A passenger perspective of surface access issues at a regional airport in the UK: the case study of Robin Hood Airport Doncaster Sheffield

Tim J Ryley and Alberto M Zanni

Contact author: Prof. Tim Ryley. E-Mail: t.ryley@griffith.edu.au.

Griffith Aviation, School of Natural Sciences, Nathan campus, Griffith University, 170 Kessels Road QLD 4111, Australia

Other Author: Dr Alberto Zanni. E-Mail: A.M.Zanni@lboro.ac.uk. Transport Studies Group, School of Civil and Building Engineering, Loughborough University, UK

ABSTRACT

For environmental reasons, there is a need to reduce surface access journeys by private car, particularly 'drop-off / pick-up' trips, and to increase public transport usage. This paper examines surface access issues at the UK regional airport of Robin Hood Airport Doncaster Sheffield (RHADS), using data from an airport survey of 438 passengers. Most respondents were holidaymakers travelling to-and-from RHADS by car, either via drop-off / pick-up or their own vehicle. There were five distinct passenger groups generated from cluster analysis of the attitudinal statements and the surface access mode chosen. Apart from the *Public transport supporters* segment, the groups strongly favoured car-based surface access travel, particularly *Car-loving socialites* and the *Practical drop-offs*. A lack of willingness amongst passengers to change away from car travel and towards public transport for surface access journeys was identified, making it very difficult for airports to reduce the environmental impact of such trips.

KEYWORDS

Surface access, regional airport, public transport, passenger

BRIEF BIOGRAPHICAL NOTES ABOUT THE AUTHORS

Professor Tim J Ryley is a Professor of Aviation and Discipline Head within Griffith Aviation, Griffith University, Brisbane, Australia. Prof. Ryley has twenty years of transport research experience, and whilst at Loughborough University in the UK led a range of major research projects that covered both surface and air transport applications. These included projects on the propensity to fly, an examination of airport surface access journeys, an evaluation of Demand Responsive Transport alternatives, transport system resilience to climate change, and travel behaviour under weather uncertainty. Prof. Ryley's aviation research expertise includes the areas of air travel demand, airport planning, airport operations, and airport surface access. Much of his academic research has involved the design and collection of major travel behaviour household surveys, and the manipulation and analysis of primary/secondary data.

Dr Alberto M Zanni is an applied economist with a 12 year experience on various research and consultancy projects broadly covering environmental, transport and spatial economics, with special attention to the analysis of consumer behavior using advanced choice modelling techniques. His most recent work has mainly looked at the environmental externalities of transport, both freight and personal, and at the way climate change affects travel behavior both in terms of mitigation and adaptation. Recent projects have looked at, in particular, the acceptability and potential behavioural impact of personal carbon trading schemes on personal transport and domestic energy choices, cities adaptation to climate change and carbon reduction potential of urban freight policies, acceptability of low carbon vehicles in the freight sector, transport system resilience to climate change and travel behaviour under weather uncertainty, surface access to airports travel decisions and noise and air quality issues around airports.

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1. Introduction

Air travel has increased in the United Kingdom (UK) over the last 30 or so years and there has been a related growth in the volume of surface travel to and from airports. Surface access infrastructure is required to increase the connectivity for passengers, as well as for airport staff. The environmental impact of increased travel to-and-from airports demonstrates a need to reduce surface access journeys (also known as ground access trips) by private car, particularly ‘drop-off / pick-up’ trips, that often create congestion on roads surrounding airports, in order to reduce both local pollutants and carbon dioxide emissions. Public transport alternatives, such as taxi, bus and rail, as well as car sharing schemes, also need to be promoted in conjunction with the measures to reduce motor vehicle impacts.

The aim of this paper is to examine surface access issues for small regional airports using the case study of Robin Hood Airport Doncaster Sheffield (RHADS) in the South Yorkshire region of the UK. The paper is based upon a survey of 438 passengers at the airport in summer 2012. Analysis of the attitudes and associated behaviour of respondents includes how respondent views vary between sub-groups of the sample, using a combination of factor and cluster analysis. It identifies the segment of travellers who are more likely to consider changing from car to other more sustainable modes when travelling to the airports in the future.

The paper is organised as follows. The next section presents the case study airport of RHADS (Section 2). There is then a literature review of surface access travel (Section 3), followed by an outline of the methodology (Section 4). Section 5 presents the main results, including the determination of the population groups and an examination of the surface access transport issues. Finally, a discussion with conclusions is offered in Section 6.

2. The case study airport: Robin Hood Airport Doncaster Sheffield (RHADS)

The growth of air travel in the UK since liberalisation of the European aviation market in 1993 has been particularly pronounced in regional airports outside the London areas. Passenger numbers doubled between 1992 and 2004 from UK regional airports (Civil Aviation Authority, 2005). Robin Hood Airport Doncaster Sheffield (RHADS) is a relatively new regional UK airport in South Yorkshire. Opened in 2005, RHADS handled just over 1 million passengers per annum in 2008, with around 1,000 employees (RHADS, 2008).

There has been passenger growth in the few years after the opening of RHADS, but like most regional airports this tailed off during the recent economic recession with few new routes opening. However, there is potential for growth in the future given that the airport terminal has a capacity of 3.2 million passengers. RHADS is particularly liked by its users, named as the third favourite UK airport for customer satisfaction in the 2013 airport satisfaction survey run by the consumer organisation “Which” (Which, 2013). RHADS is located within reasonable distance from a number of large towns and cities, like Doncaster (11 kms, population of 302,400) and Sheffield (43 kms, population of 552,700)¹. RHADS has a catchment area of roughly 290 kms (North-South) by 225 kms (East-West)², and the main

¹ Distances calculated in kilometres as quickest route by car from the centre of the large town or city, from Google Maps, Google, 2 July 2014. Population estimates are from the 2011 Census (ONS, 2012).

² Distances approximated from Google Maps, Google, 2 July 2014.

competitors to RHADS are the airports of Manchester, East Midlands, Leeds Bradford and Humberside³.

The airport is connected to Doncaster centre and rail station, as well as some of the neighbouring villages by six different bus services. For passengers arriving by car, the drop-off area is free for the first 15 minutes and they are then charged for a longer stay. The main car park is a short walk to the terminal with around 500 spaces, enough for current levels of demand. There is also a premium, higher cost car park right next to the terminal, with about 40-50 spaces (RHADS, 2014).

The Airport Surface Access Strategy (RHADS, 2008) presents the mode share from 2007 UK Civil Aviation Authority (CAA) survey data of: 70% by private car, 21% by taxi and 7% by bus (of the bus travellers around half came by train to Doncaster Station Interchange). The Strategy also includes targets for improved levels of public transport from 7.2% in 2007: for 2011 it is 14%, for 2016 it is 20% and for 2030 is 30%. One of the main proposed surface access schemes is the Finningley and Rossington Regeneration Route Scheme (FARRRS), a 7km road stretch that would provide a better link between the airport and the nearest motorways (Junction 3 of the M18). It is forecast to cut 20 minutes from the average journey time. There are difficulties with many of the bus routes that they require subsidy. There has been talk of a new railway station for RHADS but there are not the passenger numbers to justify development.

3. A literature review of surface access travel to-and-from regional airports

This literature review examines surface access trips, with a particular focus on the transport modes chosen for travel to-and-from regional airports. Firstly, some statistics on the dominance of the motor car can be presented. It is estimated that 65% of journeys to airports in Europe and the US are made by private cars, with this figure rising up to 99% for certain smaller regional airports (Humphreys and Ison, 2005). The environmental impact of surface access trips can also be considerable, particularly for drop-off / pick-up trips which generate much higher levels of carbon emissions (Miyoshi and Mason, 2013).

A number of studies provide information on surface access mode choice and preferences. One of the few that focuses on UK airports, Jehanfo and Dissanayake (2009), analyses surface access to-and-from Newcastle Airport. Their survey, performed at three different public places around Newcastle, revealed that passengers prefer using the underground system (rather than the bus or private car) to reach the airport. Car was, however, the preferred alternative for passengers with heavy luggage. Looking at the European case, the choice of regional airports in Italy is discussed by Marcucci and Gatta (2011) using a stated preference survey. The authors find that access time, parking policy, flight frequency and the presence of low cost airlines are all, to differing extents, important determinants of regional airport choice.

Access time to airports is generally defined as the time necessary to reach the airport from the airport users' home or workplace. To this it is necessary to add the service time, which includes time from the airport transport terminal or parking to the main terminal building, check-in, passport and security control, as well as walking to the gate for boarding (Koster et al., 2011). Importantly, it has been demonstrated that the value of access time savings is

³ Personal Communication with the Environment & Community Manager at RHADS in March 2010.

considerably higher than the value of time saved for normal travel by commuters (Koster et al., 2011; Tam et al., 2008). The reason for this appears to be the risk of missing a flight, which increases when travel time to airport increases (Hess and Polak, 2006). In addition, it is important to consider the time at which travellers want to arrive at airport, normally before the flight departure time. It has an important role in determining preference for different access mode. Preferred arrival time depends on whether the passenger is flying for business or leisure (business travellers prefer to arrive later at the airport), the passenger is in employment or retired, the frequency of flights taken in the past, and whether the passenger is travelling with luggage or not (Koster et al., 2011).

In terms of type of surface access trips, Gosling (2008) suggests that four segments need to be considered, linked to the type of trip: resident business trips, resident non-business trips, non-resident business trips, and non-resident non-business trips. In the context of a UK regional airport such as RHADS, the predominant segments are resident non-business trips, typically passengers taking holidays to summer sun destinations. Budd et al. (2014) determines surface access segmentation for Manchester airport passengers. There were eight groups identified, most of whom were resistant to behaviour change towards public transport for surface access trips, particularly the 'Ardent Taxi Users' and the 'Devoted Drivers' segments. A difficulty associated with promoting more environmentally-friendly travel for surface access trips was identified by the attitudes and behaviour of the 'Conflicted Greens' group. They exhibited positive attitudes towards using public transport, yet actually favoured private car modes.

Davison and Ryley (2013) examine market segmentation for two distinct life stage sub-groups, those with families and the less price-sensitive group of those in retirement. Both groups appreciated the benefits of their local regional airport that help to overcome the longer distance surface access travel of accessing larger airports. Longer surface access travel can be particularly challenging for those with children, whilst some in the older segment can struggle with the physical discomfort of a longer surface access trip. For both population groups there were clear sub-group differences. For instance, one sub-group amongst retirees consisted of those that are more 'time rich' and therefore flexible to take advantage of cheaper off-peak air fares.

In summary, the literature has shown that passengers travelling to regional airports such as RHADS have a strong preference for travel by motor car. Factors affecting passenger surface access transport mode choice, such as luggage and early flight departures, also encourage car travel. This paper examines these mode choice preferences from the RHADS survey and, building upon initial air travel market segment research, how they vary between passenger sub-groups.

4. Methodology

A passenger survey was conducted in the airside departure lounges at RHADS in July and August 2012 with a total of 438 respondents. The eight-page survey contained sections on socio-demographic information, general travel to-and-from airports, as well as more specific questions on RHADS surface access trips. There were 22 attitudinal statements within the survey questionnaire that relate to respondent opinions towards airport surface access issues, with a particular focus on the least (drop-off/pick-up trips) and most (public transport) sustainable transport options. Surface access themes from the literature review are incorporated, such as the importance of luggage and the role of cost/time in travel decision

making. Given the role of other people in drop-off/pick-up journeys and emerging research on transport and social interactions (see Ryley and Zanni, 2013), some of the statements consider the influence of people close to respondents using the following phrases: “in my household or group of friends”, “my family/friends/partner”, and “people I know”.

Statement design was informed by previous air travel and airport surface access questionnaire surveys by the authors (Davison and Ryley, 2013; Budd et al., 2014). Eight of the 22 statements were on general transport attitudes, covering opinions on airport development, environmental issues and travel decision-making. The remaining fourteen statements considered more specific attitudes, opinions and future intentions about travelling to airports.

Factor analysis was applied to reduce the attitudinal statements into more meaningful and usable sub-groups, from identification of the highly correlated variables through principal components analysis incorporating a Varimax rotation. Each statement was measured on a five-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, and 5 = Strongly agree). The factors output from this process were then input into a cluster analysis procedure, in a similar manner to Anable (2005) and Budd et al. (2014). Cluster analysis has been applied to a range of transport applications in order to determine market segments (Anable, 2005; Campbell et al., 2012; Ryley, 2006), and there have also been some more recent air travel examples (Budd et al., 2014; Davison and Ryley, 2013; Mayer et al., 2013). A hierarchical clustering technique was applied as it is the most suitable method permitting the analysis of categorical data. It incorporated Ward’s method, which creates the fusion of two clusters based upon the size of the error in the sum of squares. It was considered appropriate to generate similar-sized groups of individuals, large enough for further analysis and small enough to have a sufficient number of clusters.

5. Analysis of the survey data

5.1 Summary of the sample

Socio-demographic and car availability characteristics of the sample of 438 respondents are shown in Table 1.

Table 1. Background socio-demographic and transport characteristics of the sample (n=438)

Variable	Sample characteristics
Gender	131 (30%) are male, while 307 (70%) are female.
Age	Age distribution: 11% 18-24 years old, 17.6% 25-34 years old, 24.3% 35-44 years old, 23.5% 45-54 years old, 13.9% 55-64 years old, 9.4% 65-74 years old, and 1% above 75 years old.
Status	60% are working full time, 20% part time, 13% retired, and the remaining either unemployed or in education.
Car availability	86% have a driving licence, 48% have one vehicle owned or available to use in their household, while 38% have two vehicles. 9% have no vehicle.

Discussion with RHADS representatives showed that our sample is representative of airport users in terms of the age and status of passengers. However, the sample is clearly over-represented by female passengers; an even gender split would be expected. The average travelling party was between two and three people (with 11% being solo travellers), carrying between three and four pieces of checked-in luggage, if those travelling with the respondents are considered (given that their surface access is also covered by the survey). Individual respondents can provide information on the preference of the particular travelling group, which is likely to have a more even gender split, but the nature of the survey did not enable intra-group preference differences to be examined. There were 27% of the sample who travelled with children under 12 years old and 3.4% of people had limited mobility. In terms of car availability, most of the sample respondents can drive and have a car available to use.

5.2 Surface access characteristics

Respondents were also asked about their recent travel to UK airports other than RHADS. For all of the airports they had visited over the previous two years, car (either as driver, passenger, or drop-off/pick-up) was by far the method most commonly used, with the lowest percentage observed for London airports (60% of respondents used car) and the highest for Humberside Airport (87%). For some of the other regional airports, namely Humberside, Durham Tees Valley and Leeds Bradford airports, passengers not going by car used the taxi; none used public transport. Only 3% of the sample had experienced a missed flight due to a delay in accessing an airport.

Passengers were then asked about the main method they used to travel to RHADS on the day of the survey. Most (80%) stated they had travelled to RHADS by car, either via drop-off/pick-up or a vehicle parked at the airport. They were typically holidaymakers, travelling in groups and with a lot of luggage. The 80.2% arriving at the airport by car can be broken down into the following categories (% of total sample):

43.3% travelled to the airport and parked

- 0.5% as driver using the short-stay car park;
- 25.3% as driver using the medium/long stay car parks;
- 6.6% as passenger using the short stay car park;
- 11.0% as passenger using the medium/long stay car parks;

36.8% were dropped-off

- 31.0% driver not leaving the car to accompany them to the terminal; and
- 5.8% accompanied inside the terminal by the car driver.

There is therefore a fairly even split amongst car users between those that were dropped-off and those who parked. The respondents travelling by car stated that there were no good public transport connections to the airport from where they live. For car use, the reasons mentioned most by respondents were the constraint of the flight departure time, a general preference for travelling by car than using public transport, the perception that travelling by car was quicker, and that travelling by car was cheaper.

The breakdown for alternatives to the car is as follows. For 13.2% of the sample, taxi or minicab was the main method, 3.7% took a local bus, for 1.6% the main method was train,

0.9% took a national coach service. This public transport proposal, at 6.2% of respondents, is comparable to the Surface Access Strategy 2007 level of 7.2%, rather than the 2011 target of 14%. Amongst those who travelled by public transport (bus, train or coach), the most popular reasons were not having a car, a general preference for travelling by public transport rather than by car and that travel by public transport was cheaper than by car. One statistic that makes this policy particularly difficult is that, of the total sample, 84% were not aware of bus connections to the airport.

It is interesting that the vast majority of respondents (92%) were very satisfied about their choice of method to reach the airport, showing the popularity of car-based travel for surface access trips. On average, trips to-and-from the airport lasted 51 minutes and cost around £16; 79% of trips took up to an hour, 92% up to an hour-and-half, and 98% up to two hours. As expected the time taken for car/park and taxi trips (both had a mean time of 38 minutes) is much lower than drop-off/pick-up (mean of 59 minutes) and public transport (mean of 1 hour 33 minutes) trips to RHADS.

When respondents were asked about the reasons why they chose RHADS for their trip, most of them (38%) identified the closeness of the airport to their home as the most important one. For 21% of them, the location is very convenient (but not necessarily the closest airport to their home), for 10% the airport offered the cheapest flight/packages, 8% said they were attracted by convenient flight times, 7% said they like the airport because it is small, friendly and relaxing, 6% chose the airport after recommendation from a travel agent, and 3% chose the airport because of the destinations it serves. This shows the importance of a 'convenient' airport, close to home, although perhaps not necessarily the nearest geographically.

5.3 An examination of the attitudinal information

Table 2 shows the 22 attitudinal statements within the questionnaire with the mean score and standard deviation of the responses.

Table 2. The mean scores and standard deviation of the 22 attitudinal statements

Attitudinal statement (A1-A22)	Mean	Standard Deviation
<u>General transport</u>		
A1 More airports should be built in the UK	2.79	1.31
A2 Airports in the UK should be expanded to offer more air travel opportunities	3.30	1.30
A3 Climate change is entirely caused by human activity	3.13	1.27
A4 People should fly less for environmental reasons	2.37	1.02
A5 I would use public transport more than I currently do, if more people like me travelled in this way	2.79	1.18
A6 In my household or group of friends, I am the one who contributes the most to joint travel decisions	3.56	1.04
A7 People I know tend to ask for my opinion on travel decisions	3.43	1.05
A8 I will travel less in the future as new forms of communication reduce my need for travelling decisions	2.16	0.93
<u>Attitudes, opinion and future intentions about travelling to airports</u>		
A9 It is important for me to see off my family/friends/partner at airports	2.07	1.00
A10 It is important for me to be seen off by my family/friends/partner at airports	1.91	0.97
A11 It is important for me to welcome my family/friends/partner at airports	2.07	0.99
A12 It is important for me to be welcomed by my family/friends/partner at airports	2.07	0.96
A13 Airports should be better served by public transport	3.88	1.01
A14 It should be cheaper to park your car at airports	4.15	0.95
A15 Airports should charge people that drive to an airport to pick-up or drop-off other passengers	2.21	1.06
A16 Airports should do more to advertise the public transport alternatives to travel to and from them	3.84	1.05
A17 Most people I know travel to airports by car	4.13	0.98
A18 I travel by car to airports only when public transport is not available or convenient	2.66	1.17
A19 The amount of luggage is the main thing preventing me from travelling to airports by public transport	3.17	1.28
A20 Travelling to airports by public transport is generally more expensive than going by car	3.85	1.00
A21 Travelling to airports by public transport generally takes more time than going by car	4.03	0.89
A22 People picking up/dropping off other passengers are the main cause of traffic/congestion around airports	2.44	0.96

Note: Each statement was measured on a five-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, and 5 = Strongly agree)

The highest level of agreement is with the statements “A14 It should be cheaper to park your car at airports” (mean = 4.15) and “A17 Most people I know travel to airports by car” (mean = 4.13). This shows the importance and dominance of car travel to access airports. The lowest level of agreement is with the statement “A10 It is important for me to be seen off by my family / friends / partner at airports” (mean = 1.91). Even though drop-off / pick-up trips are a high proportion of surface access trips, perhaps people want to be dropped off / picked up because it is easier and more convenient, rather than for any specific relationship reasons. The largest standard deviations were for the first two statements “A1 More airports should be built in the UK” (standard deviation = 1.309) and “A2 Airports in the UK should be expanded to offer more air travel opportunities” (standard deviation = 1.302). This shows that there is the most divergent opinion amongst the sample on airport development.

The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) is 0.725 showing that factor analysis is an appropriate methodological tool to group the attitudinal statements. There were seven principal components generated that satisfied the criteria (Eigenvalues greater than 1.0). Table 3 shows a summary of the seven factors generated, together with an attitudinal statement example and their initial Eigenvalue.

Table 3. A summary of the factor analysis

Factor	Number of variables loading on factor	Attitudinal statement example (highest variable loading factor)	Initial Eigenvalue
1. DROP Importance of others for drop-off / pick-up trips	4 (A9-A12)	A12 It is important for me to be welcomed by my family / friends / partner at airports	3.170
2. CAR Supporter of car travel and drop-off / pick-up trips	4 (A6, A15 ¹ , A17, A22 ¹)	A15 ¹ Airports should charge people that drive to an airport to pick-up or drop-off other passengers	2.650
3. PTCAR Public transport difficulties versus the car (cost, time & baggage)	4 (A17, A19-A21)	A20 Travelling to airports by public transport is generally more expensive than going by car	1.928
4. FACIL Airports should provide better surface access facilities (public transport & car parking)	3 (A13, A14, A16)	A13 Airports should be better served by public transport	1.571
5. PT Might use public transport more (peer effects, availability & convenience)	4 (A3, A5, A6, A18)	A5 I would use public transport more than I currently do, if more people like me travelled in this way	1.305
6. FLYL Open to less travel	2 (A4, A8)	A4 People should fly less for environmental reasons	1.128
7. APORT Airport development	2 (A1, A2)	A1 More airports should be built in the UK	1.077

Note: ¹ These two statements had a negative loading

The factor analysis shows that attitudes can be grouped around the various elements associated with airport surface access travel, such as drop-off / pick-up trips and the quality of the public transport services.

5.4 Determining the market segments

The seven factor analysis variables were input to the hierarchical cluster analysis, together with a surface access mode variable (drop-off/pick-up, car/park, taxi & public transport). A review of changes in the homogeneity measure, to identify large increases indicative of merging dissimilar clusters, determined the five-cluster solution to be the most appropriate grouping, displayed as a dendrogram in Figure 1. Each group has between 52 and 170 respondents. Table 4 presents the surface access mode split proportions of each cluster group and their mean scores for the attitudinal variables.

Table 4. The five RHADS cluster groups with surface access mode split and attitudinal variables

Cluster group	1 Reluctant public transport users	2 Demanding drop-offs	3 Car- loving socialites	4 Practical drop- offs	5 Public transport supporters	Total sample
Number	84 (19.2%)	170 (38.8%)	52 (11.9%)	67 (15.3%)	65 (14.8%)	438 (100%)
Mode split						
Drop-off/pick up	22.6%	60.6%	28.8%	67.2%	16.9%	44.1%
Car/park	38.1%	32.4%	55.8%	25.4%	41.5%	36.5%
Taxi	27.4%	4.1%	9.6%	4.5%	30.8%	13.2%
Public transport	11.9%	2.9%	5.8%	3.0%	10.8%	6.2%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Attitudinal variable (mean value)						
DROP	-0.020	-0.428	1.755	-0.467	0.224	
CAR	-0.550	0.255	0.660	0.516	-1.017	
PTCAR	0.900	-0.264	0.097	0.478	-1.043	
FACIL	0.134	0.460	0.281	-1.244	-0.320	
PT	-0.344	0.084	-0.041	0.364	-0.117	
FLYL	0.222	0.020	-0.269	-0.060	-0.062	
APOINT	-0.187	0.187	-0.026	0.220	-0.454	

Note: Cells greater than 0.4 are shaded in green; cells less than -0.4 are shaded in red

Figure 1. A dendrogram of the cluster analysis results showing the 'cut' point (dotted line)

Note: y axis = respondent, x axis = distance at combination

Based on these mode split and attitudinal variables, the five clusters were given appropriate group names. The *Car-loving socialites* contain the highest proportion of respondents who drive and park (56%). The attitudinal variables show that this group has the strongest views in favour of car travel (CAR) and value most highly the other people involved in drop-off / pick-up trips (DROP). There are two passenger groups that make predominantly drop-off / pick up trips, *Demanding drop-offs* and *Practical drop-offs*. *Demanding drop-offs* are the largest passenger group with 39% (170 respondents) of the total sample. This group is the most demanding in terms of airports providing better surface access facilities, both in terms of public transport services and car parking (FACIL). The *Practical drop-offs* are a more functional group, not as demanding that airports need to provide more facilities (FACIL), whilst supporting car travel (CAR), acknowledging the difficulty of public transport (PTCAR), and not valuing highly the role of other people for a drop-off / pick-up trip (DROP).

The remaining two groups have a relatively high proportion of non-car modes (taxi & public transport), although it is noted that they still contain a majority of passengers travelling by car. The *Reluctant public transport users* group has the strongest opinion on the difficulties of public transport in comparison with the car (PTCAR), despite containing the highest proportion of public transport users (12%). In contrast, the *Public transport supporters* group has the least negative views on public transport (PTCAR), together with the strongest views against car travel (CAR). This group would, therefore, be the most appropriate segment to target for public transport use on surface access trips.

5.5 An examination of surface access transport policy and technology solution developments

The FARRRS scheme plans (outlined in Section 2) were presented to respondents in the questionnaire, and they were asked whether this would make them more willing to use the airport in the future. Responses were evenly split: 43% said 'Yes', 17% were not sure, whilst 41% said 'No'. The 'Yes' response was highest (both 48%) for the most car-favoured groups, *Demanding drop-offs* and *Car-loving socialites*. Some hypothetical changes in the current airport car parking charge were put to respondents. In the case of a 20% increase in parking charges, 47% would ask to be dropped off / picked up rather than travelling to the airport by their own car, while 11% would be more willing to travel by public transport; only 1.5% would think about using another airport in that case. These percentages increased to 52%, 15% and 4% respectively if there was a 40% increase in car parking charges. This shows that an increase in car parking charges would only encourage passengers to travel to airports in a less sustainable manner, by making drop-off / pick-up trips. The data highlighted that the two car-favoured groups for which drop-off / pick-up is not the predominant trip are those more likely to do this: *Reluctant public transport users* and *Car-loving socialites*.

Some other UK airports (e.g. London Luton, Leeds Bradford) have introduced drop-off / pick-up charges. If RHADS introduced a £5 drop-off / pick-up charge, only 14% of the sample would consider using public transport; 6% would think about using another airport. Therefore, it could be a useful measure for the airport to raise revenue (not many would change airport), but it would not be a way to encourage more sustainable transport to-and-from RHADS. Unsurprisingly the *Public transport supporters* are the most likely of the groups (although still very much the minority within the group) to use public transport in response to the charge (22%), and the *Demanding drop-offs* are the most likely group to think about using another airport (8%).

Technology solutions to encourage more sustainable surface access travel include the replacement of some drop-off /pick-up trips with three-dimensional television-based communication (using so-called telepresence systems), the development of software to encourage car sharing, and the tagging of bags to help overcome the difficulty of taking luggage on public transport to access airports i.e. passengers could travel separately from their luggage (for further information see Ryley et al., 2013).

RHADS passengers were not very responsive to these technological measures. 64% of respondents would be unlikely or very unlikely to use a lift-share system; for the same proportion of respondents a tagging system would not make them more willing to travel to airports by public transport. 84% of the respondents would not be willing to reduce drop-off / pick-up trips if a telepresence system was set up. These levels do vary across population segments, and across all measures it is the *Car-loving socialites* who are the most open to the technological measures (although still the minority of this group for each measure).

6. Discussion and conclusions

The paper has presented findings from a passenger survey at a relatively new regional airport in the United Kingdom, Robin Hood Airport Doncaster Sheffield (RHADS). Leisure trips of residents are the predominant purpose of individuals travelling to regional airports such as RHADS, typically passengers taking holidays to summer sun destinations. The dominance of the car for such surface access trips has been demonstrated from the literature and confirmed by the RHADS survey. The majority of survey respondents were happy with their surface access travel to-and-from RHADS and do not travel very far (most have a journey of less than hour), particularly those travelling by taxi or drop-off / pick-up. Respondent preferences for the car were due to the attributes of car-based travel (quicker, cheaper), the flight time constraints (although very few respondents had very early or very late departures), and the real or perceived lack of public transport alternatives.

The gender bias amongst the sample of 438 respondents is a limitation of the research, but the inclusion of attitudinal statements in the survey questionnaire and the large sample attained have enabled the factor / cluster analysis methodology to generate some useful insights. The segmentation analysis determined clear attitudinal differences amongst the car travelling groups, such as whether they would like to see an improvement in airport surface access facilities or not.

Apart from the *Public transport supporters* segment, the cluster analysis groups strongly favoured car-based surface access travel, particularly the *Car-loving socialites* and the *Practical drop-offs*. A novel aspect of the survey has been the consideration of other people involved in a drop-off / pick-up journey, although most respondents did not value the personal element of having a close family member or friend drive them to-and-from the airport.

Many respondents, particularly in the largest group of the *Demanding drop-offs*, were particularly keen for the airport to improve surface access transport facilities such as car parking and bus services. The difficulty in the promotion of bus transport at RHADS, like other regional airports, is exacerbated by the subsidy required from local government and/or the airport, by the low existing low modal share, and, as demonstrated from the RHADS survey, by most passengers not being aware of the bus services. An increase in less

sustainable car-based travel for surface access trips is likely from other airport policy measures such as the FARRRS road scheme and car park charge increases, which will encourage more drop-off / pick-up trips. A charge for drop-off / pick-up trips at RHADS, as implemented at some other UK regional airports, would not deter many passengers. Only a small proportion of respondents stated a willingness to travel by public transport as an alternative in response to such a charge.

The technological solutions were not viewed favourably by respondents. This may be due to a lack of understanding of the proposed systems from the survey instrument or a general mistrust towards technological solutions that aim to reduce car usage. Perhaps given the difficulties in achieving a modal shift from the car to public transport, alternative surface access policy solutions might be to adapt car use through the promotion of car sharing (not necessarily linked to technology), to incentivise the use of alternative fuel vehicles (for example by using different levels of charge for parking and/or drop-off/pick-up), and/or to provide a more flexible public transport service such as demand responsive transport.

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