Airport Choice Modeling: Empirical Evidence from a Non-Hub Airport.
Author(s): Steve Leon
Source: *Journal of the Transportation Research Forum*, Vol. 50, No. 2 (Summer 2011), pp. 5-16
Published by: Transportation Research Forum
Stable URL: http://www.trforum.org/journal

Airport Choice Modeling: Empirical Evidence from a Non-Hub Airport

by Steve Leon

A comprehensive review of airport choice modeling studies is presented in this paper, highlighting the key determinants of passenger preferences. Empirical research presented which models using binary logistic regression in the likelihood that airline travelers in the Fargo-Moorhead Metropolitan Statistical Area will not use the local airport, but instead use the competing major hub airport in Minneapolis-St. Paul, located 250 miles away as a viable origin airport. Moreover, this study investigates whether collecting empirical data from local travel agents may perhaps allow airport planners and airport managers to identify important passenger choice behaviors without incurring the added time and expense of administering formal passenger surveys. This study found that it is possible to obtain useful data from travel agents at significantly less time and effort. The significant factors obtained from the regression analysis were trip purpose, trip duration, number of connections, and airline.

INTRODUCTION

Like any other organization or company that sells a product or service, airports, too, must compete for customers. Rural airports by and large are isolated and may appear to be free from having to compete with other airports. In our research, we have found that this is not the case. Passengers choose a particular origin airport for a variety of reasons, notwithstanding distance between airports. Passengers are likely to drive long distances, even greater than three hours if they value the distant airport as being more advantageous than the nearby airport.

Airport managers and planners realize that airports do compete for passengers and a certain amount of leakage to competing airports is bearable. However, a false sense of security may occur among airport managers and planners if they think distance minimizes competition. It is generally assumed that smaller airports with fewer airlines serving it, fewer direct routes, and less frequency will have to compete with a larger airport within a reasonable distance that offers a broader spectrum of services. But just how far are passengers willing to drive in order to find a more suitable travel experience?

Furthermore, small rural airports do not have the resources to develop, administer, and analyze survey data that are traditionally collected from passengers at their airports. In 2009, there were 494 commercial service airports listed in the United States (Federal Aviation Administration 2010). These airports have at least 2,500 passenger boardings each year and are further classified into primary airports and non-primary airports. Primary airports have more than 10,000 passenger boardings each year while non-primary airports have between 2,500-10,000 passenger boardings per year. There are 368 primary airports and 126 non-primary airports in the United States.

In the days after the September 11, 2001, terrorist attacks it is even more difficult to obtain responses from air travelers at airports. Departing passengers are less likely to answer survey questions on the non-secure side or landside of the airport for fear of being delayed through security and missing their intended flight. To administer data collection on the secure side or airside of the terminal, the data collector needs a TSA clearance, which adds to the time, effort, and money spent for data collection. The non-secure or landside areas of an airport refer to those areas where passengers have not yet been screened by security personnel. Areas such as passenger check-in counters and roadways leading to the front of the airport terminal are considered non-secure areas.

On the other hand, the secure-side or airside refers to those areas in which passenger screening is required prior to entering. These areas include airport gate areas.

Thus an alternative method of collecting passenger travel behavior data through the use of travel agents is employed in this research. An additional problem that is solved by using travel agent data is the ability to increase the sample size with very little effort and difficulty. Small rural airports fly passengers in small numbers, which can make it troublesome to collect adequate sample sizes in a short duration.

Fargo, ND, with a Metropolitan Statistical Area (MSA) population of nearly 200,000, is somewhat isolated from other population centers and is not in close proximity to any airports larger than Fargo Hector International Airport. All airports within a 120-minute drive of Fargo offer less frequency, fewer airline choices and fewer numbers of direct non-stop destinations. The Fargo airport offers a fairly wide selection of scheduled air service options. It is served by four major airlines and their code share partners, to eight non-stop destinations, with routes to hubs and point-to-point destinations, offering an average of 20 flights per day. The airport also offers charter airline service by three airlines to four gambling destinations. By March 2010, the airport was averaging approximately 1,411 seats per day. Contrast this with Minneapolis-St. Paul (MSP) International Airport that serves 138 destinations, averaging 53,892 seats per day.

A study conducted by Sixel Consulting Group, Inc (2010) revealed that 24.5% of the passengers in the Fargo airport catchment area (approximately 120-minute drive from each direction) leak to other airports with 14.3% leaking to MSP International Airport. Other airports that attract Fargo catchment area passengers include Bismarck, ND, Grand Forks, ND, Jamestown, ND, and Sioux Falls, SD, with almost 95% of Fargo passengers using Fargo, MSP, or Bismarck airports. Additionally, Sixel (2010) reported that the Fargo airport catchment area generated an estimated 885,672 annual origin and destination (O-D) passengers, generating a total of $133.4 million in revenue for the Fargo airport.

The goal of this paper is to determine which factors through empirical data influence passengers that reside in the Fargo MSA, with seemingly adequate air service to choose the MSP International Airport, as their origin airport, incurring a drive time of approximately 3.5 hours. Additionally, this study attempts to identify whether collecting data without the use of formal passenger survey instruments will result in findings that may allow airport planners and airport managers to identify important passenger choice behaviors without incurring the added time and expense of administering a formal passenger survey.

LITERATURE REVIEW

Many airport choice studies have concentrated on large metropolitain areas with multiple hub airports. Basar and Bhat (2004) conducted a study in the San Francisco Bay Area using a probabilistic choice set multinomial logit model. The two primary determinants of airport choice were access time to the airport and flight frequency. They showed that there is sensitivity to these two variables based on traveler demographics and trip characteristics. Individuals traveling alone are more sensitive to both access time and flight frequency, whereas women travelers are more sensitive to access time.

Hess and Polak (2005) conducted a study in the San Francisco Bay Area as well; however, this study used a mixed multinomial logit model. They found that business travelers are less sensitive to fare increases than leisure travelers and are willing to pay higher prices for decreases in access time. They also found that that the random variation between business travelers in terms of sensitivity to access time is more prominent than that between leisure travelers. Hess and Polak (2006) followed with an analysis of the greater London area and revealed that access time was a determining factor in travelers' choice of departure airport while flight frequency, access cost, and flight time also were important factors. Airfares were found not to have any significant effect. This finding may have been due to the data used, not necessarily a valid finding.

Table 1: Additional Selected Studies of Airport Choice Behavior

Authors (year)	Method used	Study area(s)	Results
Skinner (1976)	Multinomial logit	Baltimore -Washington, DC	Accessibility and flight schedule are more important than flight frequency
Ashford and Benchemam (1987)	Multinomial logit	Central England	Access time and flight frequency are significant factors for all types of passengers, while fare is significant for all passengers except international business travelers
Harvey (1987)	Multinomial logit	San Francisco	Found ground access time and frequency of direct service to chosen destination to be the most significant factors
Innes and Doucet (1990)	Binary logit	New Brunswick, Canada	Aircraft-type (Jet vs. Turboprop) and flying-time difference are the important factors affecting airport choice behavior
Thompson and Caves (1993)	Multinomial logit	North England	Access time, flight frequency and the number of seats on the aircraft (reflecting size/ comfort) are found to be significant, with access time being most important for travelers living close to the airport and frequency being more important for travelers living further afield
Windle and Dresner (1995)	Multinomial logit	Washington, DC	Airport access time and flight frequencies are the dominant factors
Pels et al. (2001)	Nested logit	San Francisco	Travelers are more likely to switch between airlines than between airports
Pels et al. (2003)	Nested logit	San Francisco	Access time is of large importance in the competition between airports in a region

Source: Y. Suzuki. *Transportation Research Part E* 43 (2007) 1–20. Results column compiled by authors from various sources

Ishii, Jun, and Dender (2009) analyzed departures from the San Francisco Bay Area with arrivals in the Los Angeles area estimating a weighted conditional logit model of airport–airline choice. This study showed that non-price variables such as airport access time, airport delay, flight frequency, the availability of particular airport–airline combinations, and early arrival times were found to strongly affect choice probabilities.

Papers that focused on small or regional airports include Des Moines, IA (Suzuki 2007), Golden Triangle Regional (GTR), MS (Zhang and Xie 2005), and Harrisburg International Airport, PA (Fuellhart 2007). Each of these papers looked at leakage from their respective airports to more distant airports.

Suzuki (2007) “develops and estimates a nested logit model of airport–airline choice that incorporates the ‘two-step’ decision process of air travelers. The model assumes that a traveler first eliminates certain choice alternatives that do not satisfy his/her minimum acceptable standards (first step), and then chooses the utility-maximizing alternative from the set of screened choice alternatives (second step).” The results imply that the ‘‘two-step’’ choice model may fit the observed data significantly better than the conventional ‘‘one-step’’ choice models.

Suzuki found that “travelers tend to choose the airport that (1) is close to home, and (2) has been used by the traveler in the past. Similarly, a traveler tends to choose the airline that (1) offers lower fares, (2) provides frequent services to the traveler’s destination, and (3) for which the traveler is an ‘active’ frequent flyer program member. These results are consistent with those of previous airport and airline choice studies.”

Zhang and Xie (2005) study the GTR Airport, which competes with three larger airports, all of which are about 2.5 hours drive time away. Using cumulative logistic regression for data analysis, this paper examined passengers’ choice behavior in selecting between local small community airports and a more distant major commercial airport. Ticket price, experience with GTR Airport, and flight schedule were found to be the most significant factors.

Fuellhart (2007) focuses primarily on presenting a descriptive case study of the spatial aspects of the market catchment area of Harrisburg International Airport. The specific focus is to describe the market area in relation to several push-and-pull factors related to distance from this and competing airports in Washington, DC, Philadelphia, and Baltimore. An ordinary least squares (OLS) model was used with a gravity variable composed of distance and population for analysis. Fuellhart states, “The pull of a wider range of market choices and significantly lower fares at BWI [Baltimore-Washington Thurgood Marshall International Airport] seems to be a substantial drain on the core market catchment area of MDT. Moreover, the route-level analysis appears to corroborate this story, showing predictable variations in the relative passenger levels between MDT/BWI and a set of common O-D city pairs in relation to market and geographic factors.” These results generally support the findings of other researchers in that both access and market variables appear to play important roles in consumer airport choice behavior.

This paper extends the previous research in two ways: (1) it employs a new method of collecting empirical data through the use of travel agents where previous studies have utilized formal survey instruments to collect passenger travel behavior data, and (2) it expands upon previous airport choice studies that focused only on large metropolitan areas with multiple large airports. Focusing on a regional/rural airport, seemingly far removed from competition and employing an alternative method of collecting data, this research intends to provide managers and planners of smaller airports in rural areas with a less burdensome means of gaining insight into passenger travel behavior.

METHODOLOGY

Model

When the response variable is binary, or a binomial proportion, the expected response is more appropriately modeled by a curved association with the predictor variable. One such curved relationship is given by the logistic model, where the binary response, $E(y) = \pi$ and π is the probability that $y = 1$ (Mendenhall and Sincich 2003).

The logistic model

$$(1)\quad E(y) = \frac{\exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)}{1 + \exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k)}$$

can be written as

$$(2)\quad \ln\left(\frac{\pi}{1-\pi}\right) = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k$$

where

$$(3)\quad \pi^* = \left(\frac{\pi}{1-\pi}\right)$$

The logistic model used in this paper takes the form of

$$(4)\quad E(y) = \frac{\exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_{10} x_{10})}{1 + \exp(\beta_0 + \beta_1 x_1 + \cdots + \beta_{10} x_{10})}$$

Data

Previous airport choice studies relied on passenger surveys. The surveys were developed and then distributed to passengers to complete and return at a later time, or passengers were asked the questions directly. In both cases, however, passengers were approached at the airport to answer questions. Post 9/11 security requirements and passengers' reluctance to spending time answering questions, along with the time and cost components of developing and distributing formal passenger surveys, justifies a new approach to obtaining valid data for airport choice studies.

The data for this paper were obtained from the Fargo, ND, branch of a regional travel agency headquartered in St. Cloud, MN, with 14 branches covering North Dakota, Minnesota, South Dakota, and Nebraska. The airline ticket sales data were acquired from the Fargo branch in order to capture the Fargo airport catchment area. The study attempts to identify whether collecting data without the use of formal passenger survey instruments will result in findings that allow airport planners and managers to identify important passenger choice behaviors without incurring the added time and expense of administering a passenger survey.

The data collected include ticket purchase date, zip code of purchaser, purpose of trip (leisure or business), total fare, departure date, return date, itinerary including departure airport, arrival airport and connecting airport, and the airline flown. Of the data collected, Table 2 shows the dependent and independent variables used for this research.

The purchaser may or may not reside in the Fargo airport catchment area (within a 120-minute drive), which is the case for various corporate accounts; however, the origin airport of travel is always Fargo or MSP. Sample points that were removed from our analysis were those with missing or incomplete data, those that contained origin airports other than Fargo or MSP, flights that were between Fargo and MSP only, and those that contained an airline that does not offer flights out of Fargo and MSP. Flights by code-sharing partners were included. Of the original 3,463 data points, which spanned a full year and a half, from January 2009 through June 2010, 1,879 were used.

Table 2: Binary and Independent Variables Used in Analysis

Binary Variables	
Depart FAR = 1	
Depart MSP = 0	
Independent Variables	
Purpose	
Business = 1	
Leisure = 0	
Total Fare	
Fare paid by consumer in U.S. Dollars	
Departure Season	
Winter = 1	
Otherwise = 0	
Trip Duration	
Multiday trip = *i*, where *i* is 1…n	
One way ticket = 0	
Destination	
Domestic (contiguous 48) = 1	
International = 2	
Alaska and Hawaii = 0	
Connections	
0 connections = 0	
1connection = 1	
2 connections = 2	
Airline (includes regional airline partners)	
AA (American Airlines) = 1, Otherwise = 0	
DL (Delta Air Lines) = 1, Otherwise = 0	
NW (Northwest Airlines, prior to Delta merger) = 1, Otherwise = 0	
UA (United Airlines) = 1, Otherwise = 0	
US (US Airways) = Base Model	

By limiting our data to the customers of this one particular travel agency, it is possible that we may miss the behaviors from other passenger segments. In the future, this can be remedied by soliciting other local travel agents to provide supplemental data. Additionally, airport managers are typically engaged with the business community and have close professional relationships with their local business people, including those that are employed by travel agencies. This allows airport administration the opportunity to collaborate with local and regional travel agents with the goal of collecting passenger travel behavior data that are most useful to airport administrators. This type of cooperation may not be afforded to researchers who are not affiliated with the airport or connected through professional relationships.

Online purchases are not included. It is not unusual to see the omission of online booking in airport leakage studies. Market Information Data Transfer (MIDT), a data file that contains transaction data for airline bookings that are made through the Global Distribution Systems (GDS) is often used for industry airport leakage studies. The MIDT dataset misses online purchases and purchases made directly with an air carrier. Since travel agents accounted for 50% of all airline ticket sales in 2008, even with a decline in travel agent airline ticket sales to date, there is still ample data to analyze (American Society of Travel Agents 2011).

The sample set in this study contains a larger business segment (Table 3). In questioning the travel agency about its customer composition, they indicated that there is not an over or under representation of any one type of customer segment, although there clearly is a larger business segment for this study. In future studies, balancing the representation by obtaining data from other travel agencies should be addressed.

Explanation of Independent Variables

This section explains the independent variables used in the model and the rationale behind using the variables. Purpose of travel is a factor in purchasing behavior. Business travelers are not as concerned with price as they are with schedules and accessibility. Average fare in this sample is $859.62. Although Fargo area travel agents have indicated that price differences between originating from Fargo or MSP are not appreciably different, a fare variable is included to reduce the probability of biasing the results due to a missing variable. A second model was developed without the fare variable for comparison.

Due to the northern location of Fargo and the impact that winter snowstorms have on surface travel, a departure season variable has been added. Travelers would appear to be less likely to drive to the MSP International Airport in the winter than in other months of the year. If the departure date is in the period November through March, this is determined as winter travel. Approximately 40% of the travel was conducted during the winter months. Trip duration as measured by the number of nights between the departing date and return date has been added, since it is hypothesized that the longer the duration of the trip the more likely a person is willing to use MSP International Airport as the origin airport.

The destination variable captures, to an extent, the flight frequency from Fargo and the importance of international or long-distance travel. Passengers may be more willing to drive to Minneapolis-St. Paul for international or Hawaii and Alaska destinations since the possibility of not reaching their intended destination on the scheduled date is less certain if the Fargo origination flight is delayed or cancelled. Due to the increased number of frequencies out of MSP, there are more flight options for passengers during times of delays and cancellations. Since passengers would prefer fewer connections, a connection variable is added. A hub airport such as MSP provides more direct flights than its regional counterpart and would typically offer more flights with the fewest connections.

An adjustment to the number of connections was made in the dataset. In analyzing the itineraries of the flights, the data includes the number of actual connections in the itineraries. If the traveler originated from MSP instead of Fargo, this may perhaps indicate that the traveler has reduced his or her connections to n-1 since the traveler no longer has a flight segment from Fargo to MSP. However, this is not entirely true. If both Fargo and MSP offer nonstop flights to a common city in the itinerary, then the traveler has not reduced their number of connections, but remain equal. As an example, a traveler flies to the destination airport Reagan National in Washington, DC, via Chicago O'Hare. The traveler can arrive in Reagan National with same number of connections originating from either Fargo or MSP since the traveler is able to fly nonstop to Chicago O'Hare from both airports. In order to compensate for this anomaly, one additional connection is reintroduced into the

MSP itineraries for a total of n+1 connections if the passenger is unable to fly nonstop to a common city from both MSP and Fargo. This artificially corrects for the assumption that connections will always be reduced if originating from MSP.

Table 3: Descriptive Statistics

N = 1,879	Mean	Std Dev	Min	Max	N	Percent of 1,879
FAR Departure	0.9548	0.2079	0	1	1794	95.48%
Corporate	0.7855	0.4106	0	1	1476	78.55%
Leisure	0.2145	0.4106	0	1	403	21.45%
Departure Season	0.4002	0.4901	0	1	752	40.02%
Fare$	859.62	1151.94	30	19693.28	1879	
Trip Duration	4.1629	6.6913	0	216		
Connections	1.0862	0.4661	0	2		
AA	0.0245	0.1546	0	1	46	2.45%
CO	0.0080	0.0890	0	1	15	0.80%
DL	0.2746	0.4464	0	1	516	27.46%
NW	0.4151	0.4929	0	1	780	41.51%
UA	0.2757	0.4470	0	1	518	27.57%
US	0.0021	0.0461	0	1	4	0.21%
Itinerary Destination						
Domestic					1717	91.38%
International					146	7.77%
HI and AK					16	0.85%

ANALYSIS

Two models were developed, one with a fare variable and one without the fare variable. The results indicate that the best fitting model is the one that includes the fare variable.

Table 4 displays the results and significant variables of the logistic regression with the fare variable. Testing the global null hypothesis that all slopes are zero, the p-value < 0.001 results in rejecting the *H*o, concluding that at least one of the β coefficients is nonzero. The model is adequate for predicting the airport choice y. Table 5 shows the Pearson, Deviance, and Hosmer-Lemeshow methods of goodness-of-fit tests. Typically, the Hosmer-Lemeshow method is recommended to test goodness-of-fit for binary logistic regression. Its p-value of 0.269 shows non-significance, which equates to a good fit. The Pearson and Deviance tests, though typically used for multinomial logistic regression, are provided and show non-significance as well. Non-significance in these tests translates to a good fit.

The purpose of travel and number of connections are the significant factors that affect passenger choice behavior at the 0.01 significance level. Trip duration (nights away from Fargo), and whether Delta Air Lines, Northwest Airlines or United Airlines are the chosen air carriers are significant at the .05 level.

Table 4: Model 1 with Fare Variable; Results of Logistic Regression Showing Only Significant Variables at the .05 and .01 Level

Predictor	Coef	Standard Error	Z	P	Odds Ratio	CI 95% Lower	CI 95% Upper
Constant*	2.8950	0.8405	3.44	0.001			
Purpose	1.6514	0.2601	6.35	0.000	5.21	3.13	8.68
Trip Duration	0.0811	0.0331	2.45	0.014	1.08	1.02	1.16
Connections	-1.6230	0.2682	-6.05	0.000	0.20	0.12	0.33
DL	1.4162	0.6222	2.28	0.023	4.12	1.22	13.95
NW	1.3687	0.6068	2.26	0.024	3.93	1.20	12.91
UA	1.4530	0.6526	2.23	0.026	4.28	1.19	15.36
Log-Likelihood = -266.8							

*US Airways is the base model. With p-values of .365, .527, .521, and .791, respectively, fare, departure season, destination, and American Airlines are not significant. Test that all slopes are zero: G = 158.638, DF = 10, P-Value < 0.001

Table 5: Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	1555.93	1815	1.000
Deviance	533.75	1815	1.000
Hosmer-Lemeshow	9.95	8	0.269

Given the fact that the sample set included a large percentage of business travelers who are typically more sensitive to time and accessibility, it was expected that the purpose of trip and connections are most significant and that fare is not significant. The odds of choosing Fargo airport is 5.21 times higher when travel is for business purposes, while the odds of choosing Fargo decreases as connections increase. Even though airline choice is significant, each significant airline has similar β coefficient, p-value, and odds ratio results.

After removing the fare variable, the new results (Table 6) did not differ significantly from the model with the fare variable, although the p-value for the Pearson goodness-of-fit test is reduced to p-value < .001 (Table 7), indicating a lack of a good fit. However, as stated earlier, the Hosmer-Lemeshow method is the preferred method to test binary logistic regression goodness-of-fit and with a p-value of 0.256; the Hosmer-Lemeshow test shows non-significance, indicating a good fit. The Deviance test also shows a good fit with a non-significant p-value of 0.961.

Table 6: Model 2 without Fare Variable; Results of Logistic Regression Showing Only Significant Variables at the .05 and .01 Level

Predictor	Coef	Standard Error	Z	P	Odds Ratio	95% CI Lower	95% CI Upper
Constant*	2.8436	0.8381	3.39	0.001			
Purpose	1.6420	0.2598	6.32	0.000	5.17	3.10	8.60
Trip Duration	0.0767	0.0322	2.38	0.017	1.08	1.01	1.15
Connections	-1.6406	0.2675	-6.13	0.000	0.19	0.11	0.33
DL	1.4818	0.6174	2.40	0.016	4.40	1.31	14.76
NW	1.4276	0.6029	2.37	0.018	4.17	1.28	13.59
UA	1.5230	0.6471	2.35	0.019	4.59	1.29	16.30
Log-Likelihood = -267.237							

*US Airways is the base model. With p-values of .510, .466 and .877 respectively, departure season, destination, and American Airlines are not significant. Test that all slopes are zero: G = 157.915, DF = 9, P-Value < 0.001

Table 7: Goodness-of-Fit Tests

Method	Chi-Square	DF	P
Pearson	573.517	375	0.000
Deviance	328.212	375	0.961
Hosmer-Lemeshow	8.958	7	0.256

The model without the fare variable shows the same significant variables, with nearly the same magnitude and the same signs for the β coefficients as the model with the fare variable included. The Sixel (2010) study reported a higher leakage rate to MSP, however, the Sixel study does not clearly state the ratio of business-to-leisure travelers in their study. In this study 78.55% of the travelers were business travelers who are more likely to choose Fargo Hector International Airport as the origin airport.

In 2009, the Fargo airport boarded 352,041 passengers. At an average fare of $859.62 and a leakage rate of 4.52%, Fargo stands to lose 15,912 passengers in a year, which equates to a loss of $13,678,491.

CONCLUSION

The independent variables were chosen based on the particular characteristics of typical rural and regional airport travel experiences and the upper midwest winter weather conditions. One objective of the study was to identify the significant factors that would determine why a passenger in the Fargo catchment area would drive over 250 miles to depart out of the hub airport in Minneapolis-St. Paul, even though there are a wide variety of airline options from the Fargo airport. The purpose of trip, trip duration, number of connections, and whether Delta Air Lines, Northwest Airlines and United Air Lines are the chosen airline, have been found to be significant factors in both models. This verifies findings in previous literature, providing a clear reduction in time, expense and effort, concluding that travel agency data can be beneficial.

A second objective of this study was to determine if empirical data, while foregoing a formal passenger survey, can, in fact, be used to determine significant variables to assist airport managers, airline managers, and planners with important passenger behavior information. This study found that the ability to do so exists; however, the results for this particular study may be more compelling if there was a higher percentage of leisure travelers. The fact that regional airport managers have professional relationships with the business community, including travel agencies, these managers may coordinate the retrieval of pertinent data requirements. The data collected by travel agents can be wide ranging, including travel patterns and habits, as well as two other important types of data: demographic data and location data, such as zip code information. These can lead to the use of GIS applications to target airline passengers for advertising strategies as the Fuellhart (2007) study did. The difference being, that the effort of collecting data from passengers at the airport can be eliminated and a much greater sample size can be collected.

Moreover, the logistic regression model in this research can easily be replicated or altered into a multinomial logistic regression model for use by other regional and rural airports, which is quite helpful for time and budget constrained airport authorities. Fargo Hector International Airport was the 136th busiest U.S. airport of 494 commercial service airports in 2009, which leaves a plentiful amount of airports that should consider the travel agency method as a source of obtaining data in which to gain insight into traveler behavior.

References

American Society of Travel Agents. http://www.asta.org/about (2011).

Ashford, N. and M. Benchemam. "Passengers' Choice of Airport: An Application of the Multinomial Logit Mode." *Transportation Research Record* 1147, (1987): 1–5.

Basar, Gözen and Chandra Bhat. "A Parameterized Consideration Set Model for Airport Choice: An Application to the San Francisco Bay Area." *Transportation Research Part B: Methodological* 38(10), (2004): 889–904.

Federal Aviation Administration. "Commercial Service Airports (Primary and Nonprimary) CY09 Passenger Boardings," 2010. http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/media/cy09_cs_enplanements.pdf (accessed March 16, 2011).

Fuellhart, Kurt. "Airport Catchment and Leakage in a Multi-Airport Region: The Case of Harrisburg International." *Journal of Transport Geography* 15(4), (2007): 231–244.

Harvey, Greig. "Airport Choice in a Multiple Airport Region." *Transportation Research Part A* 21(6), (1987): 439–449.

Hess, Stephane and John W. Polak. "Exploring the Potential for Cross-Nesting Structures in Airport-Choice Analysis: A Case-Study of the Greater London Area." *Transportation Research Part E* 42(2), (2006): 63–81.

Hess, Stephane and John W. Polak. "Mixed Logit Modeling of Airport Choice in Multi-Airport Regions. " *Journal of Air Transport Management* 11(2), (2005): 59–68.

Innes, J. David and Donald H. Doucet. "Effects of Access Distance and Level of Service on Airport Choice." *Journal of Transportation Engineering* 116(4), (1990): 507–516.

Ishii, Jun, Sunyoung Jun, and Kurt Van Dender. "Air Travel Choices in Multi-Airport Markets." *Journal of Urban Economics* 65(2), (2009): 216-227.

Mendenhall, William and Terry Sincich. *A Second Course in Statistics: Regression Analysis.* 6th Ed. Pearson Prentice Hall, Upper Saddle River, NJ, 2003.

Pels, Eric, Peter Nijkamp, and Piet Rietveld. "Access to and Competition Between Airports: A Case Study for the San Francisco Bay Area." *Transportation Research Part A* 37(1), (2003): 71–83.

Pels, Eric, Peter Nikamp, and Piet Rietveld. "Airport and Airline Choice in a Multiple Airport Region: An Empirical Analysis for the San Francisco Bay Area." *Regional Studies* 35(1), (2001): 1-9.

Sixel Consulting Group, Inc. "Hector International Airport: Passenger Retention Study and True Passenger Market Size Analysis Study," 2010.

Skinner, Robert E. "Airport Choice: An Empirical Study." *Journal of Transportation Engineering* 102(4), (1976): 871–882.

Suzuki, Yoshinori. "Modeling and Testing the 'Two-Step' Decision Process of Travelers in Airport and Airline Choices." *Transportation Research Part E* 43, (2007): 1-20.

Thompson, Amanda and Robert Caves. "The Projected Market Share for a New Small Airport in the North of England." *Regional Studies* 27(2), (1993): 137 - 147.

Windle, Robert and Martin Dresner. "Airport Choice in Multiple-Airport Regions." Journal of Transportation Engineering 121(4), (1995): 332–337.

Zhang, Yunlong and Yuanchang Xie. "Small Community Airport Choice Behavior Analysis: A Case Study of GTR." *Journal of Air Transport Management* 11(6), (2005): 442–447.

***Steve Leon** is a Ph.D. candidate at North Dakota State University in the Transportation and Logistics Program and research assistant for the Upper Great Plains Transportation Institute, where he has worked in air transportation studies. His career spans 20 years in the global airline industry holding positions as pilot and manager. In addition, he teaches operations management and courses related to air transportation. Steve holds a B.S. in aeronautical studies from the University of North Dakota and an MBA in international business from Loyola University, Maryland. His research interests include government policy, risk mitigation, and customer and organizational value through supply chains.*