Chapter 3
Aviation Demand Forecasts

3.0 INTRODUCTION

Forecasts of aviation demand are a key element in all airport planning. Demand forecasts, based upon the desires and needs of the service area, provide a basis for determining the type, size, and timing of aviation facility development and are a platform upon which this master planning study will be based. Consequently, these forecasts influence virtually all phases of the planning process. The methodology to develop these forecasts and resulting projections are presented in the following sections:

- Purpose
- Aviation Demand Elements
- Forecast Framework
- Approach
- Aviation Demand Forecasts
- Alternative Scenario Projections of Demand
- Aviation Demand Forecast Summary

Master planning forecasts are completed for a twenty year period. For this master plan, the twenty-year timeframe spans from 2010 to 2030. The base year data is 2009. The twenty-year period is further separated in to three periods, the short, intermediate, and long term planning periods, which correspond to 2010-2015, 2016-2020, and 2021-2030, respectively. Forecast elements were developed for each of these periods.

3.1 PURPOSE

The aviation demand forecasts will serve four purposes in the development of this master plan. Specifically, they provide the basis for:

- Determining the necessary capacity of the airfield, passenger terminal area, general aviation area, and ground access system serving the airport.
- Determining the airport's future facility size and type of expansion needed.
- Evaluating potential environmental effects of alternative airport development layouts.
- Evaluating the financial feasibility of alternative airport development scenarios.

3.2 AVIATION DEMAND ELEMENTS

Forecasts of aviation demand can be developed for numerous elements. In the case of Buffalo-Niagara International Airport (BNIA), the key demand elements focus on scheduled airline passenger traffic and aircraft operations. Secondary demand elements include general aviation activity descriptors such as based aircraft and operations. Other important forecast elements are derived from these basic indicators. For this study, aviation activity forecasts were prepared for:

- ***Airline Passenger Enplanements:*** Defined as air travelers who have boarded departing airline aircraft.

- Mainline and Regional: Enplanements are subdivided into those passengers carried by the mainline carriers and their regional (sometimes called "express" or "commuter") partners.
- Total Annual
- Peak Period (Monthly, Daily, Hourly)

- ***Airline Aircraft Operations:*** This type of operation is either a takeoff or a landing of an airline aircraft. A takeoff and landing are two operations.
  - Total Annual
  - Operational Fleet Mix
  - Peak Period (Monthly, Daily, Hourly)

- ***Registered Aircraft:*** Defined as being either fixed or rotary wing aircraft, operated in non-airline service with a current registration.

- ***Based Aircraft:*** Defined as a general aviation aircraft which is stationed at an airport on a permanent basis.
  - Based Aircraft Fleet Mix

- ***General Aviation Enplaned Passengers:*** Defined as air travelers who have boarded departing general aviation aircraft.

- ***General Aviation Aircraft Operations:*** This type of operation is either a takeoff or a landing of a general aviation aircraft.
  - Total Annual
  - Local Versus Itinerant
  - Fleet Mix
  - Peak Period (Monthly, Daily, Hourly)

- ***Military Aircraft Operations***: This type of operation is either a takeoff or a landing of a military aircraft.

Tables 3-1 and **3-2** present the historical data used in the forecast of aviation activity at Buffalo-Niagara International Airport. **Table 3-1** shows historical enplanement data for BUF, while **Table 3-2** presents corresponding historical aircraft operations for the 2001 – 2009 period. As shown, there was a growth in enplanements of 21.4 percent in that timeframe. This translates into an average annual growth of 2.46 percent. It is interesting to note that BUF outpaced the national growth rate in enplanements.

Even though enplanements have been increasing, **Table 3-2** shows that total aircraft operations at BUF have been declining. These decreases have occurred in all segments of operational demand. Between 2001 and 2009, the airport lost 27,300 operations or 17.2 percent of its total operations.

Table 3-1 Historical Enplanements

Year	BUF Mainline	BUF Regional	BUF Total	U.S. Total
2001	1,989,358	345,069	2,334,427	682,471,448
2002	1,627,455	379,183	2,006,638	626,314,895
2003	1,475,766	551,288	2,027,054	641,160,066
2004	1,406,117	759,248	2,165,365	688,962,619
2005	1,581,588	815,083	2,396,671	736,969,479
2006	1,764,789	736,086	2,500,875	740,023,071
2007	1,871,066	762,900	2,633,966	765,330,547
2008	2,026,647	727,024	2,753,671	759,098,931
2009	2,003,902	658,119	2,662,021	704,028,463
Annual Growth %	0.09%	11.34%	1.75%	0.39%

Source: FAA Terminal Area Forecast, 2010

Figure 3-1 Historical Enplanements

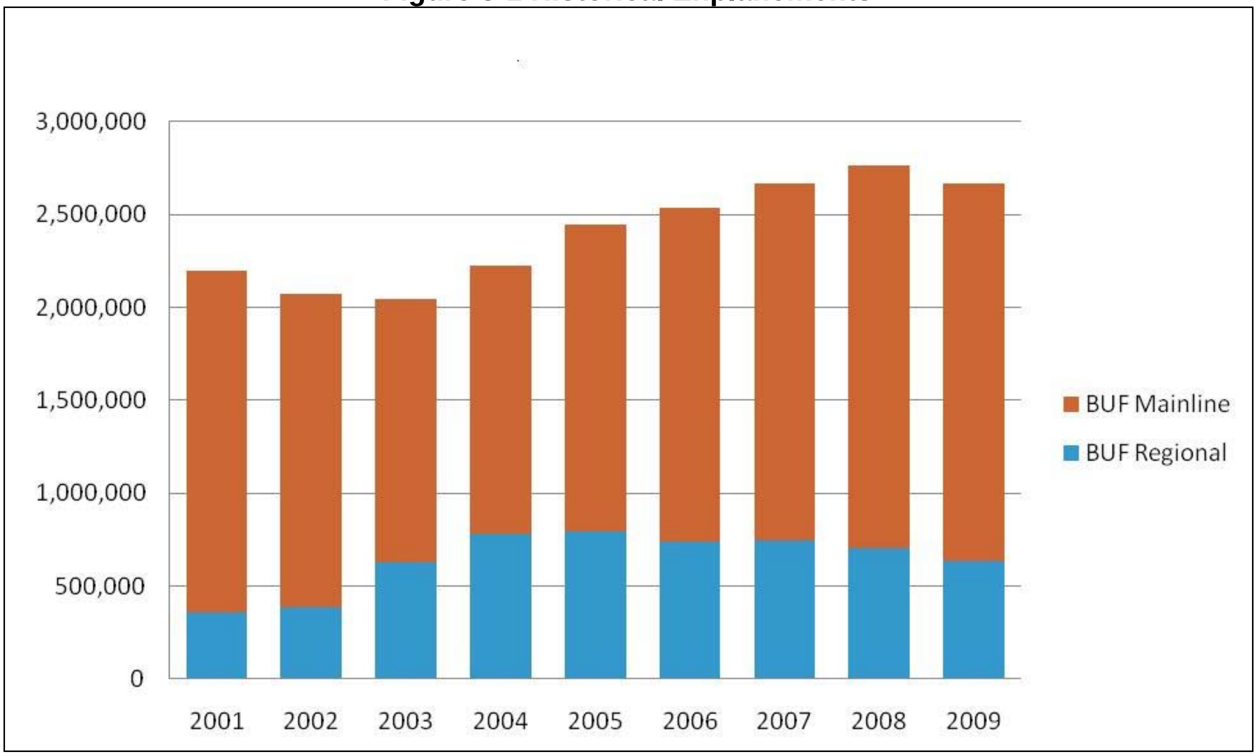


Table 3-2 Historical Aviation Operations

Year	Air Carrier/Cargo	Air Taxi*	Military	General Aviation	Total Operations
2001	58,827	46,871	61,323	5,273	172,294
2002	48,731	41,258	40,767	6,029	136,785
2003	49,658	39,712	38,737	4,386	132,493
2004	50,275	48,194	38,880	3,785	141,134
2005	54,677	46,096	33,390	2,801	136,964
2006	43,274	52,079	35,861	1,595	132,809
2007	43,796	50,890	40,656	2,124	137,466
2008	50,948	42,085	43,579	1,910	138,522
2009	49,400	38,698	42,448	2,066	132,612
Annual Growth %	-2.00%	-2.18%	-3.85%	-7.60%	-2.88%

* *Air Taxi is defined by the Federal Aviation Administration as inclusive of aircraft with 60 seats or less with a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire. Part 135 air taxi operations are classified as general aviation later in this chapter.*

Source: FAA Terminal Area Forecast, 2010

3.3 FORECAST FRAMEWORK

The framework for this forecast was based upon the development of a consensus or likely set of forecasts of demand, accompanied by potential adjustments (up or down) resulting from changes to basic assumptions of the likely forecast. By way of explanation, a twenty-year forecast of aviation demand carries inherent uncertainties. These uncertainties about the future grow as the timeframe extends. For this reason, a number of projections were developed that used different methods of prediction. Some methods were based upon local socioeconomic factors, others were based on national forecasts, while others used historical trends. The benefit of using a variety of projection methods occurs when the results show a forecast consensus. That is, if a number of projections all point in the same direction, even though they were generated using different data and methods, greater confidence is gained in the resulting forecast.

This forecast framework used a number of different statistical methods in developing a consensus approach for projecting future demand. If demand estimates from these different methods are within a reasonable range, an average of these projections is used to develop a consensus forecast. In developing this consensus, reasonable estimates of future demand are selected, based upon statistical and judgmental factors.

In addition to the typical forecasting efforts, several issues specific to BNIA were considered in the forecasting effort; specifically, the issues and trends relating to Canadian demand as well as the effects of airline mergers and acquisitions.

3.3.1 Canadian Demand

The airport service area (previously displayed in Chapter 2) for airline demand included nine counties in Western New York (Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Monroe, Niagara, Orleans, and Wyoming) and selected Canadian census divisions. In Canada, the selected Central Ontario census divisions and the Greater Toronto Area divisions were included. Within Central Ontario, census divisions included Brant, Haldimand-Norfolk, Hamilton, Niagara, Waterloo, and Wellington. Within the Greater Toronto Area, census divisions included Toronto, Durham, Halton, Peal, and York. **Table 3-3** presents a summary of the historical and forecast socioeconomic variables of population, employment, and per capita personal income (PCPI) were used in developing the airline forecasts for BNIA.

Table 3-3 – Service Area Socioeconomic Variables

Year	Population[1]	Employment[2]	PCPI (Income)[3]
2001	9,445,100	5,297,300	$21,723
2002	9,557,800	5,397,500	$21,683
2003	9,669,700	5,497,600	$23,975
2004	9,779,900	5,597,800	$26,300
2005	9,881,900	5,697,900	$28,648
2006	9,988,700	5,798,100	$31,503
2007	10,099,000	5,903,300	$34,343
2008	10,213,300	6,008,600	$35,563
2009	10,330,900	6,113,800	$33,474
Annual Growth %	*1.13%*	*1.81%*	*5.55%*
Forecast			
2010	10,434,500	6,213,400	$37,408
2015	11,012,200	6,734,000	$42,930
2020	11,636,100	7,291,700	$48,188
2030	12,931,500	8,447,400	$57,408
Annual Growth %	*1.08%*	*1.55%*	*2.16%*

Sources:[1] Cornell University Population Projections, Ontario Ministry of Finance[1,2,3] Regional Economic Information System (REIS) U.S. Department of Commerce, Bureau of Economic Analysis[2,3] 2010 Ontario Budget

The Canadian area population base is significantly greater than the Buffalo area with a population of over 8 million compared to the service area in Western New York with over 2.2 million in 2009. The population of the combined service area in 2009 was over 10 million, which makes it the 10th largest urban region in North America. Between 2001 and 2009, Western New York's population decreased by 2.6 percent while the Canadian area population increased by 13.3 percent.

The high growth rate for the service area is fueled by Ontario's expanding economy and high immigration rates. For example, almost half of the people living in Toronto were born in other countries, and the city is known to be the most multicultural city in the world. Of the 250,000 people who come to Canada to become permanent residents each year, approximately 60 percent chose Ontario. This fact influences the region's high demand for international travel as well.

Employment for the service area increased by 10 percent between 2001 and 2009, with Western New York increasing at a much slower rate than the service area in Canada - 2.8 percent versus 12.3 percent.

Perhaps the most important story regarding demand for airline service at BNIA involves the recent surge in buying power of Canadians. This increase in recent years can be attributed to U.S. – Canadian currency exchange rates which favor Canada. **Table 3-4** includes the exchange rates between 2001 and 2009. If these rates are applied to the Ontario PCPI, the growth in U.S. spending power for Ontario residents was more than twice the U.S. side growth. That is, in U.S. dollars, PCPI for Canadians living in Ontario grew more than 64 percent from

2001 to 2009. This increased buying power outgrew the New York region's PCPI by roughly 30 percent during the same period. The increased buying power of the Canadian market makes the U.S. airport fares even more attractive and continues to draw more and more air travelers across the border.

Table 3-4 – Canadian Income and Exchange Rates

Year	NY Region PCPI[1]	Ontario PCPI (Canadian $)[2]	Ontario PCPI (US $)	U.S./Canadian $ Exchange Rate[3]
2001	$28,200	$30,360	$19,613	0.646
2002	$28,635	$30,553	$19,462	0.637
2003	$29,545	$31,133	$22,229	0.714
2004	$31,007	$32,362	$24,854	0.768
2005	$32,066	$33,482	$27,623	0.825
2006	$33,812	$34,948	$30,824	0.882
2007	$36,332	$36,311	$33,769	0.93
2008	$37,698	$37,267	$34,956	0.938
2009	$38,024	$36,757	$32,199	0.876
Growth	*134.8%*	*120.1%*	*164.2%*	*135.6%*

Sources: Regional Economic Information System (REIS) U.S. Department of Commerce, Bureau of Economic Analysis; [1]Includes Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Monroe, Niagara, Orleans, and Wyoming Counties. [2]Source: Ontario Ministry of Finance; http://www.oanda.com/currency/historical-rates.

Once the consensus forecast is completed, it will be subjected to further analysis. In this regard, the framework of this forecast included an examination of a number of different scenarios that could significantly impact the forecast of demand, either positively or negatively. These scenarios deal primarily with the level of Canadian traffic attracted to BNIA each year. As shown in **Table 3-5**, this traffic has grown as a percentage of total passengers since 2006. The resulting impact has been overall continued growth in the market, even though economic and demographic reductions are taking place in BNIA's U.S. service area.

Table 3-5 Growing Canadian Use of BNIA

Origin	2006	2007	2008	2009
Buffalo-Niagara Falls[1]	66%	56%	32%	28%
Rochester Area[2]	1%	2%	13%	14%
Canada	**26%**	**34%**	**33%**	**38%**
Other	7%	8%	22%	20%
Total	100%	100%	100%	100%

Source: NFTA, 2010
[1]Erie & Niagara Counties [2]Genesee & Monroe Counties

To maintain historical growth rates, continued strong Canadian ridership is needed. There are a number of factors that may impact this market segment, most of which can be reduced to two primary influences:

- The price differential between air fares in Canada versus the U.S., which is influenced by:
  - U.S.-Canadian currency exchange rates.
  - Differences in airport and ticket charges at Canadian and U.S. airports.

  - Low fare carriers influence on ticket prices at BNIA versus Toronto Pearson International.
- The time required to travel from Canadian residences to BNIA, which is impacted by:
  - International bridge capacities including any new bridges in the future.
  - U.S. and Canadian security procedures that may reduce or lengthen crossing times.

The unforeseen elements of future Canadian demand are interjected as scenarios to the baseline consensus projections. Thus, the expected or likely forecast is accompanied by a high and low potential range, based upon the future scenarios associated with Canadian demand.

3.3.2 Airline Merger Activity and BNIA

Other potential impacts to the forecast of aviation activity at BNIA include the recent mergers of Delta and Northwest in 2008; Continental and United in 2010 and the merger of Southwest and AirTran Airways in 2011. These inter-airline mergers may impact how the service is delivered to BNIA, but they should not impact the overall numbers of future passengers unless low fares are reversed by a lack of competition. Low fares are key to the continued draw of Canadian passengers across the border. If that price differential is reduced because of mergers, lower numbers of Canadians would be induced to use BNIA.

In the short term, the merger of Delta and Northwest impacted the split between mainline and regional aircraft usage at BNIA, increasing regional aircraft operations by five percent. However, unless overall capacity (available seats) is reduced, the impacts of these mergers should be minimal to the demand forecasts of passenger enplanements and operations at the airport.

3.4 Consensus Forecast Approach

The Consensus Projection forecasting methods all employed traditional means of extrapolating historical aviation trends at the airport or in the airport service area into future time frames. Forecasting techniques such as market share, socioeconomic regression, trend analysis, and survey analysis were used to project forecasts of demand. Each of these projection techniques are discussed below.

3.4.1 Market Share Projection

Market share projections are developed by calculating historical shares of Buffalo-Niagara International Airport activity and projecting these respective shares into future time frames. This method of projection reflects demand based upon trends occurring in Western New York and the entire U.S. (Socioeconomic and per capita projections are based upon local factors). Market share projections reflect historical trends and may include static (constant) or dynamic (increasing or decreasing) future market shares. It is essentially a “top-down” method of forecasting where other forecasts of activity for larger areas are used as drivers of the local share of that demand. Socioeconomic and per capita projections, on the other hand, are considered “bottom-up” methodologies and are based upon local factors. Market share projections reflect historical trends and may include increasing, constant, or decreasing future market shares. The FAA’s most recent forecast of total U.S. enplanements includes the following:[1]

[1] FAA Aerospace Forecast, Fiscal Years 2010-2030, (U.S. Department of Transportation, Federal Aviation Administration, Aviation Policy and Plans) March, 2010.

Year	US Enplanements (Millions)
2010	707.4
2015	813.7
2020	932.6
2030	1,210.0
Ave. Annual Growth Rate	2.72%

3.4.2 Socioeconomic Regression Analysis

The socioeconomic regression projection is based upon an assumed causal relationship between population, income, or employment and the aviation activity in a particular area. This projection of demand is obtained by relating socioeconomic data via regression analysis to aviation activity. The resulting set of regression equations produces a projection of aviation activity when they are coupled with independent projections of future socioeconomic data.

This forecast utilized population, income (in the form of Per Capita Personal Income), and employment statistics as the independent socioeconomic variables. These statistics were obtained for both the U.S. service area and the Canadian service area in Ontario. For the U.S. statistics, the U.S. Department of Commerce, Bureau of Economic Analysis data was used for the history, while projections of population though 2030 were obtained from Cornell University's Program on Applied Demographics. For historical and forecast Canadian statistics, population and per capita Income numbers were gathered from the Ontario Ministry of Finance. After a number of trials, the best forecasting statistics were obtained by combining the Canadian and U.S. service area demographics.

The Socioeconomic Regression Analysis was used in forecasting airline enplanements and general aviation registered aircraft. The R^2 statistics are used to gauge the significance of the regression. An R^2 of 0 means there is no statistical correlation between the independent and dependent variables. R^2 values near 1 indicate a significant relationship or trend.

3.4.3 Trend Analysis

Trend projections use historical data to formulate predictions of future activity. For this study, two trend analysis methods were used to project baseline aviation activity: double exponential smoothing and least squares linear trending.

The double exponential smoothing process produces projections by combining the forecast for the previous period with an adjustment for past errors. It is desirable to correct for past errors when the error has resulted from changes in the trend. In this case, correcting for past errors will put the forecast back on track. Double exponential smoothing is appropriate when the time series contains a linear trend. It acts by calculating two smoothed series - a single and a double smoothed value. Both will lag behind any trend. However, the difference between them indicates the size of the trend. This difference is used to adjust the forecast for the trend.

The second trend method used was least squares linear trend. This method uses aviation activity regressed against time to produce a projection. No assumptions about the causes of trends are included in the trending methodology.

3.5 AVIATION DEMAND FORECASTS

Aviation demand forecasts were developed for all of the demand elements listed earlier in the Aviation Demand Elements section. As such the following major components are addressed:

- Consensus Airline Demand Forecasts
- Air Cargo Demand Forecasts
- General Aviation Demand Forecasts
- Military Aircraft Operations
- Aviation Demand Forecast Summary: Status Quo Scenario
- Comparisons With Other Forecasts

3.5.1 Consensus Forecasts of Airline Demand

The Consensus Forecasts for Buffalo-Niagara International Airport focus on enplanements as the driving force for all of the other components of airline demand. Thus, if the number of annual and peak hour enplanement forecasts is realistic, all of the other portions of demand should be reasonable, as well. Components of the airline forecast include:

- Airline Passenger Enplanements
  - Total Annual
  - Peak Hour
- Airline Aircraft Operations
  - Total Annual
  - Fleet Mix
  - Peak Hour

Airline Enplanement Forecast

Because of its importance in the overall master planning process, the Consensus Forecast of airline enplanements used several different means of projecting airline enplanements to determine if consistent trends evolved. As mentioned, methods used in the forecasting process included:

- Market Share
- Socioeconomic Regression
- Trend Analysis

Market Share Projection

The market share projection examined historical enplanements at Buffalo-Niagara International Airport and compared these numbers to the United States enplanement totals. This comparison revealed that the enplanement market share at Buffalo-Niagara International has increased as a percent of total U.S. enplanements since 2001, growing from 0.322 percent to 0.379 percent. Factors creating this growth, such as air service quality and price, strong Canadian air service demand, etc., are not considered in the market share forecasting method - only trends for the historical market share. Other causative factors are considered in subsequent projection methods.

To obtain a forecast, projected market shares were applied to the Federal Aviation Administration's (FAA) latest forecast of total U.S. enplanements. Both constant and dynamic market shares were evaluated. The constant market share was calculated based upon the last year of available market share data (2009) held "constant" into future time frames. The dynamic share was estimated using a trended projection of market share for the 20-year forecast period. **Table 3-6** presents the market share projections of airline enplanement demand for Buffalo-Niagara International Airport.

Socioeconomic Regression Projections

Three socioeconomic regression projections were developed for Buffalo-Niagara International Airport. These projections were used to correlate causative factors and their growth, to the growth of airline enplanements. The socioeconomic regressions used population, employment, and income statistics from the airline passenger service area as defined previously. The socioeconomic statistics were regressed against airline enplanements and projections were made based upon the resulting regression equations. **Table 3-6** presents a summary of the socioeconomic regression projections of airline enplanements for Buffalo-Niagara International. Also presented are the regression R^2 values for each projection. The strong statistical correlations are the result of positive socioeconomic growth in the Canadian service area. This growth offsets declines on the U.S. side which would have resulted in inverse correlations. Intuitively, it is reasonable to attribute the positive growth in BUF enplanements to the Canadian component of demand, which has been increasing in recent years (see **Table 3-5**)

Trend Analysis Projections

Trend projections use historical enplanement data to formulate predictions of future activity. As discussed previously, two trend analysis methods were used to project airline enplanement activity - double exponential smoothing and least squares linear trending. **Table 3-6** presents a summary of the trend projections of enplanements and their resulting statistics.

Derived Projections

To select a preferred forecast, two projections were created from the seven reasonable projections. The first "hybrid" projection was an average of the high and low reasonable projections. This projection was a mid-range estimate of enplanement demand. Because there were seven viable projections, an average of all was taken to create a second "hybrid" forecast of enplanement demand. This method (multi-average) reduced the influence of a single high or low projection to skew the forecast away from the consensus if the majority of other projections were in the opposite direction. **Figure 3-2** shows the projections in graph form.

Selection of Preferred Enplanement Forecast

Table 3-6 presents a summary of the various projections of airline enplanement demand at Buffalo-Niagara International Airport. As shown, there is a range in the projection numbers. To select a preferred forecast, a systematic process that incorporated statistical methods with intuitive judgment was used. The analytical method first examined the equational statistics for each projection. In this regard, the R^2 statistic was used to judge the strength of the correlation for the socioeconomic regressions and linear trend equation. For this analysis, R^2 values greater than 0.70 were considered significant. As such, all of the projections using regression analysis could be considered reasonable from a statistical standpoint. The year 2030 projections ranged from a low of 3,688,900 (Income) to 4,758,000 (population). The highest R^2

value was generated by the Employment projection. Since the two Market Share projections and the Exponential Smoothing projection all fell between the upper and lower ranges of the Socioeconomic projections, they could also be considered reasonable.

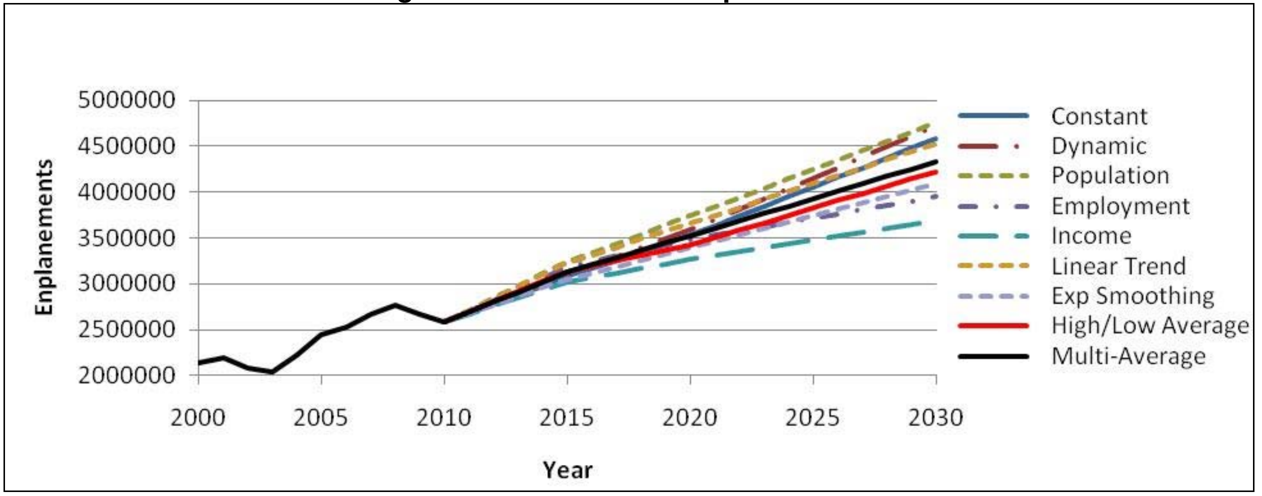
For Buffalo-Niagara International, it was determined that the **Multi-Average Projection** was best suited to the Consensus Forecast of airline passenger demand. This forecast truly selects a “consensus” growth trend for the future that is slightly higher than the High/Low Average. As shown, airline enplanements are anticipated to grow from 2,610,269 in 2010 to 4,331,700 by the year 2030; resulting in a rate of 2.46 percent annually, 62.5 percent overall growth. This can be compared to the FAA’s forecast of U.S. enplanements for the same period, which shows 2.72 average annual growth and 71 percent overall growth. Thus, although BUF shows a strong future growth, it is still below the national average.

Table 3-6 Forecast of Airline Enplanements

Projection/Forecast	2010	2015	2020	2030	R Squared
Market Share					
Constant	2,610,269	3,080,924	3,531,074	4,581,598	n/a
Dynamic	2,610,269	3,107,324	3,586,547	4,719,008	n/a
Socioeconomic Regression					
Population	2,610,269	3,245,359	3,737,064	4,757,992	0.78
Employment	2,610,269	3,184,705	3,484,155	3,950,191	0.92
Income	2,610,269	3,023,300	3,265,021	3,688,869	0.88
Trend Analysis					
Linear Trend	2,610,269	3,225,111	3,659,215	4,527,423	0.79
Exp Smoothing	2,610,269	3,049,620	3,398,736	4,096,968	n/a
Derived Projections					
High/Low Average	2,610,269	3,134,330	3,425,784	4,223,430	n/a
Multi-Average	2,610,269	3,130,906	3,523,116	4,331,721	n/a
Selected Forecast	**2,610,269**	**3,130,900**	**3,523,100**	**4,331,700**	

Source: RA Wiedemann; McFarland Johnson, NFTA Records, 2010

Figure 3-2 Forecast of Enplanements



Source: RA Wiedemann; McFarland Johnson, 2010

Mainline/Regional Carrier Split of Enplanements

For the purposes of this analysis, mainline carriers refer to major and national air carriers, while regional carriers are defined as the smaller commuter or express airlines that either feed the mainline carriers hubs or serve smaller origin and destination markets. Regional activity in the context of this report refers to airline activity with aircraft less than 100 seats; this differs from the FAA TAF where the cutoff is 60 seats. Facility requirements for aircraft such as the CRJ family which ranges from 50 to 82 seats are similar, despite aircraft having differing classifications in the TAF. This change in classification does not effect the overall operations and enplanement forecast.

When forecasting airline demand, it is important to project the split between mainline carrier enplanements and regional carrier enplanements. This split can then be used to more easily forecast airline operations by fleet type, which ultimately helps determine the future terminal building facility needs. The projection of mainline and regional carrier enplanements was based upon historical trends and knowledge of future U.S. growth of both of these segments of demand. In this regard, FAA forecasts show the regional carrier annual demand growing at a 3 percent annual rate, which is higher than the mainline carriers' projected growth of 2.2 percent annually.

The historical split between mainline and regional carriers for BNIA is presented in **Table 3-7** for the years 2000 through 2009. As shown, the mainline carriers are anticipated to lose 5 percent of the market share at BNIA in 2010 (based upon the first 8 months of 2010 data seasonally adjusted). When Delta and Northwest Airlines merged in 2009, Delta's regional carrier Delta Connection increased its market share from 6.3 percent of total operations in 2009 to 11.0 percent of total operations in the first portion of 2010. Prior to the merger, the combined market share between Delta, Northwest and Delta Connection in 2009 was 16.1 percent of operations. After the merger, Delta and Delta Connection had a combined market share of 17.1 percent of operations.

Table 3-7 Mainline and Regional Carrier Enplanements Shares

Year	Mainline* Enplanements	Percent Share	Regional* Enplanements	Percent Share	BNIA Enplanement Totals
2000	1,794,790	84.1%	339,474	15.9%	2,134,264
2001	1,835,341	83.6%	359,309	16.4%	2,194,650
2002	1,692,089	81.5%	382,981	18.5%	2,075,070
2003	1,414,983	69.2%	628,701	30.8%	2,043,684
2004	1,441,167	64.8%	781,980	35.2%	2,223,147
2005	1,646,815	67.4%	795,589	32.6%	2,442,404
2006	1,791,848	70.8%	740,094	29.2%	2,531,942
2007	1,919,983	72.0%	747,761	28.0%	2,667,744
2008	2,059,303	74.5%	703,098	25.5%	2,762,401
2009	2,028,021	76.1%	637,739	23.9%	2,665,760
Forecast					
2010	1,837,400	71.1%	746,000	28.9%	2,583,400
2015	2,201,500	70.3%	929,400	29.7%	3,130,900
2020	2,448,400	69.5%	1,074,700	30.5%	3,523,100
2030	2,937,700	67.8%	1,394,000	32.2%	4,331,700

Source: RA Wiedemann; McFarland Johnson, 2010
**Note: Mainline and Regional activity was forecast based on airline schedules to facilitate terminal planning; Regional enplanements occur on aircraft with less than 100 seats, compared to 60 seats in commuter operations in the FAA TAF.*

The large shift in 2010 operations is anticipated to be a one-time phenomenon, due to the merger activity impacts at BNIA. For the future, a gradual increase in market share between for regional carriers is predicted, based upon FAA forecasts of national trends. These trends also indicate growth in the average size of regional carrier aircraft, as a number of the 50-seat RJs are removed from service in favor of 70, 90, and 100-seat aircraft.

Airline Aircraft Operations Forecast

A forecast of airline operations is required to assess the adequacy of the terminal and airfield system throughout the planning period and to help determine the financial impact and the environmental effects associated with future air traffic levels. For the purposes of this forecast, annual airline aircraft operations were further subdivided into categories for mainline airlines and regional airlines. **Table 3-8** presents the historical level of airline operations, including the split between mainline carriers and regional airlines. As shown, there has been significant growth in the regional airline operations component over the last 10 years. Also included in **Table 3-8** is a ratio called enplanements per departure that reflects the comparative growth of aircraft capacity and passenger load factors.

Table 3-8 Mainline and Regional Carrier Operations and Enplanements

Year	Mainline* Enplanements	Mainline Operations	Enplanements /Departure	Regional* Enplanements	Regional Operations	Enplanements /Departure
2000	1,794,790	44,116	81.37	339,474	33,560	20.23
2001	1,835,341	43,580	84.23	359,309	30,604	23.48
2002	1,692,089	37,652	89.88	382,981	26,580	28.82
2003*	1,414,983	30,885	91.63	628,701	40,457	31.08
2004	1,441,167	30,868	93.38	781,980	46,914	33.34
2005	1,646,815	32,974	99.89	795,589	44,192	36.01
2006	1,791,848	34,982	102.44	740,094	40,720	36.35
2007	1,919,983	35,774	107.34	747,761	37,730	39.64
2008	2,059,303	40,608	101.42	703,098	35,524	39.58
2009	2,028,021	40,058	101.25	637,739	33,722	37.82
	Forecast					
2010	1,837,400	35,200	104.37	746,000	36,100	41.33
2015	2,201,500	41,400	106.50	929,400	41,300	45.03
2020	2,448,400	45,600	107.50	1,074,700	44,400	48.37
2030	2,937,700	52,800	111.10	1,394,000	49,800	55.95

Source: RA Wiedemann; McFarland Johnson, 2010
*Operations and Enplanements/Departure Extrapolated in 2003
**Note: Mainline and Regional activity was forecast based on airline schedules to facilitate terminal planning; Regional enplanements occur on aircraft with less than 100 seats, compared to 60 seats in commuter operations in the FAA TAF.*

The forecast of annual airline operations, each operation consisting of one takeoff or landing, was derived from the forecast of annual enplaned passengers for each respective component of airline demand. The methodology consists of the following steps:

- Determine the historical ratio of enplaned passengers to airline departures for both the mainline carriers and the regional carriers ((enplanements/operations) times 2);
- Project changes in the enplaned-passenger-per-departure ratio for the planning period for each component of demand;
- Apply the projected enplaned-passenger-per-departure ratios to the forecasts of annual enplaned passengers to calculate airline operations, ((enplanements/enplanements-per-departure) times 2).

The key component of the forecast, therefore, is the projection of a reasonable enplanement-per-departure ratio. In this regard, the historical record provides insight into the long-term trends at Buffalo-Niagara International Airport. The number of enplanements/departure has grown rapidly for both the mainline and regional airlines.

The mainline carriers are optimizing the use of their aircraft equipment in the denser markets, which tends to increase the enplanements/departure ratio. At the same time, the regional airlines are increasing the average number of available seats per departure by purchasing larger regional jets and parking or selling their smaller commuter aircraft. This increase in capacity works to increase the number of enplanements/departure on the regional carriers, even if load factors remain the same. **Table 3-8** presents the forecast of airline operations, divided by mainline and regional carrier totals.

Airline Fleet Mix

Related to the number of airline operations at BNIA is the size and make up of each airline's fleet serving the market. Forecasting the airline fleet mix permits planners to estimate the need for airport facilities in terms of runway length, strength, and terminal building requirements.

The FAA's forecast for the average number of seats for the domestic airline fleet (including mainline and regional carriers) is anticipated to grow from 121.9 seats in 2009 to 123.6 seats in 2030, an average increase of 0.1 seats per year.[2] The average aircraft size for the mainline group is expected to increase by only 0.5 seats between 2009 and 2030, growing from 151.4 to 151.9. The bulk of capacity gains are with regional carriers where seating capacity is forecast to grow from 55 seats in 2009 to 65.4 seats in 2030 (0.5 seats per year). The FAA's projection of domestic carrier average aircraft size is greatly influenced by carrier fleet plans, publicly known aircraft orders, and FAA's expectations of the changing domestic competitive landscape.

For the long-term future, it is anticipated that some aircraft types currently serving Buffalo will be retired or taken out of service such as the DC-9 30/40/50 series, the B-737-400s, and the MD-80's. Increased utilization is anticipated for newer, more efficient aircraft such as the B-737 series (700/800) and the Airbus 320 series based on current aircraft orders. In addition, some carriers, such as JetBlue and US Airways, are turning to smaller aircraft, like the 100-seat Embraer 190, to supplement their route structure. In 2010 at BNIA, 19.18 percent of departures were with the E190, up from 8.8 percent in 2008, primarily due to JetBlue. The use of smaller narrow-body aircraft allows mainline carriers to better serve their customers by boosting frequency, as well as improve profitability by more closely matching supply (the number of seats) with demand (the number of passengers).

For the regional carriers, there are a number of changes anticipated at BNIA. As the age of the turboprop fleet increases, a number of changes will be made to replace and upgrade these aircraft. In particular, older models of the CRJ 200, the Dash 8 aircraft, the Saab 340, and the Beech 1900 are anticipated to be retired within 20 years. It remains to be seen if economical replacement aircraft can be developed for these regional carrier aircraft. On the other hand, the larger, more economical turboprops such as the Dash 8/Q300s and Q400s are anticipated to see increased usage at BUF over the planning period. **Table 3-9** presents the forecast of airline fleet mix for BNIA.

[2] Ibid. p. 5

Table 3-9 Forecast of Airline Fleet Mix

Aircraft	Seats	2010 Departures	%	2015 Departures	%	2020 Departures	%	2030 Departures	%
Mainline Carriers									
A319	124	1,399	7.94%	1,677	8.10%	1,801	7.90%	1,716	6.50%
A320 (United)	138	434	2.47%	435	2.10%	2,143	9.40%	2,798	10.60%
A320	150	1,206	6.85%	1,791	8.65%	1,719	7.54%	2,138	8.10%
A321	183	-	0.00%	207	1.00%	342	1.50%	462	1.75%
B 717-200	117	1,350	7.67%	1,480	7.15%	1,391	6.10%	1,452	5.50%
B 737-300	124	2,412	13.70%	2,132	10.30%	1,186	5.20%	370	1.40%
B 737-400	144	1,302	7.40%	1,263	6.10%	0	0.00%	0	0.00%
B 737-500	122	241	1.37%	435	2.10%	251	1.10%	277	1.05%
B 737-700	137	3,762	21.37%	4,616	22.30%	5,837	25.60%	6,732	25.50%
B 737-800	150	-	0.00%	497	2.40%	1,231	5.40%	1,690	6.40%
B 737-800 (Southwest)	175	-	0.00%	725	3.50%	1,186	5.20%	1,901	7.20%
B 757-200	182	48	0.27%	58	0.28%	57	0.25%	0	0.00%
DC9-50	127	386	2.19%	377	1.82%	228	1.00%	0	0.00%
DC9 30/40/50	100	-	0.00%	104	0.50%	0	0.00%	0	0.00%
Embraer 190	100	3,376	19.18%	3,974	19.20%	5,178	22.71%	6,864	26.00%
MD-88	142	1,688	9.59%	932	4.50%	251	1.10%	0	0.00%
Totals		**17,604**	100.00%	**20,700**	100.00%	**22,800**	100.00%	**26,400**	100.00%
Average Seats		127.2		129.4		130.0		130.6	
Regional Carriers									
CRJ 700	65-70	489	2.72%	2,664	12.90%	3,885	17.50%	5,080	20.40%
CRJ 900	76-86	1,957	10.84%	2,561	12.40%	3,219	14.50%	4,507	18.10%
CRJ 200	50	6,457	35.77%	4,977	24.10%	2,331	10.50%	0	0.00%
DHC-8-200	37	1,565	8.67%	1,507	7.30%	1,376	6.20%	0	0.00%
DHC-8-300	50	245	1.36%	1,342	6.50%	3,086	13.90%	3,088	12.40%
DHC-8-400	72	1,418	7.86%	1,755	8.50%	2,486	11.20%	4,034	16.20%
Embraer 170	66-76	685	3.79%	1,301	6.30%	1,865	8.40%	3,884	15.60%
Embraer 175	76-86	342	1.90%	867	4.20%	1,154	5.20%	2,191	8.80%
Embraer RJ 145	50	4,060	22.49%	3,676	17.80%	2,797	12.60%	2,117	8.50%
Saab 340	34	832	4.61%	0	0.00%	0	0.00%	0	0.00%
Totals		**18,049**	100.00%	**20,650**	100.00%	**22,200**	100.00%	**24,900**	100.00%
Average Seats		54.9		59.9		63.0		69.6	
Airport Ave. Seats		90.6		94.7		96.9		101.0	

Source: RA Wiedemann; McFarland Johnson, 2010

As shown in **Table 3-9**, the mainline fleet mix will not grow significantly, adding just 3.4 seats to its 2010 average of 127.2 per aircraft departure. Similarly, load factors will remain in the low 80 percent range, reaching 85 percent by the year 2030. For the regional airline fleet, additional growth in the average number of seats per departure is forecast, moving from 54.9 to 69.6 over the 20 year planning period. Regional carrier load factors are anticipated to grow from the estimated 2010 level of 75.3 percent to 80.4 percent by 2030. Combining the mainline and regional carriers for the airport, the total average number of seats available per departure is anticipated to grow from 90.6 in 2010 to 101.0 by 2030.

Peak Period Airline Activity

Airline activity is subject to peak period movements. Measures of this activity include peak month, peak day, and peak hour enplanements and aircraft operations. These indicators are used by airport planners to, among other things, estimate airfield layouts and determine terminal building and parking area size and configurations. Airlines publish their schedules, thus it is easy to track peak period activity. Discussed below is the method used to forecast peak period airline activity, along with the forecasts themselves.

Peak Hour Air Carrier Operations

Operational characteristics for the peak month, peak day, and peak hour were available from the airline schedules and confirmed by Air Traffic Control Tower counts. Using the available data, August was determined to be the peak period for airline operations. **Table 3-10** presents the historical peak period airline operations for the period 2005-2009. As shown, 2008 had the highest peak hour operations total (25), with reductions following in 2009 (22) and 2010 (20). It should be noted that since 2005, the peak month has averaged 8.9% of the annual total.

To forecast the peak month operations, the historical relationship between the peak month and annual operations was projected into the future. The same method was used to project peak day and peak hour operations, also displayed in **Table 3-10.** In this regard, peak day operations have averaged 3.45% of the peak month operations. Similarly the peak number of hourly arrivals and departures was divided by the total number of daily arrivals and departures to estimate peak hour operations. The resulting average of 9.88 percent was then applied to the peak day of the peak month for the forecast period, producing up to 31 peak hour operations by the year 2030. **Table 3-10** presents the forecast of peak month operations through 2030.

Table 3-10 Peak Period Air Carrier Operations

Year	Peak Month Operations	Peak Day	Peak Hour
2005	6,802	232	22
2006	6,947	239	23
2007	6,311	222	24
2008	6,818	237	25
2009	6,520	225	22
Forecast			
2010	6,506	221	20
2015	7,373	254	25
2020	8,027	277	27
2030	9,147	315	31

Sources: FAA Buffalo Air Traffic Control Tower Records; Official Airline Guide (OAG) Schedules.

Peak Hour Enplanements

Peak hour airline enplanements are defined as those boarding during the peak hour of the peak month. In order to forecast the peak hour enplanements, peak hour departures were multiplied by the peak hour number of enplanements per departure. Rather than establish an absolute peak hour total (100 percent load factor of peak hour operations), the peak hour enplanements-per-departure metric was estimated by increasing the average peak hour enplanements-per-departure by 10 percent. Under this methodology, load factors during the peak hour are anticipated to increase from 88 percent in 2010 to 92 percent by the year 2030.

Peak hour departures were estimated using historical averages of peak hour departures to peak hour operations. At BNIA, these operations are skewed during certain hours of the day to a much higher level of departures than arrivals. For example, scheduled operations during the peak month of 2010 indicated a split of roughly 75/25 between departures and arrivals in the peak hour. That split was carried forward in the forecast and results in a much higher number of peak hour departures than would be derived by dividing peak hour operations by two.

Table 3-11 shows the forecast of peak hour enplanements at BNIA. As shown, the peak hour enplanement totals are anticipated to increase from 1,196 in 2010 to 2,230 in 2030.

Table 3-11 Peak Hour Enplanements

Year	Peak Hour Departures	Peak Hour Enplanements/Departure	Peak Hour Enplanements
2010	15	79.7	1,196
2015	19	83.3	1,583
2020	21	86.1	1,808
2030	24	92.9	2,230

Source: RA Wiedemann; McFarland Johnson, 2010

3.5.2 Air Cargo Demand Forecasts

Air cargo tonnage is cargo that is transported in aircraft operated by all-cargo carriers and in the belly holds of aircraft flown by passenger airlines. Buffalo-Niagara International Airport is served by the two largest all-cargo carriers FedEx and UPS, along with various cargo divisions of airlines, and a host of air freight forwarders. Air cargo carried by these airlines is categorized into two main components: air freight and air/express mail. The U.S. Postal Service handles the air mail and express mail cargo primarily through belly cargo shipments while the air freight category (overnight small package delivery and bulk freight) is handled primarily via the all-cargo carriers.

Enplaned Air Cargo Tonnage

Table 3-12 presents a 10 year history of air cargo activity at BNIA. Observations about the historical levels of air cargo indicate that air freight has been the major share of activity at the airport. Air freight levels declined in 2008, when DHL, d.b.a. Airborne Express at BNIA, began to cut hubs and then discontinue its air and ground operations within the United States.

Table 3-12 Historical Air Cargo Enplaned Tonnage

Year	Air Freight	Air/Express Mail	Total
2000	23,096.6	4,996.9	28,093.6
2001	23,615.6	3,311.6	26,927.2
2002	25,347.6	1,430.8	26,778.4
2003	26,078.9	1,191.0	27,269.9
2004	28,052.8	684.6	28,737.4
2005	25,770.1	725.6	26,495.7
2006	23,939.5	492.6	24,432.1
2007	24,200.0	306.5	24,506.6
2008	20,389.7	95.0	20,484.6
2009	17,503.8	57.9	17,561.7
Forecast			
2010	18,686.4	21.7	18,708.1
2015	20,631.3	23.9	20,655.2
2020	22,778.6	26.4	22,805.1
2030	27,767.0	32.2	27,799.2

Source: Historical Data from NFTA. Forecasts from RA Wiedemann; McFarland Johnson, 2010

Although there has been a decline in air cargo shipments from BNIA during the 2008-2009 recession, it is believed that there will be a modest rebound in the future. In this regard, the FAA forecasts a 2.2 percent growth in air cargo from 2011 to 2030. Given the historical air cargo trends, it is anticipated that BNIA will lag slightly behind this growth rate at 2.0 percent. **Table 3-12** shows the results of this forecast, with air cargo tonnage growing from 18,700 tons in 2010 to 27,800 tons by the year 2030.

All-Cargo Aircraft Operations

To estimate all-cargo aircraft operations, examination of the historical ratio of tons/departure was made. Historical aircraft operations conducted by all cargo aircraft are presented in **Table 3-13.** As shown, aircraft operations have declined overall as a result of greater capacities and loads. For the future, it is anticipated that the level of enplaned tons per operation will continue to increase. Operations themselves are anticipated to grow only slightly, due to the capacity of the existing all-cargo aircraft fleet. Forecasts show operations growing from 1,874 in 2009 to 2,622 by the year 2030.

Table 3-13 Forecast of All-Cargo Enplaned Tonnage

Year	Enplaned Tons	Aircraft Operations	Tons/Departure
2000	23,555.4	5,820	8.09
2001	23,553.3	3,510	13.42
2002	24,666.2	3,286	15.01
2003	25,371.2	3,258	15.57
2004	27,061.2	3,566	15.18
2005	24,481.7	3,314	14.77
2006	22,865.4	3,258	14.04
2007	23,030.4	3,202	14.38
2008	19,364.9	2,302	16.82
2009	16,863.0	1,874	18.00
Forecast			
2010	18,067.0	2,294	15.75
2015	19,947.4	2,222	17.96
2020	22,023.6	2,344	18.80
2030	26,846.6	2,622	20.47

Source: Historical Data from NFTA. Forecasts from RA Wiedemann; McFarland Johnson, 2010

<u>All Cargo Aircraft Fleet Mix</u>

All cargo aircraft fleet mix is made up of a number of different sized aircraft. However, because operational levels are so low, it is appropriate to focus on the largest aircraft used by the most significant carriers serving BUF. In this regard, UPS conducted 1,320 operations at BUF while FedEx conducted 560 operations in 2009. Although Wiggins Airways conducted 852 operations during 2009, they were all Beechcraft B-99s and A-100s, which have maximum gross weights of under 11,000 pounds. Most of the other all-cargo carrier flights to BUF were smaller Learjet and Dassault business jet types that averaged less than one flight per month. The largest all-cargo aircraft to use BUF in 2009 was a flight by an Antonov AN-124, with a maximum gross weight of 726,000 pounds.

The most demanding aircraft that regularly use BUF for air cargo delivery are the Airbus A-300-B4 (used by UPS), with a maximum gross weight of 315,920 pounds. In 2009, these aircraft performed 526 operations at BUF. The Boeing B-757-200, which has a maximum gross weight of 210,000 pounds, performed 596 operations at BUF (also used by UPS). For the future, it is anticipated that the A-300-B4 or derivative aircraft in the all-cargo aircraft fleet will be the most demanding types to use BUF.

3.5.3 General Aviation Demand Forecasts

General aviation activity is defined as civil aviation aircraft takeoffs and landings not classified as commercial or military. Forecasts of aviation demand were developed for general aviation activity at Buffalo-Niagara International. Activity indicators include the type and number of aircraft operations, along with the number of aircraft based at the airport. As such, the following general aviation elements were forecast:

- Study Area Registered Aircraft
- Based Aircraft
    - Based Aircraft Fleet Mix

- Aircraft Operations
- GA Operational Fleet Mix
  - Peak Period Operations
  - General Aviation Enplanements

At Buffalo-Niagara International Airport, general aviation accounted for 40.6 percent of aircraft operations while the military conducted 1.7 percent of operations in 2009.

Study Area Registered General Aviation Aircraft

A registered aircraft is defined as being either fixed or rotary wing, operated in non-airline service with a current registration. The number of aircraft based at Buffalo-Niagara International Airport is dependent, in part, upon the nature and magnitude of aircraft ownership in the study area surrounding the airport. The Buffalo-Niagara International Airport service area for general aviation users includes Erie and Niagara Counties. Historical information used to develop the registered aircraft forecast is based on data compiled by private vendors (Avantext, Hi-Tech Marketing) for the years 2001-2010. These sources provide aircraft information, by type for the service area county on an annual basis.

To arrive at an acceptable forecast of study area registered aircraft, several projections were made using market share, socioeconomic regression and trend analysis methodologies. Once tabulated, two derivative "reasonable" projections were developed - a high/low average and a multiple projection average. Both of these derived projections were below the constant market share projection, (meaning that the Buffalo market is not anticipated to keep pace with the US trend). Of the two derivative projections, the high/low average was selected as preferred forecast because it conforms to regional general aviation growth patterns in the Buffalo-Niagara area. **Table 3-14** presents a summary of the different projections of registered aircraft for the BNIA general aviation service area. The resulting forecast indicates a slow growth of registered aircraft in the region from 676 in 2010 to 720 by the year 2030. This conservative forecast recognizes a 6.5 percent growth over the forecast period.

Table 3-14 Forecast of Registered Aircraft

Projection/Forecast	2010	2015	2020	2030	R Squared
Market Share					
Constant	676	705	734	820	n/a
Dynamic	676	669	661	620	n/a
Socio-Economic					
Population	676	670	664	648	0.07
Employment	676	696	715	759	0.30
Income	676	664	654	635	0.15
Trend Analysis					
Linear Trend	676	668	661	646	0.08
Exp Smoothing	676	693	707	735	
Derived Projections					n/a
High/Low Average	676	684	694	720	
Multi-Average	676	681	685	695	n/a
Selected Forecast	**676**	**684**	**694**	**720**	

Source: RA Wiedemann; McFarland Johnson, 2010

Buffalo-Niagara International Airport Based Aircraft

By definition, a based aircraft is a general aviation aircraft that is stationed at an airport. Forecasting based aircraft at Buffalo-Niagara International Airport proceeded through the same process as all other demand elements: an analysis of historical data followed by forecasting into future years. The based aircraft population at Buffalo-Niagara International Airport was projected using a market share methodology. To generate the historical data for based aircraft, the FAA's Form 5010-1 and the discussions with Airport Management concerning a census of existing based aircraft were used. The forecast of study area registered aircraft was used as the "market" and the based aircraft at Buffalo-Niagara International Airport constituted the "share." The selected forecast used the 2010 market share of 6.51 percent as the selected market share. The static share remains constant at the 2010 level through the forecast time frame. **Table 3-15** presents the forecast of based aircraft at the airport.

Table 3-15 Forecast of Based Aircraft

Year	Service Area Registered Aircraft	BNIA Based Aircraft	Market Share
2001	670	43	6.42%
2002	686	43	6.27%
2003	696	42	6.03%
2004	695	43	6.19%
2005	698	46	6.59%
2006	696	45	6.47%
2007	679	37	5.45%
2008	644	44	6.83%
2009	687	44	6.40%
Forecast			
2010	676	44	6.51%
2015	684	45	6.51%
2020	694	45	6.51%
2030	720	47	6.51%

Source: RA Wiedemann; McFarland Johnson, 2010

The Market Share forecast shows very little growth from the current 44 based aircraft to 47 by the year 2030. This slow forecast growth is in keeping with the almost flat historical growth since 2001.

Based Aircraft Fleet Mix

An aircraft fleet mix refers to the characteristics of a population of aircraft. General aviation aircraft are classified with regard to specific physical traits such as aircraft type (whether fixed wing or rotorcraft), their weight, and number and type of engines. Fleet mix categories include: single engine, multi-engine, turbojet, rotorcraft, and "other." This information was collected from the on-site inventory of the Airport and compiled for the initial forecast period.

Projection of the fleet mix involved the consideration of the effects of the national trends in aircraft manufacturing, and the service area registered aircraft fleet mix. Because the total number of based aircraft at Buffalo-Niagara International Airport is expected to grow slowly over the forecast period, fleet mix changes will also slowly occur as a result of new aircraft at the Airport. **Table 3-16** presents the forecast of based aircraft fleet mix anticipated for Buffalo-

Niagara International Airport. As shown, the additional growth is anticipated to occur in the larger, business and corporate class aircraft.

Table 3-16 Forecast of Based Aircraft Fleet Mix

Year	Single Engine	Multi Engine	Jet	Rotorcraft	Other	Total
2010	20	15	8	1	0	44
2015	20	15	9	1	0	45
2020	18	16	10	1	0	45
2030	18	16	12	1	0	47

Source: RA Wiedemann; McFarland Johnson, 2010

Annual General Aviation Operations

The annual general aviation operations forecast was derived for both local and itinerant operations through the use of an operations per based aircraft (OPBA) ratio. By definition, local operations are performed by aircraft that operate within the local traffic pattern or within site of the airport. They can also be assigned to aircraft arriving or departing from local practice areas within 20 miles of the airport. In essence, local operations are associated with pilot training. Itinerant operations, on the other hand, are all other aircraft operations other than local operations. Differing from the FAA TAF, the non-airline, FAR part 135 portion air taxi and commuter operations in the TAF are classified as itinerant general aviation operations in this portion of the master plan to more appropriately plan for proper respective facilities.

For this study, historical FAA tower operations counts were used to develop OPBA ratios that could then be forecast throughout the planning period. The Local OPBA ratio decreases slightly as the activity increases at the airport, primarily to reflect the less favorable training environment, subsequently, the itinerant OPBA slightly increases. **Table 3-17** presents the 2009 OPBA ratios for local and itinerant operations at Buffalo-Niagara International Airport. As shown in the table, both the ratios of local and itinerant operations per based aircraft are expected to remain constant over the period. Growth in the overall level of general aviation operations, nevertheless, is expected to occur as a natural outgrowth in the number of based aircraft and business and corporate use of the Airport. The results of the general aviation operations forecast show a growth from 53,300 operations in 2009 to 59,900 operations in 2030.

Table 3-17 Forecast of Local and Itinerant General Aviation Operations

Year	Based Aircraft	Local		Itinerant*		Total	
		Ops	OPBA	Ops	OPBA	Ops	OPBA
2010	44	21,622	491	32,433	737	54,055	1,228
2015	45	21,375	475	33,750	750	55,125	1,225
2020	45	20,250	450	36,000	800	56,250	1,250
2030	47	19,975	425	39,950	850	59,925	1,275

Source: RA Wiedemann; McFarland Johnson, 2010
** Itinerant general aviation operations differ from the FAA TAF due to non-airline air taxi operations being classified as itinerant general aviation operations in the context of this master plan.*

General Aviation Operational Fleet Mix

The operational fleet mix forecast presents a breakdown of aircraft operations by aircraft type. **Table 3-18** presents the forecast of operational fleet mix for general aviation aircraft using the

Buffalo-Niagara International Airport. The forecast was derived through discussions with FAA tower representatives. In this regard, the FAA provided an estimate of current operational fleet mix at the airport. These numbers were then extrapolated into future time periods.

Table 3-18 Forecast of General Aviation Operational Fleet Mix

Year	Single Engine	Multi Engine	Jet	Rotorcraft	Other	Total*
2010	24,560	18,420	9,824	1,228	0	54,055
2015	24,500	18,375	11,025	1,225	0	55,125
2020	22,500	20,000	12,500	1,250	0	56,250
2030	22,950	20,400	15,300	1,275	0	59,925

Source: RA Wiedemann; McFarland Johnson, 2010
** Itinerant general aviation operations differ from the FAA TAF due to non-airline air taxi operations being classified as itinerant general aviation operations in the context of this master plan.*

General Aviation Operational Peaking Characteristics

Since a number of the airport's facility needs are related to the levels of activity during peak periods, forecasts were developed for general aviation peak month, peak day, and peak hour operations. At airports such as Buffalo-Niagara International, general aviation operations are interspersed with scheduled airline operations, yielding an overall peak hour number that is higher than either individual component. Thus, it is important to estimate peak hour general aviation operations and add this total to the airline peak hour in order to estimate the total potential airfield peak demand.

For this study, discussions with FAA tower representatives were used to develop a base year peak hour general aviation operations total. This estimate was then extrapolated into future years to provide a comprehensive forecast of general aviation operational peaking characteristics. **Table 3-19** presents the forecast of peak hour and peak month operations at Buffalo-Niagara International Airport.

Table 3-19 Forecast of General Aviation Peak Period Operations

Year	Annual GA Operations*	GA Peak Month Operations	GA Peak Hour Operations
2010	54,055	5,804	30
2015	55,125	6,132	31
2020	56,250	6,257	32
2030	59,925	6,666	34

Source: RA Wiedemann; McFarland Johnson, 2010
** Itinerant general aviation operations differ from the FAA TAF due to non-airline air taxi operations being classified as itinerant general aviation operations in the context of this master plan.*

Historically, general aviation peak months have been in July or August. Over the past five years the peak month has averaged 11.1 percent of total operations. Peak hour operations were 0.056 percent of total operations in 2009. This percentage was kept constant throughout the forecast for peak hour operations.

General Aviation Enplanements

Forecasts of annual general aviation enplaned passengers (non-commercial) can be used by Airport Management and FBO's to determine the need for such landside facilities as the general aviation terminal building sizes and the amount of automobile parking areas and access roads. This activity indicator is often ignored due to the lack of historical data.

To forecast general aviation enplaned passengers, an aircraft occupancy rate (2.5)[3] was multiplied by the number of itinerant general aviation departures from the airport. **Table 3-20** presents a forecast of general aviation enplanements at Buffalo-Niagara International Airport

Table 3-20 Forecast of General Aviation Enplanements

Year	Itinerant Operations*	Itinerant Departures	Enplanements Per Departure	GA Enplanements
2010	32,433	16,217	2.5	40,541
2015	33,750	16,875	2.5	42,188
2020	36,000	18,000	2.5	45,000
2030	39,950	19,975	2.5	49,938

Source: RA Wiedemann; McFarland Johnson, 2010
** Itinerant general aviation operations differ from the FAA TAF due to non-airline air taxi operations being classified as itinerant general aviation operations in the context of this master plan.*

3.5.4 Military Aircraft Operations

Military Operations at Buffalo-Niagara International Airport are primarily for training and military personnel transport. Over the past 5 years, military operations have fluctuated between a high of 2,241 in 2005 and a low of 1,621 in 2008. The five year average has been 1,900 annual operations. Local and itinerant splits have averaged 58%-42% respectively.

The level of future military operations is a function of Defense Department policy and Congressional spending. Without a clear knowledge of this future policy or Congressional spending levels, it was assumed that future military operations at Buffalo-Niagara International will continue at the same average level as it has over the past 5 years.

Table 3-21 Forecast of Military Aircraft Operations

Year	Local Military Operations	Itinerant Military Operations	Total Military Operations
2010	1,716	581	2,297
2015	1,103	797	1,900
2020	1,103	797	1,900
2030	1,103	797	1,900

Source: RA Wiedemann; McFarland Johnson, 2010

3.6 ALTERNATIVE SCENARIO PROJECTIONS OF DEMAND

A sensitivity analysis was performed on the baseline projection of passenger demand relative to pricing and accessibility of the service at BNIA. In this regard, four alternative projections of demand were developed, based upon different scenarios that could impact the Canadian usage of Buffalo-Niagara International. Two high projections and two low projections resulted from the analysis. As described previously, a number of factors that could impact demand can be reduced to two primary influences:

[3] Source: http://www.aopa.org/whatsnew/stats/activity.html

- The price differential between air fares in Canada versus the U.S., which is influenced by:
  - U.S.-Canadian currency exchange rates.
  - Differences in airport and ticket charges at Canadian and U.S. airports.
  - Low fare carriers influence on ticket prices at BNIA versus Toronto Pearson International.
- The time required to travel from Canadian residences to BNIA, which is impacted by:
  - International bridge capacities including any new bridges in the future.
  - U.S. Canadian security procedures that may reduce or lengthen crossing times.

By way of comparison, Toronto-Pearson International Airport enplaned roughly 15.1 million passengers in 2009.[4] BNIA on the other hand, enplaned almost 2.7 million in 2009. Of that total, it was estimated that slightly more than 1.0 million enplanements originated in Canada. Thus, while the draw of Canadian passengers to the U.S. is small relative to the size of the Toronto market, it is very large to the BNIA market. The effects of these factors on the forecasts of aviation demand at BNIA are discussed below.

3.6.1 Price Differences

The most significant factor that draws Canadians across the border to use Buffalo-Niagara International is the price differential between air travel in the U.S. versus the cost of flying from airports in Canada. If prices were the same or higher in the U.S., the draw would be significantly reduced. At that point, convenience would dictate Canadian usage of BNIA.

Low fares at BNIA began when Southwest Airlines started service in October of 2000. Since that time, other low fare carriers including JetBlue and AirTran began serving BNIA. The most recent data available ranked BNIA 12th lowest in average domestic fares among the top 100 airports in the U.S., based upon the number of originating passengers. These average fares are based on the total ticket value which consists of the price charged by the airlines plus any additional taxes and fees levied by an outside entity at the time of purchase. At BNIA, the 2nd quarter, 2010 average domestic fare was $279.06.

The nexus of low fares at BNIA has been contrasted by the opposite movement in fares at Toronto-Pearson International (YYZ). It is significant that the costs to passengers at YYZ have steadily increased over the past 10 years. In this regard, YYZ charges an Airport Improvement Fee of $25.00, a landing fee of $12.33 per 1,000 pounds (more than 2.5 times the BNIA fee), and a security fee of $12 for one-way domestic flights and $24 for international flights.[5] It is important to note that Air Traffic Control (ATC) costs are charged directly to airlines using Canadian airspace. These charges vary by weight, but can add up to almost $20 per passenger on an international flight.

As a result, airlines with the same operating costs must pay significantly more to use YYZ than BNIA. This difference can add up to more than $69 per passenger on any given flight to the same non-Canadian destination. For example, a check of the lowest prices for flights from YYZ and BNIA to Orlando, FL for a two week advance purchase indicated a difference of $112 in favor of BNIA (a 42 percent savings). A similar comparison of fares to San Francisco yielded a difference of $69 in favor of BNIA (a 20 percent savings). The implications of these price

[4] Source: http://www.gtaa.com/local/files/en/Corporate/Statistics/PassengerTraffic-200912.pdf
[5] Source: http://www.carleton.ca/europecluster/publications/2010-05-Glynn(AirSerivicesCharges).pdf

differences can be significant to the forecast of aviation demand at BNIA. As long as BNIA maintains a low price advantage, it will continue to attract large numbers of Canadians desiring to save money on air travel.

Price Elasticity of Demand

The response of consumers to changes in airline fares involves a number of factors including competition, substitutes for the service, and the purpose of the trip. Because it is more rigidly scheduled, business travel is less responsive to price changes than personal travel. Longer distance flights are also less responsive to price changes due to the lack of substitutes or alternative travel means. Given the large international flight component of demand for Toronto-Pearson International, it is anticipated that Canadians using BNIA would be primarily those with vacation destinations or domestic U.S. business destinations in mind.

It can be shown that at BNIA, airline passenger enplanement growth was stagnant during the 1990s, beginning with 1.74 million in 1990 and ending with 1.77 million in 1999. That is, little or no natural growth was experienced in the market. In the year before Southwest Airlines began service (1999), average fares were $336.66. After the first full year of low-fare service (2001), average fares had declined to $258.22.[6] This 30.4 percent decline in fares corresponded to a 31.5 percent increase in enplaned passengers (assuming no other growth factors were in play). The price elasticity of demand in this example is 1.036, meaning that a 1.0 percent decrease in price resulted in a 1.036 percent increase in passenger enplanements. A price elasticity greater than 1.0 indicates an elastic demand that can be influenced by changes in air fares. As long as BNIA maintains a price differential with YYZ, it will continue to attract Canadians in large numbers because of this price elasticity.

To a smaller extent, air passengers are attracted from the Rochester area for the same reasons. In this regard, air fares at Greater Rochester International Airport (ROC) have been higher than those at BNIA over the past five years. For example, a comparison of average fare levels for 2005 resulted in a 12.8 percent difference ($254.13 in BNIA versus $286.65 in ROC). By the second quarter of 2010, the difference in average fare levels remained at 12.2 percent - very little change over the period ($279.06 at BNIA versus $313.19 in ROC).

Impacts to Demand

Currently, 38 percent of BNIA passengers are Canadian residents. This large percentage can be attributed to the price differential between YYZ and BNIA, along with the current convenience of U.S.-Canadian border crossing. There are a number of factors that could work to change the price differential:

To the Upside:

- Marketing programs that inform more Canadians about the low fares at BNIA
- Higher pricing at YYZ
- Greater discounts in fares at BNIA

To the Downside:

- Low fare carrier service to YYZ
- Reduction in taxes/fees at YYZ

[6] Source: http://www.transtats.bts.gov/AverageFare/Default.aspx

In the first half of 2010, the average fare level for BNIA was $279.06. The fees of $69 at YYZ alone (in addition to higher fares) represent 24.7 percent of BNIA's average fare level; this contributes greatly in the attraction of Canadian passengers to BNIA, it Given the numbers of Canadians using BNIA (estimated at 1,013,000 in 2009), it is not unreasonable to envision a movement in either direction of 25 percent based upon pricing changes. That is, if the 24.7 percent price differential were eliminated, a likely decrease in passenger traffic of 25.6 percent (24.7 percent times the elasticity coefficient of 1.036) below the baseline forecast of demand would be anticipated. Similarly, if future price differentials expanded the difference in pricing between YYZ and BNIA through more discounts at BNIA and more fees at YYZ, a possible gain of passengers at BNIA would be expected. In this regard, it could be that prices need not be altered by an additional 25 percent to reap a 25 percent gain in passengers. Instead, other factors such as advertising and marketing could be used to inform more Canadians of the price benefits of using BNIA. Thus, a much smaller differential could be used to attract a larger segment of Canadian demand.

For this analysis, pricing differentials were used to develop two alternative demand scenarios where air travelers have a choice of airports. The first involves a 25 percent increase (over the baseline) in Canadian traffic (38%) and Rochester area traffic (14%), based upon greater demand of low BNIA air fares. The second involves a 25 percent (rounded down from the 25.6 percent calculation) reduction in traffic based upon pricing parity at YYZ and Rochester International (ROC) relative to BNIA. **Table 3-22** shows the upper and lower estimates of demand that could occur as a result of pricing changes. As shown, a high of 4.9 million enplanements is contrasted with a low of 3.8 million, based upon future potential airline fare levels.

Table 3-22 Potential Impacts of Pricing on BNIA Passenger Demand

Year	Baseline	High Scenario 1	Low Scenario 2
2010	2,583,400	2,583,400	2,583,400
2015	3,130,900	3,537,917	2,723,883
2020	3,523,100	3,981,103	3,065,097
2030	4,331,700	4,894,821	3,768,579

Source: RA Wiedemann; McFarland Johnson, 2010
Legend – High Scenario 1 = Air Fare Decrease of 25 %; Low Scenario 2 = 25% Increase in Air Fares

3.6.2 Canadian Travel Time

In addition to price, another deciding factor on the choice of transportation involves its convenience. The primary value of air transportation is that it saves time, relative to other modes of transportation. Within the same mode (air transportation), the time required to use one airport over another (the *convenience*) may also impact the choice of which one to use. The primary choice of airports for Canadians living in Ontario between the U.S.-Canada border and Toronto involves YYZ and BNIA. A secondary choice for Canadians would involve the John C. Munro Hamilton International Airport (YHM).

For Canadians, the decision to use BNIA remains a viable substitute for both YYZ and YHM, if the convenience of driving to BNIA is not reduced or eliminated. The key to convenience for Canadians is the ability to cross the bridges into the U.S. without undue delay. Discussions with the Niagara Falls Bridge Commission and the Buffalo and Fort Erie Public Bridge Authority indicate the following:

Niagara Falls Bridges (Lewiston/Queenston, Rainbow, Whirlpool)

- Travelling U.S. bound peaks Monday-Thursday 9:00 am – 2:00 pm with minimal to 30 minute delays.
- Travelling Canadian bound peaks Monday-Thursday 2:00 pm – 10 pm with minimal to 30 minute delays.
- Friday and Saturday can experience heavier delays of 20-90 minutes.
- The Lewiston/Queenston is the largest bridge with the most traffic.

Buffalo Peace Bridge

- The Peace Bridge, opened in 1927, was planned for capacity expansion in the 1990s.
  - That expansion was stopped in 1999 for a number of reasons.
- A new effort to expand capacity by adding a companion bridge with three lanes is underway with bridge design occurring in 2010.
- Current peak periods for the Peace Bridge are afternoons and weekends with Fridays experiencing a later peak (7:00 pm) than other days.

The Lewiston/Queenston Bridge and the Peace Bridge are the only two bridges in the Buffalo-Niagara Corridor that allow truck traffic. Delays can occur at any time and are based on the amount of traffic, security concerns, accidents etc. and are often unpredictable. While there are not any peak days for travel through the year, traffic (both vehicular and pedestrian) is heavier in warmer weather. The historical traffic levels for U.S.-bound vehicular traffic for the four international bridges include the following (in vehicles):

Year	Vehicular Traffic
2003	8,133,112
2004	8,888,958
2005	8,271,242
2006	7,777,356
2007	7,583,984
2008	7,170,575
2009	6,598,693

Source: Niagara Falls Bridge Commission

As shown, the highest traffic year in recent history has been 2004, with almost 8.9 million vehicles. The lowest traffic year occurred during the recent recession in 2009 with 6.6 million vehicles.

Travel Convenience and Bridge Traffic

The airline passenger demand catchment area for BNIA has been defined through parking lot license surveys. This area is inclusive of a number of counties in the U.S. extending to Rochester on the east, to Jamestown in the southwest, and to Toronto in Canada. For NFTA's air service planning studies, a 90-minute drive time was established as the practical limits of the catchment area. While there are instances of longer driving times in reaching BNIA, the parking lot survey results appear to confirm the 90-minute convenience preferences of air passengers.

It is possible that this drive time for Canadians could be increased or decreased, depending upon capacity enhancements or security procedures for the international bridges. For example, if a companion bridge is constructed beside the existing Peace Bridge, it would double the existing capacity of three lanes to six lanes. Those changes, along with greater plaza capacity will permit higher volumes and reduced delays. Under the current capacity constraints, one estimate shows queues of up to 2.7 miles by 2015. With the companion bridge, the queues are reduced to 0.9 miles according to the Draft Environmental Impact Statement.[7] Thus, a doubling of the number of lanes on the Peace Bridge could conceivably double its existing U.S.-bound capacity if U.S. Customs and Border Patrol could accommodate the increase. Theoretically, this expansion could increase overall U.S.-Canadian bridge capacity in the Buffalo-Niagara Corridor by up to 30 percent.

Without the expansion, it is likely that within the 20-year planning period of this study, bridge capacities could be exceeded. In addition to simple vehicle throughput, bridge capacities can be affected by border security provisions. In this regard, capacity constraints could occur if U.S.-Canadian border security is enhanced to the point of creating delays at bridges. These delays could occur via more thorough screening processes including enhanced inspection of all vehicles, computer verification of all identities, etc.

Impact of Bridge Capacities on BNIA Demand

In 2009, it was estimated that more than 1 million Canadians used BNIA as the originating point for their air travel. This number, compared with 6.6 million U.S.-bound vehicles from Canada shows a fairly high number of vehicles involved in carrying air travelers to BNIA. Discussions with the U.S. Customs and Border Patrol indicated that the occupancy rate of vehicles entering the U.S. over the four bridges in the Buffalo-Niagara Corridor is known, but for security reasons cannot be shared. Thus, it can only be speculated as to the number of vehicles carrying air travelers headed to BNIA, but under the worst-case scenario, an occupancy rate of one is the minimum possible. Thus, the highest number of vehicles traveling to BNIA would have been 1,013,000 in 2009. This would amount up to 15 percent of the total bridge traffic.

For this analysis, the primary impact to Canadian air passenger demand at BNIA was estimated on the basis of delay time experienced at the bridges. In this regard, the 90 minute drive time was considered to be the practical limits of the service area. Additional time (above the 90 minutes) spent in transit could result in lower future demand for airline service at BNIA. Given that existing peak period delays are from zero to less than 30 minutes, an additional average delay of 13.5 minutes (15 percent of 90 minutes), could reduce demand by 15 percent. Similarly, an average 22.5 minute increase in delay could result in a 25 percent reduction in demand.

For delay reductions at bridge crossings either from increased physical capacity or from streamlined security procedures, the effect will be to expand the geographic service area. That is, the future 90-minute driving time service area may expand as a result of less time spent at bridge crossings. However, because there are little or no current delays, that expansion would not be significantly larger than the current service area. For this analysis, the addition of bridge capacity to relieve delays will likely have the effect of keeping the consensus forecast on track, rather than to add more Canadian passengers. Therefore, the impact of not expanding bridge capacity will likely hurt demand, while the addition of adequate capacity is not likely to increase demand over the consensus forecast. **Table 3-23** presents the potential impacts of an additional average 22.5 minute delay on bridge traffic.

[7] Source: Peace Bridge Expansion Project Bi-National Integrated Environmental Process Traffic Analysis September 2007 (Draft Design Report, Draft Environmental Impact Statement), U.S. F.H.A. and NYSDOT, and Buffalo and Fort Erie Public Bridge Authority.

Table 3-23 Potential Impacts of Increased Bridge Traffic Delay

Year	Baseline	Increased Bridge Traffic Delay
2010	2,583,400	2,583,400
2015	3,130,900	2,833,500
2020	3,523,100	3,188,400
2030	4,331,700	3,920,200

Source: RA Wiedemann; McFarland Johnson, 2010

Because only the Canadian traffic is impacted by bridge delays (as opposed to pricing impacts which affect all travelers with alternative choices), the decrease in total traffic at BNIA would be less than that associated with pricing delays. The overall decrease to BNIA traffic is 9.5 percent, based upon 25 percent of Canadian air travelers being impacted by potential delays.

It is believed that the pricing and delay factors are additive. That is, if both pricing parity and bridge delay events occurred simultaneously, both impacts would be felt. Since there is no stimulation from additional bridge capacity, this impact is strongest on the downside, where total demand would be reduced by 22.5 percent. The double effect on enplanements is shown as follows:

Year	Enplanements
2010	2,583,400
2015	2,426,400
2020	2,730,400
2030	3,357,100

3.6.3 Summary of Alternative Scenario Projections

Several alternative projections were made, based upon possible scenarios that could influence demand from outside Erie and Niagara Counties in New York. For impacts surrounding the price of airline fares at BUF, two scenarios were developed. The high scenario assumed continued price differentiation at BUF, relative to its competitors. That is, price increases at Toronto Pearson International and Hamilton Airport, or price decreases at BUF could continue to drive Canadian passengers to the U.S. ***The high scenario for this option was 4,984,800 enplanements by the year 2030, which was the overall highest alternative forecast. The overall lowest alternative forecast was 3,357,100, combining the parity pricing scenario with U.S.-Canadian bridge traffic delays***. It is believed that the actual future demand will occur between these high and low bounds.

3.7 AVIATION DEMAND FORECAST SUMMARY: CONSENSUS FORECAST

Table 3-24 presents a summary of the aviation demand forecasts for Buffalo-Niagara International Airport. These forecasts are considered reasonable and achievable and will be used throughout the master plan to help in the development of facility requirements and the identification of alternatives.

Table 3-24 Aviation Demand Forecast Summary

Aviation Demand Element	2015	2020	2030
Enplanements			
Airline	3,130,900	3,523,100	4,331,700
Mainline	2,201,500	2,448,400	2,937,700
Regional	929,400	1,074,700	1,394,000
Airline Peak Hour Eps.	1,583	1,808	2,230
General Aviation	42,200	45,000	49,900
Aircraft Operations			
Airline	82,700	90,000	102,600
Mainline	41,400	45,600	52,800
Regional	41,300	44,400	49,800
Air Cargo	2,200	2,300	2,600
General Aviation*	55,100	56,300	59,900
GA Local	21,400	20,300	20,000
GA Itinerant*	33,700	36,000	39,900
Military	1,900	1,900	1,900
TOTAL AIRPORT	141,900	150,500	167,000
Peak Period Operations			
Airline Peak Hour	25	27	31
GA Peak Hour	31	32	34
Military Peak Hour	5	5	5
TOTAL AIRPORT	61	64	70
General Aviation Aircraft			
Service Area Registered Aircraft	684	694	720
Based Aircraft	45	45	47
OPBA	1,225	1,250	1,275
Average Aircraft Size (Seats)			
Mainline	129.4	130.0	130.6
Regional	59.9	63.0	69.6
Average Enplaning Load Factor			
Mainline	82.29%	82.68%	85.05%
Regional	75.21%	76.80%	80.42%

Source: RA Wiedemann; McFarland Johnson, 2010
** Itinerant general aviation operations differ from the FAA TAF due to non-airline air taxi operations being classified as itinerant general aviation operations in the context of this master plan.*

3.8 COMPARISON WITH FAA TERMINAL AREA FORECASTS

In comparing the Consensus Enplanement and Operations forecasts with the FAA's most recent Terminal Area Forecasts, it can be shown that the Master Plan Update remains within specified tolerances for out-years if the TAF's 2010 values and Actual 2010 data are adjusted to incorporate actual enplanements and operations. That is, the TAF understates actual enplanements in 2010 by 1.11 percent. If those corrections are made to the TAF projections, still employing the same growth rates, it reduces the differences to 9.5 percent in 2015 and to

11.49 percent by the year 2020. The operations totals are within reasonable ranges (10% within 5 years and 15% within 10 years) of the TAF as well. As such, these 2010 Master Plan Update projections can be considered reasonable. A comparison of the selected forecast with the FAA TAF is displayed in **Table 3-25.**

Table 3-25 Aviation Demand Forecast Summary

Forecast/Component	Actual 2010	2015	2020	2030	Growth Rate[1]
FAA Terminal Area Forecasts (2010)					
Enplanements	2,581,553	2,831,862	3,137,103	3,894,984	2.3%
Total Aircraft Operations	131,020	140,459	149,663	170,107	1.6%
Enplanements/Operation	19.8	19.5	20.0	21.0	0.28%
Master Plan Update 2010					
Consensus Enplanements	2,610,296	3,130,900	3,523,100	4,331,700	2.6%
Consensus Operations	136,574	141,900	150,500	167,000	1.3%
Enplanements/Operation	20.3	22.1	23.4	25.9	1.17%
Percent Difference From TAF					
Enplanements	1.11%	10.56%	12.3%	12.51%	
Operations	4.24%	1.03%	0.56%	-1.83%	
FAA Terminal Area Forecasts Adjusted to Actual 2010 Data					
Adjusted TAF Enplanements	2,610,296	2,858,393	3,159,997	3,862,178	2.3%
Percent Difference	0%	9.53%	11.49%	12.16%	

Source: RA Wiedemann; McFarland Johnson, 2010
1 Average annual compound growth rate from 2010 to 2030

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