CHAPTER TWO
AVIATION DEMAND FORECASTS

Consistent with the scope of work for this Master Plan, this chapter presents forecasts for commercial, cargo, business/general aviation, and military aircraft demands and will provide the basis for facility requirements necessary to accommodate the forecasted demand. The recommended forecasts are based on trends generated from data provided by airport management, the aviation industry, Federal Aviation Administration, and the U.S. Census. The forecasts included in this chapter were approved by the FAA in March 2009.

The forecasts are developed utilizing several scenarios for each forecasted element. These scenarios attempt to determine the possible impacts to demand at Burlington International Airport (BTV) resulting from potential trends in each aviation sector. The trends for each sector are discussed at the beginning of each section.

Forecasts were prepared for the following elements:

- Commercial Passenger Enplanements
- Commercial Operations
- Cargo Tonnage
- Cargo Operations
- Business/General Aviation Based Aircraft
- Business/General Aviation Operations
- Military Operations

As with any forecast, outside determinants can influence the actual level of activity realized at the airport. As such, while the use of local and national trends provides the foundation for the forecast, the actual level of demand experienced will vary from the forecast each year based on unknown factors, and this variance will compound each year.

2.1 REVIEW OF NATIONAL TRENDS

The following documents were consulted to understand the current trends in the national aviation industry: the FAA Forecast for Fiscal Years (FY) 2008-2025; the 2003 Aviation Capacity Enhancement Plan; and the National Plan of Integrated Airport Systems (NPIAS) 2009-2013 Report to Congress.

Since 2000, the aviation industry has suffered through the terrorist attacks of 9/11, the threat of an outbreak of Severe Acute Respiratory Syndrome (SARS), dramatic spikes in fuel prices, and the 2008-2009 worldwide economic crisis. Mainline carriers have undergone significant restructuring and downsizing, while low-cost and regional carriers have experienced growth.

Several of the mainline carriers have in recent years filed for, or emerged from, bankruptcy protection (Delta, Northwest, United and US Airways). A recent particular concern is the cost of jet fuel, which has more than doubled since 2000.

The Office of Management and Budget (OMB) projects U.S. economic growth to be between 1.7% and 3.1% through FY 2009, despite the current economic slowdown. Economic growth is anticipated to remain temperate until 2025, with growth rates ranging between 2.7% and 3.0% through 2018, and slowing to 2.5% until 2025. This economic growth bodes well for passenger demand levels unless the economy succumbs to inflationary pressures including the worldwide price of oil. This will directly affect airline revenues, as jet fuel is typically an airline's second-largest expense.

2.2 COMMERCIAL AVIATION

2.2.1 Commercial Airline Trends

According to the FAA Aerospace Forecast FY 2008-2025, three trends are contributing to the shaping of the commercial air carrier industry. These trends are: 1) growth by low-cost carriers; 2) significant restructuring and shrinking by mainline network carriers; 3) strong growth among regional carriers. These trends directly and indirectly affect the facilities at BTV. BTV is already experiencing the impacts from low-cost carriers. Low cost carriers by definition are focused on providing low fares. As such, when these carriers locate to a new city, enplanements tend to increase substantially as a new demographic is suddenly able to afford to fly more frequently, or at all.

The corporate restructuring and reduction of operating costs by commercial airlines, particularly in light of the recent high fuel prices and economic crisis, is a major trend in order to allow the commercial airlines to remain viable. This could result in airlines shifting operations to regional/commuter partners, eliminating unprofitable routes, or even consolidating operations. An example is the decision by United Airlines to downsize its fleet by March 2009. In response to the lagging economy caused by the worldwide economic crisis, United is replacing some of its larger jets (120-passenger Airbus 319) with more fuel-efficient 50-66 passenger regional jets. As these are the types of aircraft that serve BTV by United it is expected that this trend will directly impact BTV.

While mainline carriers such as United are reducing the size of their domestic aircraft, regional carriers are increasing the size of their aircraft in order to increase the average seating capacity of the fleet- thus narrowing the gap between the size and type of aircraft operated by the mainline and regional carriers. The high frequency and low fare structures could stimulate additional travel; however, competition at other airports in the region could result in some passengers choosing other airports.

Market Structure: The period of profitability in the commercial airline industry during the late

1990s ended in FY 2001, which was expected to be a year of financial downturn for the industry even prior to September 11th. The airline industry was only just beginning to recover from the financial effects of the terrorist attacks when the current economic crisis began. As such, mainline carrier domestic market capacity is expected to increase by only 0.3% in 2008 following a 1.8% rise in 2007 as network carriers continue to decrease in size and low-cost carriers moderate their growth due to record high fuel prices. Regional carrier capacity is anticipated to grow 2.5% in 2008 as more 70- and 90- seat regional jets enter service, while the number of smaller regional jets (50 seats or less) in the fleet decreases. Over the 2008-2025 forecast time period, domestic capacity is expected to grow at an average annual rate of 3.6%, slightly faster than economic growth, with mainline carriers increasing at a slower pace (3.2%) than regional carriers (5.9%). International markets continue to see healthy growth in capacity, especially the Atlantic, spurred on by the March 2008 "Open Skies" agreement which deregulates flying between the United States and the European Union.

Financial Performance: In 2007, the combination of higher load factors and slightly higher fares enabled the commercial aviation industry to post its first profit since 2000. This is largely due to the dramatic improvement in the financial performance of the seven network carriers. After reporting losses of $3.2 billion in 2006, the carriers collectively posted a $4.4 billion net profit in 2008, which represents a "swing" of $7.6 billion. The eleven low-cost carriers also reported positive financial gains in 2007, reporting operating profits of $2.4 billion and net profits of $1.1 billion.

FAA Aerospace Forecasts: The FAA Aerospace Forecast FY 2008-2025 states the following:

- **Average Aircraft Size:** For the first time in ten years, domestic aircraft size increased in 2007 by 0.1 seats to 120.3 seats. Domestic aircraft size is projected to decrease through 2018 to 118.1 seats, then increase slowly to reach 118.6 seats by 2025. In the longer term, network carriers are expected to replace their wide-body and larger narrow-body aircraft in their domestic route networks with smaller, narrow-body aircraft in order to increase frequency and to better match supply (number of seats) with demand (number of passengers).

- **Revenue per Passenger Mile:** Since 2000, revenues per passenger mile for U.S. mainline carriers fell 3.3% per year, from 15.71 cents per mile to 12.44 cents per mile. Revenues per passenger mile for regional carriers also decreased, from 15.71 cents per mile in 2000 to 12.44 cents per mile in 2007. The FAA Aerospace Forecast FY 2008-2025 predicts that both mainline and regional revenue per passenger mile will decrease through 2025, by an average annual rate of -0.7% and -1.9%, respectively.

- **Available Seat Miles (ASMs):** In 2007, system capacity increased by 2.6% to reach 1.03 trillion ASMs. (Domestic carriers reached 752 billion ASMs in 2007, while international carriers reported 275.9 billion.) By 2025, U.S. commercial air carriers are anticipated to fly 2.1 trillion ASMs and to transport 1.3 billion passengers a total of 1.7 trillion passenger miles.

- **Revenue Passenger Miles (RPMs):** In 2007, system RPMs grew 3.9% to reach 821.4 billion. The FAA forecasts domestic RPMs to increase by only 0.6% in 2008. For the forecast period, domestic RPMs are slated to increase 3.7% per year, rejuvenated by continued economic growth and falling real yields. This includes a 3.3% increase by mainline carriers and a 6.1% increase by regional carriers. System RPMs are projected to increase by 4.2% per year, with 4.0% and 6.0% increases by mainline and regional carriers, respectively.

- **Load Factors:** System load factor grew 0.9 points in 2007 to 79.9%. Domestic load factor is expected to remain flat at 79.8% during 2008. After that time, load factor is forecasted to increase between 0.1 and 0.2 points per year, reaching 81.6% by 2025.

2.2.2 Commercial Aviation Passenger Enplanement Forecasts

Demand for aviation services was impacted by the terrorist attacks of September 11, 2001; however, demand has since returned to pre-September 11th levels, and BTV has become one of the fastest-growing commercial airports in the country. Despite this momentum, the economic crisis of 2008-2009 was taken into account when producing the following forecasts. Three enplanement forecasts were performed which utilized data from airport management, the aviation industry, FAA, and U.S. Census to create low, medium, and high growth scenarios. These scenarios were then analyzed in order to provide a recommended enplanement growth scenario through 2030.

1. Historical Enplanements: Historically, enplanements at BTV have experienced a healthy growth. From 2000 to 2008, they increased at a compounded annual rate of growth (CARG) of 6.71%. This rate of growth was higher between 2007 and 2008 when total enplanements increased by 7.30%. Nationally enplanements grew at 3.3% in 2007 with fluctuations between -0.4% growth and 7.5% growth over the past 6 years (FAA 2008-2025 Aerospace Forecast). The BTV enplanement growth rate has surpassed the national average and is currently growing at more than twice the rate of the national average. It should also be noted that the historical BTV data provides a good baseline of growth information as it includes both periods of low to no growth (after the events of September 11, 2001) as well as periods of moderate and high growth. It is reasonable to assume that these trends of ups and downs with commercial aviation will continue and that this past growth is indicative of the types of change that can be anticipated to continue to occur. **Figure 2.1** displays the historical monthly enplanement information.

Figure 2.1: Historical BTV Enplanements									
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Jan	31,342	40,429	36,904	42,253	44,936	50,981	53,219	54,643	56,751
Feb	35,601	42,924	42,147	40,973	49,395	55,413	54,003	51,231	57,216
Mar	36,252	45,429	43,643	44,461	49,788	57,525	60,089	58,597	60,116
Apr	35,781	47,045	46,957	42,282	49,448	57,448	55,794	60,728	59,478
May	32,480	43,939	42,202	40,999	44,519	53,013	52,330	55,496	58,116
Jun	35,383	46,019	46,094	46,131	53,346	58,033	56,325	58,429	65,845
Jul	37,462	51,376	52,489	50,308	58,934	66,383	67,302	67,704	79,154
Aug	40,253	57,755	56,386	53,726	65,264	66,043	64,774	68,922	79,304
Sep	36,989	30,882	44,477	45,340	51,443	55,051	52,335	57,621	63,544
Oct	49,316	43,314	52,134	53,720	65,441	64,934	65,032	65,670	69,556
Nov	40,364	34,769	40,859	43,376	51,631	52,307	55,228	54,213	52,518
Dec	40,359	36,290	46,128	46,481	50,653	54,454	54,137	54,141	57,373
TOTAL	**451,582**	**520,171**	**550,420**	**550,050**	**634,798**	**691,585**	**690,568**	**707,395**	**759,021**

2. Forecast increase to year 2030: Using the enplanements listed in **Figure 2.1** as a baseline, three forecast scenarios (Low, Medium, and High) were generated for commercial enplanements for the period between 2009 and 2030.

a) **Low**: This scenario assumes that the number of enplanements increases commissariat with the projected (2009-2025) annual Airport Service Area (ASA) population growth rate of 0.43% (See **Section 1.5** for ASA information). This scenario generates a 2030 enplanement count of 834,532, which provides for 75,511 more enplanements than the 2008 figure. While this provides for some increase, the increase is so small (less than 10% growth over a 21 year period) that this is essentially a no growth scenario.

Figure 2.2: Low Forecast Scenario							
	2008	2010	2015	2020	2025	2030	CARG
Jan	56,751	57,242	58,490	59,764	61,066	62,396	0.43%
Feb	57,216	57,711	58,969	60,254	61,566	62,908	0.43%
Mar	60,116	60,637	61,958	63,308	64,687	66,096	0.43%
Apr	59,478	59,993	61,300	62,636	64,000	65,395	0.43%
May	58,166	58,670	59,948	61,254	62,589	63,952	0.43%
Jun	65,845	66,415	67,862	69,341	70,851	72,395	0.43%
Jul	79,154	79,839	81,579	83,356	85,172	87,028	0.43%
Aug	79,304	79,991	81,733	83,514	85,334	87,193	0.43%
Sep	63,544	64,094	65,491	66,918	68,375	69,865	0.43%
Oct	69,556	70,158	71,687	73,249	74,845	76,475	0.43%
Nov	52,518	52,973	54,127	55,306	56,511	57,742	0.43%
Dec	57,373	57,870	59,131	60,419	61,740	63,086	0.43%
TOTAL	**759,021**	**765,593**	**782,274**	**799,317**	**816,737**	**834,532**	**0.43%**

b) **Medium**: This forecast is the "market share forecast" which compares the number of enplanements at BTV to the surrounding "market." For the purposes of this analysis, the market is defined as all commercial service airports within 150-nautical miles of BTV. These airports are: Albany International (ALB); Watertown International (ART); Lebanon Municipal (LEB); Manchester (MHT); Massena International (MSS); Ogdensburg International (OGS); Plattsburgh International (PBG); Rutland State (RUT); Adirondack (SLK); Oneida County (UCA); and Montreal-Pierre Elliott Trudeau International (YUL).

Enplanement data from 2000-2008 was collected for all airports, except YUL, using the FAA-TAF database. BTV enplanement numbers for 2000-2008 were those supplied by airport management as listed in **Figure 2.1.**

The medium scenario assumes that the total market remains at 2008 levels through 2009 to account for the 2008-2009 recession. In 2010, the entire market (except YUL) increases at a CARG of 2.39% (per the FAA 2010-2025 CARG for airports in the New England region). BTV, whose market share in 2008 is 7.2% of all enplanements, increases its market share by an additional 0.1% annually and reaches a 9.3% market share in 2030. This increase in market share represents the percentage of the market that BTV is "capturing" from YUL each year. YUL enplanement figures are the "remainder" from the total after the other airports are subtracted. This scenario generates a 2030 enplanement count of 1,609,916. This is 850, 895 more than the 2008 figure. In this scenario BTV enplanements are increasing both due to the increases projected by the FAA for enplanements and also due to the increase in market share.

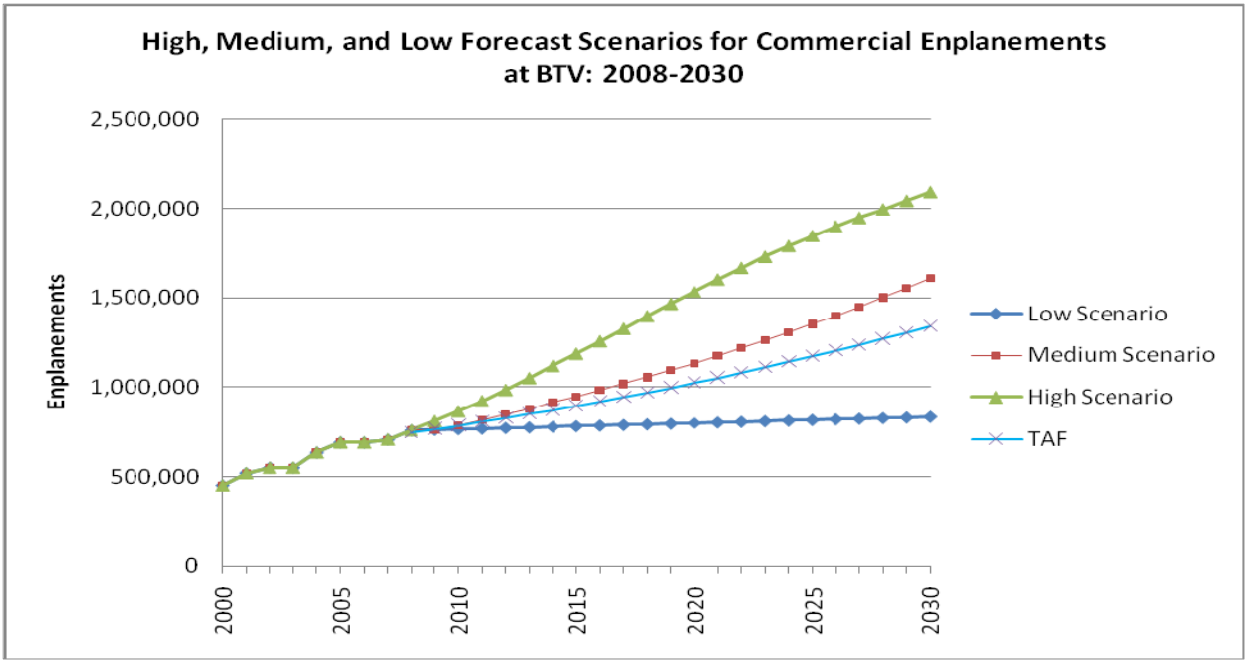
Figure 2.3: Market Share Forecast (Medium Scenario)						
	2008	**2010**	**2015**	**2020**	**2025**	**2030**
ALB	1,464,443	1,499,443	1,687,399	1,898,915	2,136,944	2,404,811
ART	4,035	4,131	4,649	5,232	5,888	6,626
LEB	9,324	9,547	10,744	12,090	13,606	15,311
MHT	1,893,422	1,938,675	2,181,688	2,455,163	2,762,919	3,109,251
MSS	3,156	3,231	3,636	4,092	4,605	5,183
OGS	1,706	1,747	1,966	2,212	2,489	2,801
PLB	405	415	467	525	591	665
RUT	2,272	2,326	2,618	2,946	3,315	3,731
SLK	2,719	2,784	3,133	3,526	3,968	4,465
UCA	453	464	522	587	661	744
BTV	**759,021**	**787,954**	**947,454**	**1,134,558**	**1,353,684**	**1,609,916**
YUL	6,400,000	6,542,167	7,301,501	8,148,404	9,092,901	10,146,150
TOTAL	**10,540,956**	**10,792,885**	**12,145,776**	**13,668,252**	**15,381,571**	**17,309,655**

c) **High**: This forecast assumes that BTV enplanements continue to increase at the historical CARG of 6.71% during the short term (2009-2013), with the CARG then gradually declining to a growth rate of 2.39% by 2030 (the 2.39% growth rate is the FAA 2010-2025 CARG for enplanements in the New England region, as stated in the FAA Aerospace Forecast FY 2008-2025). This scenario generates a 2030 enplanement count of 2,091,398. This is 1,332,377 more than the 2008 figure.

Figure 2.4: High Forecast Scenario						
	2008	**2010**	**2015**	**2020**	**2025**	**2030**
Jan	56,751	64,623	88,762	114,745	138,062	156,371
Feb	57,216	65,152	89,490	115,685	139,193	157,652
Mar	60,116	68,454	94,025	121,549	146,248	165,643
Apr	59,478	67,728	93,027	120,259	144,696	163,885
May	58,116	66,234	90,975	117,606	141,505	160,270
Jun	65,845	74,978	102,986	133,132	160,186	181,429
Jul	79,154	90,133	123,802	160,042	192,563	218,100
Aug	79,304	90,304	124,037	160,345	192,928	218,513
Sep	63,544	72,358	99,387	128,480	154,588	175,088
Oct	69,556	79,204	108,790	140,635	169,214	191,654
Nov	52,518	59,802	82,142	106,186	127,764	144,707
Dec	57,373	65,331	89,735	116,003	139,576	158,085
TOTAL	**759,021**	**864,299**	**1,187,158**	**1,534,667**	**1,846,524**	**2,091,398**

Figure 2.5 graphically depicts historical (2000-2008) enplanement growth at BTV as well as the growth under each forecast scenario and the FAA-TAF.

Figure 2.5



3. Terminal Area Forecast: For comparison to the three proposed forecast scenarios, the approved TAF was reviewed. The existing TAF indicates that in 2008 there were 746,906 enplanements and by 2025 (the end of the TAF forecast years) there will be 1,173,369 enplanements. This represents a 2.69% annual growth rate. If this TAF were extended to year 2030 using its established rate of growth, enplanements would be approximately 1,339,909 in 2030. This growth in enplanements falls between the medium and low forecast scenarios and most closely mimics the 2030 forecast of the medium market-share scenario.

4. Recommended Enplanement Forecast: The recommended enplanement forecast for BTV is the Market Share Forecast (medium-scenario), which produces a 2030 enplanement count of 1,609,916 and sees the market share for BTV increase from 7.2% in 2009 to 9.3% in 2030. While this forecast is not as aggressive as the growth historically seen at the airport, it still anticipates substantial increases in enplanements over the planning horizon.

2.2.3 Commercial Operations

The forecasted number of commercial operations is a product of the passenger forecasts in that the number of operations required depends upon three factors: total passengers, aircraft load factor and the average aircraft size (i.e., number of seats) operating at the airport. The forecasted passenger enplanements were presented in **Section 2.2.2,** and are anticipated to reach 1,609,916 enplanements by the end of the planning horizon. The following sections address the anticipated trends in aircraft load factor and average aircraft size by sector of commercial aviation.

Information supplied by BTV and FAA was used to determine these figures.

1. Load factor: The load factor is the ratio of the number of enplaned passengers to the total number of seats. In 2008, the load factor for BTV was 74.8%. The FAA Aerospace Forecast FY 2008-2025 projects load factor for commercial air carriers to increase to 81.6% by 2025. For the purposes of this analysis it is assumed that the load factor for BTV gradually increases to 81.6% by 2025, where it will remain at that level until 2030.

2. Total seats available: The total number of seats for 2008 was obtained from data provided by BTV management. To account for the current economic recession the total number of seats available at BTV remains the same during 2009 as in 2008. From 2010 through 2030 the number of available seats is determined by simply dividing enplanements by load factor.

3. Average aircraft size at BTV: The baseline (2008) for average aircraft size at BTV is 68.8 seats per commercial aircraft. This was found by dividing the total skewed seats per month by the number of scheduled arrivals/departures per month for January through October 2008, and then finding the average of these totals. This baseline figure was then increased by 0.1 seat per year based on a prediction in the FAA Aerospace Forecast FY 2008-2025, and reaches 71.0 seats in 2030.

This increase in aircraft size reflects the industry trend of moving away from smaller 40 and 50-seat regional aircraft toward larger regional jet aircraft (70 and 90-seat regional jets).

4. Additional Departures: In order to accommodate the anticipated enplanement increases additional departure operations will become necessary beginning in 2010. This figure is found by dividing the number of additional seats over 2008 seats (for that year) by the average aircraft size for that year.

The additional seats needed over and beyond the 2008 number of seats is found by subtracting the number of seats in 2008 (1,015,351) from the number of seats for each year. By 2010 this equates to 32,746 additional seats and by 2030, 958,685 additional seats.

The number of additional departure operations per year is found by dividing the additional seats needed beyond 2008 seats by the average aircraft size for that year. This equates to an additional 474 commercial departures in 2010, 3,024 additional departures in 2015, and an additional 13,498 commercial departures by 2030.

Assuming that these additional operations are spread evenly over the year this translates into an additional 2 departures per day in 2010, an additional 9 departures per day in 2015, culminating in an additional 37 departures per day in 2030.

5. Total Departures: For 2008 there were 14,753 commercial departures. After 2008, the figure is found by adding the 2008 figure of 14,753 to that year's additional departure operations count. That is, there are an additional 13,498 departure operations forecasted in 2030 and therefore are 28, 251 total departure operations by 2030.

Figure 2.6: Departures Forecast for BTV: 2009-2030

	2008	2010	2015	2020	2025	2030
Enplanements	759,021	787,954	947,454	1,134,558	1,353,684	1,609,916
# Seats	1,015,351	1,048,097	1,225,612	1,428,383	1,659,851	1,974,036
Load Factor	0.748	0.752	0.773	0.794	0.816	0.816
Seats Needed over 2008 Seats	0	32,746	210,261	413,032	644,500	958,685
Avg. Aircraft Size at BTV	68.8	69.0	69.5	70.0	70.5	71.0
Add'l Departures	0	474	3,024	5,898	9,139	13,498
Add'l Daily Departures	0	2	9	17	26	37
Total Departures [1]	14,753	15,227	17,777	20,651	23,892	28,251

[1] Total Departures includes the recorded 2008 departure operations plus the Additional Departures as forecasted in this Figure.

2.2.4 Potential Impact of a New Commercial Airline

It should be noted that the operation increases discussed above in **Section 2.2.3** do not address the potential impact of a new airline starting operations at the airfield. Instead they assume a steady fleet-mix change (increase in aircraft size) over time. However, it is possible that a low-cost carrier will begin operation to and from BTV during the course of the planning horizon. A Boeing 737-700, which contains 137 passenger seats, is a typical aircraft utilized by low-cost carriers. The number of seats provided by a 737-700 is significantly more than the average aircraft seat amount in aircraft currently serving the airport and predicted, as shown in **Section 2.2.3**. As such, if it is assumed that in 2010 a low-cost carrier begins operations with 2 departures per day and by 2015 it is operating with 4 departures a day it should impact the total forecasted operations growth by reducing the total number of aircraft departures necessary to accommodate the enplanement growth. As shown in **Figure 2.7** if a low-cost carrier were to begin operation with 2 departures per day in 2010 this would more than accommodate the forecasted enplanement increase and could actually result in lower load-factors on all airlines or fewer aircraft departures. However, by 2015, even with additional departures (4 total) added, the forecasted enplanement growth will again call for additional daily departures by the other commercial operators in order to accommodate the demand for seats. **Figure 2.7** indicates a total of 6 additional departures in 2015, and 32 additional departures by 2030.

Figure 2.7: Departures Forecast for BTV Assuming a New Low-Cost Airline: 2009-2030						
	2008	**2010**	**2015**	**2020**	**2025**	**2030**
Enplanements	759,021	787,954	947,454	1,134,558	1,353,684	1,609,916
Load Factor	0.748	0.755	0.776	0.796	0.816	0.816
Seats Needed over 2008 Seats	0	32,746	210,261	413,032	644,500	958,685
# of Low-Cost Departures	0	2	4	6	8	8
# of Low Cost Seats per year	0	75,543	155,127	238,751	326,416	326,416
Remaining Additional Seats	0	-42,797	55,134	174,281	318,084	632,269
Avg. Aircraft Size at BTV (other than low-cost)	68.8	69.0	69.5	70.0	70.5	71.0
Other Add'l Departures	0	-620	793	2,489	4,510	8,902
Total Add'l Daily Departures (LC + Others)	0	0	6	13	20	32
Total Departures [1]	14,753	14,133	15,546	17,242	19,263	23,655

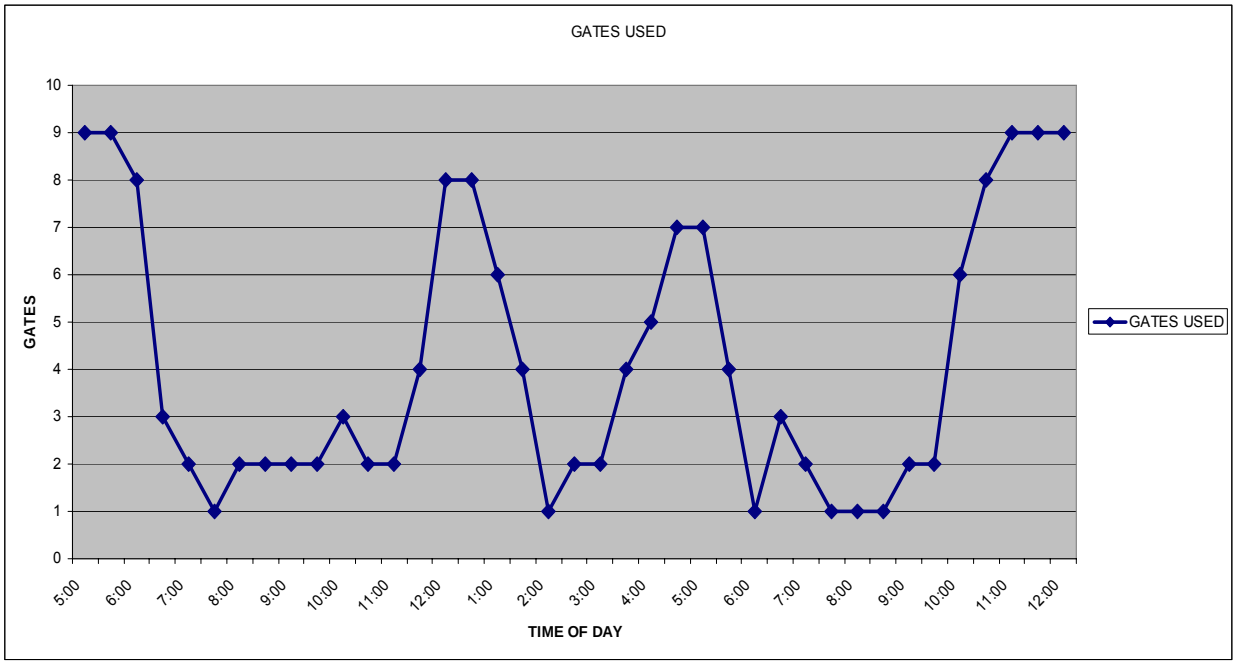
[1] Total Departures includes the recorded 2008 departure operations plus the Additional Departures as forecasted in this Figure.

2.2.5 Commercial Daily and Peak Hour Forecast

The capacity-based assumptions are derived from FAA Advisory Circular 150/5070-6B "Airport Master Plan and Advisory Circular 150/5060-5 'Airport Capacity.'" This suggests that the average daily demand for the peak month can typically be estimated by dividing the total annual activity by 12 months, then 30 days, and then adjusting up by 10%. Using this method, average daily demand is found to be 90 operations for 2008 and increasing to 173 by 2030.

Commercial operations at BTV do not occur evenly throughout the day. Instead the operations generally occur within four distinct peak periods. These periods occur in the early morning, noon, late afternoon, and evening. The valleys between the peaks generally represent the turn-around time from destinations to and from BTV. This dynamic is illustrated in **Figure 2.8**, which illustrates gate utilization at the airport throughout the day based on the December 2008 schedule.

Figure 2.8: Daily Commercial Gate Usage Based on December 2008 Schedule



It is important to note that the early morning peak of gate utilization is composed of aircraft that overnight at BTV and are starting their routes from the airport. Therefore while gate utilization is highest in the morning and evening peaks, the true operational peak hour is the noon peak. This noon peak is the operational peak hour as this period represents both arrival and departure operations occurring, and is the period when the airline turn times are most critical. Based on information provided by the airport, 14 commercial operations occurred in the one hour surrounding the noon peak in 2008, which represents 15.5% of daily operations during the peak month.

From a system standpoint it can be assumed that these four periods will continue to be peak times of gate usage and operation. Approximately 15.5% of all commercial operations occur during the noon peak hour. Using this percentage one can forecast that by 2015, 17 commercial operations will occur during the noon peak and by 2030, 27 commercial operations will occur during this period.

As shown in **Figure 2.9** enplanements will also increase during the peak hours- from 458 persons in 2008 to 911 persons in 2030. It is assumed that the seats available during the peak hour are the most sought-after and therefore a higher load factor of 95% is utilized in determining enplanements. It is important to note that it can also be assumed that an equal number of persons will deplane and enter the terminal during this peak hour as well. These figures do not account for family, friends, or colleagues who may accompany the traveler and use terminal building facilities as well.

Figure 2.9: Commercial Peak Hour Usage						
	2008	**2010**	**2015**	**2020**	**2025**	**2030**
Annual Enplanements	759,021	787,954	947,454	1,134,558	1,353,684	1,609,916
Annual Departures	14,753	15,227	17,777	20,651	23,891	28,250
Annual Operations	29,506	30,454	35,554	41,302	47,782	56,500
Avg. Daily Operations	90	93	108	126	146	172
Peak Hour Operations	14	14	17	20	23	27
Peak Hour Seats	482	483	591	700	811	959
Peak Hour Enplanements	458	459	561	665	770	911

2.2.6 Recommended Commercial Operations Forecast

It is difficult to provide an accurate enplanement forecast beyond the short-term horizon as unknown or unforeseen factors compound each year creating greater variance from the recommended forecast. However, for planning purposes, and for determining future facility requirements, forecasts that are within 5-10 years from present generally provide a good picture of the demand that airports need to accommodate. Based on past growth and the recommended forecast, it appears reasonable to assume that between 7 and 9 additional departures per day will occur at BTV by 2015 (within 6-7 years from today). By the end of the planning horizon a total of 28,250 departures, or 56,500 commercial operations, are forecast to occur.

2.3 CARGO AVIATION

2.3.1 Cargo Aviation Trends

Air cargo is transported either in the bellies of passenger aircraft or in specialized all-cargo aircraft. Air cargo activity has historically moved in synch with GDP- therefore, growth in this sector is tied to economic growth. The following significant structural changes have occurred in the air cargo industry in recent years: new air cargo security regulations by the FAA and the Transportation Security Administration (TSA); market maturation of the domestic package express market; shift from air to other modes (especially truck); increases in fuel surcharges; growth in international trade from open skies; expanded use of all-cargo carriers (i.e., FedEx) by the U.S. Postal Service to transport mail; and, increased use of mail substitutes (i.e., e-mail).

Several factors could positively influence the worldwide demand for air cargo. The continued efforts of "open skies" could open markets in Hong Kong, the United Kingdom, China, Japan and Brazil. A positive demand factor that is particularly related to BTV is the expanded use of second tier airports. As primary cargo airports, such as Boston-Logan, become more congested, shifting cargo operations to second tier airports allows cargo carriers to continue to meet demand. Another positive demand factor is the "round-robin" route, which is a practice by air cargo carriers that helps to minimize route imbalances and increase yields. Air cargo carriers are increasingly using several airports along the route, as well as feeder trucks to

consolidate regional cargo into one airport. Existing integrators at the airport currently use the round-robin route structure to consolidate cargo prior to returning to the hub city.

Industry Forecasts: The industry forecasts, Boeing World Aviation Cargo Forecast for 2008/2009 and the FAA Aerospace Forecast FY 2008-2025, were reviewed to determine the historical trends and forecasted rates of growth in cargo movements, RTMs, and cargo aircraft fleet mix.

In 2007, world air cargo traffic grew by 5.1%, after a 3.2% and 1.7% annual growth in 2006 and 2005, respectively. According to the Boeing World Air Cargo Forecast 2008/2009, these three years represent the weakest growth period since the first Gulf War (1990-1992), mainly due to higher jet fuel costs. World air cargo traffic is expected to experience negative growth in 2008.

Economic activity (measured in world GDP) continues to be the primary force behind air cargo industry growth, meaning that the current worldwide economic crisis may result in feeble figures for 2009. While world GDP grew 3.9% in 2006 and 3.7% in 2007 the current economic outlook grows progressively bleaker. Lasting economic recovery is unlikely to occur before 2010.

Despite current challenges, Boeing forecasts world air cargo traffic to triple, and the number of aircraft in the freighter fleet to double (from 1,948 airplanes in 2007 to 3,892 airplanes in 2027), over the next 20 years. The inconsistency between tripling traffic growth and doubling fleet growth is due to the shift toward widebody freighters - medium widebody and large freighter aircraft will grow from an overall share of 61% in 2007 to 65% in 2027 as traffic continues to favor long-haul, international trade lanes.

The world air cargo freighter fleet can be broken into three segments: standard body, medium widebody, and large, as is outlined in **Figure 2.10**.

Figure 2.10: Air Cargo Aircraft Fleet Mix

Forecast Horizon	2007	2027	% Change	Annual ROG
Total Aircraft	**1,948**	**3,892**	**99.79%**	**3.52%**
Standard-body *(< 45 tons)*	760	1,362	79.30%	2.96%
Medium Widebody *(40-75 tons)*	682	1,168	71.25%	2.73%
Large *(>75 tons)*	506	1,362	168.95%	5.08%

Source: Boeing World Air Cargo Forecast 2008/2009

According to the FAA, total air-cargo revenue ton-miles (RTMs) are expected to increase 2.8% in 2008 and 6.1% in 2009. Until 2025, total RTMs are forecast to increase at an average annual rate of 5.1%, reaching 96.5 billion RTMs in 2025.

Domestic cargo RTMs are anticipated to grow by 2.8% in 2008 and by 4.4% in 2009. Between 2009 and 2025, domestic cargo RTMs are forecast to increase at an average annual rate of 2.9%, reaching 26.7 billion RTMs in 2025. These forecasts are heavily correlated with U.S. economic growth.

International cargo RTMs are forecast to grow by 2.7% in 2008 and by 7.3% in 2009. For the remainder of the forecast period, international cargo RTMs will increase at an annual rate of 6.2%, reaching 69.7 billion RTMs in 2025. All cargo carriers increased their share of international cargo RTMs flown from 54.5% in 1997 to 66.7% in 2007, and are forecast to increase their share to 72% by 2025.

2.3.2 Cargo Tonnage Forecast

The cargo forecasts presented in the following section reexamines the Cargo Study conducted as part of the 2001 SED Planning Report and uses recent trends in the cargo industry to present revised forecasts. Airport Management is the main source for historical cargo activity.

Figure 2.11: Historical Cargo Tonnage at BTV

	Enplaned (tons)	Deplaned (tons)	Total (tons)
1997	3,115	3,562	6,677
1998	3,489	4,995	8,484
1999	3,283	5,906	9,189
2000	3,735	4,659	8,394
2001	3,509	4,980	8,489
2002	3,477	5,673	9,150
2003	3,724	6,599	10,323
2004	4,157	6,497	10,654
2005	4,021	6,057	10,078
2006	4,206	6,512	10,718
2007	4,359	6,362	10,721
2008	3,727	6,982	10,709

Cargo activity has a high correlation with economic activity within the region where an airport is located simply because the greater the economic activity the greater the reliance on time-definite deliveries that air cargo service provides. As industry grows in the region, dependence on "just-in-time" delivery of components increases. Thus, the level of deplaned cargo is typically a function of the health of the local industrial base. Similarly, the health of the industrial base outside of the region helps to increase the demand for products made in the region of the airport that may be components required to make the end product at a different geographic location. Thus, the level of demand for enplaned cargo can be influenced by economic trends distant from the airport environment. Because of this, a common measurement used to forecast future cargo demand on a national scale is gross domestic product. Similarly, a common measurement used to forecast cargo demand on a more regional scale is gross state product which is simply the total value of all goods and services in

the state.

According to the U.S. Bureau of Economic Analysis, the gross state product (GSP) in the State of Vermont has increased from over $11.7 billion in 1990 to $24.5 billion in 2007, or a compounded annual growth rate of 4.45%. The GSP of New York increased at a compounded annual rate of 4.72% during this time period, and the Gross Domestic Product (GDP) of Quebec (the province in which Brome-Missisquoi and Le Haut-Richelieu are located) increased by 2.97% annually since 1990. By taking the weighted average of the figures for Vermont, New York, and Quebec, one could infer that the GSP rate of growth for the ASA is approximately 4.14%.

Tonnage forecasts were developed for both enplaned and deplaned cargo using the same projected rates of growth. No growth was calculated for 2009 in light of the current economic crisis. From 2010 to 2015, cargo is projected to grow at an average annual rate of 2.66%, which is the historical rate of growth of total cargo at BTV from 2002 to 2008. After 2015 until 2030, cargo is projected to increase at an annual rate of 2.9%, which is the projected rate of growth for domestic cargo according to the FAA Aerospace Forecast FY 2008-2025. This methodology anticipates 6,699 tons of enplaned freight at the airport in 2030; and 12,550 tons of deplaned freight in 2030, for a total forecasted cargo tonnage of 19,249 in 2030.

Figure 2.12: Forecasted Cargo Tonnage at BTV

	2008	2009	2010	2015	2020	2025	2030
Enplaned	3,727	3,727	3,826	4,363	5,034	5,807	6,699
Deplaned	6,982	6,982	7,168	8,173	9,429	10,878	12,550
Total	10,709	10,709	10,994	12,536	14,463	16,685	19,249

The forecast of total cargo tonnage is consistent with the forecasted cargo tonnage contained in the Cargo Study included in the 2001 SED Planning Report. The 2001 SED Planning Report Cargo Study anticipated total cargo tonnage to increase from 9,360 tons in 2003 to 17,600 tons in 2025 which yields a compounded annual growth rate of 2.76%. This Master Plan Update anticipates total cargo tonnage to increase from 10,712 tons in 2008 to 19,249 tons in 2030, which yields a compounded annual growth rate of 2.70%.

2.3.3 Cargo Fleet Mix

FedEx and Airborne Express (ABX) are the two primary Cargo Operators serving BTV. The cargo fleet mix serving BTV consists of a Boeing 727-200, operated by FedEx, and a DC-9-30 operated by Airborne Express. Both of these are older aircraft and are in the process of being phased out. Both FedEx and Airborne Express have orders placed for new aircraft. FedEx is acquiring several new Boeing 757-200 and ABX will likely replace its DC-9-30 with Boeing 737's or similar-size aircraft. For the purpose of this report it is assumed that both operators will continue to utilize their existing fleet through 2014 and by 2015 begin utilizing these new cargo aircraft.

The Boeing 727-200 has a maximum cargo capacity of 21.5 tons, while the DC-9-30 has a maximum cargo capacity of 17.5 tons. The Boeing 757-200 has a maximum cargo carrying capacity of 43 tons, and the Boeing 737 has the ability to carry 20 tons of air cargo. As the fleet mix changes the carrying capacity of air cargo using BTV will increase.

2.3.4 Cargo Operations

The cargo operations forecast is dependent on market share, cargo aircraft size and cargo aircraft load factors. Total operations in markets that have an imbalance between enplaned and deplaned cargo segment tonnage are typically determined by the cargo segment that has the lowest load factor. Historically, load factors on operations departing the airport (i.e. enplaned cargo) have been lower than load factors of operations arriving at the airport (i.e. deplaned cargo), thus the number of operations required to service enplaned cargo will determine the number of total annual operations.

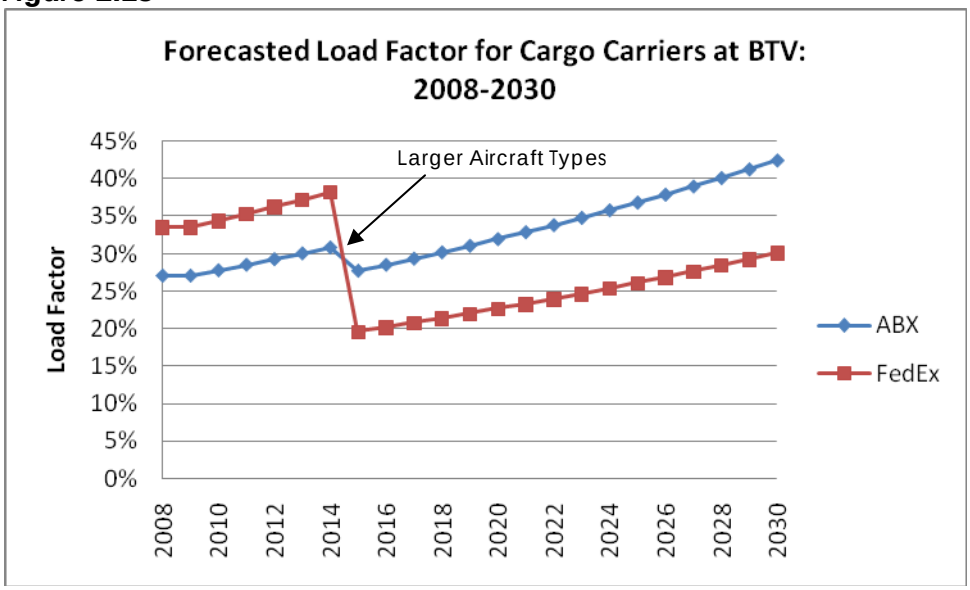
Market Share: Since 1997, the two integrated cargo carriers at the airport, FedEx and ABX, have accounted for over 90% of total cargo tonnage at the airport. In 2007, both FedEx and Airborne Express accounted for 99% of all cargo tonnage, with the remaining 1% of cargo being carried by the commercial carriers. It is anticipated that cargo operators like FedEx and Airborne Express will account for all of the future cargo tonnage in response to the trends in reducing aircraft belly hold capacity in the commercial aircraft operating at the airport and in response to the FedEx/USPS agreement.

Load Factors: The total cargo capacity will increase over the planning horizon as a result of the existing aircraft types anticipated to be replaced by aircraft with larger cargo capacities. Aircraft load factor is anticipated to increase through 2014 as demand increases and cargo capacity does not increase; in 2015 when new, larger aircraft types replace the existing aircraft, load factors will appear to drop, but only as a comparison with the increased capacities. The load factor for FedEx is anticipated to decrease at a compounded annual rate of -0.48% over the planning horizon, from 33.6% in 2008 to 30.2% in 2030, largely due to the replacement of the Boeing 727-200 with the larger Boeing 757-200 in 2015. From 2008 to 2014, the load factor for FedEx is projected to increase by 2.21%. The load factor will decline by 48.8% in 2015 with the upgrade in aircraft capacity, but will increase by an average annual rate of 2.9% throughout the rest of the planning period.

The load factor for ABX is anticipated to increase by an average annual rate of 2.06% from 2008 to 2030. While the load factor for ABX will experience the same dip in 2015 as that for FedEx does, the change is less dramatic since the capacity increase is smaller (ABX will gain 2.5-tons of capacity while FedEx will gain 21.5 tons of capacity). The load factor for ABX is anticipated to increase at an average annual rate of 2.21% from 2008 to 2014; then will decrease by 10.06% in 2015 with the capacity upgrade; and will increase once again by an average annual rate of 2.92% through 2030.

While these load factors appear to be low, they demonstrate the value to the integrators of the "round robin" routing that cargo operators conduct to increase aircraft utilization prior to returning to the hub city. As state earlier both FedEx and Airborne Express do not return directly to the hub from Burlington, rather they make an intermediate stop in Syracuse, New York.

Figure 2.13



Required Departures: The fleet change toward higher-capacity aircraft will allow the cargo carriers to accommodate the increase in demand forecasted during the planning period, without increasing the number of flights per day. As the load factor for both FedEx and ABX is not anticipated to increase beyond 42.5% over the planning horizon, it may not be necessary to increase the number of flights per day. Using this set of assumptions, no substantial increase in the number of air cargo aircraft operations would be anticipated. One flight per day, per company, equates to 1,252 cargo operations per year.

Figure 2.14: Forecasted Cargo Tonnage and Operations

Year	Total Enplaned Cargo (in tons)		Cargo Load Factor	
	FedEx	ABX	FedEx	ABX
2008	2,265	1,486	33.6%	27.0%
2010	2,326	1,525	34.5%	27.8%
2014	2,583	1,694	38.3%	30.8%
2015	2,652	1,739	19.6%	27.7%
2020	3,059	2,006	22.7%	31.9%
2025	3,530	2,315	26.1%	36.9%
2030	4,072	2,670	30.2%	42.5%

2.3.5 Additional Cargo Operator

The addition of another air-cargo carrier over the planning horizon is possible. Even if the freight

tonnage enplaned or deplaned from BTV did not change from what is reported in **Section 2.3.2** the inclusion of a third operator could increase the number of cargo operations out of BTV. For the purpose of this report it is assumed that a third cargo operator would gradually enter the market. The FAA Aerospace Forecast FY 2008-2025 assumes that domestic air cargo will increase at an annual rate of 2.9% throughout its planning horizon. The application of a CARG of 2.9% to the existing cargo operations results in a forecast of only 36 operations, or 1.5 flights in a month, in 2010. However, by 2020 this additional operator would be operating almost daily out of BTV.

Figure 2.15: Forecasted Cargo Operations

	2008	2010	2015	2020	2025	2030
FedEx	626	626	626	626	626	626
ABX	626	626	626	626	626	626
Add'l Cargo-Operator	0	36	234	463	726	1,030
Total	**1,252**	**1,288**	**1,486**	**1,715**	**1,978**	**2,282**

2.3.6 Recommended Cargo Operations

For planning purposes the nominal increase in cargo operations as shown in **Figure 2.15** is utilized in order to provide sufficient planning to allow for the operation of another air-cargo carrier. As such the recommended number of annual cargo operations in 2030 is 2,282. For planning purposes this translates into a cargo peak hour of one (1) cargo operation.

2.4 BUSINESS/GENERAL AVIATION

2.4.1 Business/General Aviation Trends

The Business/General Aviation market can be divided into four distinct segments: 1) single-engine piston aircraft; 2) multi-engine piston aircraft; 3) turboprop aircraft; and 4) turbojet aircraft. The demand for business jets has strengthened in recent years. The business/corporate segment should benefit from the growing market for Very Light Jets (VLJ), which are expected to enter the active fleet at a rate of 400 to 500 aircraft a year, reaching 8,145 aircraft by 2025.

Since 2001, the Business/General Aviation market has seen an average of 2,600 new aircraft delivered per year. Historically, the majority of general aviation aircraft shipments have been single-engine piston aircraft, which has comprised on average 67% of total shipments since 2001. The second largest component of new aircraft shipments have traditionally been turbojet aircraft, which have accounted for 21% of total shipments (see **Figure 2.16**).

Figure 2.16: Business/General Aviation Aircraft Shipments from 2001-2007

Year	Total Aircraft Shipments				Total	Total Value of Shipments (millions)		
	SE Piston	ME Piston	Turboprop	Turbojet		Piston	Turboprop	Turbojet
2001	1,581	147	306	600	2,634	$471	$742	$7,428
2002	1,366	130	187	524	2,207	$389	$487	$6,843
2003	1,519	71	163	384	2,137	$440	$411	$5,583
2004	1,706	52	194	403	2,355	$568	$555	$5,693
2005	2,024	71	240	522	2,857	$712	$749	$7,205
2006	2,208	79	256	604	3,147	$722	$853	$8,792
2007	2,097	77	290	815	3,279	$712	$1,001	$10,227
2001-2007 ROG	**4.82%**	**-10.22%**	**-0.89%**	**5.24%**	**3.72%**	**7.13%**	**5.12%**	**5.47%**

Source: General Aviation Manufacturers Association (GAMA) 2007 General Aviation Statistical Databook

A useful measure of the health of the business/general aviation industry is aircraft utilization, a measure of how active an aircraft is in terms of hours flown during a given year. Typically, single-engine aircraft are used for low-frequency recreational purposes, while turboprops and turbojets are ideal for higher frequency business/corporate purposes. The average hours flown by aircraft segment supports this observation. According to General Aviation Manufacturers Association (GAMA), in 2008 single-engine aircraft had an average yearly utilization of 95 hours; multi-engine piston aircraft had an average utilization of 140 hours; turboprop aircraft had an average utilization of 268 hours; and turbojet aircraft averaged 426 hours (see **Figure 2.17**).

While turbojet aircraft only represented 5% of the total active aircraft in the United States in 2008, they accounted for 16.8% of the total hours flown, which reflects their higher levels of utilization. Within the New England region, the actual aircraft utilization rates probably fall below the national averages because of the long winter months that could reduce annual activity levels. However, the trend of turbojet aircraft having the greatest level of utilization would still apply to the region as these aircraft types typically fly during all kinds of weather thanks to their increased avionics and operating capabilities.

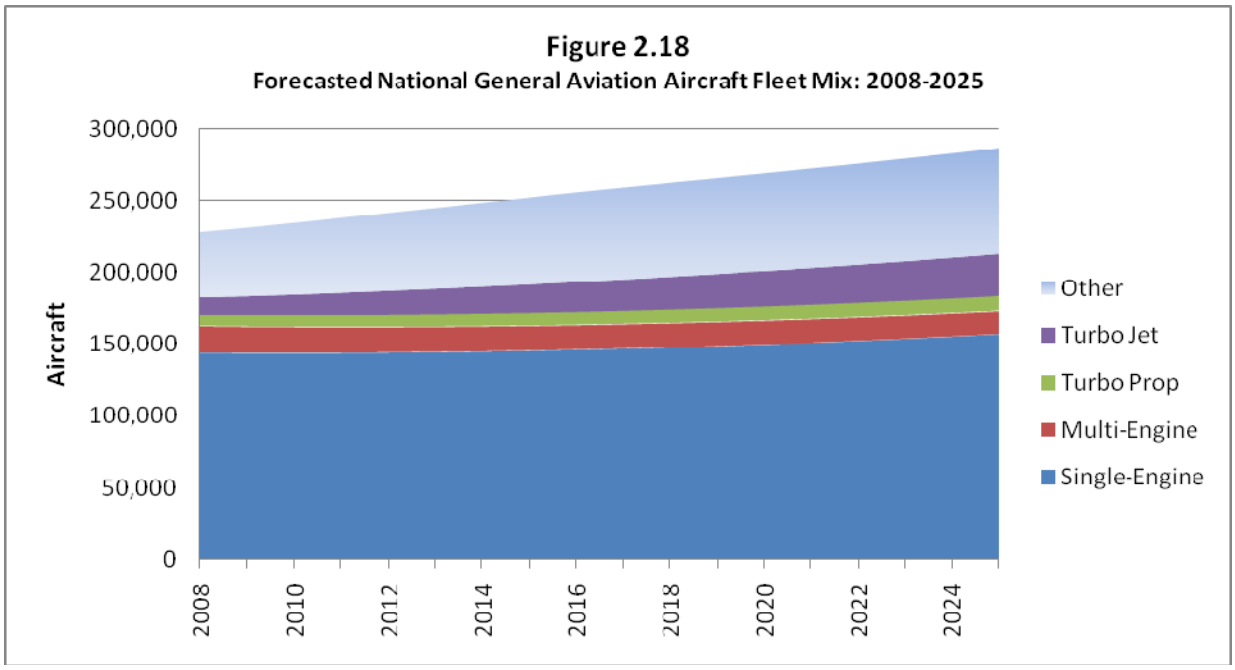
Figure 2.17: Business/General Aviation Aircraft Average Utilization for 2008					
Aircraft Type	Total Aircraft	Total Hours Flown	Avg. Utilization (Hours)	% of Total Fleet	% of Total Hours
Single-Engine Piston	149,100	14,145,000	95	63.4%	47.6%
Multi-Engine Piston	19,272	2,698,000	140	8.2%	9.1%
Turboprop	8,146	2,183,000	268	3.5%	7.3%
Turbojet	11,676	4,979,000	426	5.0%	16.8%
Other	47,066	5,697,000	121	20.0%	19.2%
TOTAL	**235,260**	**29,702,000**	**1,050**	**100%**	**100%**

Source: General Aviation Manufacturers Association (GAMA) 2007 General Aviation Statistical Databook

NOTE: "Other" includes rotorcraft, gliders, lighter-than-air, sport, and experimental aircraft.

The FAA Aerospace Forecast FY 2008-2025 suggests a healthy average annual rate of growth in the active general aviation fleet of 1.3% until 2025, from 225,007 in 2007 to 286,500 in 2025.

The number of General Aviation (GA) hours flown is projected to increase at an average annual rate of 3.0% until 2025. Hours flown by turbine aircraft (including rotorcraft) are expected to increase 5.3% yearly, while hours flown by piston-powered aircraft should increase at an annual rate of 1.1%. Jet aircraft, at a projected average annual rate of increase of 7.7%, account for most of the increase in the number of GA hours flown. This is due to the introduction of VLJs as well as the augmentation of the fractional ownership fleet and its activity levels (fractional ownership aircraft fly about 850 hours more annually than business jets in all applications).



Source: FAA Aerospace Forecast FY 2008-2025

2.4.2 Business/General Aviation Forecasts

Any increase in the number of based aircraft at the BTV will occur as a result of: 1) individuals in the airport service area purchasing new or used aircraft and choosing to base the aircraft at the airport; 2) companies or individual aircraft owners relocating to the airport service area and basing their aircraft at the airport either by choice or by default (i.e., insufficient facilities at nearby airports); 3) natural increase in population and licensed pilots in the airport service area; or 4) attraction of based aircraft at other airports by newly constructed facilities at BTV. The most important reason will be the perceived convenience of basing an aircraft at the airport and the availability of required facilities.

Business/General Aviation Aircraft Forecast: Current counts of based aircraft at BTV were provided by airport management and are displayed in **Figure 2.19**. Historically (since 2004), the total number of based aircraft at BTV has increased at an average annual rate of 1.87%.

Figure 2.19: Historical Based Aircraft Counts at BTV					
	2004	2005	2006	2007	2008
Single Engine	50	50	50	50	50
Multi Engine*	9	9	9	10	11
Helicopter	1	1	1	1	1
Jet	5	5	5	6	8
Other	0	0	0	0	0
TOTAL BASED	**65**	**65**	**65**	**67**	**70**

*includes turboprop

Three forecast scenarios of business/general aviation aircraft through 2030 were conducted: low, medium, and high. The methodology for each scenario is discussed below.

Low: The low forecast scenario uses the FAA-TAF forecast for the New England region, which anticipates the number of based aircraft in New England to increase at an average annual rate of 0.9% from 2008 through 2025. Applied to the current based aircraft at BTV, this scenario produces a 2030 total based aircraft count of 85, which represents an increase of 15 based aircraft since 2008. **Figure 2.20** outlines the growth rate of based aircraft at BTV using the Low-Growth scenario.

Figure 2.20: FAA-TAF (Low) Forecast Scenario						
	2008	2010	2015	2020	2025	2030
Single Engine	50	51	53	56	58	61
Multi Engine	11	11	12	12	13	13
Helicopter	1	1	1	1	1	1
Jet	8	8	9	9	9	10
TOTAL BASED	**70**	**71**	**75**	**78**	**81**	**85**

Medium: The medium scenario applies the forecasted growth rates for each general aviation aircraft type (provided by the FAA Aerospace Forecast FY 2008-2025) to the number of based aircraft at BTV. This scenario forecasts a total of 94 based aircraft at BTV in 2030, which represents a compounded annual rate of growth of 1.35% and an increase of 24 aircraft to the airport's general aviation fleet. **Figure 2.21** outlines the growth rate of based aircraft at BTV using the Medium-Growth scenario.

Figure 2.21: Industry Standard (Medium) Forecast Scenario						
	2008	**2010**	**2015**	**2020**	**2025**	**2030**
Single Engine	50	51	52	53	55	56
Multi Engine	11	11	11	10	10	10
Helicopter	1	1	1	1	2	2
Jet	8	9	12	15	20	26
TOTAL BASED	**70**	**72**	**76**	**79**	**87**	**94**

High: The high scenario applies the historical (since 2004) growth rate of based aircraft at BTV to the current number of based aircraft, and forecasts a total of 106 based aircraft at the airport in 2030. This represents an increase of 36 aircraft over the planning period. **Figure 2.22** outlines the growth rate of based aircraft at BTV using the High-Growth scenario.

Figure 2.22: Historical (High) Forecast Scenario						
	2008	**2010**	**2015**	**2020**	**2025**	**2030**
Single Engine	50	52	57	62	69	75
Multi Engine	11	11	13	14	15	17
Helicopter	1	1	1	1	1	2
Jet	8	8	9	10	11	12
TOTAL BASED	**70**	**72**	**80**	**87**	**96**	**106**

Recommended Based Business/General Aviation Aircraft Forecast: The recommended forecast of based business/general aviation aircraft is the Industry Standard (Medium) Scenario, which forecasts an average annual rate of growth of 1.3% and which projects 94 based aircraft at the airport by 2030.

The possible impacts if a nearby general aviation airport close must also be investigated. A GA airport closure would cause an influx of aircraft to BTV as they relocate from their original airfield. The average number of based aircraft at the six general aviation airports within the BTV service area is 50. While the closure of a GA airport is not predicted, it is assumed that if this did occur a large portion of the GA airport's based aircraft would relocate to BTV. In this case the High forecast scenario, which anticipates 105 based aircraft at BTV in 2030, would be the better predictor of future based aircraft.

General Aviation Operations: The forecast for general aviation operations was conducted by applying the industry-wide rate of growth for general aviation operations to the 2007 number of operations at BTV as recorded by BTV air traffic control, which is 53,389.

According to the FAA Aerospace Forecast FY 2008-2025, general aviation operations will increase by 0.9% in 2008 and 2.3% in 2009, and will then grow at an annual rate of 1.3% through

2025. This method forecasts the number of general aviation operations at BTV in 2030 to be 64,498 (See **Figure 2.23**).

Figure 2.23: General Aviation Operations Forecast						
Year	**2008**	**2010**	**2015**	**2020**	**2025**	**2030**
# of Operations	53,870	55,825	59,549	63,522	67,759	72,280

2.4.3 General Aviation Operations by Type of Aircraft

General Aviation operations by aircraft type were simply determined by utilizing the ratio of aircraft based at BTV and adjusting the ratio based on aircraft usage as recorded by the industry and FAA Forecast documents and then applying this ratio to the total operations as recorded in **Figure 2.23**. As can be seen in **Figure 2.24** business-type aircraft such as turbo prop and jet will see the majority of the increase over the planning horizon.

Figure 2.24: Operations by Aircraft Type: 2008-2030

Forecast Year	SE	ME	TP/TJ	HELO/Other	ALL
2008	34,304	11,675	5,765	2,126	**53,870**
2010	35,397	11,795	6,424	2,210	**55,825**
2015	35,077	10,999	11,193	2,279	**59,549**
2020	36,704	11,527	12,796	2,497	**63,522**
2025	38,746	11,642	14,658	2,712	**67,759**
2030	40,528	11,768	17,037	2,947	**72,280**
CAGR	**0.8%**	**0.1%**	**5.3%**	**1.6%**	**1.4%**

Note: "other" aircraft includes helicopter and experimental.

Source: Campbell and Paris, 2009

2.4.4 GA Daily and Peak Operations

Peak period operations typically occur during good weather (VFR), when the local traffic is most active. The weather analysis indicates that VFR conditions exist approximately 93-percent of the year, or about 339 days (refer to **Section 1.9**). Using the calculation for average daily demand for the peak month mentioned in FAA Advisory Circular 150/5070-6B "Airport Master Plan and Advisory Circular 150/5060-5 'Airport Capacity,'" the estimated average daily activity for the peak month is found to be 147 operations for 2008. No data is available to confirm the actual peak month; however it is reasonable to expect peak month activity to occur during

periods of predominantly good, temperate weather and generally light winds which pilots of single engine piston aircraft typically prefer.

Using the estimated average daily rate of 147 operations, the average hourly operations (using a ten hour period) is roughly 17. Using a 10 percent factor for average peak hour activities yields a rate of about 18 operations per hour. This rate is consistent with the procedures identified in the "Airport Capacity" circular, which suggests that an average peak hour during the peak month can typically be calculated by dividing average daily operations by a factor of 9, which also yields 18 operations per hour.

Peak daily and hourly activities at general aviation airports such as BTV will easily vary, due in part to the sporadic nature of transient activity. Therefore, these average daily and peak hour rates should be viewed as reasonable, but *minimal* factors for planning facilities needed to accommodate peak period activities and for evaluating overall airfield capacities. The aircraft mix comprising the peak hour operations (i.e., aircraft types) will also vary, but on average should follow the relative percentages described previously.

Figure 2.25: GA Peak Period Forecasts

FORECAST PERIOD	TOTAL OPERATIONS	AVG. DAILY OPERATIONS (PEAK MONTH)	AVG. PEAK HOUR (PEAK MONTH)
2008	**53,870**	165	18
2010	**55,825**	171	19
2015	**59,549**	182	20
2020	**63,522**	194	21
2025	**67,759**	207	23
2030	**72,280**	221	24

Source: Campbell and Paris, P.C. 2009

2.5 MILITARY AIRCRAFT

2.5.1 Military Aircraft Trends and Operations Forecast

According to the FAA Aerospace Forecast FY 2008-2025, military operations declined 2% in 2007 and are forecast to fall 0.5% in 2008. In 2007, the number of aircraft handled for the military user group at FAA En Route Centers was 9.3% below its 2000 activity level.

It should be noted that according to BTV ATCT the number of military operations has typically fluctuated between 10,000 and 15,000 operations a year. However, in 2008 approximately 9,000 military operations were recorded. Both the Vermont Air National Guard and Army Guard facilities are expected to continue to operate at the airport throughout the planning horizon. Therefore, for planning purposes it is assumed that annual military operations will return to

15,000 at a steady rate by 2030.

2.5.2 Military Daily and Peak Hour Operations

Average daily demand by the military for the peak month is estimated here by dividing the total annual activity by 12 months, then 30 days, and then adjusting up by 10%. This method results in an estimated average daily activity for the peak month of 28 operations for 2008. Using the estimated average daily rate of 28 operations, the average hourly operations (using a ten hour period) is roughly 2.7. Using a 10 percent factor for average peak hour activities yields a rate of about 3 operations per hour. (See **Figure 2.26**)

It should be noted that a military operations can differ from a commercial operations in that in some instances multiple military aircraft will take off simultaneously (in "sorties"). This can sometimes lead to confusion when determining the number of operations at the airport. For the sake of this analysis, each military aircraft is considered one operation.

Figure 2.26: Military Peak Period Forecasts

FORECAST PERIOD	OPERATIONS	AVG. DAILY OPERATIONS (PEAK MONTH)	AVG. PEAK HOUR (PEAK MONTH)
2008	**9,000**	28	3
2010	**9,437**	29	3
2015	**10,625**	33	4
2020	**11,963**	37	4
2025	**13,469**	41	5
2030	**15,000**	46	5

Source: Campbell and Paris, P.C. 2009

2.6 RECOMMENDED AVIATION DEMAND FORECASTS

The recommended forecasts for each element will be used to guide development of required facilities, but, as past forecasts have demonstrated, the true level of demand will vary from those in the forecasts. As such, the facility requirements presented in the following chapter will be based on these forecasts, but actual timing and size of the facilities should be determined by market conditions and the demand present at the time the facility is required. **Figure 2.27** presents the recommended forecasts in summary form. These enplanement forecasts were approved by the FAA Northeast Region in February 2009.

The recommended forecast for commercial activity at the airport is the market-based analysis presented in **Section 2.2.2**. Under this methodology, total enplanements are forecasted to increase from 759,021 in 2008 to over 1.6 million in 2030. Average aircraft size operating out of BTV will increase from 68 seats to 71 seats, in response to subtle changes in anticipated fleet mix. As a result, total commercial operations will increase from 29,506 operations in 2008 to

56,500 operations in 2030.

The recommended cargo activity forecast (presented in **Section 2.3.2**) shows total cargo tonnage increasing from 10,709 tons in 2008 to 19,249 tons in 2030, primarily as a result of local demand and increases in the gross state product of Vermont. Total cargo operations are forecasted to increase from 1,252 operations in 2008 to 2,282 operations in 2025.

The recommended forecast for business/general aviation based aircraft population is presented in **Section 2.4.2**. Total based business/general aviation aircraft is expected to increase from 70 based aircraft in 2008 to 94 based aircraft in 2030. The fleet mix is expected to show a gradual decline in single-engine and multi-engine fleet shares and an increase in turboprop and turbojet fleet shares, primarily as a response to the introduction of micro-jets into the national fleet. Total operations are expected to increase from 53,870 operations in 2008 to 72,280 operations in 2030. Finally, military operations at the airport are expected to return to historical levels from approximately 9,000 operations in 2008 to 15,000 operations in 2030.

2.7 FORECASTED PEAKING CHARACTERISTICS

2.7.1 Average Day of Peak Month

The average day of the peak month is anticipated to have approximately 445 operations by 2030, up from 287 operations in 2008. Average day of commercial operations is anticipated to increase from 90 operations in 2008 to over 172 operations in 2030, or from 45 daily departures to 86 daily departures. As air-cargo operates on a very regular schedule there is no peak day or month and as such operations per day will grow from 4 in 2008 to 6 by 2030. Business/general aviation average day of the peak month operations is anticipated to increase from 165 operations to 221 operations in 2030. Military operations are anticipated to increase from 28 daily operations to 46 daily operations by 2030.

2.7.2 Peak Hour Operations

The number of total airport operations during the peak hour was 36 operations in 2008. This is anticipated to increase to 57 operations by 2030. Peak hour commercial departures are anticipated to increase from 14 departures in 2008 to 27 departures in 2030. Using the average number of seats per commercial aircraft and assigning this to each peak hour commercial departure, results in 482 seats departing during the airport's peak hour in 2008. This increases to 959 commercial seats departing during the peak hour in 2030. It is assumed that the peak hour seats are the seats preferred by users; as such it is assumed the load factor is 95% for these seats. Applying this anticipated load factor results in peak hour enplanements increasing from 458 in 2008 to 911 in 2030, or 916 total passengers in 2008 to 1,822 total passengers in 2030.

Peak hour cargo is assumed to be 1 operation. Peak hour business/general aviation operations is anticipated to increase from 18 operations in 2008 to 24 operations in 2030 while military operations are anticipated to increase from 3 operations in 2008 to 5 operations in 2030.

Figure 2.27: Summary of Forecasts							
		2008	2010	2015	2020	2025	2030
Commercial							
	Enplanements	759,021	787,954	947,454	1,134,558	1,353,684	1,609,916
	Average Seats per Aircraft	68.8	69	69.5	70	70.5	71
	Avg. Load Factor	0.751	0.752	0.773	0.794	0.816	0.816
	Departures	14,753	15,227	17,777	20,651	23,892	28,251
	Operations	29,506	30,454	35,554	41,302	47,784	56,502
	Avg. Day – Peak Month Ops	90	93	108	126	146	173
	Peak Hour Operations	14	14	17	20	23	27
	Peak Hour Enplanement	458	459	561	665	770	911
Cargo							
	Tonnage	10,709	10,994	12,536	14,463	16,685	19,249
	Enplaned Tonnage	3,727	3,826	4,363	5,034	5,807	6,699
	Deplaned Tonnage	6,982	7,168	8,173	9,429	10,878	12,550
	Departures	626	644	743	857	989	1,141
	Operations	1,252	1,288	1,486	1,715	1,978	2,282
	Peak Day Ops	4	4	5	5	6	6
	Peak Hour Ops	1	1	1	1	1	1
GA							
	Based Aircraft	70	72	76	79	87	94
	Single Engine	50	51	52	53	55	56
	Multi Engine	11	11	11	10	10	10
	Helicopter/Other	1	1	1	1	2	2
	Turbo-Jet	8	9	12	15	20	26
	Operations	53,870	55,825	59,549	63,522	67,759	72,280
	Peak Day Ops	165	171	182	194	207	221
	Peak Hour Ops	18	19	20	21	23	24
Military							
	Operations	9,000	9,437	10,625	11,963	13,469	15,000
	Peak Day Ops	28	29	33	37	41	46
	Peak Hour Ops	3	3	4	4	5	5
Totals							
	Operations	93,628	97,004	107,214	118,502	130,990	146,064
	Peak Day Ops	287	297	328	362	400	445
	Peak Hour Ops	36	37	42	46	52	57

Figure 2.28: Fleet Mix Forecast							
		2008	**2010**	**2015**	**2020**	**2025**	**2030**
Commercial Aviation	**Total Annual Operations**	29,506	30,454	35,554	41,302	47,784	56,502
	ERJ 145	4721	4873	8533	9912	16477	19483
	ERJ 190	2951	3045	4266	4956	6591	7793
	Dash 8	8262	8527	5689	6608	0	0
	CJR 900	2360	2436	2844	3304	3295	3897
	Airbus 320	3541	3654	3555	4130	4943	5845
	Boeing 737	0	1	1423	1653	3296	3897
	CJR 200	6491	6700	9244	10739	13182	15587
	Boeing 717	1180	1218	0	0	0	0
Air Cargo	**Total Annual Operations**	1,252	1,288	1,486	1,715	1,978	2,282
	727-200	626	644				
	DC-9-30	626	644				
	757-200			743	857	989	1,141
	737			743	858	989	1,141
General Aviation	**Total Annual Operations**	53,870	55,825	59,549	63,522	67,759	72,280
Single Engine	Cessna 172	34,304	35,397	35,077	36,704	38,746	40,528
Multi-Eng Piston	Beech Baron 58	11,675	11,795	10,999	11,527	11,642	11,768
Turbo-Prop	King Air 200	2306	2570	4477	5118	5863	6815
Turbo Jet	Cessna Citation	2306	2568	4478	5117	5864	6815
Turbo Jet	Gulfstream 350	1153	1285	2239	2559	2932	3407
Helicopter	Bell 205	2,126	2,210	2,279	2,497	2,712	2,947
Military	**Total Annual Operations**	9,000	9,437	10,625	11,963	13,469	15,000
Jet	F-16	7015	7356	8282	9325	10500	11692
Helo	Blackhawk	1890	1982	2231	2512	2828	3150
Turbo-prop	C-130	95	99	112	126	141	158