight times. Furthermore, strong wind conditions are likely to coincide with poor weather conditions requiring an instrument approach, potentially adding another 5-10 minutes to flight times.

DESCENT SPEEDS

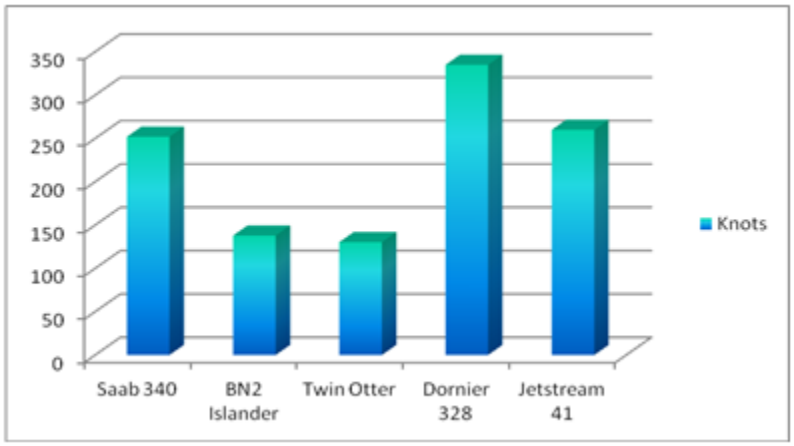
Because the aircraft is unpressurised, passenger comfort necessitates a normal descent rate that is limited to 800 feet per minute (500 is preferred). When descending from 9,000 feet, this implies more than 10 minutes in the descent.

When descending over the sea, this will add little to sector time. But descent over the Highlands (e.g. descending for approach for landing at Skye, from Glasgow) may need to be delayed until almost over the destination due to the presence of high ground, under the aircraft-effectively, and the aircraft may need to circle overhead while losing altitude. This will add a few minutes to the total sector time.

Relatively Slow

*As shown at **Figure 13**, the Twin Otter (like the BN2 Islander) is a relatively slow aircraft.*

Figure 13: ***CRUISE SPEEDS FOR VARIOUS SCOTTISH BASED REGIONAL AIRCRAFT***



*As noted earlier, slower aircraft are more prone to headwind delays. This is elaborated at **Figure 14**.*

Figure 14:

Figure 14: TWIN OTTER HEADWIND TIME PENALTIES		
Head Wind Penalty Over Still Air Time	***Increase in Sector Time (approximate)***	***Comparable Saab 340 Time Penalty (approx)***
40 knot H/W-Glasgow-Barra	*20 minutes*	*5 minutes*
40 knot H/W-Kirkwall-Glasgow	*25-30 minutes*	*10 minutes*

*This potential for extended sector times in headwind conditions needs to be considered when timetabling longer sectors with a Twin Otter. How this might translate for a Kirkwall-Glasgow service using a Twin Otter is set out at **Table 7**, over.*

The potential for extended sector times led us to discount the practicality of using the Twin Otter aircraft for longer sectors over the central mountains of Scotland- notably such routes as Kirkwall-Glasgow and Aberdeen-Oban.

Table 7:

KIRKWALL-GLASGOW SECTOR TIMES IN VARYING WEATHER CONDITIONS		
Conditions	***Sector Time***	***Expected Incidence Throughout Year***
Good weather, light wind	*1h 20m*	*50%*
Poor weather, light wind	*1h 30m*	*15%*
Good weather, 40+ knots H/W	*1h 45m*	*15%*
Poor weather, 40+ knots H/W	*2h*	*15%*
Poor weather, 40+ knots H/W *Severe turbulence*	*2h 15m*	*5%*

The BN2 Islander

The BN2 Islander's outstanding shortfield performance permits it to operate on all the Council airfields in question, and potentially many more in Scotland.

Its rugged and simple design ensures good in-field levels of reliability. It is the perfect 'bush' and remotely located aircraft.

The BN-2 Islander was Britten-Norman's second original design, work on which began during 1963.

Developed as a Dragon Rapide replacement, the emphasis was on producing a rugged and durable aircraft that had good field performance, low operating costs and was easy to maintain. One unusual feature is that there is no centre aisle between seats in the main cabin; instead there are three doors along each side of the fuselage for passenger boarding. Exporting up to 90% of output, earned the company a prestigious Queens Award for export achievement in 1970. By 1982, Britten Norman had delivered 1000 of its famous light twins. Enhancements and options over the years enabled the Islander to develop with its markets.

In 1971, with strengthened airframe and underwing hard points to carry weapons, the type made its debut as the BN2 Defender at the Paris Air Show. Defenders went on to serve with distinction with armed forces worldwide including the UK's Army Air Corp.

Substituting 320hp Allison turbine engines for the standard Lycoming piston engines led to the BN2T Turbine Islander/Defender option, available from 1981 for those requiring higher performance. Extending the fuselage to 18-seat capacity, enlarging the wing and adding a third engine on the fin, led to the BN2A MK III Trislander, launched in 1970. A totally new, larger, fuselage with the Trislander wing and turbine engines are the basis for the most recent range addition, the BN2T-4S Defender 4000, which first appeared in 1998. This capable aircraft, with its ability to carry several observers along with most sophisticated sensors, is already serving successfully worldwide.

Adaptable, versatile and durable, it has an unsurpassed record of solving transportation problems simply and economically in some of the world's harshest environments. Ten seats, twin engines and a design driven by the requirements for ease of operation provide exceptional levels of utilisation. Constant adaptions have ensured the Islander a place in a wide range of modern-day roles.

Power Plants options are

- BN-2A - Two 195kW (260hp) Lycoming O-540-E4C flat six piston engines driving two blade constant speed propellers.
- BN-2B-20 - Two 225kW (300hp) Textron Lycoming IO-540-K1B5s.

The BN-2B-20 delivers a maximum speed 280km/h (150kt), max cruising speed 264km/h (142kt), economical cruising speed 245km/h (132kt). Initial rate of climb 1130ft/min. Service ceiling 17,200ft. Range at economical cruising speed and standard fuel 1136km (613nm), with optional fuel 1965km (1060nm).

The aircraft permits one pilot and one passenger on flight-deck, with seating for a further eight passengers in main cabin.

In Scotland the aircraft type is operated by Loganair (Orkney inter island PSO); DirectFlight (Shetland inter island PSO) and Hebridean Airways (Argyll and Bute inter island PSO from Oban). Cormack Engineering services at Cumbernauld Airport also support the aircraft type with engineering services and run a trading business in the type. Loganair have a significant engineering support operation at Kirkwall Airport. SIC own 2 of the aircraft type; Loganair have two based in Orkney and Hebridean have two in Oban and access to more through their re-sale business.

The Cessna Caravan and Grand Caravan family

Three options of the aircraft type

1. The (land) Caravan with up to nine seats that could replace the Islander on all its current operations
2. The amphibious Caravan which is the same aircraft but with floats added for access to water aerodromes, but which is also able to land on airstrips, while equipped with floats
3. The (land) Grand Caravan, at around $3 m, which is an extended version of the Caravan capable of carrying 13 passengers and additional cargo. It could also open up new routes which are too small for the Twin Otter, and too distant for the Islander.

Despite being seen as possible future replacements to the Britten Norman 2 Islander and as an option for new route start-ups such as the possible reintroduction of air services to the Isle of Skye or Oban to Glasgow, the Cessna Caravan family of aircraft themselves do not solve every challenge.

> In November 2015 EASA recommended approving commercial single engine turbine (SET) operations and once this is passed by the European parliament will become EU law (anticipated to be before the end of 2016). The proposed changes are expected to maintain the safety of CAT operations by allowing, based on proportionate requirements, the operations in IMC and/or at night of single-engined turbine aeroplanes better equipped and with a higher engine reliability than some currently operated twins. The Quest Kodiak aircraft also provides an alternative aircraft in the SET class.
>
> It will still require operators to develop and have an approved a safety and operational case for such services, which in any specific time limited and pressurised tender process is very difficult / impossible. It would make sense that some sort of prior or collective assessment of island flights might be taken if the SET option starts to become more compelling.
>
> It is likely that something like a 15 minute risk period per flight could be accepted so the aircraft can cross open water or transit areas where a forced landing and landing in inhospitable terrain – such as much of Shetland. Any new provisions in all likelihood will expect operators to be able to glide and navigate to, safe landing areas (aerodromes or simple fields of sufficient size without obstacles) in the event of an engine failure. Taking account of the enroute availability of Sumburgh and any identified and surveyed fields, it should be possible to devise a compliant route, but agreement with the CAA would be involved. It would still require an in depth risk assessment of operating a single engine aircraft down the spine of Shetland Mainland and across the sea between Sumburgh and Fair Isle, with its longer stretch of intervening water. The risk assessment would probably recommend a life-raft was carried on the aircraft. Insurance premiums for such operations are another unknown.
>
> **A significant drawback of the C208 is its much lower cross field performance limitations, which would impact on despatch reliability under certain wind direction conditions. The aircraft's cross wind limits, because of its design, are 20kts. as opposed to Islander's 30kts., which could be a significant drawback in the Scottish environment, especially on those airfields that do not have cross runways.**
>
> The Cessna 208 does require slightly longer runways than the BN2 Islander, but this should not be an issue on many outer island main runways. Operationally the aircraft require approximately 500m for take-off.

The aircraft type uses Jet fuel which is currently cheaper than AvGas, but the increased fuel consumption of a turbine tends to cancel out any potential savings.

Another drawback to operating a turbine engined aircraft on the short Inter Island air services is the very short sector times. Turbine engines suffer fatigue related to the number of cycles (starts and shutdowns) they perform rather than in relation to the total time they are running, which is the case with a piston engine. However Cessna 208 are popular parachute jumping platforms and they do perform well in the typically short missions (10-15mins several times each hour) and high cycles that this entails. Engine overhaul costs for turbine engines are said to be around five to six times those of piston engines. This problem is mitigated somewhat by the use of propeller brakes, which allow the turbines to stay powered whilst the propeller is stationary. The turbine would still need to be shut down whilst refuelling and the cyclical costs would still be significantly higher than a piston engine in an equivalent power range.

More modern avionics and aircraft systems (generators, hydraulic pumps, controls etc) tend to be more sophisticated and hence more expensive than piston engine technology. Maintenance costs can be expected to be significantly more than a piston BN2.

Although EASA have established that these aircraft have a demonstrably higher engine reliability than some currently operated twins, there is still the potential for consumer resistance to such a development. If these aircraft were to be introduced some sort of prior information dissemination and familiarity type campaign would seem prudent.

Cost is also a significant consideration. A standard Cessna 208 has a 9 passenger capacity although certificated versions up to 14 seats exists. A version of the 208 is also available with increased baggage capacity in a belly pannier. A new C208 costs in the region of $2.5 million, and 10 year old models still reaching around $2 million.

Permitting IFR flying could also enable the aircraft to operate as a small cargo aircraft at night, or on behalf of the Scottish Ambulance Service as an air ambulance, with a shorter runway requirement than the currently operated 'high dependency' King Aircraft, which incidentally have had modifications carried out to enhance their take-off and landing performance. Nevertheless fire regulations still can restrict their operation into certain Scottish airfields.

There may be additional airport costs should SET aircraft replace the BN2 Islander at airports such as Oban, as their marginal increase in length would be reflected in a higher category of Rescue and Fire Fighting Services (RFFS) requiring larger appliances and additional staff.

No alternative aircraft currently offers a transformative replacement to the BN2 Islander without some accompanying drawbacks, be they operational or cost based. However SET seems a possible future evolution, when the BN2 Islander truly is no longer available/operational.

The TecNam P2012 Traveller

The Italian designed TecNam P2012 Traveller concept aircraft illustrates what a next generation BN2 Islander aircraft might look like.

The aim was to design a modern aircraft with state-of-art equipment, an 11 seats twin, using latest technologies to reduce costs including simple and low maintenance costs and simple and easy to access airframe & systems. Using easy-to-replace parts (100% CATIA designed), robust interiors and with fixed landing gear 70% lower maintenance.

The P2012 Traveller would be powered by two Lycoming engines (350 HP, turbocharged, six-cylinder, direct-drive, horizontally opposed, air-cooled, avgas or mogas fed) mounted on the wings. Next generation engines with alternate fuels approved. It would have two rather than a single engine and is here compared with the Cessna Caravan.

This is the sort of aircraft innovation that Scotland should keep a close eye on. Scotland collectively should take an interest in relevant emerging technology and should monitor and even influence its development to their special needs.

Seaplanes

In parts of the USA (Alaska in particular) and Canada the seaplane continues in use as a regular mode of transportation. Scotland ostensibly is equally suitable for seaplanes with more than 790 islands (only 120 populated) and over 30,000 freshwater lochs.

One Scottish operator, Loch Lomond Seaplanes (LLS), operates two amphibians, a Cessna Caravan and a Cessna 208, on charter and sightseeing flights around the west coast. There are equivalent initiatives in Ireland, Croatia and Greece. However LLS withdrew from scheduled passenger flying because of the potential costs imposed by EU denied boarding compensation strictures, combined with its relatively low operational reliability. They now restrict its offer to chartering and sightseeing flights, and are considering ventures outside of Scotland (eg flights from the Thames).

Canada's Harbour Air operates the world's largest all-seaplane fleet with over 50 aircraft. The route network is extensive and the primary route connects Vancouver with Victoria on Vancouver Island, a distance of approximately 50nm. Two of the world's largest seaplane operators are in the Maldives, Maldivian Air Taxi and Trans Maldivian, which both offer connecting flights from the International Airport at Male to more than 40 resort islands.

Loch Lomond Seaplanes currently operates one amphibious Turbine Caravan, and also one (smaller) amphibious piston engine Cessna Stationair which carries five passengers. It is understood that the costs of flying the Stationair are significantly higher than the Caravan and that one passenger on the Caravan covers the Direct Operating Costs on the sectors flown.

The amphibious Caravan with floats added for access to water aerodromes, but which is also able to land on airstrips while equipped with floats flies more slowly than the land version, and has reduced carrying capacity because of the drag caused by the floats. The amphibian option allows the aircraft to land on both land and water. Owing to the time required to undertake the conversion it would not be practical to keep changing the aircraft between landplane and seaplane mode.

Beechcraft King Air B200C

Worth noting is the turbine-engined Beechcraft King Air B200C operated by Gama Aviation on behalf of the Scottish Ambulance Service. The main advantages it offered over the BN2 Islander was the enhanced cabin space, the superior comfort and reduced noise of its cruise, and its faster speed. It does limit the Ambulance Service access to most of the remote mainland and island airstrips, as it requires a minimum 800 metres of available runway. It is also a more expensive aircraft to operate.

Rotary Solutions

The PSO for the air services to the three Aran Islands in Southern Ireland requires a total subvention of nearly €2 million to run the flights as well as the three aerodromes on the Aran Islands and the Connemara Regional Airport in Indreabhán (Inverin).

Aer Arann Islands (the islander and airport operator) employs approximately 38 full-time and two part-time staff, to run these services.

In a 2014 review ***A Scheduled Air Transport Service Sustaining the Socio-economic Vitality of the Aran Islands***, written by Dáithí Ó Briain of NUI Galway, concluded that air service is critically important to the economic and social vitality of the Aran Islands community. "It is already a struggle to retain young people on the islands without taking away such a vital transport service. A significant number of respondents also indicate that they would have no choice but to abandon the islands if the scheduled air service was discontinued." The report concluded that "discontinuation or curtailment of the service is not an option." If air services to the Aran Islands are stopped, islanders will be left with little choice but to relocate to the mainland, leading to the depopulation of the Ireland's most populous islands.

A new contract was tendered by the Irish Department of the Arts Heritage and the Gaeltacht in 2014 with a 30% discount cap imposed on current spending intentions, apparently at €900,000 pa for the air service component on its own.

Rather surprisingly the tender was awarded to a rotary company (Executive Helicopters). They proposed offering a twin engine helicopter with 8 plus passenger capacity (type is currently confidential because of award review currently underway).

Executive Helicopters planned to fly in and out of Galway airport at Carnmore, some 52 km from the ferry port Rossaveal, instead of Inverin, which is just 8 km from the port. However the rotary company claimed they were to be charged exorbitant fees by Aer Arann Islands to use that facility; four times more than using Carnmore.

The helicopter tender, if introduced, would have resulted in the loss of many jobs at ***Aer Arann Islands***, which has provided an airplane service to the Aran Islands for over 45 years.

Executive Helicopters, claimed that the proposed helicopters for the routes would have a greater passenger capacity than the existing Aer Arann Islander aircraft, would have similar luggage/cargo capacity and can fly in a greater range and variety of weather conditions.

It claimed the new helicopter service would provide a reliable, faster, more efficient service to Galway city under the terms of the public service tender.

Fixed wing aircraft are not permitted by law to operate in worse weather than helicopters for this route it was pointed out and fixed wing aircraft require a minimum visibility of almost twice [1,500 metres] that required by a helicopter [800 metres] to operate to the relevant airports.

Helicopters are the air transport of choice to other Irish offshore islands such as the Tory Island service[3] off the Donegal coast, and Executive Helicopters have been operating helicopters in the west of Ireland for almost 20 years "without any problems whatsoever".

Helicopters are also better placed to deal with deleterious situations such as rapidly deteriorating weather, as they have the option to either slow down or land, whereas the fixed wing aeroplane has to seek a suitable diversion airfield. Safety statistics demonstrate that helicopters are every bit as safe as fixed wing aircraft it was claimed.

However considerable backlash to the proposed award who apart from concerns about the weather conditions that helicopters would be able to fly in, also raised concern about the fact the helicopters would fly from Galway city, a one-hour road journey to the existing ferry service to the islands, reducing the option to use the ferry if flights are cancelled due to weather. There was also concern about potential loss of jobs.

Such was the outcry that the tender award was postponed and a one year standstill and review was instituted, which is still currently underway.

The Isles of Scilly also enjoyed a 45 year air link with Penzance provided by British International Helicopters until October 2012. In 2014 local MP Andrew George and Graham Cole, the chairman of AgustaWestland, the Anglo-Italian helicopter company with a production facility in Yeovil "jointly expressed" their optimism over a potential re-establishment of the helicopter service. AgustaWestland previously said it would offer the first of its AW 189 helicopter (carrying up to 19 passengers) off the production line at a cheap rate to encourage someone to set up a commercial service to Scilly.

There is also a rotary PSO to Værøy in the Lofoten Islands in Norway, which is the most isolated island in the Peninsular chain. The service flew over 9,000 passengers in 2014.

A rotary solution might be competitive in an island context, when the total cost of maintaining airfields, rather than helipads is considered, although helicopters cost considerably more per hour to fly than the BN2 islander.

Innovation whenever it should come to the air service, and if it involves a change in aircraft or employment levels can be frustrated by the forces of inertia and fear of change expressed as they may be through concerns by the travelling public about deterioration of reliability, levels of safety or whatever.

Apparently air service tenders cannot deliberately exclude rotary aircraft, and it can be expected that they may well bid for inter island air service work in the future.

Airline Issues

[3] Run by the Local Health Board but also taking members of the public in winter months using a helicopter from Irish Helicopters (part of the PDG Group with its HQ in Inverness)

For many internal flights or routes from our islands to the central belt the circumstance is that there is effectively only one airline serving the region – **Loganair** – and there are some views that its very close franchise relationship with Flybe on routes to England from all four Scottish airports has led to there being almost a monopoly. Although there are no restrictions on other airlines competing alongside Loganair, direct competition from other airlines on individual routes is a very unlikely outcome – in the UK market direct competition is only present on some of the busiest routes connecting London with other UK cities. In a backdrop of aircraft failures and a perception of creeping fare cost increase there is a sense that the current situation leaves little room for manoeuvre for the passenger.

There is some general passenger dissatisfaction with service cancellations and some flights being full. Loganair state that their year-round system-wide passenger load factor is only 62%, giving an average of 12 empty seats on each flight of a Saab 340.

A combination of the limitations of aircraft design and safety regulations result in some concern and even complaints being received about inform and disabled passengers access to smaller regional aircraft. Ambi-lifts do not work with the smaller aircraft types used for regional flights. This means that passengers must be able to climb the aircraft steps. Also CAA require passengers to be able to self-evacuate in case of an emergency – or if they are unable to do this then they must travel with a companion who can assist with their evacuation. This can lead to misunderstandings when disabled people are refused access to a flight – the safety rules trump general rights to travel and for special assistance. There was for instance an internet campaign against Eastern Airways recently when a disabled celebrity was refused access to one of their services, and growing expectations that mobility should not be a barrier to air travel.

It is unlikely that the rules on self-evacuation will be changed, but perhaps there could be scope to identify a low-cost passenger lift solution that would work with smaller aircraft – or otherwise to design a solution that would provide improved access (this may need to incorporate internal aircraft design to allow a wheelchair user to at least enter the aircraft in chair and then transfer to a seat?).

Loganair/Flybe helpfully offer a range of codeshare and interline connections . In addition to a codeshare with British Airways on flights to/from London, they now also offer connections (either through codeshare or interline) with a number of international services at Glasgow and Edinburgh including those operated by Air France/Hop, American Airlines, Emirates, Etihad and Virgin Atlantic.)

It should also be mentioned that Loganair and bmi regional became part of the airline became part of a new the Bond Helicopters associated regional airline group, Airline Investments Limited (AIL) in August 2015. Although it is not clear to what extent the two airlines will synergise in the future. bmi Regional has an important base in Aberdeen, but also bases in Bristol, East Midlands (HQ), Karlstad, Munich and Newcastle. Its business model, because of the aircraft it operates suits affluent high-percentage business usage routes, or charter operations such as Airbus' shuttle between Munich and Hawarden. The operator has codeshares with Lufthansa and Brussels Airlines.

Of the possible competitors, the strategy of **Eastern Airways** would appear to be to concentrate all its Scottish activities on routes to and from Aberdeen – it could thus choose to offer competition on

the routes to Sumburgh and Kirkwall, or increase its frequency to Stornoway. Eastern operate a codeshare with Wideroe providing connections via Aberdeen to a range of destinations in Norway, although do not provide interlining with likes of BA / KLM to London/Amsterdam – which is arguably more attractive. Lack of interlining for its passengers tends to result in higher combined fares, no through ticketing of baggage, and no protection if connections are missed.

Also of significance is the acquisition by Bristow Helicopters of Eastern Airways - 2014 (and Humberside Airport - 2012). Eastern significantly operate the oil industry's consortium service into Scatsta Airport with Saab 2000s from Aberdeen. Bristow recently also won the contract with BP to provide charter services linking up with some Sumburgh based helicopters, between Aberdeen and Sumburgh.

Appendix 9 - Possible Route Innovations & Elaborations

Background

The Highlands and Islands are quite well-served by a network of local scheduled air services linking communities with their regional and national centres, and a range of routes from these Scottish Gateway Airports connecting the region with other parts of the United Kingdom and beyond.

When given the opportunity to suggest other routes in the 2010 route review the challenge becomes to winnow the 'nice to have' from the more vital, especially as assessment is required to demonstrate if a route might be sustainable, or be worthy of receiving public support.

Requests and suggestions are reviewed by council area.

Shetland Islands

Inter-island routes. These are generally found to be adequate. No additional islands were suggested to be added to the route network, despite the possibility ostensibly of flights to Unst, Fetlar and Whalsay. Main concerns relate to the provision of sufficient capacity on the routes to meet both summer peaks of tourism demand, and the needs of scholars accessing the Shetland Mainland.

Concern was expressed about capacity on services to Fair Isle, where there were 10 scholars requiring access to Lerwick, and significant numbers of ornithology tourists during migration months and in the summer. This is likely to be exacerbated by the recent improvements in facilities for ornithologists on Fair Isle. There was no call for flights to be operated earlier or later in the dark winter months.

The fragility of the link with Out Skerries, because of lack of fire cover staff, and the weak once weekly double rotation link with Papa Stour are two hot issues in the current inter island transport review.

The poor punctuality (estimated at 34% of flights being delayed) is another area of concern in the current study.

Routes beyond. From Sumburgh, there was some call for additional frequency to Glasgow. There was also mention of additional direct flights to Scandinavia and other parts of Europe from Sumburgh, following the introduction of the route to Bergen, but it was accepted that there was likely to be insufficient demand.

Following the cancellation of the Loganair service between Fair Isle and Kirkwall, there remains some interest in a possible re-introduction, with the service possibly extended to Wick. Similarly, some saw potential for a low-frequency (Faeroes) - Sumburgh – Stansted service to be resurrected to better address the inbound tourist market from London.

Orkney Islands

Inter-island routes.

Recent work on the Orkney inter island Air Services provides more information and is available on the HITRANS website. Final recommendations are awaited.

For the existing routes, there are calls for increased capacity on most, especially to cater for the summer tourism peak and to meet short-notice demand – load factors are generally felt to too high for these purposes. It was accepted that this extra capacity should be the result of extra flights, not of larger aircraft.

It was believed that the current Islander aircraft could not provide the capacity necessary for small urgent packages, or to cope with the occasional stretcher.

In terms of schedules, the NHS would like to see a standardised year-round service with flights to each of the islands departing Kirkwall around 0800 and 1730 daily; this may of course require investment in airstrip lighting, although the North Ronaldsay experience with runway lighting should be borne in mind. In particular, there were calls for Eday to have flights on more days than the current Wednesdays-only service.

One possible medium, term recommendation from the current inter island transport study may be the ambition to introduce a third BN2 aircraft into the system to better cater for Education (teachers and scholars) and Council staff needs alongside more occasional ad hoc, Health Board, summer tourism and other business demand, whose similar timing requirements cause systemic demand bottlenecks.

Routes beyond. There is some interest in a second daily service to Glasgow and increased frequency to Inverness.

Western Isles.

From Stornoway there is strong support for the service to Aberdeen to be improved so it better serves the needs of passengers travelling to off shore / energy sector jobs. Ideally this would see a twice-daily service operated, albeit loads are currently not high enough.

The 2013 Regional Air Service Development Opportunities Study for HITRANS was supported by an online survey which highlighted the desire for more shoulder month capacity between Glasgow and Barra, which was trialled successfully and was then included in the subsequent PSO specification from October 2015.

The Council is currently also investigating the practicality of improving the Stornoway – Benbecula PSO service; ideally reinstating the five day / week service from the current three says, although funding is potentially an insurmountable impediment.

Argyll and Bute.

Inter-council routes. Following the introduction of services from Oban Airport to Coll and Colonsay in 2008, and seaplane charters from the Clyde to Oban and Tobermory harbours, there has been an increased focus in Argyll and Bute by the opportunity aviation offers in bringing together scattered island communities.

Regarding the current service from Oban to Colonsay, Coll and Tiree, the frequent observation during the 2010 Review was that there was demand for more than the twice-daily return flights currently operated on just two days a week, particularly at the weekends when tourist demand adds to local usage, and this despite a perceived lack of marketing for the service. There were also concerns that the services struggles to cope with peak scholar demands.

The 2012 Campbeltown Weekend Air Services Market Assessment for HIE led to Sunday air services being introduced to respond mainly to the potential increased leisure demand presented

by tourism investments. The impact of this innovation could be reviewed in the study. Indeed PSOs in Scotland have traditionally been seen as five day / week exercises, whilst many other countries treat them as 6 or 7 / week operations. This weekend service and some summer services in the Northern isles could usefully be reviewed on this wider principle. The Cardiff – Anglesey PSO has also been recently reviewed on this very point.

The 2013 Regional Air Service Development Opportunities Study for HITRANS examined air service possibilities out of Oban, and Oban – Barra (elaborating on the existing PSO aircraft timetable), and Oban - Glasgow have received the most interest. Oban – Glasgow was accepted in principle by the first round of UK Regional Air Connectivity Fund (RACF). Oban – Islay has been a welcomed free market elaboration on the current PSO.

Appendix 10 – Emergent Technology

Global Navigation Satellite System

GNSS antennas on aircraft can pick up signals generated from a constellation of satellites, GNSS uses the difference in the time of travel of radiowaves from four satellites to fix the position of the receiver and get an accurate value for time.

Based on classical mechanics, the principles underlying GNSS are simple, but the system is formidably complex in practice, the main problem being timing errors. One source of error is the delay in the transmission as the signal passes through the ionosphere. The waves are slowed down as they pass through this electrical maelstrom of ions – atoms stripped of their outer electrons by solar radiation. Water vapour in the atmosphere also slows the signal down. And sometimes the satellites' atomic clocks go haywire, while the receivers' quartz crystal clocks always carry significant uncertainties. Yet another source of error is multipath error – caused when obstacles near the GPS receiver reflect the radiowaves. The errors are amplified or annulled, depending on factors including the geometry of the satellites. Together, they could throw the navigation solution out by as much as 10 metres.

It is impossible to put a single figure on the accuracy of GPS as it depends on several ever-changing factors, many of which affect the ionosphere, the biggest single source of error. They are: position time of day season and solar activity (which affect the ionosphere); the number of operating satellites in the constellation and their angular spacing from the aircraft; update of satellite clocks and ephemeris data; reflection from buildings and terrain; (multipath) receiver performance.

Current systems have a way of alerting users that GNSS is underperforming for any reason.

The potential is that GNSS can be used to supplement visual navigation (VFR[4]), and IFR[5] and night time navigation. All this without the need for ground based Nav Aids, which are both expensive and not currently installed at Shetland's outer island airfields.

HIAL received a 70% grant to undertake GNSS approvals for three of its airfields. This has required a safety case and operational procedure to be developed for each airfield and then for the CAA to approve the submission. HIAL used Cyrrus to manage the project and actually used Hebridean Airways' BN2 Islanders to undertake much of the 'field' calibration work. Barra, Tiree and Campbeltown are either currently approved or near approval.

The approval delivers managed approaches to 200 feet at strips of 500 metres (since 2012) and this reduces the pilot's decision height considerably in IFR conditions.

The Garmin database coding[6], Flight validation and CAA approvals cost between £12k - £20k depending on the location. Timeline for database coding and flight validation is approximately three months. The consultancy, design, Hazard Identification & Safety cases cost approximately between £24k and £38k with a delivery timeline around 4-6 months.

[4] Visual Flight Rules
[5] Instrument Flight Rules
[6] Garmin charges are going up significantly and they only give quotations when the designs are finalised

The timeline for CAA Approvals is elastic and has varied from 18 months to more than 24 months mainly because of resource issues within the CAA.

One needs to allow approximately 6 months from CAA approval to allow NATS AIS[7] to assess the work required to meet one of their AIRAC[8] cycles, and for the charts to be published in the Aeronautical Information Publication.

The cost of the GNSS unit for a BN2 aircraft is approximately £10k and Hebridean Airways have it installed on both their 'west coast' aircraft. It was established that the on board equipment needs revalidated each year at an approximate cost of £750.

HIAL has now been successful in receiving further EU funding to roll out GNSS approvals to all their airfields.

Hebridean have now four years experience using the equipment, although few of the airfields they operate into have approved approaches.

GNSS provides the prospect of permitting IFR flying in the Scottish environment, which should improve despatch reliability and additionally supplement current VFR flying from a safety perspective. Further feasibility study will be required, but a source of some experience already now exists within Scotland.

Runway Lights

Runway lights offer improved decision heights for pilots in poor visibility or in night-time conditions. However wiring up a runway can prove to be an expensive proposition.

Airfield Ground Lighting (AGL) is a challenging environment in which shocks, vibrations and great changes in temperature (frost or intense heat from the sun and surrounding tarmac). Currently the main provision for AGL is still in the form of incandescent lamps using a filament. These suffer from a number of weaknesses, in particular a relatively short average life as filaments are burnt out after 1,000 to 2,000 hours. Another weakness of incandescent lights is their "poor spectral emission" .

Precision Approach Path Indicator (PAPI) lights help pilots acquire and maintain the correct vertical approach to an airfield. PAPIs are generally located beside the runway approximately 300 meters beyond the landing threshold of the runway.

HIAL have been undertaking trials with Battery Operated LED runway lights and even PAPI Lights.

LED Lights have a much longer service life; lower power consumption; low maintenance and higher luminosity with good temperature and vibration tolerance, and they have battery operated options that only need re-charged every fortnight or so.

At Campbeltown they are using a company called CALKIT.

Prices vary inevitably because of specifications such as red white lighting mixes and number of units required, bearing in mind that Campbeltown's runway is almost three times longer than the Shetland island airfields.

[7] National Air Traffic Services *Aeronautical Information Service*
[8] Aeronautical information regulation and control

A Manual Controlled CALKIT LED with 54 White 125cd & 6 Red & 6 Green is coming in at just over £42,000, whilst a radio controlled CALKIT LED with charging unit & desktop charger is just over £58,000.

Delivery costs are another significant factor with our correspondent at suggesting that arranging one's own dedicated low loader is more cost effective.

Runway Markings

Runway markings are another way that pilots are aided in their identification of the runway in poor light conditions. The markings nor only provide a guide the pilots to and from the runway; they also provide situational awareness; the only continuous visual aid and are recognised that they promote safety, reduce confusion and off runway incursions.

In the Northern airfields, with their gravel surfaces, this presents particular challenges in the application of surface paint, and the harsh weather also suggests significant subsequent maintenance obligations. From a pilot perspective runway lights are seen as more effective than runway markings.

IN the HIAL GNSS trial runway lights and runway markings were cited as supplementary ancillary adaptions to the technology

Remote Tower

SESAR[9], Eurocontrol and other agencies such as LFV[10] and private sector companies such as Saab (Saab Digital Air Traffic Solutions) have been working to demonstrate the utility of and gain

[9] Single European Sky ATM Research

approval for the remote air traffic concept in Scandinavia operations. LFV and Saab establish a joint venture, Saab Digital Air Traffic Solutions, to promote, develop, deliver and operate digital remote air traffic control for the export market. On 21 April 2015 with the opening of LFV's Remote Tower Centre in Sundsvall, when Örnsköldsvik Airport became the first airport in the world to be remotely controlled. Since operations began, LFV has accumulated over 4,000 hours of valuable experience of RTS.

HIAL has been monitoring the technology and is considering its applicability in the Scottish environment. A trail demonstrator is a likely next step. Inverness is being considered as the centre for operations.

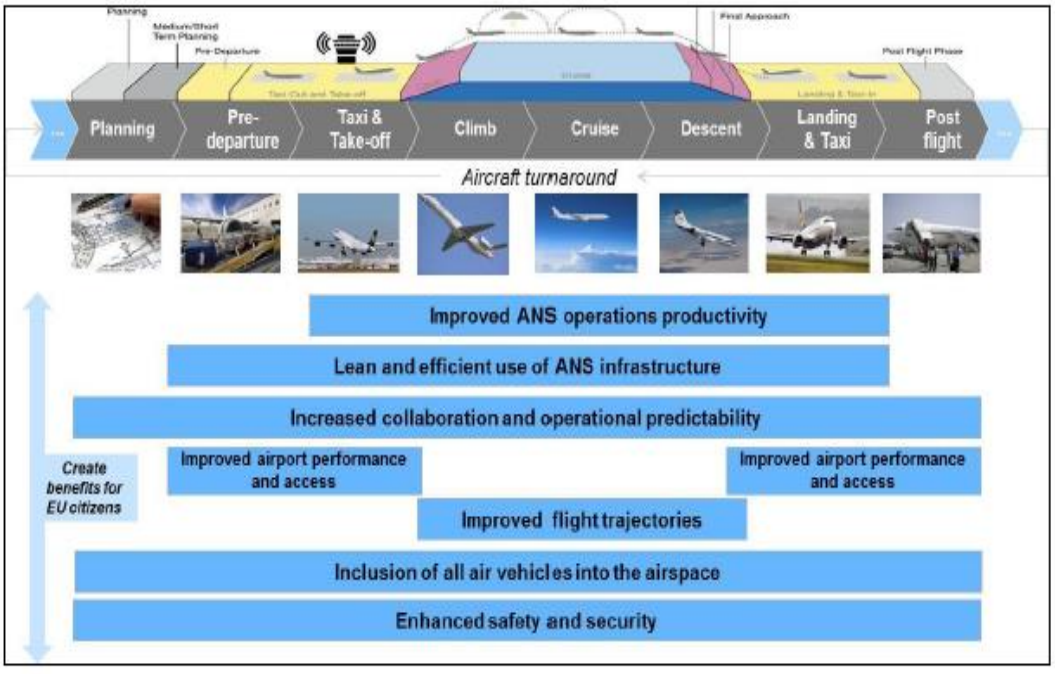
Airport Collaborative Decision Making (ACDM)

Eurocontrol has been working with Europe's larger airports on developing ACDM systems whereby Air Traffic Control information is used to inform and h=guide other airport operations to improve efficiency and responsiveness.

SPARA2020 is looking at the practicality of an ACDM Lite version that would be more appropriate for smaller airports.

The following schematic illustrates how the eight Air Traffic gateways could be used to inform other parts of the airport's operation such as ground handling, but even potentially passengers via an APP, local taxis companies and local radio, particularly when there are flight delays.

Figure 15



Greening Aviation

[10] Swedish Luftfartsverket

An agreement is expected to be reached at the International Civil Aviation Organization assembly in September 2016 in Montreal. This agreement is expected to define the framework for *global market based measures* that international aviation will use to offset its carbon emissions beyond the 2020 reference level.

This is the first aspirational goal for carbon reduction set out globally by a given industry. While all recognised that there will be costs associated to purchasing offsets through market based measures, these costs will be manageable to industry, will produce the environmental results that government's around the world want and the aviation mobility that passengers and shippers need.

Even prior to agreement progress is being made. For instance Canada has managed to reduce its emissions from aviation by 12 percent in the last decade. In fact, were the entire global fleet replaced today by the most modern aircraft available, global emissions would drop by 30 percent overnight. This *shows the great strides aircraft and engine manufacturers have made to build greener aircraft through innovation and technology, improving fuel efficiency by 1.5% to 2% per year*. This progress has enabled today's jetliner to only emit a fifth of the emissions produced by the first generation of jetliners some 60 years ago. Aircraft manufacturers have introduced 7 new aircraft types in the last decade with three more expected to roll out shortly. Airlines in many other countries have placed significant new orders for these types in recent years.

There has been significant progress with the development of *biofuels* from a range of sustainable sources and their testing of biofuels that can be used as a partial replacement for kerosene in existing aircraft engines. Flights with a 50% conventional fuel and 50% biofuel mix have been undertaken. Biofuels are commercially present at airports such as Oslo and Los Angeles and an EU funded project SPARA2020 is looking at their applicability at smaller airfields using Karlstad in Sweden as an exemplar. The biggest challenges to the widespread use of biofuels in the aviation sector are:

- Competition for the existing output from other transport sectors
- The difficulty of up-scaling production to a level where it is widely available and competitively priced with oil-based Jet A1
- The costs of distribution to remote and peripheral airports and the consequent need to also develop mini-production facilities, ideally using locally available feedstock, is also a problem that has yet to be resolved.

Given Scotland's capability in chemicals production, process engineering, farming and forestry and the aviation sector, and the availability of research and seedcorn funding from EU Horizon 2020 and UK sources, this may be one area where Scotland could seek to develop a market presence and join with Scandinavian partners for private funding and first mover advantage.

Technology can also help *ground-based aviation initiatives*. For example, there are greener alternatives today than having an aircraft use one or more engines to taxi to the threshold of a runway through the use of electric taxiing systems. Similarly, airports are looking to solar power in order to provide the electricity an aircraft needs when on the ground for lights and ventilation. The results of these and other efforts are tracked by the Airport Council International's airport carbon accreditation program; in fact, over 20 airports in that program are carbon neutral today. HITRANS are currently preparing trials for electric airport taxis, car hire and buses under the SPARA 2020 project.

Threat to, or reformulation of, AvGas

It is important to flag the medium term risk to the supply of Avgas that is currently essential for BN2 Islander engines.

The component in leaded avgas that establishes the octane level is tetraethyl-lead, or TEL, an additive used in small quantities to raise the ignition point of the fuel so that it doesn't pre-ignite under compression before the spark plugs fire during the ignition cycle. That pre-ignition, or detonation ("knock" in auto engines), can tear aero engines apart at the high power settings at which they operate. So TEL allows the fuel to deliver high performance, and the octane number is a measure of how well it can protect against the onset of detonation. Avgas — now available in only one grade, 100 low lead (LL) remains the sole transportation fuel still containing lead.

Apparently there is no solution that will allow the existing 100-octane fuel to be unleaded and continue to be used.

An entirely new type of gasoline will have to be developed to meet the octane anti-detonation requirement plus all the other necessary properties implicit in a fuel that must operate properly (and safely) at altitude, not to mention its effect on the aircraft's fuel system. The challenge is to come up with a 100-octane fuel for the estimated 230,000 piston-engine aircraft worldwide that they can safely use without modification or — the worst-case scenario — being permanently grounded until a whole new class of large-displacement engines is developed.

The complexity of developing and approving an alternate unleaded fuel can only be appreciated when considering the ancillary requirements in addition to the octane, *i.e.,* the performance measures and properties. Some of the more critical elements are:

- Vapour pressure, as the fuel cannot be allowed to vaporise at high altitudes
- Freezing points
- Materials compatibility with the fuel's different chemical components, examples being whether they could dissolve the seals or adversely affect gaskets in the engine, hoses, pumps, tubing and bladders in the fuel delivery system, etc., all requiring extensive testing
- Electrical conductivity, which is necessary for proper functioning of modern fuel-level gauges
- Impact of the distillation curve or when the energy is produced in the combustion cycle

The new fuel will have to be approved by regulators across the world and each engine producer will have to satisfy themselves that there are no adverse implications on engine performance or other critical elements. Any transitional programme also has to find a global network of fuel producers and distributors and a delivery system and storage systems at all airports.

The US FAA think the fuel replacement project will take 11 years, or maybe longer, to make a successful transition to an alternative fuel. As a result, the agency is launching a government-industry initiative called PAFI (Piston Aviation Fuel Initiative) to work it all out. It is a major task, and there is no advance indication of what this fuel might cost and what transitional equipment costs there will be. Additionally will existing suppliers of Avgas withdraw in the meantime, or during the transition period as the commercial drivers for production wane?

The eventual withdrawal / replacement of AVGAS may provide future complications and cost to the service or could, in extremis, force a fleet renewal at some point (estimate 10 plus years).

Appendix 11 - Interlining – US & Canadian Efforts

In 2016 the Canadian government published its **Pathways: Connecting Canada's Transportation System** report. This was an extensive review of the Canadian transportation system and the legal and regulatory frameworks which govern it. Consultations were held and advice received from a broad range of transportation interests, other governments, experts and members of the public.

This one particular recommendation was worthy of highlighting.

The Review recommends that the Government of Canada act to maintain and improve access to air transportation for communities and for the economic well-being of the North by:

strengthening cooperation between southern- and northern-based airlines by seeking commitments from southern carriers or, in the absence of such commitments, the Government should consider monitoring, reporting and other mechanisms to encourage such cooperation. The purpose of a more collaborative system would be to ensure that customers are able to access global networks by paying a single fare, on a single itinerary or ticket, from place of origin to final destination. Other enhancements could include improved cooperation on schedules, baggage handling, and access to frequent flyer programs.

Unlike European and Canadian programmes, the US Essential Air Service Programme was framed as linking small communities with hub airports, unlike linking with their nearest large metropolitan centre or State Capital. Hence almost all those taking EAS flights are heading for connecting flights.

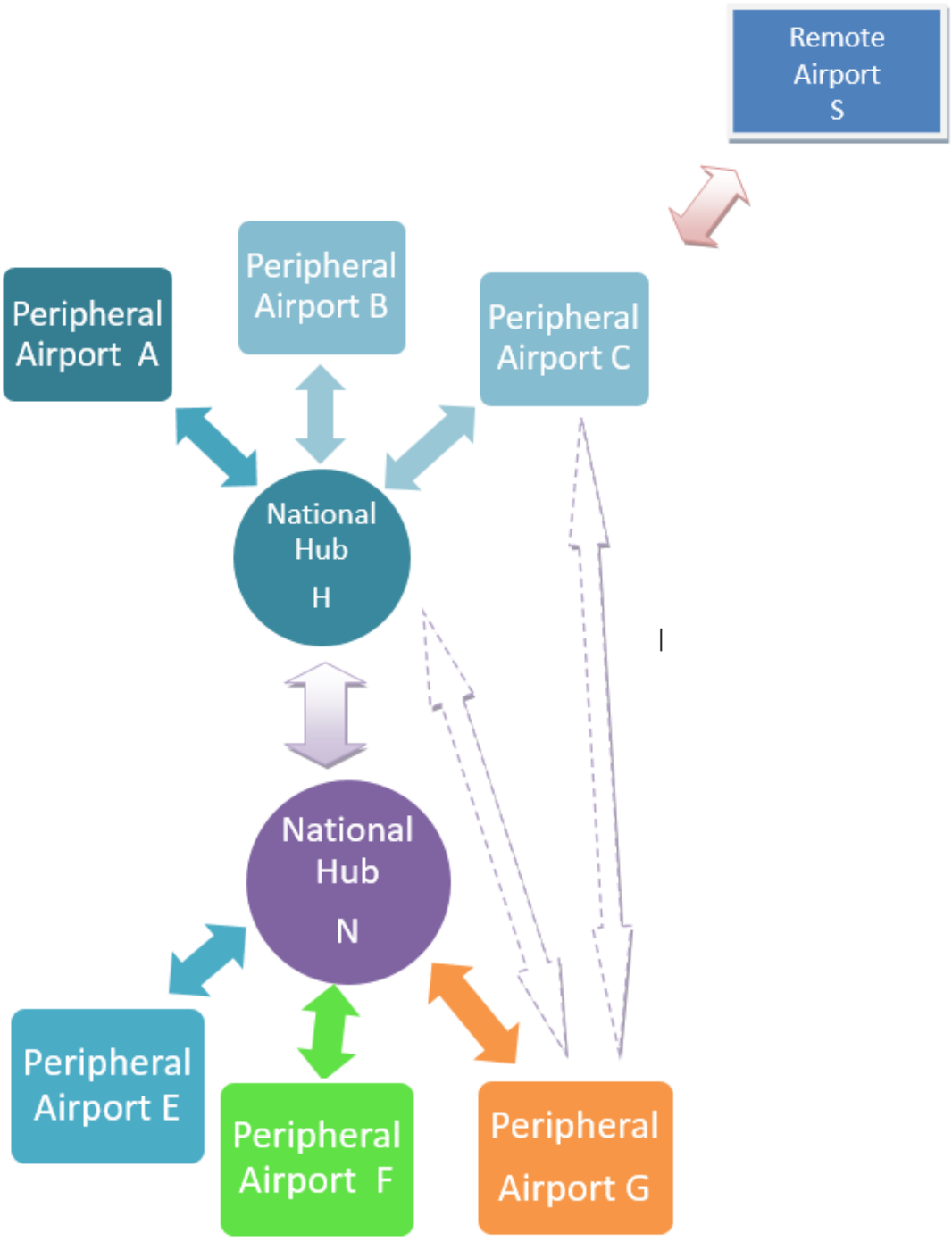
The EAS statute was amended by Congress in *Vision 100—Century of Aviation Reauthorization Act*, PL 108-176, December 12, 2003. Congress increased the authorised appropriation, in addition to the $50 million in overflight fees, from $15 million to $77 million. Moreover, Congress created community and regional choice programs that include the Alternate EAS Pilot Program and the Community Flexibility Pilot Program. **Congress also created a code-sharing pilot program that gives the Secretary the discretion to require air carriers providing subsidized EAS and major air carriers serving large hub airports to participate in code-share arrangements.** On July 12, 2005, the Department issued a Notice requesting comments on and interest in participating in the code-sharing pilot program. **Comments received by communities, air carriers and other interested parties were predominately against the concept of forcing air carriers into code-share agreements.**

Appendix 12 – Remote Tourism Destination Development

An Extract from Baltic Bird's **Tourism Destination Development Guidelines – PART 5 December 2013**

Typically remoter destinations require travellers to undertake an additional flight to visit, with all the additional cost, time and potentiaI additional overnights required.

Figure 16: Peripherality and Connectedness



Tourists visiting A, B or C, it can be appreciated and travelling from E, F, or G will have much longer and more expensive itineraries than tourists originating at N. Domestic tourists from H will have the least expensive air journey to A, B or C.

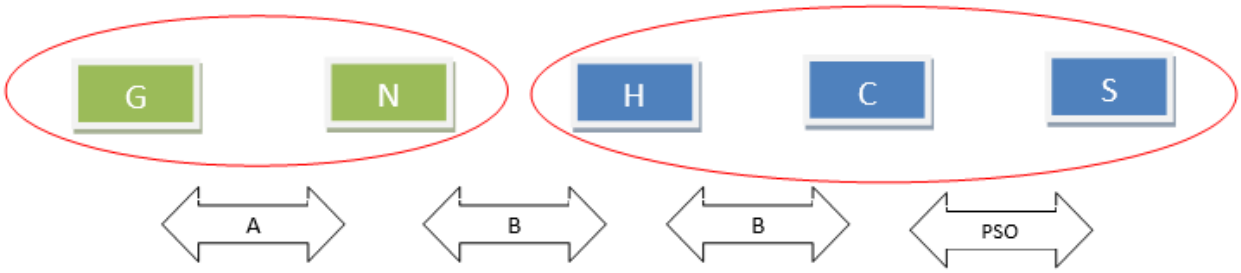
A further permutation is the situation such as in the Lofoten Islands (destination S in our diagram), where the tourist will face a further journey by air or sea, or in the Scottish context destinations such as Kirkwall, which can only be accessed from London via a journey to one of the main Scottish cities

such as Edinburgh, Aberdeen or Inverness before catching an additional flight to Kirkwall. In this example there may even be a further internal island flight required to access even more remote destinations such as smaller islands like Papa Westray.

Charter flights or route development initiatives linking E, F or G with H, or N with A, B or C do improve accessibility, and even more attractive are direct flights from E, F or G to A, B or C. However most destinations under consideration in the Baltic cannot support these direct links with international regional centres.

We can easily appreciate that regional centres must adapt to much smaller percentages of the total tourists visiting the national hub.

So can airlines, airport groups or government do anything to influence these hard realities? Let us explore one scenario set out below.



Let us examine the costs and stages of travelling between airport G and N in one country and airports H, C and S in another country. We are assuming H, C and S are in the same airport group (such as Avinor or Finavia), and air operator B is accomplishing both the international flight between N and H and also the domestic flight between H and C, much as SAS or Finnair might. We are assuming that the flight between C and S is an internal PSO flight, such as Wideroe's flight between Bodø and Solvær.

Air operator B could design ticket prices that incentivise passengers to fly N to C via H and make them cheaper than just combining the NH and HC standalone prices together. Stakeholders in C could potentially contribute to this 'fund' to improve the through ticket prices on NC.

Airport Group HCS could ensure its passenger and security charges are not applied onerously on the multi-stop passengers in their care. Indeed they could work with Airline B to ensure any pricing discounts are reflected in the special offers on NH flights.

The public authorities can intervene both positively and negatively in this situation.

We have seen how the UK Air Passenger Duty (APD), which controversially penalises UK regional domestic travellers more heavily than travellers residing near the international hub. In our example someone living in G will pay the UK tax on their flight GN and also on one leg of their international flight NH, whilst residents near H will only pay one leg of the flight NH. In recognition of this effect the UK authorities do not apply APD in the Highlands and Islands, where an additional second internal flight is often required to get to London for instance (eg Kirkwall – Aberdeen – London).

We have also seen how the Scottish authorities have developed a resident's Air Discount Scheme (ADS) which gives residents in remote areas discounts on their tickets paid directly by the government. The Spanish government runs a similar scheme for residents in the Canary Islands. This of course does not help our tourists, but it might be possible that government could cleverly design schemes that

encouraged a certain category of traveller to enjoy a discount, if a suitable discriminating mechanism could be found, that was compliant with EU non discriminatory law. The Northern Norway Air Charter Fund is an example of such an effort aimed at helping tour operators.

We have seen how PSOs often specify a maximum fare, and this will influence a tourist's decision to make the additional journey from C to S or not. Indeed in Orkney we saw a further elaboration of this effect whereby the PSO pricing favours remote island residents by offering a cheaper return price if the journey originates in the outermost isle rather than from Kirkwall. It should be noted that the ADS does not apply on PSO routes in Scotland, on the principle of not applying double subsidy mechanisms.

It should be noted how few existing aviation policies actually favour tourist promotion, and if government is serious about developing a nation's tourist potential it should perhaps review its policies in relation to aviation from this perspective. Tourists don't have a vote in the country they are visiting, but tourists do vote with their wallet.

Appendix 13 - An RDF for Incoming Tourism Charters - an illustrative outline approach

1. **A weekday service** that shares a lunchtime flight between three destinations on alternating days. The ambition is to thereby serve business, VFR and tourism interests. London is the most obvious initial target market.

   Indicative Schedule

   London - Stornoway M & W
   London - Kirkwall Tu & Fri
   London – Sumburgh Th & Sat *(It is noted that Sumburgh has some runway length and obstacle issues which may obviate the use of certain aircraft types)*

2. **A summer only weekend service**[11] that attempts to utilise aircraft that would otherwise be idle and that can afford to be left at the Scottish destination for the weekend before bringing the travelers back after a two night stay at the destination. The indicative timings would be a Friday evening flight north returning late Sunday afternoon for a 16 week summer period.

   The markets targeted would be major northern European metropolitan centres within reasonable flying time of the destinations in regional aircraft. London is the most obvious initial target, but other centres such as Amsterdam, Copenhagen, Oslo could be drawn into the proposition.

   Destinations that could collaborate. Typically each destination might receive two or three charters in a season.

Airports	USPs			
Islay	Golf	Whisky	Wildlife	Marine
Tiree	*Surfing*	Gaelic / Culture	*Birds*	*Marine*
Campbeltown	Golf	Kintyre	Wildlife	Marine
Stornoway	Wilderness	Gaelic / Culture	Fishing	Festival
Wick	Wilderness	Whisky	Orkney	Marine
Benbecula	Golf	Gaelic / Culture	Wildlife	St Kilda
Sumburgh	Wilderness	Pre-history / Viking	Birds	Marine
Kirkwall	Wilderness	Pre-history / Viking	Whisky	Marine

The target airports (in order of attraction/likelihood) would be:-

Gatwick
Luton
Stansted

[11] This is based upon insights from C. I. Travel, Ramsay World Travel (Dundee), Newmarket Travel, Executive Golf tour operators, and Voigt Travel of the Netherlands (wilderness holiday specialists of which there are several around Europe)

Southend
Amsterdam
Copenhagen
Oslo
However as this would be building upon the operational convenience of airlines, the approach would have to be opportunistic.

Target Airlines would be

Flybe
Stobart Air
KLM Regional
SAS / Wideroe
Eastern
Loganair
And aircraft types that may be suitable, and available, are listed as

Aircraft options	ATR72	ATR42	E-195	E-175	Saab2000	CRJ-900
Seats	72	48	118	88	50	88

The public sector could be available to help reduce risks and it is likely that the weekend flights could be run by a tour operator or group of tour operators who specialise in the different USPs of the destinations.

The availability and standard of island hotel, guest house and self catering accommodation could be a limiting factor for some potential destinations.

Further work would need to be undertaken to develop this into firmer propositions.

Appendix 14 - Stronger Island Branding – An Illustrative Approach

A key aim of the SG should be to encourage and facilitate that every visitor to Scotland is tempted by an offer to visit a Scottish island. We recommend that the SG works with Scottish island authorities to create stronger demand for visits to outlying islands.

This could be based upon creating a brand like **Munro Bagging**.

A Munro is a mountain in Scotland with a height over 3,000 feet (910 m). Munros are named after Sir Hugh Munro, 4th Baronet (1856–1919), who produced the first list of such hills, known as Munros Tables, in 1891. A Munro top is a summit that is not regarded as a separate mountain and which is over 3,000 feet. In the 2012 revision of the tables, published by the Scottish Mountaineering Club, there are 282 Munros and 227 further subsidiary tops.

A popular practice amongst hillwalkers is "Munro bagging", the aim being to climb all of the listed Munros. As of 2009, more than 4,000 had reported completing their round, and many, many thousands more are in process.

Consider cultivating such a demand for **Scottish Island Bagging**. Some further thought needs to applied, but there may be mileage in creating some sort of targets and thresholds for potential participants.

'Somerled' the most famous of the **Lord of the Isles** was known as by an appropriate (for these purposes) Viking name that means "summer wanderer". Fortunately, he is very much associated with the Western Isles and perhaps by this device the difference in the Gaelic and the Norse Isles can be bridged. The use of the term Lord of the Isles may be such a device for an 'Scottish Island Bagger' seeking different levels of accomplishment. For example

- Those who have set foot on all Scotland's inhabited Isles
- Those who have set foot on all Scotland's main Isles, including those previously inhabited
- Those who have set foot on all Scotland's Isles above a certain minimum size

Other terms that could be adapted for use of these various levels of achievement could be the Gaelic version of the title (Triath nan Eilean or Rìgh Innse Gall) or the Norse term of Jarl, or even Lalland Scots version - Laird of the Isles.

Some sort of bucket list approach may also be helpful, including summer holiday trips that allow certain groups of islands to be visited together over a 2 week holiday by ferry, air and quite possibly by hired boat for some more challenging destinations (eg the Shetland, Orkney, Western Isles, Inner Hebrides, The Clyde Islands could be grouped separately).

Two key things we think are needed.

1. A full listing of all islands (however defined) so that the whole thing can be quantified.
2. Ideally a book written about all these islands that visitors could treat as their handbook.

Some mileage could also be had with getting a stamp on each Island as proof of visit (eg the local post office on inhabited islands) or a photo in front of some cairn on each island. The West Highland Way has created signage at end of route (see below), and there is also a Cairn in centre of Fort William which is something of a tourist draw.

And some sort of acknowledgement for those who complete various levels of task (eg Certificate signed by royalty or First Minister of Scotland, the poet laureate or whatever)

The concept could be worked up by the Our Island Council collaborating with VisitScotland and the transport and accommodation providers (ferry, charter, yachting and air services).

Marketing and Branding, properly resourced, could help underpin the justifications for expanding the inter island air services by delivering new users and revenue to the air service and additional economic and social benefits to the outer islands.

Appendix 15 - Swedish Connectivity Indices

Using the timetables for selected Swedish airports in the official airline guide (OAG) it was assessed how much time could be spent at a given destination during a day trip on a selected date. For example, someone taking the first flight from Luleå in northern Sweden to Frankfurt and returning on the last flight home can spend nine hours in Frankfurt. doing it the other way round, from Frankfurt to Luleå and back, allows four hours in Luleå. Looking at it from the Luleå perspective, the former is termed Luleå's "reachability" (for want of a better word) to Frankfurt, and the latter is Luleå's accessibility from Frankfurt.

In their 2010 Aviation Trends publication the Swedish Transport Agency undertook and interesting snapshot of trends in accessibility for their domestic interior. A similar snapshot of the UK regions could be instructive.

It is noticeable that the UK seems to have no such ambition to monitor and concern itself about the *reachability and accessibility* of its regions. The Swedish report is reproduced here.

The time that can be spent at the destination has been defined as the period between landing and departure on the last flight that enables the passenger to reach his "home base" before 24:00 hrs the same day. Periods of less than four hours have not been considered, because it is not normally meaningful to make a day trip if you have less than four hours at your disposal to carry out your business.

The study calculated the visit duration for those airports in Sweden with scheduled traffic, and the average of these visit durations became the measure of an airport's reachability and accessibility.

Reachability and Accessibility – Domestic

The possibility of getting to and from the various airports in one day varies greatly. Airports with many direct connections and frequent departures naturally have an advantage. Figure XX shows average visit durations on a selected day in 2009 for Swedish airports with scheduled traffic.

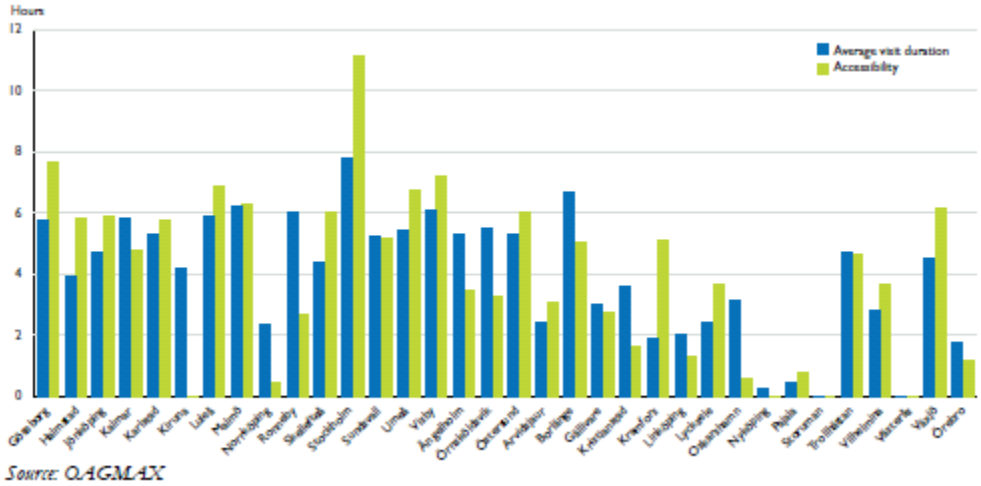
Stockholm, being the major hub in the Swedish air transport system, naturally had the best reachability and accessibility by virtue of its direct connections to and from most of the other airports in Sweden. Other airports generally have only one direct connection, namely to and from Stockholm. The factor most important to the mutual relationship between these airports is timetabling, though distance is also important.

The poorest reachability (disregarding Nyköping and Västerås, because they have no domestic connections) is displayed by Hemavan in northern Sweden. Poor accessibility is displayed by Kiruna, Hemavan, Nyköping and Västerås, which could not be reached from any other airport in Sweden for a day trip.

The average visit duration for the whole group decreased by 14 per cent from 3.5 hours in 2008 to 3 hours in 2009. This applies to both reachability and accessibility.

The table shows the changes in reachability and accessibility for the various airports/regions between 2008 and 2009. It also shows changes in the number of domestic destinations that can be reached, or that the airport can be reached from.

Figure 17 Reachability and accessibility – domestic. Average visit duration, 2008



Source: QAGMAX

Table 8: Change in reachability and accessibility, domestic

	REACHABILITY				ACCESSIBILITY			
	Average visit duration 2009, hrs	Change, minutes	No. of dest. 2009	Change, No. of destinations	Average visit duration 2009, hrs	Change, minutes	No. of dest. 2009	Change, No. of destinations
Gothenburg	5.53	11	28	2	7.16	-2	32	1
Halmstad	3.53	-13	20	-2	2.68	-164	13	-18
Jönköping	4.92	3	25	-1	1.87	-226	8	-24
Kalmar	5.84	2	28	1	4.39	14	23	5
Karlstad	5.45	6	27	-1	2.32	-194	11	-21
Kiruna	0.34	-196	2	-15	0.00	0	0	0
Luleå	4.89	-35	23	-3	5.26	-71	25	-5
Malmö	4.34	-82	22	-5	5.95	3	31	1
Norrköping	1.82	-14	11	-3	0.39	2	3	1
Ronneby	4.95	-36	23	-3	3.50	46	18	6
Skellefteå	4.42	16	22	0	3.58	-128	18	-11
Stockholm	7.39	-8	33	1	10.76	13	35	2
Sundsvall	4.92	24	24	5	4.00	-63	19	-4
Umeå	4.03	-60	22	-3	5.26	-69	22	-10
Visby	5.95	21	28	1	6.21	-39	28	-4
Ängelholm	4.45	-30	23	-1	4.74	92	28	12
Örnskoldsvik	4.79	-44	22	-5	3.55	14	20	5
Ostersund	4.42	-30	23	-2	5.05	-43	23	-9
Arvidsjaur	1.16	-57	8	-7	2.63	-16	20	-2
Borlänge	6.13	-25	27	-2	4.47	-14	30	-1
Gällivare	1.45	-68	10	-8	2.63	16	20	2
Hagfors	3.63	-16	21	-2	1.26	0	6	0
Hemavan	0.00	0	0	0	0.00	0	0	0
Kristianstad	1.24	-133	8	-13	0.55	-52	3	-5
Kramfors	1.58	-2	11	-1	4.24	-33	23	-3
Linköping	0.97	-46	6	-5	0.63	-30	4	-3
Lycksele	1.16	-57	8	-7	3.16	-19	20	-2
Mora	3.11	8	18	1	3.68	0	20	0
Oskarshamn	2.11	-38	13	-2	0.21	-17	1	-2
Nyköping	0.16	-3	1	0	0.00	0	0	0
Pajala	0.39	2	2	0	0.79	8	6	1
Storuman	1.11	66	8	8	0.00	0	0	0
Sveg	0.00	0	0	0	3.16	0	20	0
Torsby	3.63	-16	21	-2	1.11	-9	6	0
Trollhättan	1.95	-128	10	-11	2.08	-131	12	-16
Vilhelmina	1.16	-76	8	-9	3.63	0	23	0
Västerås	0.00	0	0	0	0.00	0	0	0
Växjo	3.37	-54	19	-5	5.05	-39	31	1
Örebro	0.61	-55	3	-5	0.89	-8	6	-1

Of these 39 airports, 26 experienced reduced reachability and 10 saw an improvement, whilst the situation for 3 of them remained unchanged. The greatest improvement was to be seen at Storuman. The biggest decreases were to be seen at Kiruna, Kristianstad and Trollhättan.

Accessibility increased at 9 destinations and decreased at 21. At 9 destinations the situation remained unchanged. The greatest positive change was displayed by Ängelholm, whilst Jönköping displayed the biggest negative development.

Reachability and Accessibility – EUROPE

Looking at the international scene, the visit durations for the 33 European cities most frequently flown to from the Swedish airports have been calculated (see Figure XX). The average times have been calculated in the same way as in Figure 1.

As a rule reachability is better than accessibility, i.e. you can spend longer at European destinations than you can spend in Sweden when travelling there from those destinations. In 2009 Stockholm and Gothenburg scored highest on both parameters, because they offered a relatively large number of direct connections to European cities. Other airports with good reachability had good connections to Copenhagen Airport, the main Scandinavian hub. The poorest reachability was displayed by airports in northern Sweden (except those near the coast), together with Trollhättan and Västerås. The accessibility calculations revealed that day trips to Kiruna, Hemavan, Pajala, Storuman or Västerås were impossible.

Average reachability for the whole group decreased to 3 hours in 2009 - 5% less than in 2008. Average accessibility was 2 hours in 2009, i.e. 16% less than in 2008.

Table 2 shows average calculated visit durations for 2009 together with the change (in minutes) from 2008 and the number of destinations which can be reached.

Figure 18: Reachability and accessibility – Europe. Reachability. Average visit duration – 2009

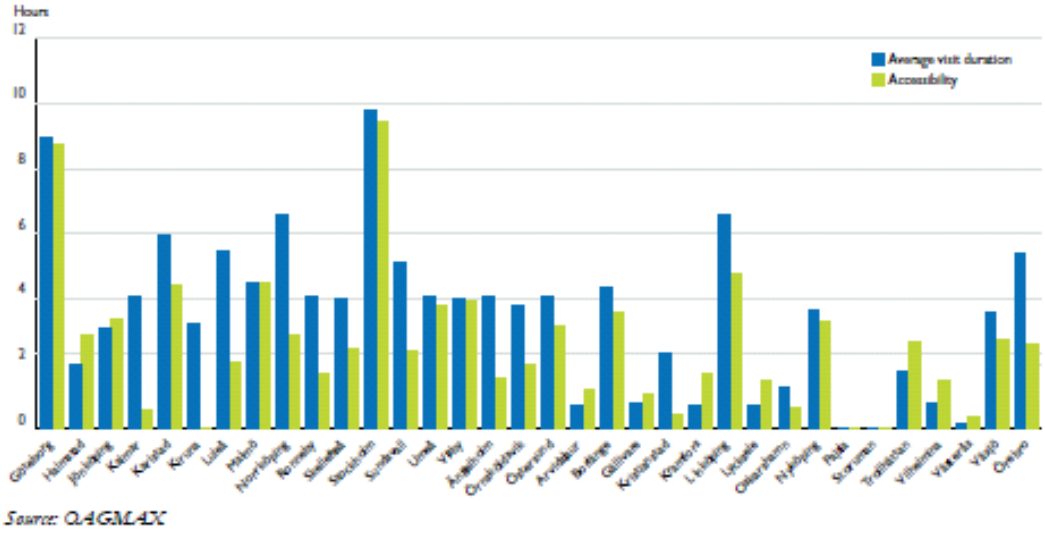


Table 9: Change in reachability and accessibility, Europe

	REACHABILITY				ACCESSIBILITY			
	Average visit duration 2009, hrs	Change, minutes	No. of dest. 2009	Change, No. of destinations	Average visit duration 2009, hrs	Change, minutes	No. of dest. 2009	Change, No. of destinations
Gothenburg	9.33	25	33	0	8.36	-22	32	-1
Halmstad	2.42	27	13	2	1.36	-89	7	-9
Jönköping	2.64	-25	14	-2	1.06	-138	5	-13
Kalmar	4.00	-2	21	1	2.21	100	13	11
Karlstad	5.94	2	26	0	4.18	-15	22	0
Kiruna	3.45	13	18	0	0.00	0	0	0
Luleå	5.03	-25	22	-3	2.88	51	17	8
Malmö	1.76	-162	10	-11	2.94	-91	16	-6
Norrköping	6.39	-11	27	-2	1.36	-89	9	-9
Ronneby	3.91	-9	20	0	1.67	-2	8	1
Skellefteå	5.27	78	23	3	1.82	-38	9	-4
Stockholm	9.58	-11	33	0	9.39	-4	32	0
Sundsvall	5.27	11	23	-1	2.06	-22	9	-2
Umeå	3.58	-27	19	-1	2.27	-91	11	-9
Visby	3.64	-20	19	-1	3.18	-44	18	-1
Ängelholm	3.73	-18	20	0	2.79	75	18	9
Örnsköldsvik	4.97	73	22	3	1.61	-20	8	0
Östersund	3.58	-27	19	-1	1.67	-87	8	-11
Arvidsjaur	0.58	-9	3	-1	0.91	-18	6	-2
Borlänge	4.12	-15	21	0	3.85	16	21	1
Gällivare	0.61	-9	3	-1	0.91	-9	6	-1
Hagfors	1.09	-4	6	0	0.73	-15	3	-1
Hemavan	0.00	0	0	0	0.00	0	0	0
Kristianstad	1.03	-78	6	-7	0.85	26	4	2
Kramfors	0.61	-7	3	-1	1.70	0	8	0
Linköping	6.82	15	29	0	2.73	-122	15	-13
Lycksele	0.58	-9	3	-1	1.09	-22	6	-2
Mora	1.06	-4	6	0	1.48	-13	7	-1
Oskarshamn	1.06	-13	6	-1	1.52	53	7	4
Nyköping	4.91	75	22	4	2.12	-69	10	-7
Pajala	0.00	0	0	0	0.00	0	0	0
Storuman	0.30	18	2	2	0.00	0	0	0
Sveg	1.06	-4	6	0	1.27	-11	7	-1
Torsby	1.09	-4	6	0	0.64	-20	3	-1
Trollhättan	0.00	-104	0	-10	0.36	-136	2	-14
Vilhelmina	0.61	-9	3	-1	1.27	-11	7	-1
Västerås	0.00	-11	0	-1	0.00	-22	0	-1
Växjö	1.85	-102	10	-8	3.27	33	18	1
Örebro	5.48	4	24	-1	2.33	-15	15	-2

Source: QAGMAX

Accessibility increased at 7 airports, in particular Kalmar and Ängelholm. Jönköping, Trollhättan and Linköping displayed the biggest decreases.

Appendix 16 - Avinor Benchmarking Study

In 2012 the Norwegian Ministry of Transport and Communications undertook a Comparative study (benchmarking) on the efficiency of Avinor´s airport operations. This study is interesting from a variety of viewpoints that throw some light on the UK situation as it was often used as a comparator.
State Owned Avinor operate 46 (nearly all) of Norway's airports receive no public subsidy and cross subsidse the loss making airports with the profits from the profitable airports of Oslo Gardermoen, Stavanger, Bergen and Oslo Torp. Alesund, Bodø and Kristiansand are approaching profitability. They handled 46 million passengers in 2012, had 3100 employees and a turnover of €1.1 billion.

The benchmark study by Avinor (2010) was very detailed, and it advised some specific steps to improve the airport operations efficiency with respect to detailed technical and organsational aspects of airport operations.

Because DEA identifies the "peers" for units (airports) that are not efficient, the approach in Avinor's own study appears as convenient at looking into the inefficient units and comparing them with their "peers" in order to improve their operations. Examples of elements that need to be looked into such a study are:

- Regulatory issues. An update on regulation and their impacts
- Different organisational structures
- Outsourcing
- Staff multi-tasking
- Automation of operations, current state and potential for development
- Collaboration and coordination with the airlines
- Off-site development, like paid parking
- Emergency preparedness (like ambulance flights)

The study is of particular interest to this report because Avinor used some UK airports and HIAL as peer comparators.

Avinor was interested to compare Norwegian airports with UK airports because UK airports face relatively strong competition compared to other European airports, in particular because of a high airport density and footloose Low Cost Carriers. Starkie (2008) argues that the behaviour of UK airports is similar to that observed in a competitive industry.

Figure 19 Average EBIT per passenger at European Airports between 2002 and 2009 for different size classes in PPP-adjusted NOK[12] 2010 prices

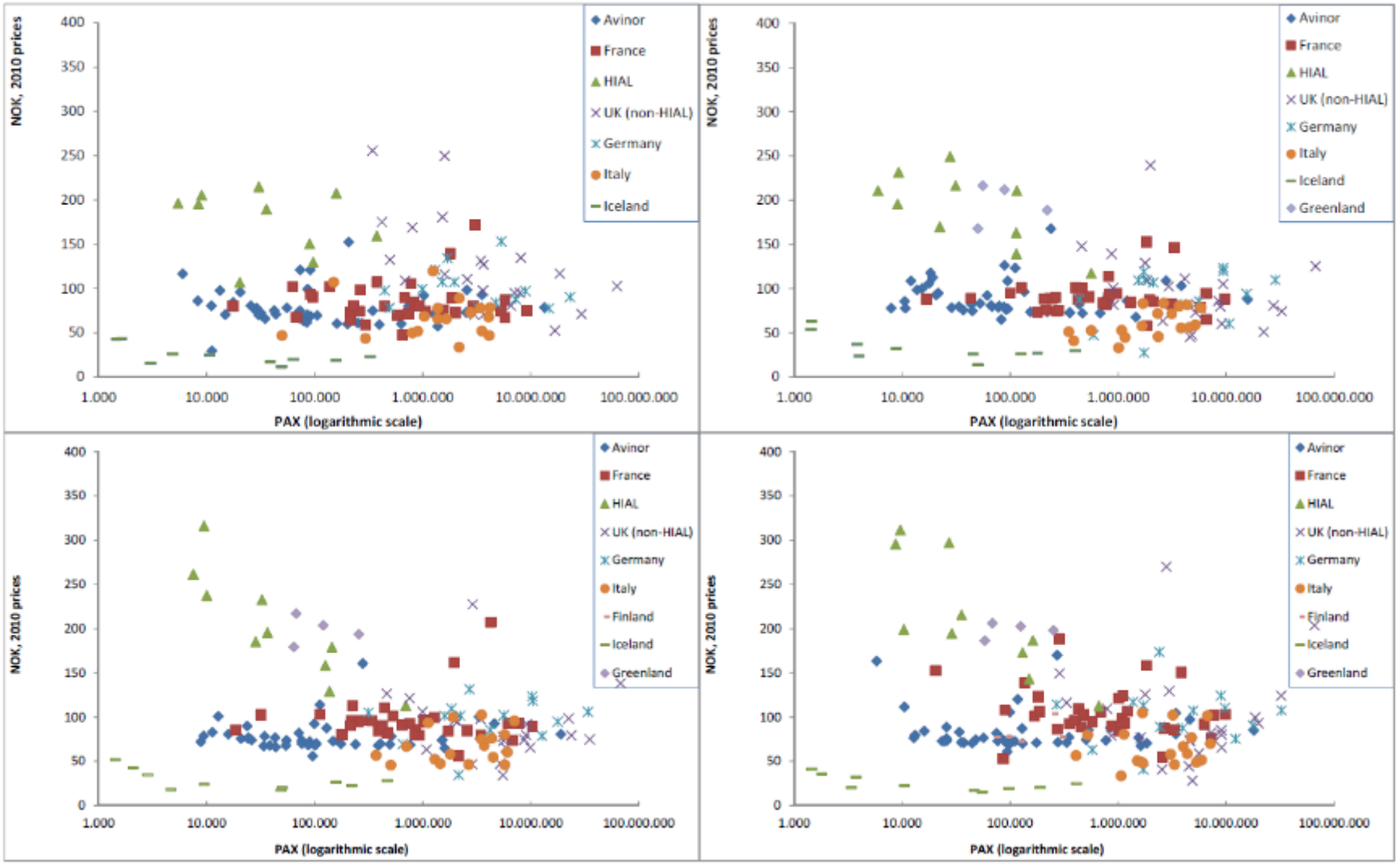
Country	1.000-10.000 pax				10.000-100.000 pax				100.000-1.000.000 pax				1.000.000-10.000.000 pax				>10.000.000 pax			
	'02	'05	'07	'09	'02	'05	'07	'09	'02	'05	'07	'09	'02	'05	'07	'09	'02	'05	'07	'09
France					-49	-108	-306	-135	10	-27	-23	-34	22	22	23	8			46	
Germany									-99	-130	-157	-218	6	-25	-20	-24	57	28	45	38
HIAL	-1,132	-1,168	-938	-925	-446	-605	-496	-537	-155	-241	-151	-140								
Italy					-144				-5	-48	-45	-142	12	12	13	12				
Norway	-762	-1,661	-2,085	-2,756	-194	-608	-606	-628	-19	-82	-128	-136	54	42	30	38	43	63	79	78
UK									42	11	-11	-94	52	47	47	27	55	52	49	20
Iceland	-853	-683	-577	-708	-209	-146	-147	-154	-150	-101	-83	-93								

What is noticeable is how HIAL has been able to reduce the losses in all its airport size categories during the period, whilst larger UK airports were enduring reducing profitability. Norway's small airport performed less well than HIAL during this period, whilst Avinor's larger airports were able to increase their profitability unlike their UK counterparts. The small non-HIAL UK Airports[13] fared badly.

[12] Currently 11.8 Norwegian Krone to the £

[13] Bournemouth, Exeter, Humberside, Durham Tees Valley

Figure 20: Aeronautical revenue (w/o ground handling) per pax vs nos of pax at European Airports 2002 upper left; 2005 upper right 2007 lower left and 2009 lower right in PPP-adjusted NOK, 2010m prices



At the beginning of the series that UK airports (HIAL and non HIAL) receive more aeronautical revenues than their European peers, but it is also noticeable that non HIAL airports become more like their European peers during this period, whilst HIAL maintains its pricing distinctiveness.

Figure 21: Average commercial revenue per passenger at European airports for 2002, 2005, 2007 and 2009 for different size classes (outliers not considered), in PPP-adjusted NOK, 2010 prices

Country	1.000-10.000 pax				10.000-100.000 pax				100.000-1.000.000 pax				1.000.000-10.000.000 pax				>10.000.000 pax			
	2002	2005	2007	2009	2002	2005	2007	2009	2002	2005	2007	2009	2002	2005	2007	2009	2002	2005	2007	2009
France									74	71	68	58	78	93	81	61				
HIAL					21	34	26	30	20	24	27	33								
Norway	30	45	49	-	30	39	33	27	24	29	42	48	37	46	56	60	76	92	112	114
UK									145	169		178	69	69	78	75	118	110	107	125
Finland																				
Greenland						29	34	27		12	7	6								
Iceland	7	8	7	1	6	6	5	4	4	3	3	8								

This comparison neatly illustrates how smaller airports find it difficult to match the commercial revenue (retail parking etc.) generated by the larger airports, particularly those in the UK.

When reviewing operating costs in Figure XX below we can appreciate how HIAL at the beginning of the series had significantly higher operational costs than say Avinor, which be the end of the time series had been eliminated and that non HIAL airports generally were in the bunch with their peers for most of the series but with the larger airports suffering a noticeable rise in costs in 2007 and 2009.

Figure 22: Operating costs (without depreciation) per passenger at European airports in 2002 (upper left), 2005 (upper right), 2007 (lower left) and 2009 (lower right) in PPP-adjusted NOK, 2010 prices

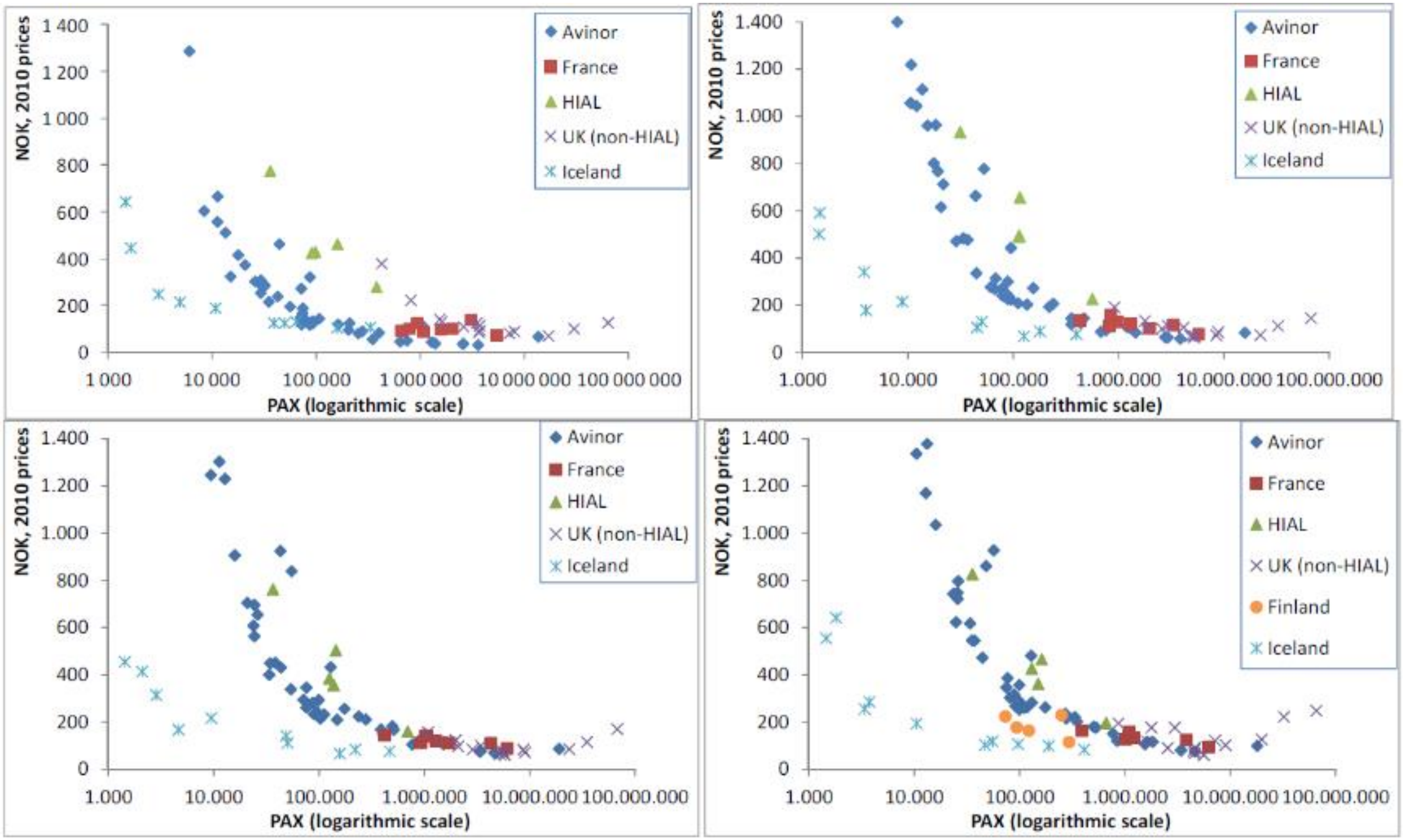
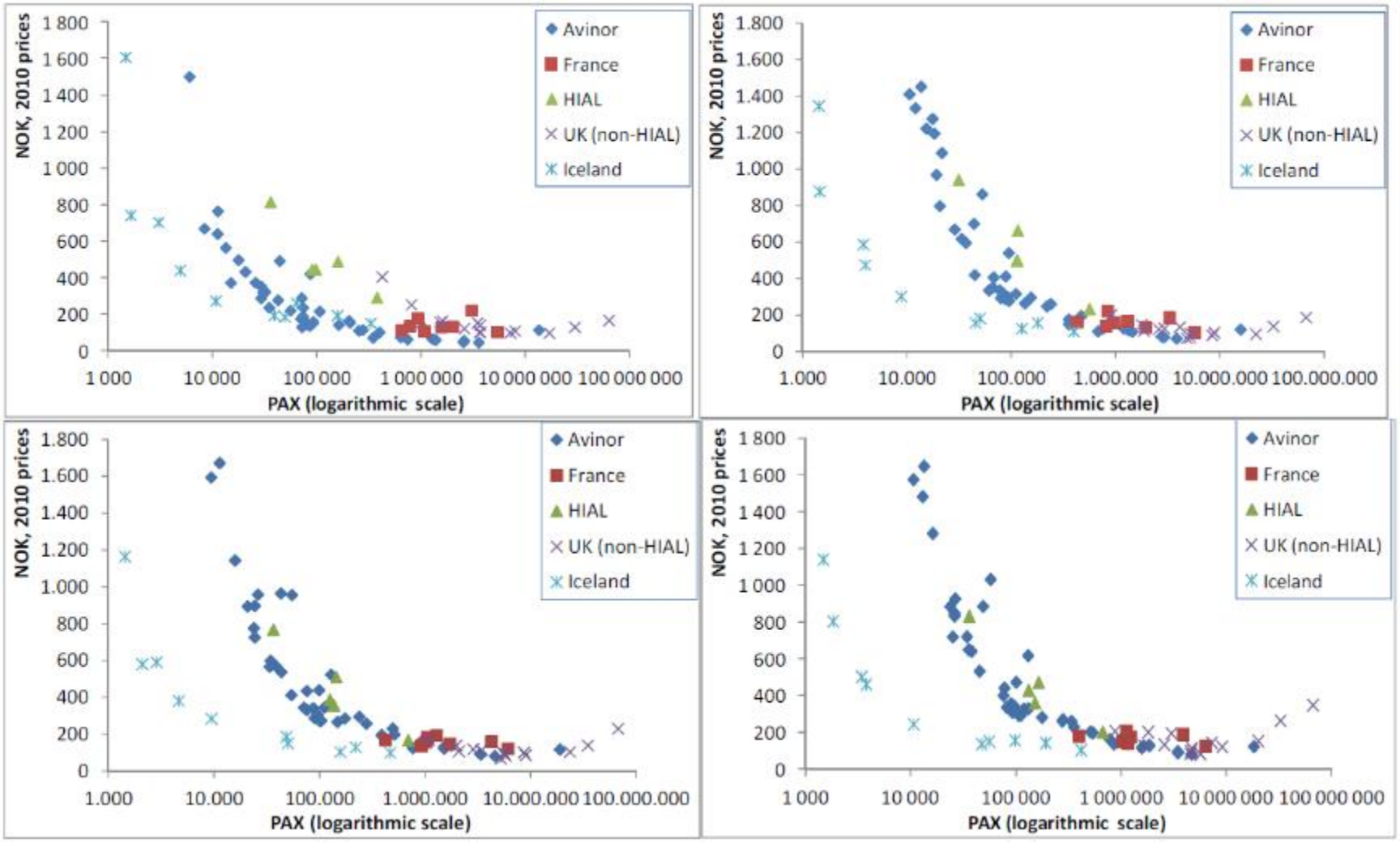
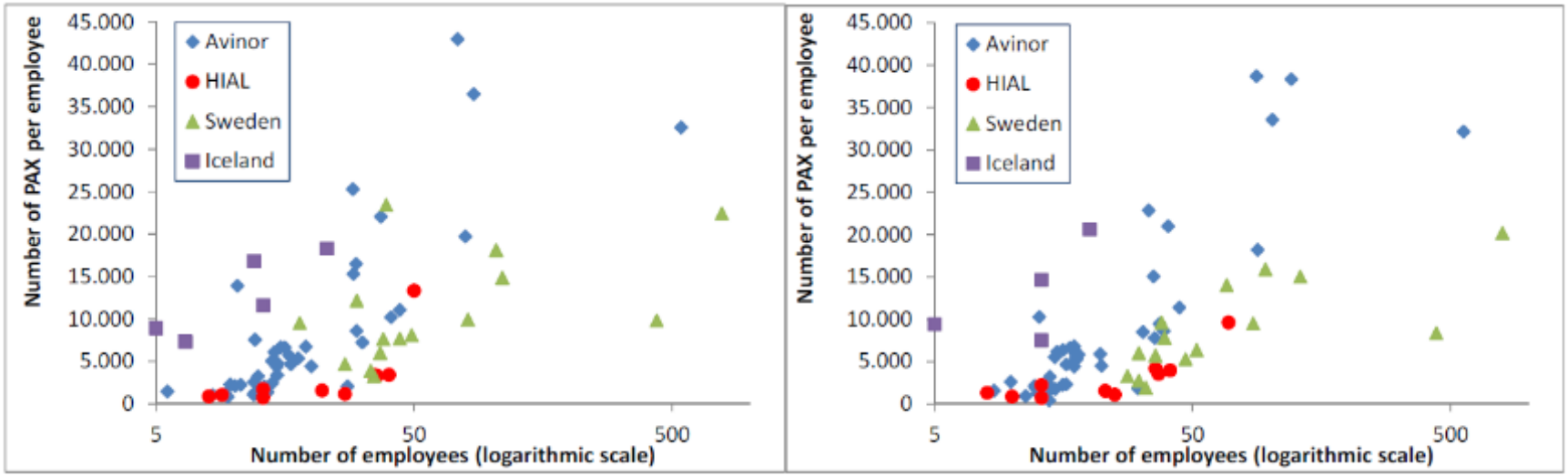


Figure 23: Operating costs (including depreciation) per passenger at European airports in 2002 (upper left), 2005 (upper right), 2007 (lower left) and 2009 (lower right) in PPP-adjusted NOK, 2010 prices.



Including depreciation exacerbates the larger UK hike in costs in 2007 and 2009, but does not significantly change the operational cost performance of HIAL against its peers.

Figure 24: Annual number of pax per employee (FTE) at selected European airports in 2006 (left) and 2009 (right)



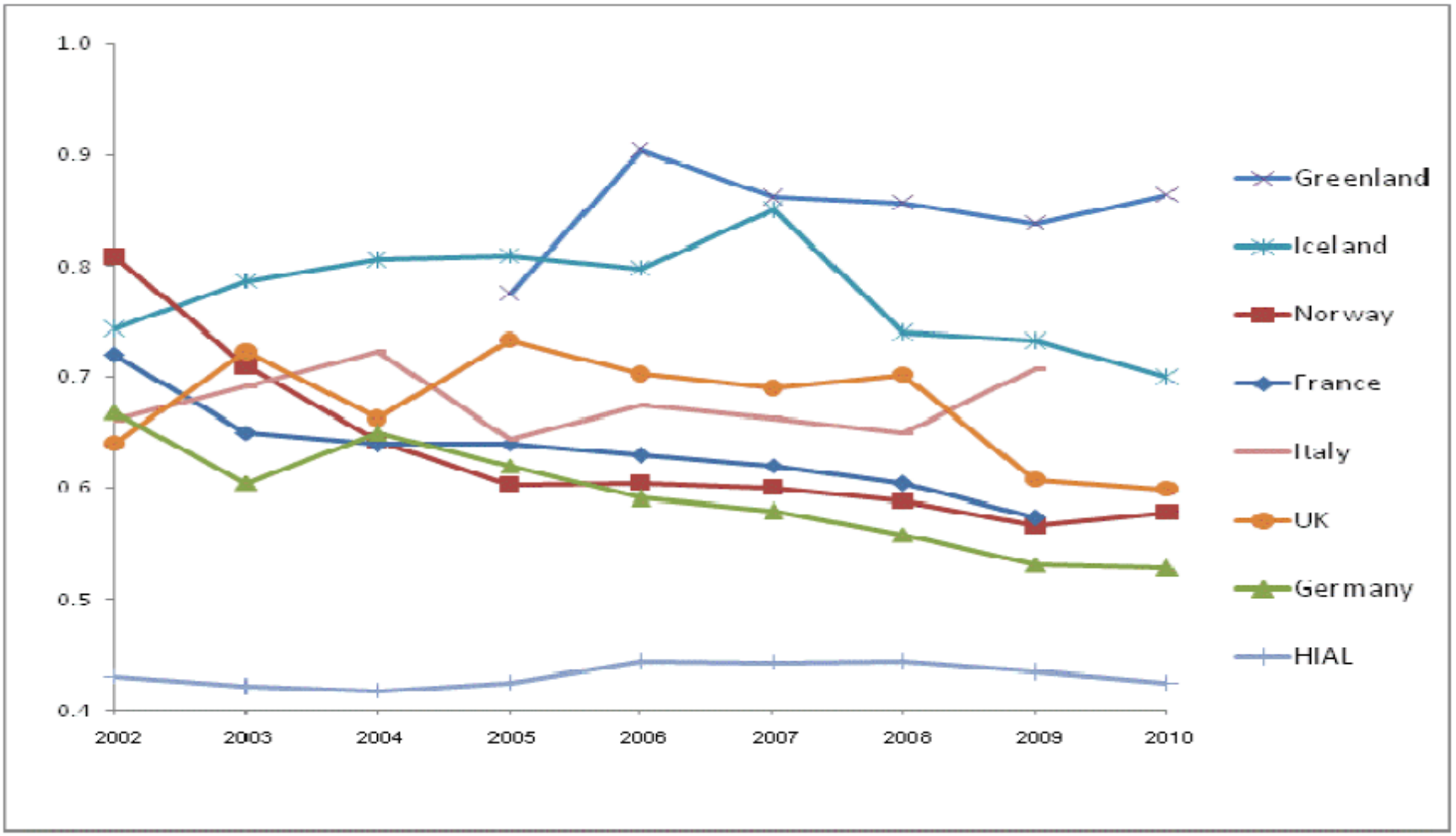
In a simple comparison of numbers of pax per employee HIAL, which is the only UK entity compared in this graph demonstrates that from this perspective it is amongst the least efficient amongst its peers, particularly at the smaller airport level. This of course is a very blunt comparison that does not compensate for the small islands and communities, and hence social role, that HIAL serves.

However further less sanguine comparisons for HIAL emerge from Figure XX where the study presents efficiency trends for each country or group of airports on an annual basis. The small Norwegian airports show a clearly decreasing trend in their efficiency estimates over time, particularly in the period up to 2005 after which the decline is more gradual. Similar patterns in efficiency can be observed for Greenland, Germany and France.

Greenland airports' efficiency estimates are fairly static and clearly exceed the other airports as does Iceland's. The Scottish HIAL airport group remains highly inefficient throughout the timeframe. Non HIAL small UK airports[14] appear to be provide good benchmarks for the HIAL airport system. Whilst the UK and Italian airports show small fluctuations in efficiency, the Icelandic airports have slightly decreased efficiency towards the end of the observed period. In summation, the Icelandic and Greenland airports present the highest relatively efficient performance overall although most of the small airports show decreasing efficiency levels over time.

[14] Bournemouth, Exeter, Humberside, Durham Tees Valley

Figure 25:Small Airport Efficiency Averages over Time



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