Chapter 3:
Aeronautical Forecasts and Air Service (Passenger Demand) Evaluation

3.1 Introduction

This chapter of the Master Plan Update projects aviation demand over a 20-year planning horizon for Burlington International Airport (BTV or "the Airport"). Facility sizing and capacity recommendations, both airside and landside, are directly impacted by the projected aviation activity levels presented in this chapter. The projections are derived from approved methodologies in accordance with the requirements provided in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*.

To develop the most realistic forecasts possible, an understanding of current and historical airport operations, industry trends, and economic conditions within BTV's primary catchment area (i.e., market) is necessary. These variables must be detailed and factored into individual forecast scenarios that will comprise the commercial passenger and operations forecasts.

The assumptions, methodologies, and data used to create the various projections are presented and analyzed in the sections to follow. The specific activity elements to be forecasted are limited to passenger and operational activity that directly affect the terminal and immediately adjacent land use associated with passenger and general aviation (GA) activity. As such, the evaluations presented in this chapter are in **Table 3-1**:

Table 3-1: Forecast Evaluation Categories

Evaluation Category	Subcategories
Enplaned Passengers	5-, 10- and 20-year forecast Load Factors
Air Carrier Activity	Operations Fleet Mix
Air Cargo Activity	Volume Operations
General Aviation Activity	Based Aircraft Operations
Military Aviation Activity	Based Aircraft Operations
Peak Activity	Passengers Operations

3.1.1 Forecast Data Sources

Information factored into both the planning and the forecasting efforts include commercial air carrier industry trends, airframe orders and retirement programs, GA operational trends, and anticipated changes in the aircraft fleet mix operating at BTV. The data and assumptions used to define baseline conditions and future activity trends were derived from the following sources:

- Airport Management
  Airport management representatives typically provide the most accurate historical data and future assumptions at the Airport. This includes passenger and operational activity, fleet mix transitions, and upcoming service changes.

- FAA Terminal Area Forecast (TAF).[25]
  TAF activity estimates are derived by the FAA from national estimates of aviation activity. These estimates are then assigned to individual airports based upon multiple market and forecast factors. The FAA looks at local and national economic conditions, as well as trends within the aviation industry, to develop each forecast.

- Airline Management
  Airline representatives provide insight on upcoming airlines route and airframe changes, which are directly factored into the assumptions and methodologies of the demand projections.

- FAA Aerospace Forecast (FY 2018-2038)
  This forecast provides an overview of aviation industry trends and expected growth for the commercial passenger air carrier activity segments. National growth rates in enplanements and operations, as well as growth and mix for commercial fleets, are provided over a 20-year forecast horizon. For the purposes of this forecast, the FAA Aerospace Forecasts were used as comparisons for the basis of determining the growth of the BTV general aviation and commercial fleet. This forecast also provides insight into future air cargo growth trends on a national and international level.

- Boeing Commercial Market Outlook (2018-2037)
  This market outlook provides information detailing future fleet mix transitions, such as new aircraft entering the market and future equipment retirements, for commercial and air cargo carriers.

- Airbus Global Market Forecast (FY 2018-2037) and Boeing World Air Cargo Forecast (2016-2017)
  These forecasts provide insight into future cargo fleet growth and anticipated fleet mix of both domestic and foreign air cargo carriers. These insights were used to assist in developing and confirming the validity of future BTV cargo carrier fleet mix and projected volume assumptions.

- Woods & Poole Economics, Inc.
  Woods & Poole Economics, Inc. is an independent firm that specializes in developing long-term economic and demographic projections. Their database includes every state, Metropolitan Statistical Area (MSA), and county in the U.S. and contains historic data and projections through 2050, utilizing more than 900 economic and demographic variables.

3.1.2 BTV Catchment and Core Area

An airport's catchment, or market, is defined as the area in which an airport captures the majority percentage of airport users. To determine the catchment area, an evaluation using socioeconomic factors was conducted to identify which airports the local area population are most likely to use, based on the proximity of residencies in respect to other airports in the region, drive-time, and demographics. For the purposes of the forecasts in this chapter, the catchment area for BTV traffic exists primarily in the following Vermont Counties: Addison, Caledonia, Chittenden, Essex, Franklin, Grand Isle, Lamoille, Orange, Orleans, Rutland, Washington, and Windsor. The catchment area also extends partially into

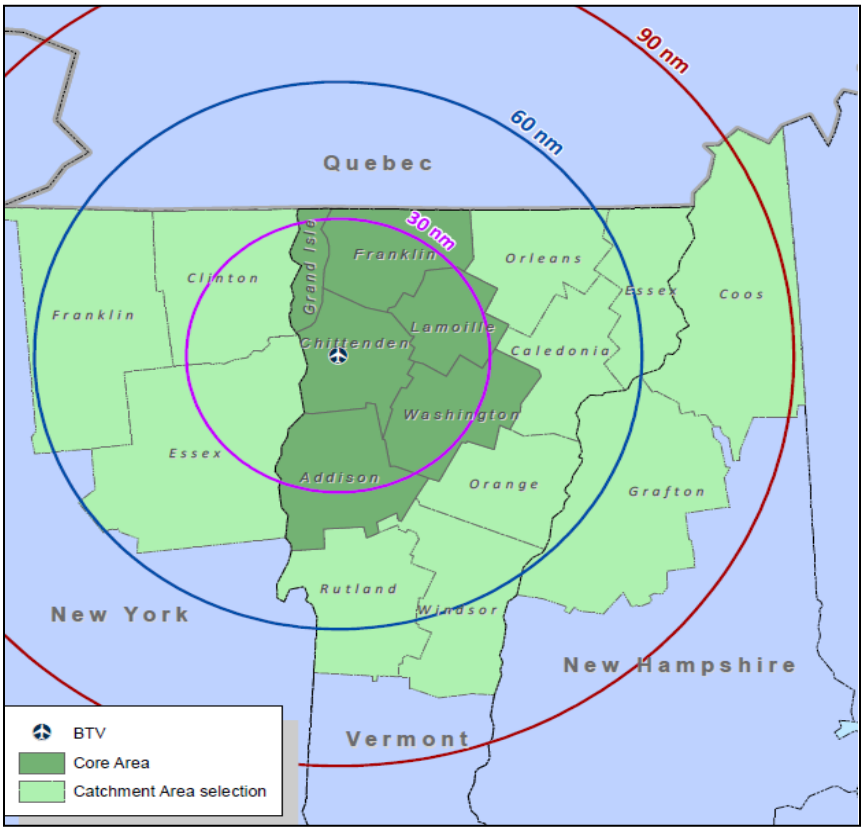
[25] Note, the '2017 FAA TAF', which was published in 2018, represents the TAF containing all data from Fiscal Year (FY) 2017.

New Hampshire (Coos and Grafton County), New York (Clinton, Essex, and Franklin County), and Quebec, Canada.

In addition to domestic enplanements, BTV sees passenger traffic from Canada, specifically the proximity of the Quebec Province and the City of Montreal, results in some of the overall catchment area extending in to Canada. Depending on a wide range of factors (e.g., airline ticket prices, Canadian exchange rate, border crossing times, available non-stop destinations, etc.), some Canadian traffic will drive to BTV for airline service. At the time this report was prepared, detailed ticket purchasing analysis was not readily available for the purposes of determining the additional catchment area within Canada. However, the passenger traffic impact for BTV will be discussed in further detail in subsequent sections of this report.

Based on its location relative to major competing airports in Vermont, New Hampshire, New York, and Québec, BTV depends on a core region within its catchment area for a large portion of its passenger activity. The core region consists of areas located within a one-hour drive-time. This region includes portions of Addison, Chittenden, Franklin, Grand Isle, Lamoille, and Washington Counties in Vermont. **Figure 3-1** shows the catchment area, as well as the core area.

Figure 3-1: BTV Catchment and Core Areas



Source: CHA, 2018

3.1.3 Socioeconomic Data

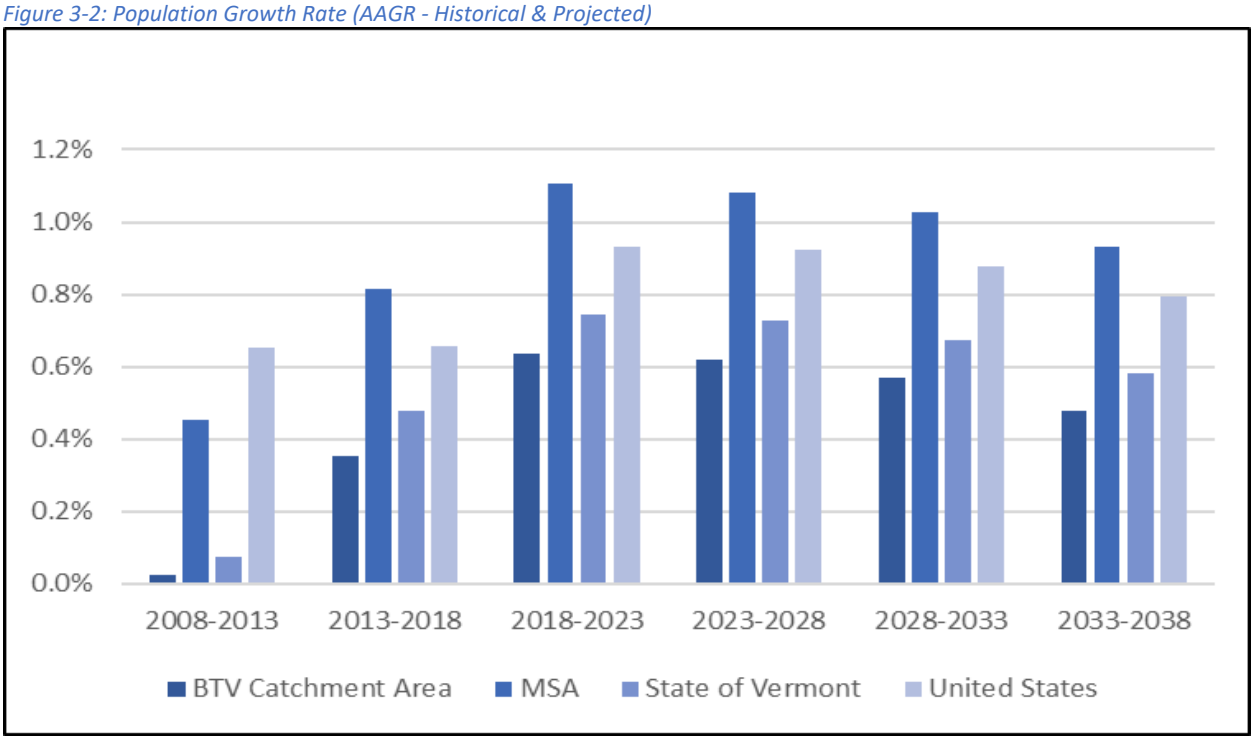
The factors that have the greatest impact on the growth prospects of an airport are the socioeconomic characteristics, such as population, employment, and income, present within the Airport's catchment, or market, area. The economic and demographic growth patterns for this core area will have major impacts on future demand for air service at BTV.

Population

In 2017, the Burlington-South Burlington (Vermont) Metropolitan Statistical Area (MSA), consisting of Chittenden, Franklin, and Grand Isle Counties, had a population of approximately 220,000, while the BTV catchment area had a population of approximately 850,000. The Average Annual Growth Rate (AAGR) for the MSA and catchment area are 0.6 percent and 0.2 percent, respectively, which were below the National AAGR of 0.7 percent, despite having steady increases in population from 2008- 2017. The State

AAGR was 0.3 percent, which was higher than the AAGR of the catchment area but lower than the MSA and National AAGRs. The MSA is projected to grow at a slightly higher rate (1.0 percent) than the United States (0.9 percent), despite having had a lower historical AAGR. The higher growth rate shows that the Airport is dependent upon state-resident travelers for passenger activity growth. Passenger leakage occurs when travelers choose to utilize airports outside their core area when flying. See **Figure 3-2** and **Appendix D.1**.

Figure 3-2: Population Growth Rate (AAGR - Historical & Projected)

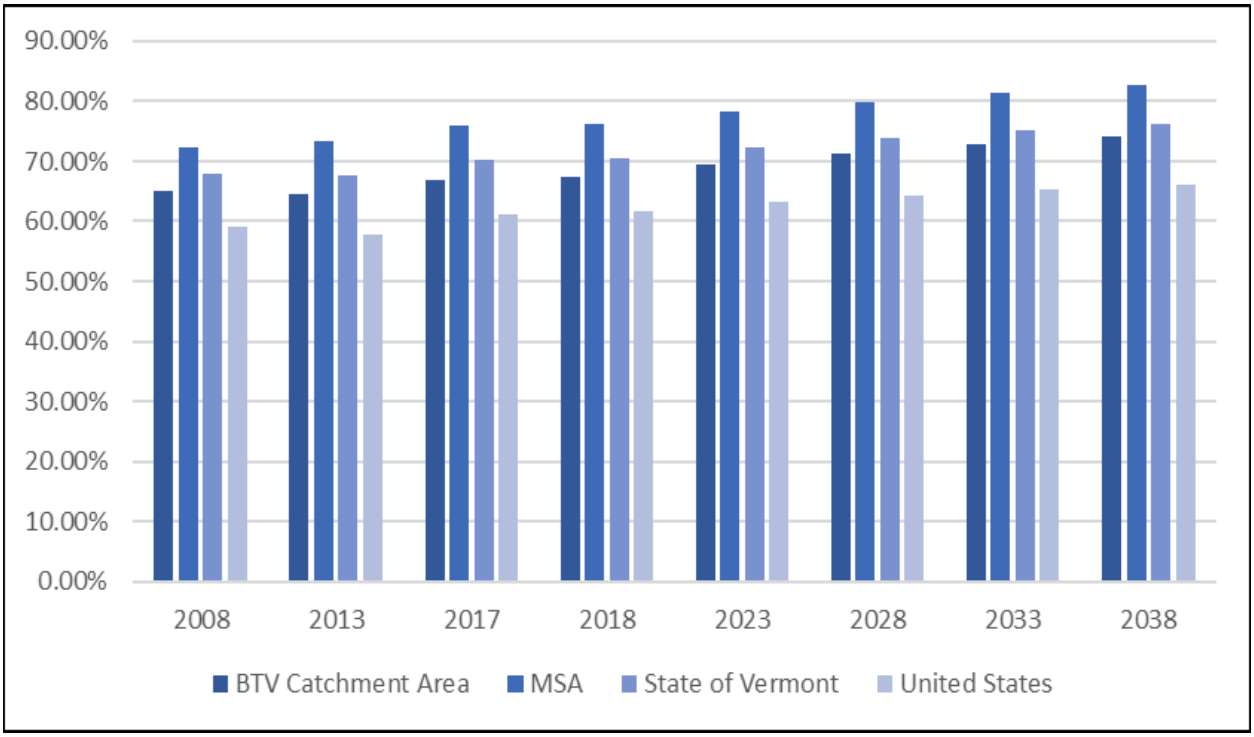


Note: Woods & Poole Economics, Inc. data is estimated
Source: Woods & Poole Economics, Inc., CHA, 2018

Employment

In 2017, the Burlington-South Burlington MSA had approximately 170,000 people employed (approximately 75.9 percent of the MSA's population), while the catchment area had approximately 570,000 people employed (approximately 66.9 percent of the catchment area's population). The MSA had an AAGR of 1.1 percent, slightly higher than the United States' and State of Vermont's AAGRs, which were 1.0 and 0.6 percent, respectively. The BTV catchment area had an AAGR of 0.4 percent, which was lower than the AAGRs of the MSA, State of Vermont, and United States. The lower AAGR for the BTV catchment area can be attributed to a decline in employment levels from 2008 until 2011. The MSA and United States are projected to grow at an AAGR of approximately 1.4 percent and 1.2 percent, respectively. Despite having the lowest AAGR historically, the BTV catchment area is projected to grow at the same rate as the State of Vermont, with an AAGR of 1.1 percent. The counties in the BTV catchment area are not anticipated to experience declines in employment levels as they had historically. See **Figure 3-3** and **Appendix D.1**.

Figure 3-3: Employment (Historical & Projected)

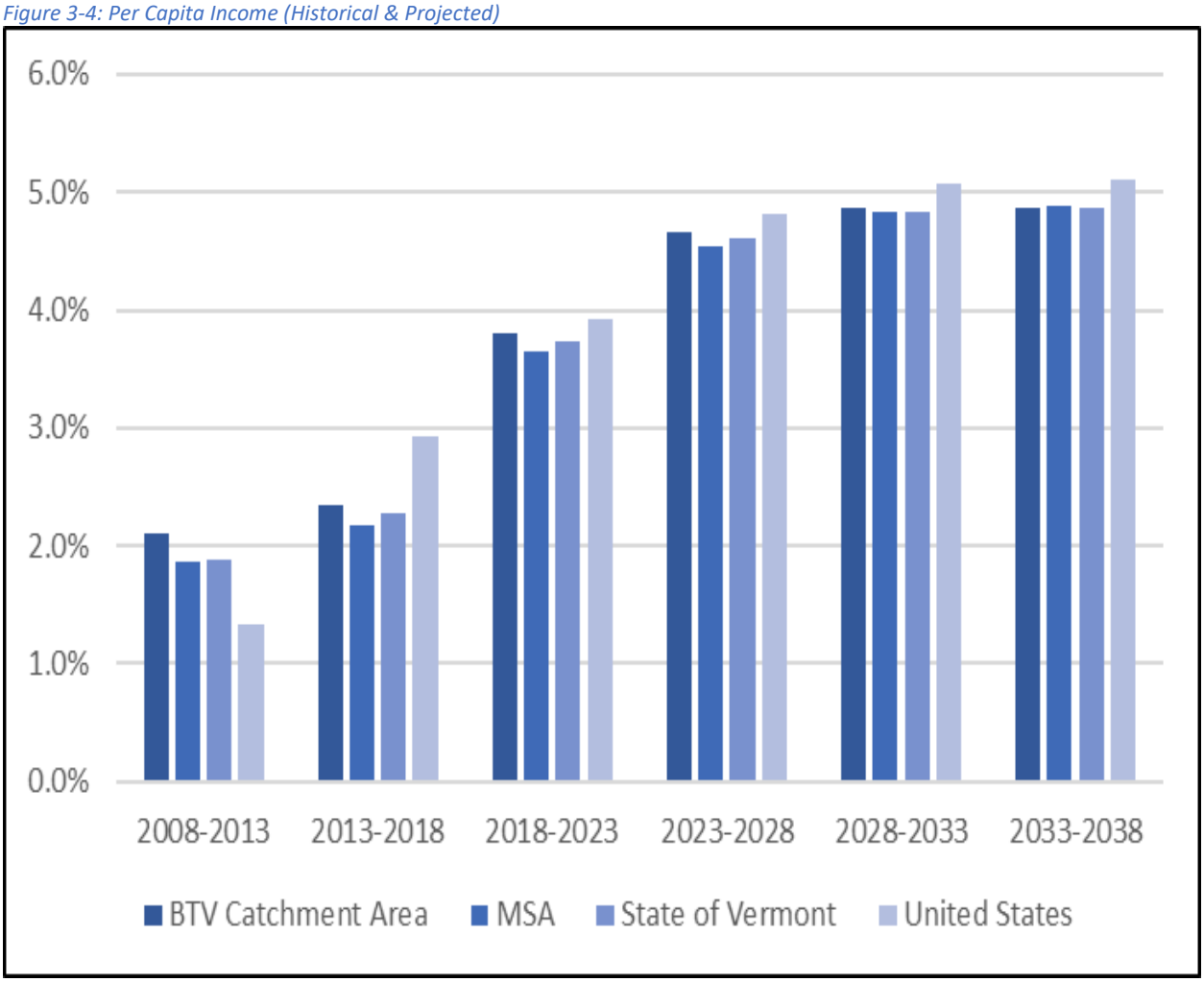


Note: Woods & Poole Economics, Inc. data is estimated
Source: Woods & Poole Economics, Inc., CHA, 2018

Per Capita Income

In 2017, the Burlington-Burlington South MSA had a per capita income of approximately $53,115, while the BTV catchment area had a per capita income of approximately $46,370. The AAGR for the catchment area was 2.4 percent, while the United States and State of Vermont both had AAGRs of 2.2 percent. The MSA had an AAGR of 2.1 percent. The State of Vermont, the MSA, and the State of Vermont are all projected to have AAGRs of 4.5 percent. While the United States historically had an AAGR lower than the BTV catchment area, it is projected to grow at a slightly higher rate, with a projected AAGR of 4.7 percent. See **Figure 3-4** and **Appendix D.1**.

Figure 3-4: Per Capita Income (Historical & Projected)



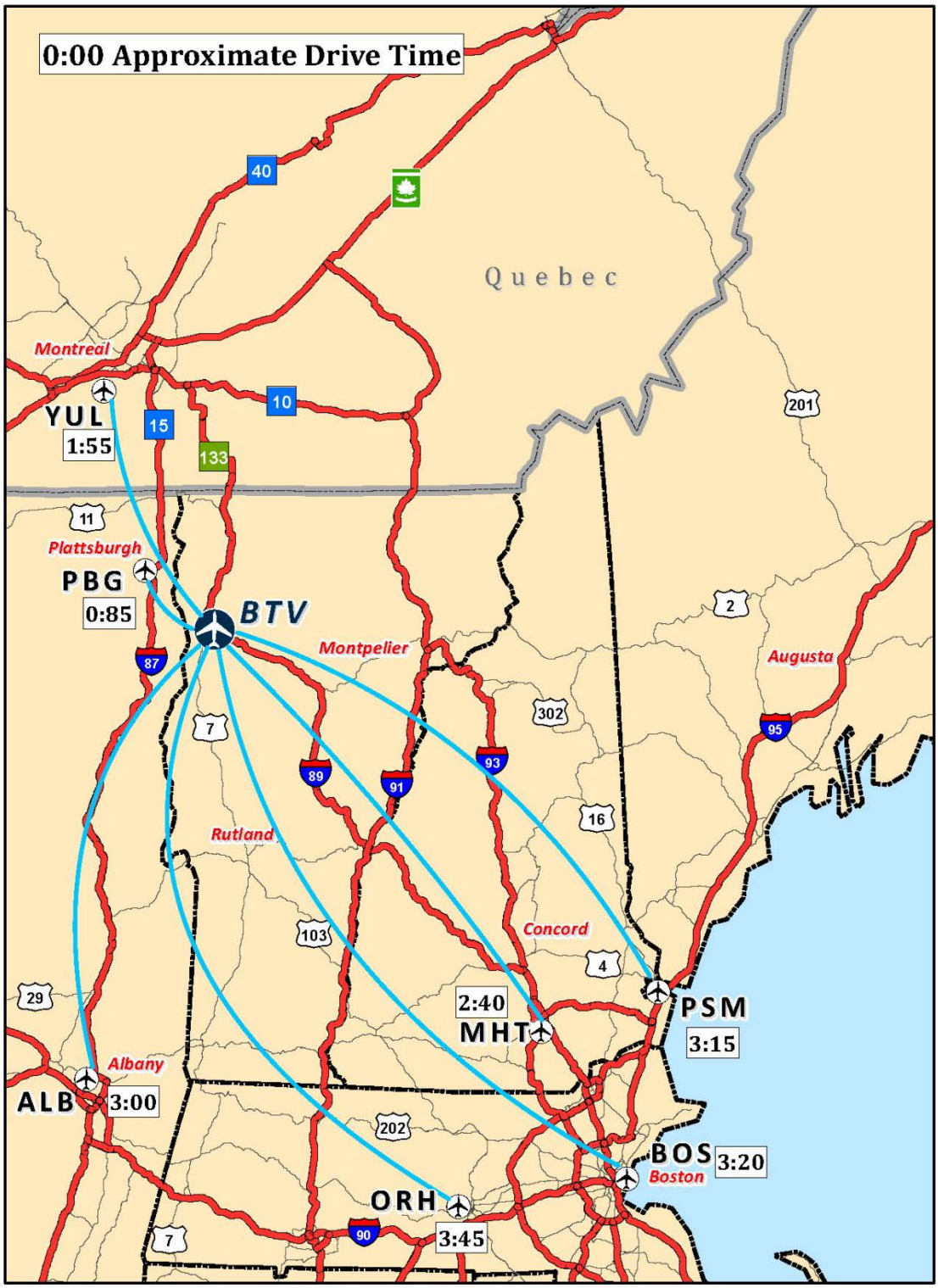
Note: Woods & Poole Economics, Inc. data is estimated
Source: Woods & Poole Economics, Inc., CHA, 2018

3.1.4 Destinations and Nearby Airports

As shown in **Figure 3-5**, BTV is located within 157 nautical miles (nm) and a 3 ¾ hour drive time of the following major airports:

- Plattsburgh International Airport (PBG) – 17.2 nm; 85-minute drive; northwest of BTV
- Montréal-Pierre Elliot Trudeau International Airport (YUL) – 64 nm; 1-hour 55-minute drive; northwest of BTV
- Albany International Airport (ALB) – 107 nm; 180-minute drive; south of BTV
- Manchester-Boston Regional Airport (MHT) – 119 nm; 160-minute drive; southeast of BTV
- Portsmouth International Airport at Pease (PSM) – 131 nm; 195-minute drive; southeast of BTV
- Worcester Regional Airport (ORH) – 144 nm; 225-minute drive time; southeast of BTV
- Logan International Airport (BOS) – 157 nm; 200-minute drive time; southeast of BTV

Figure 3-5:Drive-Time to Nearby Airports



Source: Google Earth Pro, CHA, 2018.

Figure 3-5
Drive-Time to Nearby Airports

According to the NPIAS BTV, ALB, and MHT are small-hub airports. ORH and PSM non-hub airports, while BOS is a large-hub airport.

According to statistics released by Aéroports De Montréal in December 2017 and by Statistics Canada (Canada's national statistical office), YUL is the busiest airport in the province of Quebec, Canada and is the third busiest airport in Canada (in passenger and aircraft activity).

As of the August 2018 published schedule, BTV has service to 12 non-stop destinations (10 year-round destinations and two *seasonal destinations)[26], shown in **Figure 2-6**, via five air carriers[27]: American Airlines, Delta Air Lines, JetBlue, United Airlines, and Porter. In 2017, Allegiant also operated at BTV, providing seasonal service to one destination. Even though Allegiant had the fewest departures, it was the largest airline at BTV in terms of total seats in 2017, followed by JetBlue, American, Delta, United, and Porter, respectively. It is expected, with Allegiant leaving the BTV market and the addition of Frontier Airlines' new service destination, JetBlue and Frontier will lead the BTV market in terms of total annual seats throughout the forecast period.

As shown in **Table 2-1**, BTV, ALB, BOS, MHT, ORH, PBG, PSM, and YUL have varied numbers of destinations and non-stop domestic flights. The availability of non-stop service at these airports draws travelers from Vermont, as well as from parts of New Hampshire and New York.

Table 3-2: Comparison of Airports in the Region

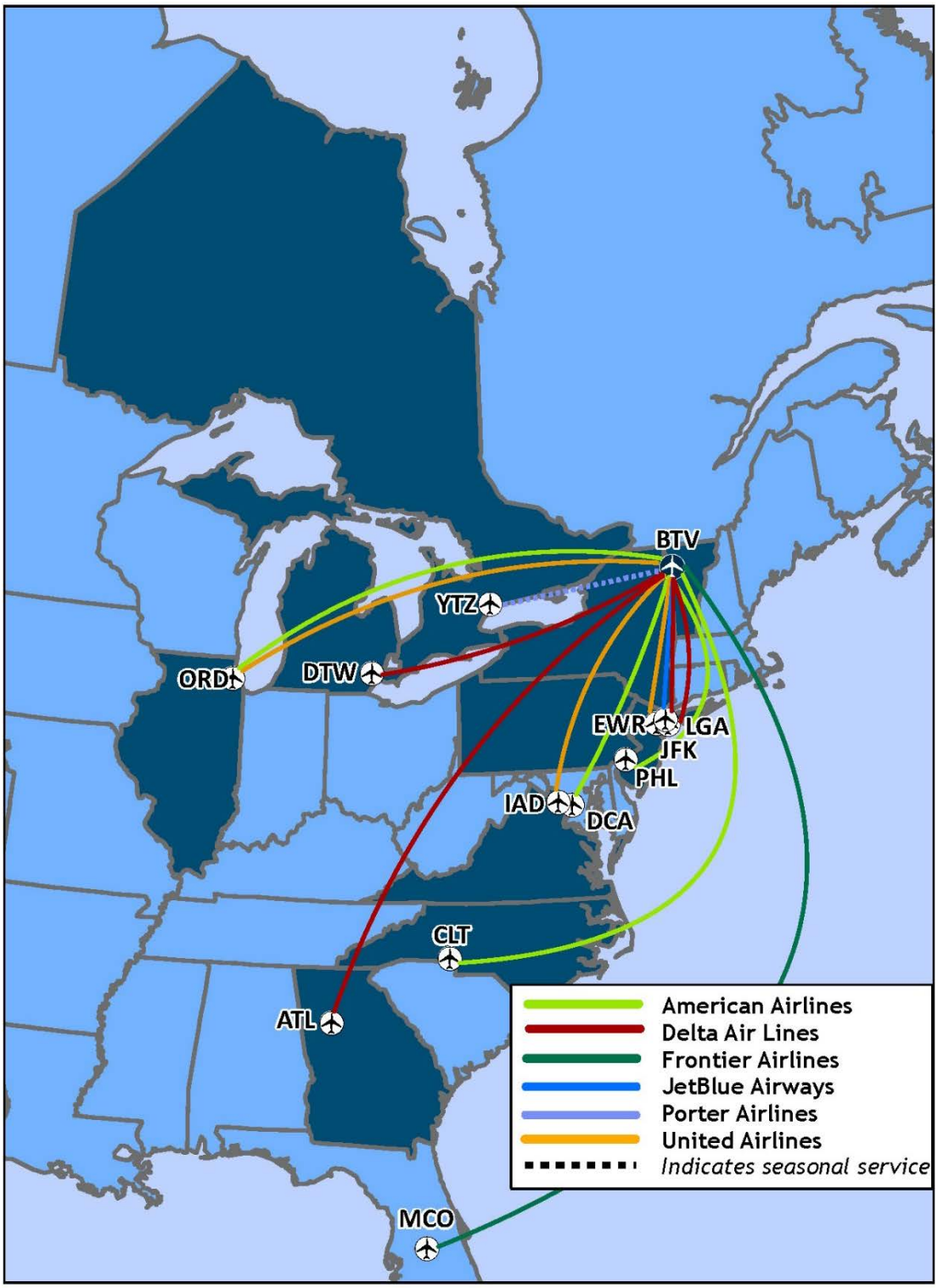
Flights	BTV	ALB	BOS	MHT	ORH	PBG	PSM	YUL
Non-Stop	12	18	108	12	5	6	5	145
Avg. Daily Flights	66	106	1,014	60	4	7	5	640

Source: Airport Websites (BTV, ALB, BOS, MHT, ORH, PBG, PSM, YUL), Burlington Airport Commission, CHA, 2018

[26] Hartsfield-Jackson Atlanta International Airport (ATL), Charlotte Douglas International Airport (CLT), Ronald Reagan Washington National Airport (DCA), Detroit Metropolitan Airport (DTW), Newark Liberty International Airport (EWR), Washington Dulles International Airport (IAD), John F. Kennedy International Airport (JFK), LaGuardia Airport (LGA), O'Hare International Airport (ORD), Philadelphia International Airport (PHL), *Billy Bishop Toronto City Airport (YTZ), *Orlando International Airport (MCO).

[27] On February 9, 2019, Frontier Airlines will begin operating at BTV, offering direct service to Orlando International Airport (MCO).

Figure 3-6: BTV Non-Stop Route Map



Source: Burlington Airport Commission, CHA, 2018.

Figure 2-6
BTV Non-Stop Route Map

3.2 Commercial Activity Historical Trends

This section provides a brief overview of the recent commercial aviation trends at BTV, such as enplanements and operations, as well as historical seats, average aircraft size, fleet mix, and load factors.

3.2.1 Enplanements

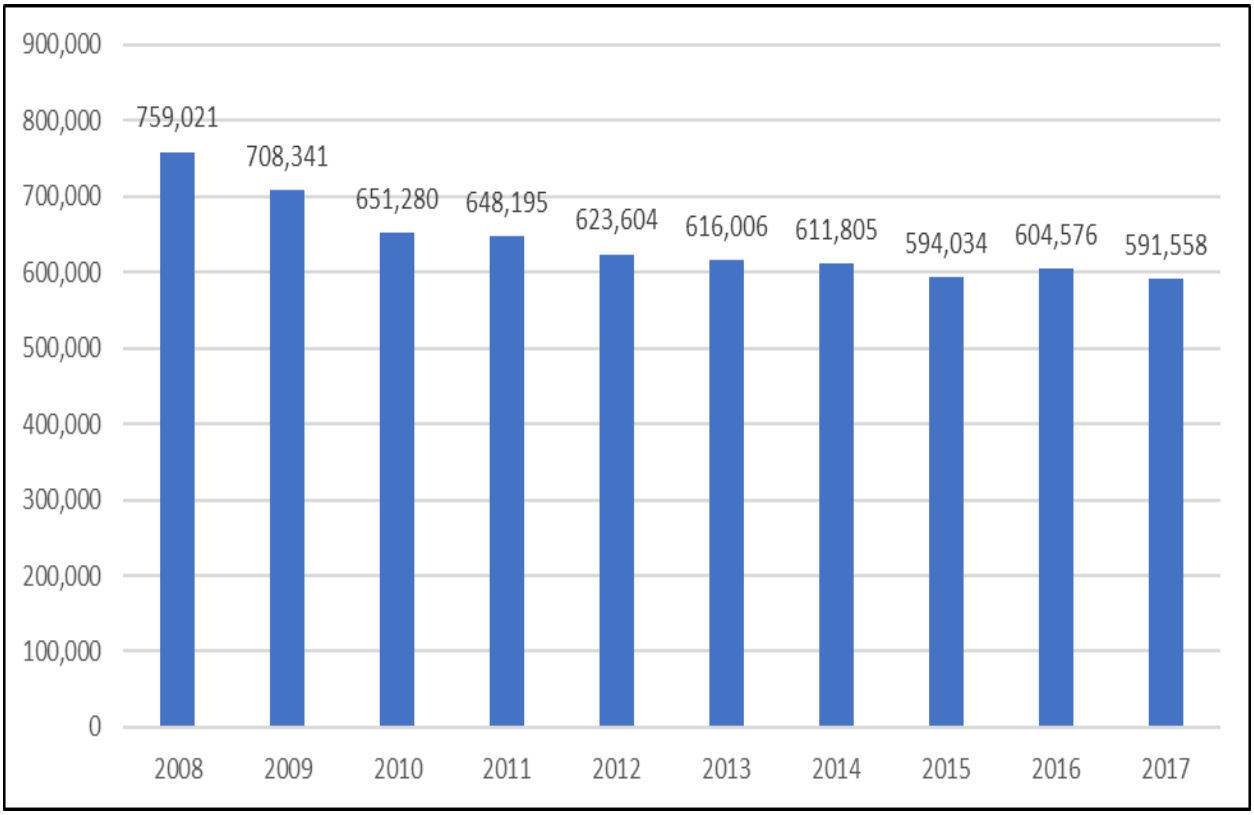
An enplanement is defined as a revenue-paying passenger boarding an aircraft at a given airport. Enplanements are the primary measure of a commercial airport's passenger activity and are key factors for terminal building and parking facility requirements. In addition to being an important trend tracking tool for airport management, an airport's reported annual enplanements are also used by the FAA to calculate Airport Improvement Program (AIP) passenger entitlement funding through its apportionment formula. For the purposes of this Study, forecast enplanements will serve as the basis for numerous facility requirements, as well as financial projections. These include:

- Passenger Terminal
  - Internal (space allocations, both pre- and post-security checkpoint)
  - External (vehicle access, vehicle parking, curb frontage, taxi- and Uber-queuing)
- Airport and Airline Support Facilities
- US Customs/Federal Inspection Facilities
- Surface Transportation

BTV enplanements have been gradually declining since 2008, as seen in **Figure 3-7**. The decline in enplanements between 2008 and 2017 can be attributed to many factors. The economic recession had a tremendous impact on the aviation industry from 2007-2009 which had the most impact on small-hub and small non-hub airports like BTV. In addition to the recession, the decline from 2014 through 2017 can likely be attributed to low load factors and a reduction in frequency of flights to previous and existing service destinations. These factors are mostly associated with the departure of Allegiant from the Airport and the re-emergence of The Montreal-Pierre Elliott Trudeau International Airport (YUL). Within the 10-year historical timeframe of BTV, Montreal has seen the emergence of Ultra-Low-Cost carriers, Low-Cost carriers, and competitive main-line carriers all enter the Canada-U.S. market. Specifically, low-cost carriers to Florida from Montreal, and Montreal to major hubs that provide the highest leakage from BTV, specifically Boston Logan International Airport (serviced by WestJet from YUL to BOS). Canadian traffic as part of the forecast projections will be addressed in subsequent sections of this report.

BTV is not expected to experience further declines in enplanements as it had in recent years. According to Airport officials, the Airport has already begun seeing increases in capacity during 2018, which can be attributed to new and increased services from the Airlines. In 2018, American began offering flights to O'Hare International Airport (ORD), Delta began offering flights to John F. Kennedy International Airport (JFK), and United expanded service to Newark Liberty International Airport (EWR).

Figure 3-7: Enplaned Passengers

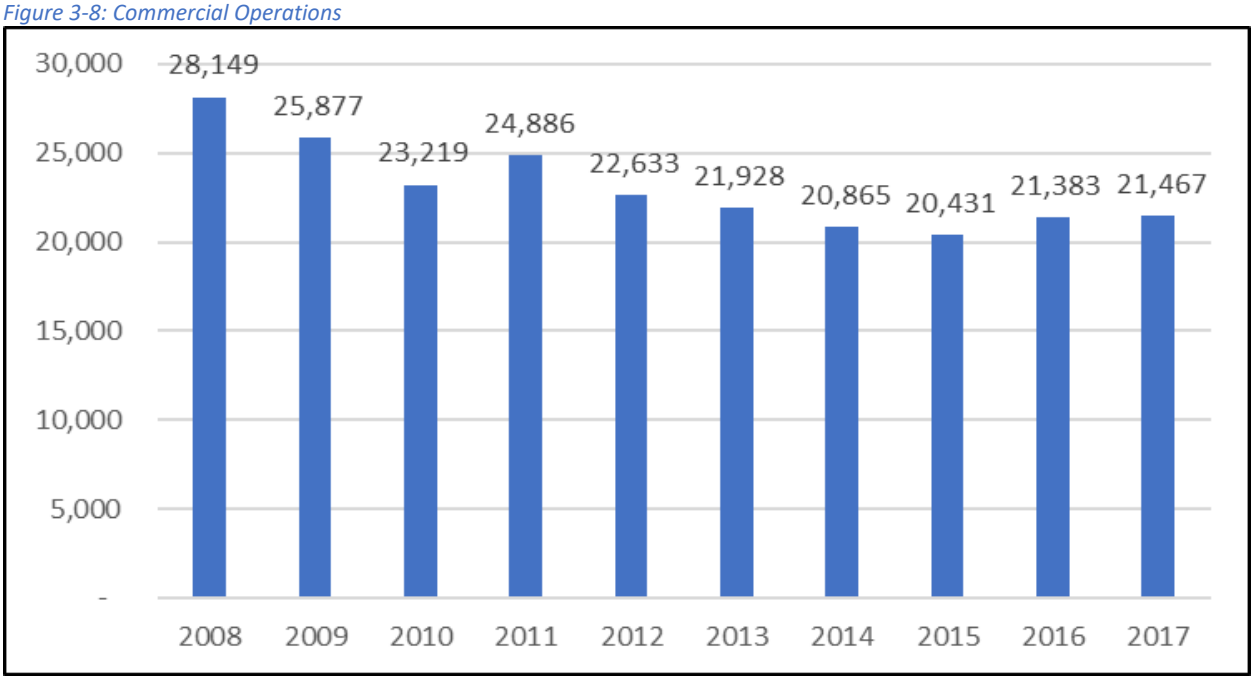


Source: Burlington Airport Commission, CHA, 2018.

3.2.2 Commercial Operations

Commercial operations include scheduled air carriers and their regional partners. BTV experienced a 17.9 percent decrease in air carrier operations from 2011-2015, as seen **Figure 3-8**, below. Airline bankruptcies, carrier consolidation, high fuel prices, and the economic recession were factors contributing to the decrease in commercial operations, as well as the retirement of certain aircraft and changes in fleet mixes; however, aircraft operations at BTV have experienced gradual growth since 2015 (5.1 percent growth from 2015-2017).

Figure 3-8: Commercial Operations

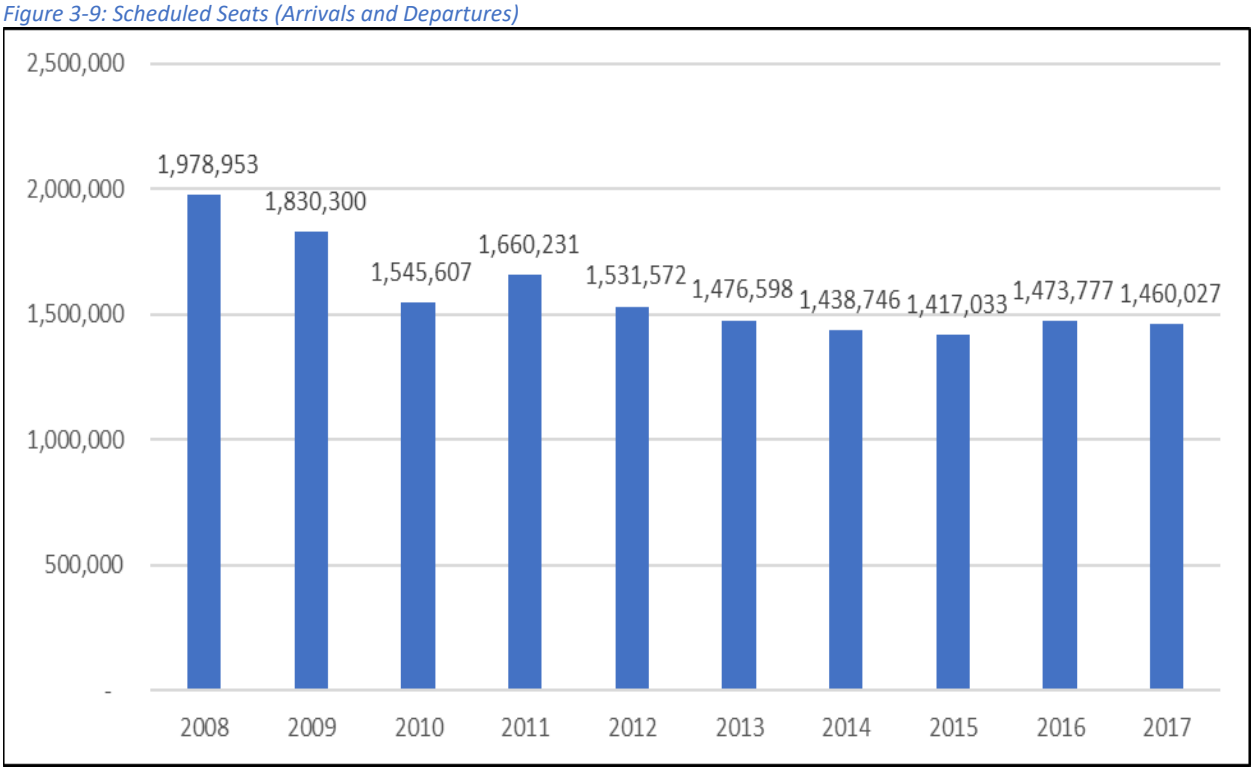


Source: Department of Transportation (DOT) T-100 Data, Burlington Airport Commission, CHA, 2018.

Commercial Seats and Average Aircraft Size

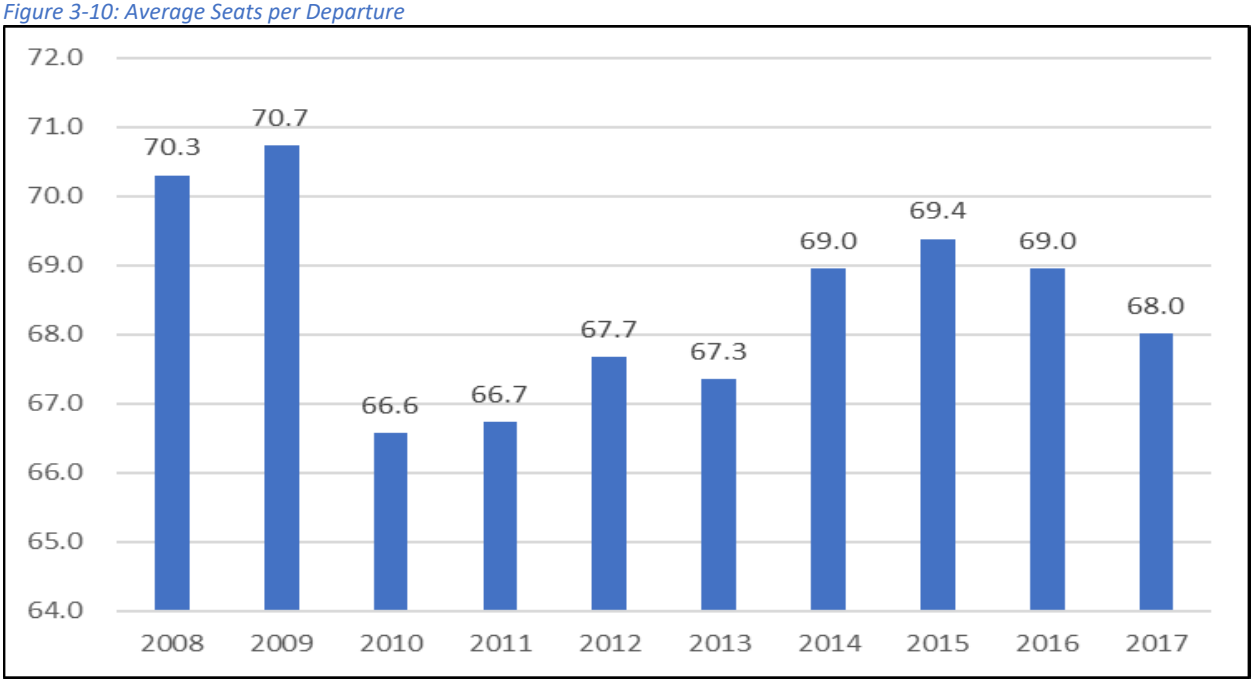
BTV'S approximate 1.5 million scheduled seats in 2017 has also declined but has been relatively consistent since 2013. As shown in **Figure 3-9**, 2008 was the peak year, with approximately 2.0 million seats. The number of seats decreased between 2011 and 2015, averaging 1.5 million seats. The lowest counts of scheduled seats in 2014 and 2015 can be attributed to the transition in airframe from smaller 50 seat aircraft with increased frequency to larger regional jets (RJs) and narrow-body aircraft. See **Figure 3-10** for average seats per departure.

Figure 3-9: Scheduled Seats (Arrivals and Departures)



Source: DOT T-100 Data, Burlington Airport Commission, CHA, 2018.

Figure 3-10: Average Seats per Departure



Source: DOT T-100 Data, Burlington Airport Commission, CHA, 2018.

Historical Commercial Fleet Mix

The types of commercial aircraft serving BTV in a typical week in August, the Airport's peak month, in the years 2008, 2013, and 2017 are shown in **Table 3-3** below. August was chosen because it has schedule continuity year after year..

Table 3-3: Aircraft Serving BTV (August Departures)

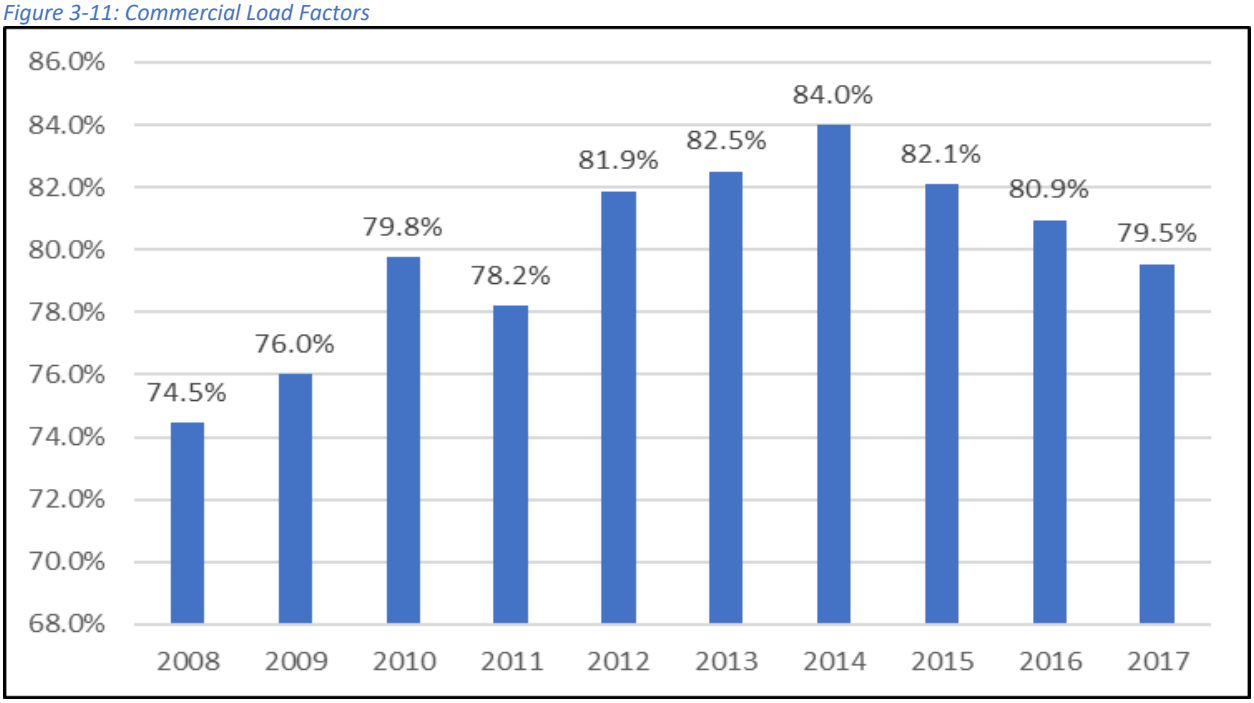
Aircraft Type	2008	2013	2017
Bombardier CRJ-200/440	493	481	547
Embraer EMB-175	140	302	390
Embraer EMB-145	405	332	347
Bombardier CRJ-700	231	427	248
Embraer EMB-190	63	247	176
Airbus A319	68	-	79
Boeing B717-200	184	-	79
Bombardier CRJ-900	-	-	66
Embraer EMB-170	66	66	32
Airbus A320-1/2	284	-	20
DeHavilland DHC8-300	56	-	15
Boeing B737-700	-	-	2
Boeing B737-9	-	-	2
DeHavilland DHC8-100	385	-	-
DeHavilland DHC8-400	172	197	-
McDonnell Douglas MD-80	-	62	-

Source: DOT T-100 Data, Burlington Airport Commission, CHA, 2018.

Load Factor

Load factor (LF) measures the capacity utilization and is used to measure efficiency in filling air carrier seats and in generating revenue. LF is calculated by dividing revenue passenger miles by available seat miles. The LF at BTV, as depicted in **Figure 3-11**, increased from 78.2 percent in 2011 to 84.0 percent in 2014, a 7.4 percent increase. LFs began falling in 2014, decreasing 5.3 percent by the end of 2017.

Figure 3-11: Commercial Load Factors



Source: DOT T-100 Data, Burlington Airport Commission, CHA, 2018.

3.3 Commercial Activity Demand Forecasts

A forecast of annual enplaned passengers and annual commercial aircraft operations was developed to determine the facility sizing requirements necessary to adequately accommodate the current and future activity demand. The most basic indicator of activity demand for a commercial service airport is the number of annual enplaned passengers. It is the number of forecast enplanements that will drive passenger terminal sizing requirements, and to a lesser extent, commercial carrier operations and fleet mix. Commercial aircraft operations will influence the requirements for passenger terminal and airside infrastructure.

This section provides the methodology for the development of the forecasts of commercial enplanements and operations at BTV, as well as the methodologies analyzed for developing the commercial forecast, and details the final recommendation for commercial passengers and operations through 2038.

3.3.1 Enplanements Forecast

Enplanement data is the most important indicator of aviation demand at commercial service airports. Historical and forecast enplanement data can provide relevant evidence that improvements and/or expansions to an airport may be necessary. To determine the facility sizing requirements necessary to adequately accommodate the current and future activity demand, a forecast of annual enplaned passengers and annual commercial aircraft operations was developed.

Several FAA-approved forecast methodologies and statistical analyses were used to provide a range of potential passenger activity levels. From these projections, a recommended forecast is developed that represents the most likely projection of future activity based on existing data and current trends (detailed in the following section) in passenger activity.

Five different methodologies were considered and analyzed in the development of the recommended BTV enplanements forecast. Each of the methodologies, along with accompanying enplanements forecasts, are shown below and then compared to each other. The full results of each methodology can be found in **Appendix D.2**.

3.3.1.1 TAF Forecast Scenarios

During the forecasting process, the FAA's TAFs were reviewed and used to develop three separate TAF Scenarios: Adjusted TAF, Variable TAF, and Extrapolated TAF.

Adjusted TAF

The Adjusted TAF takes the FAA's AAGR for 2018-2038 and applies that rate to actual airport-reported data. In other words, the TAF annual growth (0.8 percent) is applied to an actual 2017 enplanement count (591,558) and projected throughout the forecast period.

Variable TAF

The Variable TAF takes the FAA's year-over-year growth for 2018-2038 and applies that variable to the Airport's previous year enplanements. In other words, the TAF growth from 2017 to 2018 (8.6 percent) is applied to the enplanements in 2017 (591,558) to project the enplanements in 2018 (642,421), followed by taking the TAF growth from 2018 to 2019 (1.1 percent) and applying that rate to the Airport's 2018 enplanements (642,421) to project the enplanements in 2019 (649,714), and so-forth.

Extrapolated TAF

The Extrapolated TAF takes the actual enplanements data from January 2018 through August 2018 to estimate the total 2018 enplanements Based on extrapolating the first eight months of the year, the 2018 enplanement are estimated at 667,004. The enplanements for the remaining years within the forecast horizon are determined by taking the FAA's AAGR for 2018-2038 (0.8 percent) and applying that variable to the previous year's enplanements. In other words, the TAF growth is applied to the 2018 enplanement estimate (667,004) and projected throughout the forecast period (similar to the Adjusted TAF scenario).

Table 3-4: Comparison of TAF Scenarios

Year	TAF	Adjusted TAF	Variable TAF	Extrapolated TAF
2017	585,099	591,558	591,558	591,558
2018	635,407	596,472	642,421	667,004
2023	665,850	621,660	673,200	695,171
2028	693,485	647,913	701,140	724,528
2033	721,769	675,273	729,737	755,124
2038	749,730	703,790	758,006	787,012
AAGR 2018-2038	**0.8%**	**0.8%**	**0.8%**	**0.8%**
Growth 2018-2038	**18.0%**	**18.0%**	**18.0%**	**18.0%**

Source: FAA TAF, Burlington Airport Commission, CHA, 2018.

Of the various TAF scenarios, the Extrapolated TAF is considered most reasonable because it uses the modest 0.8% AAGR and is adjusted for the 2018 actual enplanements.

3.3.1.2 Historical Trend Analysis

A historical trend forecast is a simple time-series model that relies on extrapolating historical enplanements growth specific to the Airport into the future. Examining the historical growth rates and

projecting them forward provides a picture of growth, assuming the market area and the state of the commercial passenger airline industry reflect past trends through the forecast period. For the historical trend scenario, the historical enplanement data was projected forward through the forecast horizon. The BTV historical trend of passenger enplanements has shown to be slowly declining over the ten-year period. The AAGR from 2008 to 2017 was negative 2.5 percent. For the purposes of the Historical Trend Analysis, three scenarios were identified in the evaluation (3-year, 5-year, and 10-year) of the time series model. The results are depicted in **Table 3-5**.

Table 3-5: Historic Trend Comparisons

Year	TAF	3-Year Time Series	5-Year Time Series	10-Year Time Series
2017	585,099	591,558	591,558	591,558
2018	635,407	590,735	586,786	576,995
2023	665,850	586,637	563,498	509,382
2028	693,485	582,567	541,134	449,692
2033	721,769	578,526	519,657	396,997
2038	749,730	574,513	499,033	350,476
AAGR 2018-2038	**0.8%**	**-0.1%**	**-0.8%**	**-2.5%**
Growth 2018-2038	**18.0%**	**-2.7%**	**-15.0%**	**-39.3%**

Source: FAA TAF, Burlington Airport Commission, CHA, 2018.

As recent trends have shown a decline in activity, this forecast type exhibits a negative relationship over time, which is opposite to what the TAF shows. As such, all time trend forecasts for BTV have been rejected from further considerations as they are likely the opposite of true.

3.3.1.3 Market Share Analysis

A Market Share Analysis is a "top-down" method where projected growth rates of potentially more reliable larger aggregates (e.g., the nation) are used to derive forecasts for smaller areas (e.g., airports). In other words, a market share forecast essentially applies nationally forecast growth rates to airport-specific market areas. Future BTV enplanements were estimated by multiplying the future share trend and the FAA's Terminal Area Forecast (TAF) National, State, and Regional enplanement numbers. **Table 3-6** depicts the results of this evaluation.

In the National and State Market Share scenarios, it was assumed that BTV will maintain a level market share based on its 10-year average, or static market share, of commercial enplanements relative to activity projects throughout the planning period. Nationally, BTV has 0.1 percent of the total enplanements. Regarding the state market share, it is noted that as virtually all enplanements in the State of Vermont are from BTV, the state market share is not significantly different than that of TAF itself.

The Adjusted Static Regional Market Share scenario methodology uses the aggregate, regional level forecast of commercial activity projections from the FAA's TAF for the individual commercial service airports in the region (ALB, BOS, MHT, ORH, PBG, and PSM) to derive forecast for the Airport based on market share. This forecast assumes that BTV will maintain its current level, or static market share (2.7 percent), of commercial enplanements relative to regional activity projections throughout the planning period.

Both the National and Adjusted Static Regional Market Share scenarios are considered an aggressive forecast of commercial activity. These scenarios project the high growth of large hub airports and major

US cities into the forecast for BTV. As such, these forecasts were rejected for use at BTV as they likely overstate potential activity growth.

Table 3-6: Market Share Comparisons

Year	TAF	Static National	Static State	Adjusted Static Regional
2017	585,099	591,558	591,558	591,558
2018	635,407	619,760	641,986	626,322
2023	665,850	694,723	672,501	709,322
2028	693,485	766,041	700,202	794,069
2033	721,769	842,939	728,554	887,313
2038	749,730	924,008	756,581	985,934
AAGR 2018-2038	**0.8%**	**2.0%**	**0.8%**	**2.3%**
Growth 2018-2038	**18.0%**	**49.1%**	**17.9%**	**57.4%**
% Above TAF	**-**	**23.2%**	**0.9%**	**30.3%**

Source: FAA TAF, Burlington Airport Commission, CHA, 2018.

3.3.1.4 Regression Analysis

Regression-based forecasts examine aviation and passenger activity through the scope of current and historical activity levels, seeking to find a relationship between the activity levels and the socioeconomic conditions prevalent during that period. Causal relationships between population, employment, and income are examined to determine if there is a statistically valid correlation that may assist in projecting future activity.

The output of a regression analysis is the 'coefficient of determination', or R^2, which ranges from 0 to 1.0. If the R^2 of an analysis falls between 0.85 and 1.0, there is a statistical correlation; if it falls below 0.85, there is not a statistical correlation. In other words, the higher the R^2 value, the stronger the correlation is between the variables; however, if the R^2 of an analysis is above 1.0, an anomaly, or outlier, has been detected.

Demographic projections for the catchment area provided by Woods & Poole Economics, Inc. were used to estimate growth at BTV. The results of the regression analyses conducted are shown in **Table 3-7**. Though the socioeconomic indicators have grown at rates that are consistent with those at the state and national levels, the 10-year historical BTV enplanements have shown to be declining over that time. Based on these parameters and fluctuations in Airport activity, it is evident that there may be poor correlation between this activity and the relatively stable socioeconomic conditions in the study area; therefore, the socioeconomic regression analyses were not considered to be statistically reliable to serve as the preferred forecast scenario.

Similarly, the historic trend forecasts, the socioeconomic regression forecasts all result in a decline in future activity as the they are based on the recent trends in airport enplanements. As such, regression forecasts for BTV have been rejected from further considerations.

Table 3-7: Regression Comparisons

Year	TAF	Population-Based	Employment - Based	Income-Based	Population-Income-Based	Employment-Income-Based	Population-Employment - Income-Based
2017	585,099	591,558	591,558	591,558	591,558	591,558	591,558
2018	635,407	536,395	577,497	551,649	589,132	593,279	572,147
2023	665,850	356,189	506,075	421,392	530,539	485,920	410,113
2028	693,485	175,467	438,105	225,552	387,273	253,672	124,357
2033	721,769	4,628	375,561	-31,900	158,123	-99,830	-277,198
2038	749,730	-143,572	319,036	-358,687	-174,723	-589,626	-802,928
AAGR 2018-2038	**0.8%**	**-6.3%**	**-2.9%**	**-8.3%**	**-6.5%**	**-10.0%**	**-12.0%**
Growth 2018-2038	**18.0%**	**-126.8%**	**-44.8%**	**-165.0%**	**-129.7%**	**-199.4%**	**-240.3%**
R^2	**-**	**0.29**	**0.22**	**0.75**	**0.79**	**0.96**	**0.98**

Source: Woods & Poole Economics, Inc., FAA TAF, Burlington Airport Commission, CHA, 2018.

3.3.1.5 Additional Analyses

The following scenarios were performed in addition to the previously described scenarios evaluated during the formulation of the enplanements forecast: Population Econometric, Extrapolated Population Econometric, and Extrapolated Static Regional Market Share. The results from these scenarios can be found in **Appendix D.2**.

In the Population Econometric scenario, the catchment area population growth from 2018-2038 for BTV (0.6 percent) is applied to the actual 2017 enplanement count (591,558) and projected throughout the forecast period. In the Extrapolated Population Econometric scenario, like the Population Econometric scenario, the catchment area population growth for BTV is applied to an enplanement count; however, in this scenario, the growth rate from 2019-2038 (0.6 percent) is applied to the 2018 extrapolated enplanement estimate (667,004) and is projected throughout the forecast period.

The Extrapolated Static Regional Market Share scenario uses the same methodology as the previously described Adjusted Static Regional Market Share scenario, with one exception: rather than using the static market share in 2017 of 2.7 percent, the market share of the 2018 extrapolated enplanement count was used, resulting in a market share of 2.9 percent of commercial enplanements relative to regional activity projections throughout the planning period. However, this projection results in over 1 million enplanements at BTV, which is seen at too high for the size of the catchment area.

Of these additional forecasts, the simple approach provided by the Extrapolated Population Econometric scenario is reasonable as it estimates 2018 enplanements, and projects them at the rate of population growth anticipated for the region.

3.3.2 Recommended Enplanement Forecasts

Based on the analyses presented in **Section 3.3.1**, three of the various scenarios appear reasonable for BTV, including the:

- FAA TAF,
- Extrapolated TAF, and
- Extrapolated Population Econometric

For planning purposes, it is recommended that the Extrapolated TAF forecast be used as the recommended commercial enplanements forecast in the Master Plan Update. The planning variables used in this forecast consist of multiple market factors (at local and national levels), as well as trends within the aviation industry.

The TAF for BTV is considered to be a realistic forecast scenario for the Airport that takes into account regional demographics, historical trends, and commercial service growth within the BTV market. In addition to domestic trends at BTV, the FAA TAF also takes into account projected passenger growth as a result of Canadian traffic entering the BTV market. Therefore, for the purposes of planning and development at BTV, because the TAF takes into account domestic, international, and regional socioeconomic and airline growth, the Extrapolated TAF was chosen as the recommended forecast for BTV.

The Airport has experienced significant year-over-year growth from 2017 that is not factored in the FAA 2017 TAF. As such, the 2018 enplanement figure was updated to reflect a more accurate representation of growth occurring at the Airport. The FAA TAF annual growth factor (0.8%) was then applied to the updated 2018 enplanement figure and projected throughout the forecast period.

It is important to note that based on the comparison with the FAA TAF, the recommended forecast scenario projections fall within the FAA criteria for commercial forecasts as required by FAA AC 150/5070.2B, *Airport Master Plans*, which states enplanement and operational forecasts must be within 10 percent in the short-term (five-year) period and 15 percent within the 10-year period.

Table 3-8 depicts the recommended forecast in comparison to the FAA TAF.

Table 3-8: Recommended Enplanements Forecasts vs. TAF

Year	TAF	Recommended	Recommended vs. TAF
2017	585,099	591,558	1.1%
2018	635,407	667,004	5.0%
2023	665,850	695,171	4.4%
2028	693,485	724,528	4.5%
2033	721,769	755,124	4.6%
2038	749,730	787,012	5.0%
AAGR 2018-2038	**0.8%**	**0.8%**	-
Growth 2018-2038	**18.0%**	**18.0%**	-

Source: FAA 2018 TAF, Burlington Airport Commission CHA, 2018.

3.3.3 Commercial Operations Forecast

The operations forecast for BTV takes several factors into consideration such as the recommended enplanements forecast, growth trends in percentage of seats filled, and average seats per departure, as well as the future schedules and industry trends surrounding the airlines (as they are relevant to BTV).

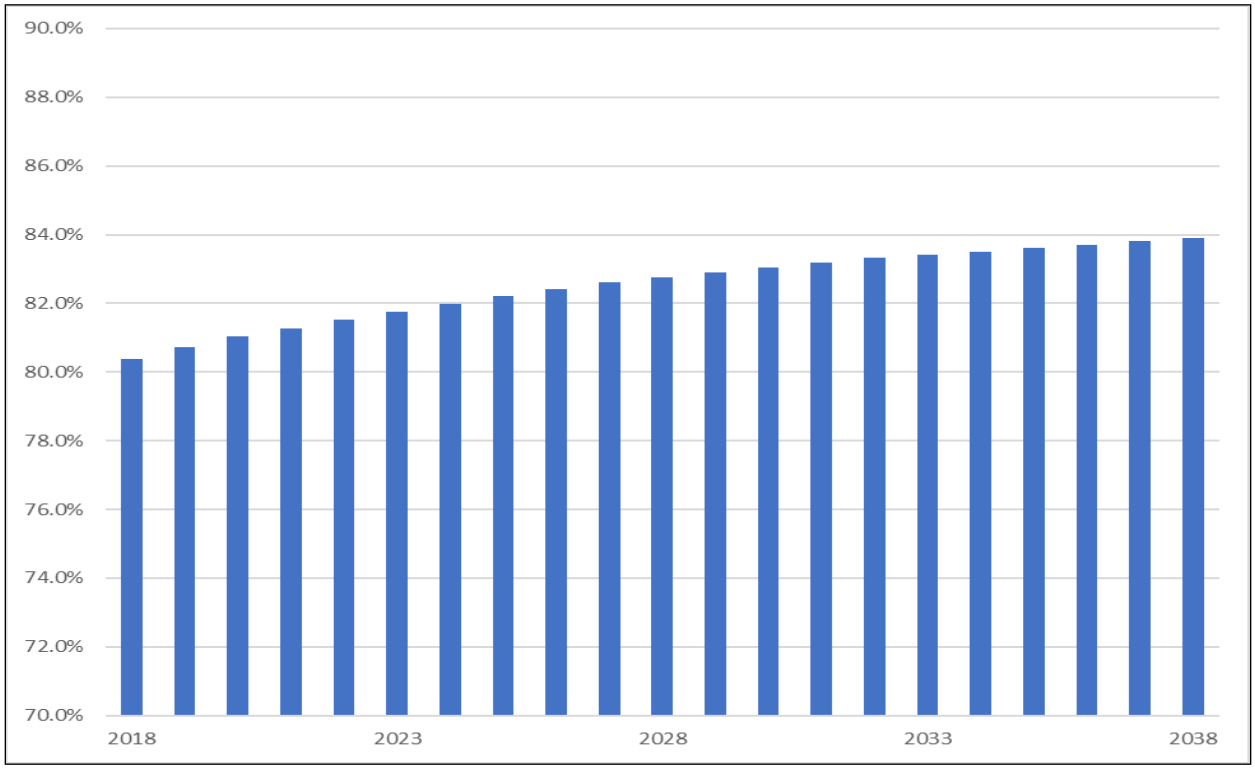
3.3.3.1 Estimated Seats

The forecast of BTV percentage of seats filled for 2018 through 2038 is calculated by dividing the forecasted enplaned passengers by the forecasted load factor by year. The percentage of seats filled is determined by taking the 2017 load factor and growing the seat factor modestly each year through 2038. Once the percentage of seats filled reaches 85.0 percent per route, it is capped at this value for all future years. This methodology is also included in the FAA TAF which has the national load factor continuing to grow each year through the end of the TAF period, capping between 86 and 87 percent.

To determine the estimated total seat-departures, divide the forecasted enplaned passengers per year by the estimated percentage of annual seats filled. Total operations are forecast by multiplying total seats-departures by two (to get to total seats) and then dividing by the forecast of seats per departure by year.

The forecast for average seats per departure is assumed to grow by 0.6 percent per year after 2018. The growth rate of 0.6 percent is a proxy from the 2018 National Forecast for domestic average aircraft seats per mile. Assumed within the forecast, by 2038, is the replacement of several equipment types currently flying at BTV with younger, more fuel-efficient aircraft of larger seat capacity. The resulting estimate for percentage of seats filled is shown in **Figure 3-12.**

Figure 3-12 – BTV Percentage of Seats Filled

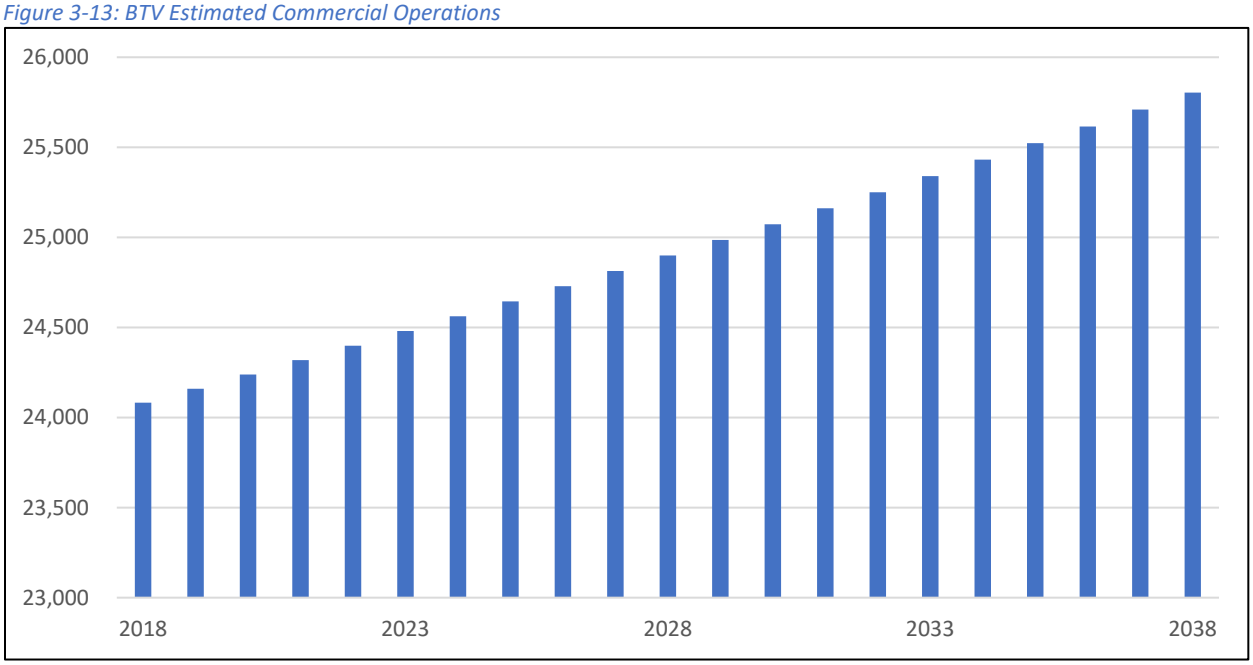


Source: FAA 2017 TAF, Burlington Airport Commission CHA, 2018.

3.3.3.2 Operations

Taking the forecasted total seats by year and dividing by the estimated average seats per departure by year, results in the forecast for total operations, as shown in **Figure 2-13.**

Figure 3-13: BTV Estimated Commercial Operations



Source: FAA 2017 TAF, Burlington Airport Commission CHA, 2018.

3.3.3.3 Commercial Carrier Fleet Mix

The commercial aircraft fleet mix projections are a function of the scheduled commercial passenger air carriers that operate (or are expected to operate) at the Airport during the forecast period. Each carrier's anticipated future fleet mix (i.e., aircraft acquisitions, aircraft phase-outs, retirements, route demand, etc.) and forecast enplanement levels influence a carrier's aircraft type and level of operations. This data is then coupled with the forecasted commercial air carrier operations to determine the number of annual departures by aircraft type to the greatest extent practical. It is important to note that the assumptions provided within this section are a function of seats per departure and annual seats applied to an assumed LF. The operational fleet mix forecast provided within this section will serve as practical planning activity levels for the purposes of developing airside and terminal development initiatives.

The first step in determining BTV's future commercial carrier fleet mix was to identify the overall market trends that will drive future airline fleets, as well as aircraft fleet mix decisions specific to each airline operating at the Airport and its demand associated with individual routes by load factor. It is important to reiterate that overall passenger enplanements are projected to grow incrementally and maintain a positive stable growth throughout the planning period. With the increase in the number of short to medium haul, low-cost air carriers, and the replacement of older larger aircraft, such as early versions of the Boeing B737, Boeing 757, Airbus A320, and the MD80, the demand for smaller single-aisle aircraft has grown within the past two decades, trending the industry toward aircraft with fewer seats, peaking in 2007. In general, this has translated to a higher passenger load factor per flight; however, per the Boeing Commercial Market Outlook (2018-2037), domestic air carriers have begun trending away from regional jet aircraft and retiring smaller 50-seat aircraft at an accelerated rate. As such, the trend towards smaller aircraft has now reversed.

These 50-seat aircraft are being replaced with larger 70- and 90-plus seat regional jets, as well as larger narrow-body aircraft; however, replacements will not keep pace with retirements. Boeing predicts that

in 2030, the fleet of regional jets will consist of 760 aircraft, down from 1,780 in 2010. Single-aisle mainline aircraft will continue to comprise much of the domestic fleet and will increase market share from 56 percent in 2009 to 73 percent in 2030.

As with the predicted national fleet shift toward newer, larger, and more efficient aircraft, BTV-specific fleet mix characteristics and trends were identified and applied directly to the preferred passenger carrier forecasts through 2038. To provide a detailed picture of future BTV operations, the following assumptions are based upon airline-specific fleet plans and aircraft orders, as well as overall industry trends:

- As announced in 2016 (Delta.com), Delta is currently planning an aggressive overhaul of their small-plane fleet both through the mainline carrier and Delta Connection carriers. According to Delta.com, the airline plans to buy larger regional jets with a list value up to $2.3 billion, pending pilot union approval. This will provide Delta the option of adding 50 aircraft, each with 70-76 seats. This is indicative of the airline progressing towards eliminating their fleet of 50-seat aircraft.
- Delta Air Lines regional jet aircraft with a passenger capacity of 50-seats or under (CRJ200, ERJ145, ERJ140, etc.) will be gradually phased out of service and replaced with larger 70-seat plus regional jet aircraft (CRJ700/900) and larger narrow-body B717s, which were leased from Southwest after the Southwest/Air Tran merger.
- In addition to transitioning to larger RJs and B717s, according to a Delta Air Lines press release (Delta.com), and according to Bombardier Orders & Deliveries, Delta Air Lines has ordered 75 A220 (formerly Bombardier CS100s) airplanes (pending congressional legislation on imports). This aircraft will be utilized on the short- and medium-haul routes and will host a two-class 100-seat configuration. It is unlikely that BTV will see this airframe in the short-term, however in the five- to 15-year time frame it is likely this airframe will serve the BTV-ATL route.
- Based on Airbus Fleet Orders and on discussions with airline representatives, Delta's McDonnell Douglas MD80 aircraft (166-seats) will be phased out of service. Although most Delta sources (Delta.com) show the phase out of the MD80 aircraft happening by calendar year (CY) 2019, according to airline representatives and recent press releases, the MD-80 phase out is contingent upon the delivery of the new A220 series aircraft. For forecasting purposes, it was assumed that this transition would occur during the short-term forecasting period (2018-2023)
- According to SkyWest Airlines representatives, the airline is in transition to flying primarily dual-class aircraft on its CRJ operations (specifically through ExpressJet) by reducing the number of CRJ200s in service. This will result in an increase of ERJ145 operations as the airline (ExpressJet) will not phase out these aircraft until a later date (unannounced). Currently, the ExpressJet fleet consists of 35 CRJ700s, 28 CRJ900ERs, and 164 ERJ145s. In December 2016, SkyWest announced that ExpressJet and American Airlines have agreed to place 12 dual-class CRJ700s into a multi-year service term.
- With the recent major acquisition and merger announcements of Boeing/Embraer and Airbus/Bombardier, an influx of 100+ seat aircraft will be joining the market. This will have an impact specifically on small hub and small non-hub airports. These new 100+ seat aircraft (Airbus 220-200/300 and Embraer E175/190/195 E2s) will provide the necessary sized aircraft for smaller markets that may not have the demand to transition to narrowbody Boeing 737s and A320s on a daily operational basis. These aircraft are expected to enter the market in the short-term period and increase in operations throughout the forecast period.
- CRJ200 operations on short stage length flights (i.e., BTV to JFK/EWR/PHL) via smaller regional feeder airlines are expected to remain a large part of service at smaller hub with shorter stage

length operations and are expected to transition out of service in the medium-term time periods. This transition is assumed to take place over the next 10-15 years.

Using BTV's commercial air carrier schedule data provided by the Airport and supplemented with FlightAware Data, the commercial air carrier fleet mix forecast considers the assumptions listed above, as well as the projected annual departures for the Airport associated with the enplanement projections listed in the recommended forecast. A departure is considered a single operation, while an arrival is another. Simply put, departures equal one-half of total operations.

For future facility planning purposes, annual commercial operations are converted to operations by aircraft type for select years. The 2017 fleet mix was taken as the baseline, with adjustments for retiring fleet types (e.g. MD80s, Dash-8s, 50-seat regional jets) and reasonable replacement aircraft types through the forecast period. **Table 3-9** below shows the fleet mix and departures for FYs 2018, 2023, 2028, 2033, and 2038

Table 3-9: Commercial Fleet Mix

Aircraft Series	Aircraft Seats	Operations					
		2017	2018	2023	2028	2033	2038
RJ-700	63	1,718	2,301	4,123	7,147	8,717	8,879
EMB-175	63	4,056	5,026	8,174	8,314	8,461	8,616
RJ-900	76	1,498	1,686	1,844	2,029	2,128	2,168
EMB-190	76	2,188	2,431	2,343	2,253	2,160	2,064
A220	116	-	-	268	1,295	1,376	1,342
EMB-195*	114	0	40	245	832	846	903
A320-1/2	177	164	206	323	443	567	697
A319	128	338	384	415	448	481	516
B737-700	143	2	120	153	187	222	258
B737-8	162	60	120	153	187	222	258
B737-9	189	82	92	95	98	100	103
EMB-170	63	212	227	173	117	60	0
RJ-200/440	50	5,010	5,250	3,431	1,551	0	0
EMB-145*	50	5,508	5,571	2,527	0	0	0
B717-200	110	468	473	214	0	0	0
MD-80	166	66	71	0	0	0	0
DHC8-300	20	54	58	0	0	0	0
DHC8-200	39	24	26	0	0	0	0
Total Operations		21,448	24,082	24,480	24,899	25,340	25,804

Source: BTV, FlightAware, CHA, 2018.
**EMB-195 is projected to be the new E2 Series as a result of the Embraer/Boeing merger*

3.3.4 Recommended Commercial Forecast Summary

Table 3-10 shows a summary of the recommended commercial enplanements and operations forecast, with average seats per departure and percent of seats filled detailed. As mentioned earlier in this section, average aircraft size grows at 0.8 percent per year after 2022, similar to the 2017 National FAA TAF change in domestic average aircraft seats per mile. The percentage of seats filled results in 83.9 percent in 2038, an approximate total growth of 4.4 percent over the forecast period.

Table 3-10: Recommended Commercial Forecast

Year	Enplanements	Operations	Average Seats per Departure	Load Factor
2017	591,558	21,448	68.0	79.3%
2018	667,004	24,082	68.9	80.4%
2023	695,171	24,480	69.5	81.7%
2028	724,528	24,899	70.3	82.7%
2033	755,124	25,340	71.4	83.4%
2038	787,012	25,804	72.7	83.9%
AAGR 2018-2038	**0.8%**	**0.3%**	**0.3%**	**0.2%**
Growth 2018-2038	**18.0%**	**7.1%**	**5.5%**	**4.4%**

Source: FAA TAF, CHA, 2018.

3.4 Air Cargo Forecast

Air cargo traffic is comprised of freight, express, and airmail. Air cargo is typically transported via three different methods: commercial air carrier "belly cargo", dedicated all-cargo aircraft (integrators), or charter service cargo. Air cargo activity and demand is cyclical in nature and fluctuates based on national and global economic trends. Factors that affect air cargo growth are fuel price volatility, movement of real yields, and globalization.

This section develops forecasts for cargo volume and cargo operations. BTV's cargo activity is dominated by domestic traffic for the U.S. integrated air carriers, FedEx and Wiggins Airways (contract carrier for UPS). The future growth of cargo activity at BTV will primarily depend on growth in the demand for integrator cargo services provided by these carriers. Most of the traffic is next-day and second-day delivery traffic, which is affected by local consumer and business demand for both inbound and outbound services, specifically the continued expansion of e-commerce-based traffic. Traffic carried on other all-cargo operations and passenger aircraft will likely continue to contribute a minor amount of traffic. BTV does not have scheduled international all-cargo service due to a modest level of demand within BTV's service area. International cargo is typically received at the integrators hubs and distributed domestically thereafter. For the purposes of this forecast, only domestic air cargo was evaluated.

3.4.1 Cargo Volume

According to Airports Council International, BTV's cargo activity ranked 130th among U.S. airports in calendar year 2017 (in terms of all-cargo landed weights). In 2017, the United States' domestic cargo industry revenue ton miles (RTMs) was 14.6 billion [FAA Aerospace Forecast (Fiscal Years 2018-2038)], 5,400 tons of which were at BTV. The forecasts of cargo volume are based on the following assumptions:

- The FAA and TSA security regulations and restrictions on air cargo transportation will remain in place and continue to be enforced.
- The shift from air to ground transportation has occurred.
- Long-term cargo activity will correspond to economic growth.

The cargo forecasts will be based on research and findings by industry experts, such as those found in the *FAA Aerospace Forecast (FY 2018-2038)*, *Boeing World Air Cargo Forecast (2016-2017)*, and the *Airbus Global Market Forecast (FY 2018-2037)*. The findings are as follows:

- *FAA Aerospace Forecast (FY 2018-2038)* – Domestic cargo RTMs are forecast to grow 7.9 percent in 2018 as the United States' economic recovery accelerates, followed by an AAGR of 1.9 percent throughout the remainder of the forecast period.

- *Boeing World Air Cargo Forecast (2016-2017)* – The domestic economy is forecast to grow at an average annual rate of 2.3 percent through 2025 and 2.2 percent over the entire forecast period.
- *Airbus Global Market Forecast (FY 2018-2037)* – The domestic economy is forecast to grow at an annual rate of 1.5 percent through 2027, followed by average annual growth of 1.6 percent over the remainder of the forecast horizon.

Gross Domestic Product (GDP) is the main driver in air cargo activity and is used as the basis for the FAA, Boeing, and Airbus forecasts. When developing the cargo volume forecast, the 2018 level and future projections are set at the 2017 level and incremental growth was based on national trends in aviation and projected throughout the forecast period. The resulting volume levels for the traffic forecasts are shown in **Table 3-11**. The Boeing forecast produces the highest growth rate while the Airbus forecast produces the lowest growth rate for total volume.

Table 3-11: BTV Air Cargo Volume Forecasts Summary

Year	National FAA	National Boeing	National Airbus
2017	10,726,000	10,726,000	10,726,000
2018	11,573,354	10,972,698	10,886,890
2023	12,715,404	12,293,954	11,728,272
2028	13,970,150	13,720,528	12,659,588
2033	15,348,714	15,297,670	13,705,287
2038	16,863,314	17,056,101	14,837,361
AAGR 2018-2038	**1.9%**	**2.2%**	**1.6%**
Growth 2018-2038	**45.7%**	**55.4%**	**36.3%**

Note: volume is depicted in pounds (lbs.)
Source: FAA Aerospace Forecast (FY 2018-2038), Boeing World Air Cargo Forecast (2016-2017), Airbus Global Market Forecast (FY 2018-2037), Burlington Airport Commission, CHA, 2018.

The recommended forecast is the average of the three forecasts, which falls between the Airbus and FAA Aerospace forecasts. The average annual growth rate is 1.9 percent. The cargo volume forecast assumes that the average load for 2017 will apply for the entire forecast period. **Table 3-12** shows the forecasted totals in this scenario. For the entire results of the analysis, see **Appendix D.3**.

Table 3-12: Recommended Air Cargo Volume Forecast

Year	Volume (lbs.)
2017	10,726,000
2018	10,929,436
2023	12,005,976
2028	13,188,554
2033	14,487,616
2038	15,914,634
AAGR 2018-2038	**1.9%**
Growth 2018-2038	**45.6%**

Source: FAA Aerospace Forecast (FY 2018-2038), Boeing World Air Cargo Forecast (2016-2017), Airbus Global Market Forecast (FY 2018-2037), Burlington Airport Commission, CHA, 2018.

3.4.2 Cargo Operations

Like the all-cargo volume forecast, the recommended all-cargo operations forecast is based on the average of the FAA, Boeing, and Airbus forecasts, which was 1.9 percent.

Table 3-13 presents the estimated number of operations by the cargo carriers at BTV based on annual operations (full results available in **Appendix D.3**). It is anticipated that any additional capacity required will likely be accommodated by upsizing the aircraft in lieu of adding an additional flight.

Table 3-13 – Recommended Air Cargo Operations Forecast

Year	Operations
2017	1,396
2018	1,422
2023	1,563
2028	1,717
2033	1,886
2038	2,071
AAGR 2018-2038	**1.9%**
Growth 2018-2038	**45.6%**

Source: FAA Aerospace Forecast (FY 2018-2038), Boeing World Air Cargo Forecast (2016-2017), Airbus Global Market Forecast (FY 2018-2037), Burlington Airport Commission, CHA, 2018.

3.4.3 Cargo Fleet Mix

Air cargo fleet mix directly correlates to growth of air cargo traffic; therefore, as air cargo experiences growth, fleet mix expands to meet the projected needs. The freighter aircraft fleet is categorized as standard-body, medium-widebody, and large-widebody freighters. The projected fleet growth in the United States from 2016 to 2036 is depicted in **Table 3-14**.

Table 3-14: Domestic Cargo Freighter Fleet Forecast

Year	Widebody	Standard-Body	Total
2017	1,170	700	1,870
2037	1,980	1,280	3,260

Standard body freighters: less than 45 tons of carrying capacity. (Boeing 737-800)
Widebody freighters include Medium widebody and large freighters
Source: Boeing Commercial Market Outlook (2018-2037)

The change in domestic freighter fleet mix will consist of 1,260 aircraft being retired (670 widebody and 590 standard-body) and 980 widebody freighter deliveries that will be added to expand the fleet mix, meeting projected traffic growth.

Future fleet mix patterns for air cargo should remain relatively unchanged due to the consistency of the fleet mix over the historical time-period. For the integrators, the stability of BTV's role in their networks, the long operating life for freighter aircraft, and the ability to add converted passenger aircraft to replace aging freighter models contributes to this assumption. As such, the Boeing 757-200 and smaller model feeder cargo aircraft (Cessna Caravan 208, Aerei da Trasporto Regionale ATR-72), are projected to remain unchanged throughout the forecast period.

3.5 General Aviation and Military Forecast

General aviation (GA) includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations. General aviation represents the largest percentage of civil aircraft in the U.S. and accounts for most operations handled by towered and non-towered airports. Its activities include flight training, sightseeing, recreational, aerial photography, law enforcement, and medical flights, as well as business, corporate, and personal travel via air taxi charter operations. General aviation aircraft encompass a broad range of types, from single-engine piston aircraft to large corporate jets, as well as helicopters, gliders, and amateur-built aircraft.

Military activity is often included in the based aircraft and operations projections but are not forecast in the same manner as general aviation activity since their number, location, and activity levels are not a function of anticipated market and economic conditions, but are rather a function of military decisions, national security priorities, and budget pressures that cannot be predicted over the course of the forecast period. Typically, military based aircraft and military operations, for forecasting purposes, remain static at baseline year levels throughout the forecast period, unless more specific information is provided by the military.

General aviation and military operations are further categorized as either itinerant or local operations. Local operations are those performed by aircraft that remain in the local traffic pattern or within a 20-mile radius of the tower. Local operations are commonly associated with training activity and flight instruction and include touch and go operations. Itinerant operations are arrivals or departures, other than local operations, performed by either based or transient aircraft that do not remain in the airport traffic pattern or within a 20-nautical mile radius. It is important to note that as shown in **Table 3-15**, the TAF indicates low growth in GA operations at BTV. For GA operations at FAA facilities, the FAA TAF uses trend models to project growth in the future. Based on the historical decline in GA activity, the TAF will not project growth at BTV until trends show incremental growth in consecutive years; however, growth is expected at BTV in the short- and long-term projections and will be detailed in subsequent sections.

Table 3-15: FAA TAF (Condensed to GA Only)

Year	Itinerant Operations			Local Operations			Total Itinerant and Local Operations	Based Aircraft
	GA	Military	Total	GA	Military	Total		
2017	22,148	3,357	25,505	11,838	1,789	13,627	39,132	115
2018	22,481	3,357	25,838	11,138	1,789	12,927	38,765	116
2023	22,636	3,357	25,993	11,133	1,789	12,922	38,915	123
2028	22,791	3,357	26,148	11,128	1,789	12,917	39,065	133
2033	22,946	3,357	26,303	11,123	1,789	12,912	39,215	143
2038	23,101	3,357	26,458	11,118	1,789	12,907	39,365	153
AAGR 2018-2038	**0.1%**	**0.0%**	**0.1%**	**-0.01%**	**0.0%**	**-0.01%**	**0.1%**	**1.4%**
Growth 2018-2038	**2.8%**	**0.0%**	**2.4%**	**-0.2%**	**0.0%**	**-0.2%**	**1.5%**	**31.9%**

Source: FAA TAF, CHA, 2018.

3.5.1 GA Based Aircraft Forecasts and Methodologies

Like commercial operations forecasts, the FAA provides multiple methodologies to be used to forecast GA based aircraft. To determine the most reasonable scenario for BTV, it is necessary to compare and eliminate those forecasts that do not support the key factors and variables that comprise the specific direction of the Airport and its market. This section provides the methodology used, as well as methodologies that were analyzed, for the development of the forecasts of GA based aircraft at BTV. The following methodologies, and results therein, are described in the following sections, with a summary of the results shown in **Table 3-16**. For full results of each scenario, see **Appendix D.4**.

Adjusted TAF Forecast Scenario

This scenario takes the FAA's projected based aircraft annual growth for 2018-2038 and applies that assumption to actual airport-reported data. In other words, the TAF growth is applied to an actual 2017 based aircraft count and projected throughout the forecast period. For example, the 2018 TAF has an estimated 2017 based aircraft count of 115. According to airport records, the actual number of based aircraft was 92. The year-to-year TAF growth rate was then applied to the actual 92 based aircraft and projected from 2018 through 2038. The result of this methodology was 123 based aircraft in 2038, approximately 19.6 percent below the 153 reported in the TAF.

FAA Aerospace Forecast Scenario

This forecasting approach analyzes data provided in the FAA Aerospace Forecast (FY 2018-2038), such as annual aircraft projections by category, and then projects growth for based aircraft at the Airport based on these growth rates. This assumes that the Airport's GA based aircraft will grow at the FAA projected national rates while maintaining their respective share of fleet throughout the forecast period. As shown in **Table 3-16**, the growth is conservative compared to the TAF. A detailed evaluation of the Aerospace methodology identified the single-engine market at BTV decreasing (from 45 single-engine aircraft in 2017 to 36 by 2038), while turbo-prop and multi-engine aircraft appear to remain unchanged. Rotorcraft are expected to increase by one aircraft, while jet aircraft show significant growth (eight additional jet aircraft by 2038).

Market Share Scenario

Similar to enplanements, a Market Share forecast is a "top-down" method where projected growth rates of larger aggregates (e.g., the nation) are used to derive forecasts for smaller areas (e.g., airports). Future BTV based aircraft were estimated by multiplying the future share trend and the FAA TAF for

National, New England Region, and State based aircraft numbers. Between the State, Eastern Region, and National projections, BTV ranges from 92 to 111 based aircraft, resulting in relatively conservative growths within the BTV market for based aircraft.

Table 3-16: Based Aircraft Forecast Comparisons

Year	FAA TAF	Adjusted TAF	FAA Aerospace	Market Share		
				Static National	Static Regional	Static State
2017	115	92	92	92	92	92
2018	116	93	92	93	93	92
2023	123	100	92	97	97	93
2028	133	107	92	100	102	95
2033	143	115	92	104	106	97
2038	153	123	92	108	111	99
AAGR 2018-2038	**1.4%**	**1.4%**	**0.0%**	**0.8%**	**0.9%**	**0.4%**
Growth 2018-2038	**31.9%**	**31.9%**	**0.2%**	**16.6%**	**19.7%**	**7.5%**

Source: FAA Aerospace Forecast FY 2018-2038, FAA 2018 TAF, Airport Master Record (Form 5010), Burlington Airport Commission, CHA, 2018.

Based on discussions with the Fixed Based Operator (FBO) and other general aviation users at BTV, growth is anticipated in based aircraft in the future. The forecast scenarios in Table 2-15 have a high degree of variability; however, it is believed that the modest growth scenario is appropriate for BTV. As such, a The Static Regional Market Share scenario was chosen as the recommended GA based aircraft forecast.

3.5.2 GA Operations Forecast

According to the FAA, the "Air Taxi & Commuter" category of FAA reported operations data includes both scheduled Air Carrier operations with 60-seats or less (i.e., this will include all 50-seat regional jet operations) and business and charter jet operations (Part 135). As such, the Air Taxi & Commuter category of the FAA 2018 TAF includes both scheduled airlines and business/charter general aviation operations. The following describes the difference between Air Carrier and Air Taxi & Commuter operations, as defined by the FAA.

- **Air Carrier** – Operations with aircraft designed to have a seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. This includes US and foreign flagged carriers.
- **Air Taxi & Commuter** – Operations with aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation.

To accurately gauge commercial air carrier operations in comparison to GA operations when examining air taxi & commuter operations data, it is necessary to split GA Air Taxi operations from the Commercial Air Carrier operations to account for the scheduled air carrier operations using 50-seat regional jet aircraft.

This is accomplished by calculating the total scheduled commercial air carrier operations at BTV and applying the split to account for Air Carrier operations categorized under Air Taxi & Commuter operations and reclassifying those operations as commercial airline operations. By removing the

scheduled commercial operations from the Air Taxi & Commuter operations (which contributes to the steep decline in operations due to 50-seat aircraft phasing out) and categorizing operations at the Airport by air carrier and GA, both categories then project growth throughout the forecast period.

Table 3-17 shows a comparison between BTV-reported GA operations with the previously described split, as well as the FAA-reported operations numbers for 2017. Based on schedule data and commercial aircraft operations counts, these operations were performed by scheduled air carriers utilizing 50-seat regional jet aircraft; therefore, they were counted in the Air Carrier category. It is important to note that all cargo operations (schedule, and non-scheduled) are included within the GA Itinerant operations counts.

Table 3-17: FAA TAF vs. BTV Actual Total Airport Operations (With Split)

Source	Year	Itinerant				Local	Total Military	Total Operations	Based Aircraft
		Air Carrier	Air Taxi	GA	Total Itinerant	GA			
FAA	**2017**	11,266	15,411	22,148	48,825	11,838	5,146	65,809	115
BTV (adjusted)	**2017**	21,467	-	26,890	48,357	11,838	8,567[28]	68,762	92

Note: Cargo operations are included in GA operations.
Source: FAA 2017 TAF, Airport Master Record (Form 5010), U.S. Air Force, Burlington Airport Commission, CHA 2018.

Adjustment calculation example (All numbers provided by Burlington Airport Commission and shown in **Appendix D.4**):

- Air Carrier + Air Taxi = Total Air Carrier and Air Taxi Operations
  → 11,266 + 15,411 = **26,677**
- Total Air Carrier and Air Taxi Operations – Actual Air Carrier Operations = Adjusted Air Taxi
  → 26,677 – 21,467 = **5,210**
- Adjusted Air Taxi + Airport Reported Itinerant GA = Actual Itinerant GA
  → 5,210 + 21,680 = **26,890**
- Actual Itinerant GA + Local GA = Actual Air Taxi and GA
  → 26,890 + 11,838 = **38,728 (Combined GA Itinerant and Local Operations)**

3.5.2.1 Forecast Methodologies

Like commercial operations forecasts and GA based aircraft forecasts, several methodologies exist that could be used to forecast GA operations. To determine the most plausible and reasonable scenario for BTV, it is necessary to compare and eliminate those forecasts that do not support the key factors and variables that comprise the specific operational direction of the Airport. This section provides the methodology used, as well as methodologies that were analyzed, for the development of the forecasts of general aviation operations at BTV. A summary of the results shown in **Table 3-18**, while the full results of each scenario can be found in **Appendix D.4**. It is important to note that all cargo operations have been extracted prior to performing the methodologies listed below.

[28] United States (U.S.) Air Force (2013 September) *Final Environmental Impact Statement for United States Air Force F-35A Operational Basing*. Available at: https://www.158fw.ang.af.mil/Portals/52/Vol%20I%20F-35A%20Ops%20FEIS%2010Sept13.pdf?ver=2018-01-18-111249-890 (Accessed 27 November 2018).

Historical Growth Scenario

Historical Growth is a time trend analysis that uses the airport's historical activity as a metric to provide future growth projections. These historical trends are typically developed as 3-, 5-, and 10-year historical trends. These historical growth rates are then extrapolated over the forecast horizon (20 years). Over the last decade, BTV has experienced a sharp decline in GA activity, from 56,216 total itinerant and local ops in 2008 to 37,332 total ops in 2017. It is highly improbable that this decrease in activity will continue; as such, the Historical Growth Scenario was considered unreliable and was not used for this forecasting effort.

Operations Per Based Aircraft (OPBA) Scenario

This is a straightforward forecasting methodology which assumes the total number of annual operations is representative of the number of aircraft based at BTV. At BTV, itinerant traffic makes up approximately 69.4 percent of all GA activity at the Airport. These operations are typically performed by aircraft based at BTV flying charter and corporate aviation operations or flight training (where the flights leave the local airport airspace and return, i.e., cross country flight training). When projecting operations using OPBA for BTV, it is assumed that OPBA will remain static throughout the forecast period (406 OPBA). The results of this scenario will serve as the recommended GA operations forecast for BTV. **Appendix D.4** includes a breakdown between itinerant and local GA operations.

Market Share Scenario

This scenario compares local GA activity levels with aggregate level trends. This methodology assumes that the activity of any one airport is regular and predictable in accordance with the average of airports within the market. An evaluation of local, regional, state, and national FAA GA projections was performed.

Table 3-18: General Aviation Operations Forecast Comparisons

Year		Historical Trends				Market Shares		
	FAA TAF	3-Year	5-Year	10-Year	OPBA*	Static National	Static Regional	Static State
2017	39,132	37,332	37,332	37,332	37,332	37,332	37,332	37,332
2018	38,765	36,337	36,789	35,960	37,655	37,508	37,074	37,387
2023	38,915	35,268	36,693	30,075	39,449	38,143	37,218	37,453
2028	39,065	38,246	39,770	25,483	41,263	38,823	37,364	37,520
2033	39,215	43,572	45,099	21,838	43,101	39,555	37,513	37,587
2038	39,365	50,622	52,296	18,895	45,063	40,349	37,664	37,653
AAGR 2018-2038	**0.1%**	**1.7%**	**1.8%**	**-3.2%**	**0.9%**	**0.4%**	**0.1%**	**0.0%**
Growth 2018-2038	**1.5%**	**39.3%**	**42.2%**	**-47.5%**	**19.7%**	**7.6%**	**1.6%**	**0.7%**

Scenario results based on the recommended based aircraft forecast
Note: Excludes Cargo and Military Operations.
Source: Airport Master Record (Form 5010), Burlington Airport Commission, CHA 2018.

3.5.3 Military Operations Forecast

Burlington International Airport is utilized by the Burlington Air Guard Station (AGS) 158th Fighter Wing (158 FW). They currently operate 18 F-16 aircraft with a baseline operation count of 8,099, along with 468 operations due to aircraft other than the F-16 (resulting in 8,567 operations), as per the *United States Air Force F-35A Operational Basing Environmental Impact Statement (EIS).* Due to military needs, Burlington AGS proposes a fleet overhaul with the newer F-35A aircraft replacing the current F-16's by the end of 2020. Under the proposed action, all F-16 aircraft will be retired from Burlington AGS and replaced on a one for one basis. The first two F-35A aircraft will arrive in September 2019. The

remaining 16 aircraft will enter service and be fully operational by mid-2020. According to the USAF EIS, this is expected to result in 5,486 airfield operations at BTV. This results in a net reduction of 2,613 annual military and fighter jet operations at BTV.

3.5.4 General Aviation Recommended Forecast Summary

The following table presents a summary of the recommended GA activity forecasts for based aircraft and operations, along with military activity as detailed in the previous sections. Based on the transient nature of the corporate growth market at BTV, the OPBA scenario (assuming that OPBA, which is 406, will remain static throughout the forecast period) was believed to be the most reasonable scenario for the BTV forecast based on the nature of GA itinerant operations of aircraft based at the Airport's FBO. **Table 3-19** presents the summary of the preferred GA forecast for based aircraft and operations by type. The recommended GA Forecast can be found in **Appendix D.4**.

Table 3-19: Recommended GA Forecast

Year	Based Aircraft	Operations				Total GA Operations
		Itinerant	Local	Total Civil	Military	
2017	92	25,494	11,838	37,332	8,567	45,899
2018	93	25,715	11,940	37,655	8,567	46,222
2023	97	26,940	12,509	39,449	5,954	45,403
2028	102	28,178	13,084	41,263	5,954	47,217
2033	106	29,433	13,667	43,101	5,954	49,055
2038	111	30,773	14,289	45,063	5,954	51,017
AAGR 2018-2038	**0.9%**	**0.9%**	**0.9%**	**0.9%**	**-1.8%**	**0.5%**
Growth 2018-2038	**19.7%**	**19.7%**	**19.7%**	**19.7%**	**-30.5%**	**10.4%**

Note: Excludes Cargo Operations.
Source: Airport Master Record (Form 5010), CHA, 2018.

3.6 Recommended Forecast Summary

The following tables present a summary of the preferred aviation activity forecasts for air carrier activity (operations and enplanements), GA activity (based aircraft and operations), and military activity as detailed in the previous sections. Additionally, direct comparisons to the FAA's TAF for BTV are provided for evaluation purposes. The recommended forecasts are the preferred projections on which future planning for the Airport will be based. **Table 3-20** presents the complete summary of the preferred forecast for based aircraft, enplanements, and operations by type.

Table 3-21 details the recommended forecast of enplanements and total airport operations (all activity types) in comparison to the FAA TAF forecast. At the end of the planning period, the recommended forecast predicts a level of enplanements 5.0 percent above the BTV TAF, and total Airport operations 22.0 percent above what is reported in the TAF. Per FAA requirements, forecasts should be within 10 percent of the TAF in the first 5 years and 15 percent in 10 years, as set forth by the FAA in AC 150/5070-6B*, Airport Master Plans,* for approval of Master Plan forecasts.

Table 3-20: Recommended Forecast Summary

Year	Based Aircraft	Enplanements	Total Operations				
			Air Carrier	GA	Cargo	Military	Total
2017	92	591,558	21,467	37,332	1,396	8,567	68,762
2018	93	667,004	24,082	37,655	1,422	8,567	71,727
2019	94	672,545	24,160	37,984	1,449	8,567	72,161
2020	95	678,131	24,239	38,350	1,477	8,567	72,633
2021	95	683,764	24,318	38,717	1,505	5,954	70,494
2022	96	689,444	24,399	39,027	1,534	5,954	70,913
2023	97	695,171	24,480	39,449	1,563	5,954	71,446
2024	98	700,946	24,562	39,822	1,592	5,954	71,930
2025	99	706,768	24,645	40,176	1,622	5,954	72,397
2026	100	712,639	24,729	40,536	1,653	5,954	72,872
2027	101	718,559	24,814	40,903	1,685	5,954	73,355
2028	102	724,528	24,899	41,263	1,717	5,954	73,832
2029	103	730,546	24,986	41,629	1,749	5,954	74,318
2030	103	736,614	25,073	41,995	1,782	5,954	74,805
2031	104	742,733	25,161	42,356	1,816	5,954	75,287
2032	105	748,903	25,250	42,728	1,850	5,954	75,783
2033	106	755,124	25,340	43,101	1,886	5,954	76,281
2034	107	761,396	25,431	43,486	1,921	5,954	76,792
2035	108	767,721	25,523	43,864	1,958	5,954	77,299
2036	109	774,098	25,616	44,249	1,995	5,954	77,814
2037	110	780,528	25,709	44,647	2,033	5,954	78,343
2038	111	787,012	25,804	45,063	2,071	5,954	78,892
AAGR 2018-2038	**0.9%**	**0.8%**	**0.3%**	**0.9%**	**1.9%**	**-1.8%**	**0.5%**
Growth 2018-2038	**19.7%**	**18.0%**	**7.1%**	**19.7%**	**45.6%**	**-30.5%**	**10.0%**

Source: Airport Master Record (Form 5010), FAA TAF, FAA Aerospace Forecast (FY 2018-2038), Boeing World Air Cargo Forecast (2016-2017), Airbus Global Market Forecast (FY 2018-2037), U.S. Air Force, Burlington Airport Commission, CHA, 2018.

Table 3-21: Recommended Forecast vs. FAA TAF

Year	Enplanements			Operations		
	TAF	Recommended Forecast	Recommended Forecast vs. TAF	TAF	Recommended Forecast	Recommended Forecast vs. TAF
2017	585,099	591,558	1.1%	65,809	68,762	4.5%
2018	635,407	667,004	5.0%	67,136	71,727	6.8%
2023	665,850	695,171	4.4%	61,380	71,446	16.4%
2028	693,485	724,528	4.5%	62,343	73,832	18.4%
2033	721,769	755,124	4.6%	63,511	76,281	20.1%
2038	749,730	787,012	5.0%	64,686	78,892	22.0%
AAGR 2018-2038	**0.8%**	**0.8%**	-	**-0.2%**	**0.5%**	-
Growth 2018-2038	**18.0%**	**18.0%**	-	**-3.6%**	**10.0%**	-

Source: FAA TAF, Burlington Airport Commission, CHA, 2018.

As previously discussed, per FAA requirements, forecasts should be within 10 percent of the TAF in the first 5 years and 15 percent in 10 years. However, the operations forecast falls outside of these

parameters. This can be attributed to three factors; the increase in cargo, military, and GA operations projected at BTV and the difference between the TAF Air Carrier and military operations and actual operations in the base year. The FAA TAF shows static GA forecasts for the 20-year planning period and the recommended forecast shows moderate growth. Military operations were a major contributing factor of the discrepancy since the USAF shows 8,567 annual operations at BTV as opposed to the TAF's 5,146 annual operations in the base year. Additionally, the TAF did not account for the new commercial air service slated to begin in 2019. Although operations are outside FAA criteria, the percent difference is not expected to have an impact on airfield facility requirements.

3.7 Peak Activity Forecasts

Commercial service airports experience peaks in enplanements, commercial air carrier operations, and total airport operations that drive demand for various areas of airport infrastructure. To properly plan, size, and design passenger terminal facilities, we must understand peak month-average day (PMAD) and peak hour demand.

The peak month is the calendar month when the highest level of enplanements and commercial aircraft operations typically occur. When developing the forecast, August was determined to be BTV's peak month and was used for all peak evaluations. PMAD is simply the total commercial operations, or total enplanements, divided by the number of days in the peak month (31). To provide the necessary metrics for the demand/capacity analysis, PMAD is forecast for the following: enplanements, total passengers (enplaned and deplaned), commercial air carrier operations, and total aircraft operations (commercial, cargo, GA, and military). Peak hours for enplanements, deplanements, total passengers, and commercial operations are determined when further evaluating the Airport's schedule and reported operations during its peak month and peak day. All peak hour analyses are based on a 90-minute rolling basis.

Peak enplanements, deplanements, and peak total passengers have direct impacts on the terminal (e.g., ticketing and baggage claim) and landside (e.g., access roads and parking) facilities. Terminal facilities are generally designed to accommodate enplanements on the average day during the peak month, rather than the absolute peak level of activity. Peak commercial air carrier operations define the demand for airside facilities (e.g., gates and ramp), while peak hour airport operations determine runway capacity and airfield needs.

3.7.1 Peak Enplanements and Deplanements

Table 3-22 presents the peak analysis for enplanements at BTV. Enplaned passengers are those that depart the airport via an air carrier. The peak hour for enplanements is between 5:55 am and 7:25 am.

Table 3-22: Peak Enplanements

Year	Annual	Peak Month % of Total Annual	Peak Month	PMAD % of Peak Month	PMAD	Peak Hour % of PMAD	Peak Hour
2018	667,004	9.8%	65,640	3.2%	2,117	37.8%	801
2023	695,171	9.8%	68,412	3.2%	2,207	37.8%	835
2028	724,528	9.8%	71,300	3.2%	2,300	37.8%	870
2033	755,124	9.8%	74,311	3.2%	2,397	37.8%	907
2038	787,012	9.8%	77,450	3.2%	2,498	37.8%	945

Source: Burlington Airport Commission, CHA, 2018.

Table 3-23 presents the PMAD and peak hour for deplanements at BTV. Deplaned passengers are those that are arriving at the airport via an air carrier. The peak hour for deplanements was determined to be between 10:10 pm and 11:40 pm (22:10 and 23:40).

Table 3-23: Peak Hour Deplanements

Year	PMAD	Peak Hour % of PMAD	Peak Hour
2017	1,842	36.3%	668
2018	2,082	36.3%	756
2023	2,170	36.3%	788
2028	2,262	36.3%	821
2033	2,357	36.3%	856
2038	2,457	36.3%	892

Source: Burlington Airport Commission, CHA, 2018.

3.7.1.1 Peak Passengers

When conducting the analyses for peak passengers, the data sets for enplanements and deplanements are compiled. It was determined that the peak hour for passengers was between 5:55 pm and 7:25 pm (17:55 and 19:25). The results of the peak passenger analyses are presented in **Table 3-24**.

Table 3-24: Peak Passengers

Year	Annual	Peak Month % of Total Annual	Peak Month	PMAD % of Peak Month	PMAD	Peak Hour % of PMAD	Peak Hour
2017	1,181,522	9.8%	115,307	3.2%	3,720	21.7%	806
2018	1,334,008	9.8%	130,188	3.2%	4,200	21.7%	910
2023	1,390,342	9.8%	135,686	3.2%	4,377	21.7%	948
2028	1,449,055	9.8%	141,416	3.2%	4,562	21.7%	988
2033	1,510,248	9.8%	147,388	3.2%	4,754	21.7%	1,030
2038	1,574,024	9.8%	153,612	3.2%	4,955	21.7%	1,073

Source: Burlington Airport Commission, CHA, 2018.

3.7.1.2 Peak Operations

Air carrier operations, as depicted in **Table 3-25**, account for all take offs and landings performed by the airlines serving BTV. It was determined that the peak hour for operations is 5:20 pm to 6:50 pm (17:20 to 18:50).

Table 3-25: Peak Commercial Operations

Year	Annual	Peak Month % of Annual	Peak Month	PMAD % of Peak Month	PMAD	Peak Hour % of PMAD	Peak Hour
2017	21,467	9.3%	2,003	3.2%	65	17.0%	11
2018	24,082	9.3%	2,247	3.2%	72	17.0%	12
2023	24,480	9.3%	2,284	3.2%	74	17.0%	13
2028	24,899	9.3%	2,323	3.2%	75	17.0%	13
2033	25,340	9.3%	2,364	3.2%	76	17.0%	13
2038	25,804	9.3%	2,408	3.2%	78	17.0%	13

Source: Burlington Airport Commission, CHA, 2018.

Peak airport operations, as shown in **Table 3-26**, represent all air carrier, cargo, GA, and military operations (take offs and landings, but excluding touch-and-go operations) at BTV.

Table 3-26: Peak Month Average Day Total Airport Operations

Year	Annual	Peak Month % of Annual	Peak Month	PMAD % of Peak Month	PMAD	Peak Hour
2017	68,762	9.9%	6,797	3.2%	219	22
2018	71,727	9.9%	7,090	3.2%	229	23
2023	71,446	9.9%	7,063	3.2%	228	23
2028	73,832	9.9%	7,299	3.2%	235	23
2033	76,281	9.9%	7,541	3.2%	243	24
2038	78,892	9.9%	7,799	3.2%	252	25

Note: Total Airport Operations accounts for Commercial, GA, Military, and Cargo operations.
Source: FAA TAF, FAA Operations Network (OPSNET), Airport Master Record (Form 5010), U.S. Air Force, Burlington Airport Commission, CHA, 2018.

3.8 Current and Projected Critical Aircraft

Evaluating the Airport's current fleet mix and determining the current design aircraft, as well as the projected design aircraft, are important aspects of the Master Plan Study. The design aircraft (commonly referred to as the "critical aircraft") determination is a key consideration in FAA decision making on project justification.

3.8.1 Aircraft Classification

The FAA has established aircraft classification systems that group aircraft types based on their performance and geometric characteristics. These classification systems (described below) are used to determine the appropriate airport design standards for specific runway, taxiway, taxilane, apron, or other facilities, as described in FAA AC 150/5300-13A, *Airport Design*. The standard classifications are summarized in **Table 3-27**.

- **Aircraft Approach Category (AAC)** – AAC is a grouping of aircraft based on a reference landing speed (VREF), if specified, or if VREF is not specified, 1.3 times stall speed (VSO) at the maximum certificated landing weight. VREF, VSO, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.
- **Airplane Design Group (ADG)** – ADG is a classification of aircraft based on wingspan and tail height. When the aircraft wingspan and tail height fall in different groups, the higher group is used.
- **Taxiway Design Group (TDG)** – TDG is a classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

Table 3-27 – Aircraft Classification Criteria: AAC & ADG

Aircraft Approach Category (AAC)			
Approach Category	**Air Speed (knots)**		**Example Aircraft**
A	<91		Cessna Caravan, Pilatus PC-12
B	91 ≤ 121		Bombardier CRJ-700, Cessna Citation X
C	121 ≤ 141		McDonnell Douglas MD-80, Boeing 737-7, Airbus A320
D	141 ≤ 166		Boeing 737-8/9, Boeing 767-4, Gulfstream G650
E	166+		Military Fighter Jets
Airplane Design Group (ADG)			
Design Group	**Tail Height (ft.)**	**Wingspan (ft.)**	**Example Aircraft**
I	<20	<49	Cessna 152, Citation CJ1 (Model C525)
II	20-<30	49 ≤ 79	Bombardier CRJ-2/4, Cessna Caravan
III	30-<45	79 ≤ 118	McDonnell Douglas MD-80, Boeing 737-7
IV	45-<60	118 ≤ 171	Boeing 757-2, Boeing 767-4
V	60-<66	171 ≤ 214	Airbus A330-3
VI	66-<80	214 ≤ 262	Airbus A380-800, Boeing 787

Source: FAA AC 150/5300-13A Airport Design, CHA, 2018.

The applicability of these classification systems to the FAA airport design standards for individual airport components (such as runways, taxiways, or aprons) is presented in **Table 3-28**.

Table 3-28: Applicability of Aircraft Classifications

Aircraft Classification	Related Design Components
Aircraft Approach Speed (AAC)	Runway Safety Area (RSA), Runway Object Free Area (ROFA), Runway Protection Zone (RPZ), runway width, runway-to-taxiway separation, runway-to-fixed object
Airplane Design Group (ADG)	Runway, Taxiway, and apron Object Free Areas (OFAs), parking configuration, taxiway-to-taxiway separation, runway-to-taxiway separation
Taxiway Design Group (TDG)	Taxiway width, radius, fillet design, apron area, parking layout

Source: FAA AC 150/5300-13A Airport Design, CHA, 2018.

3.8.2 Design Aircraft Family

The "design aircraft" or "design aircraft family" represents the most demanding aircraft or grouping of aircraft with similar characteristics (relative to AAC, ADG, TDG) that are currently using or are anticipated to use an airport on a regular[29] basis. Upon review of the FAA's ETMSC data, OAG data, T100 and forecast fleet mix assumptions described in this chapter, the design aircraft family identified for BTV is presented in **Table 3-29**. This grouping represents the typical commercial aircraft and cargo aircraft anticipated to operate at BTV over the planning horizon. These aircraft generally have higher AAC, ADG, and TDG classifications than the other regularly scheduled commercial aircraft. While the Study is not limited to planning for the design aircraft, it must still be considered when planning airfield and landside facilities as they may require specific facility design accommodations within their designated areas of operation. The current and future critical aircraft for taxiway design is the Boeing 757-200 (TDG 4).

[29] According to FAA AC 150/5000-17, *Critical Aircraft and Regular Use Determination*, the terminology of "regular use" is defined as 500 annual operations, including itinerant and local operations but excluding touch-and-go operations. An operation is either a takeoff or landing.

Table 3-29– Design Aircraft Family

Aircraft	Total Operations (2017)	Total Operations (2038)	AAC	ADG	TDG	AAC		ADG		TDG
						Approach Speed (knots)	Wingspan (ft.)	Tail Height (ft.)	CMG (ft.)	MGW (ft.)
Operated by Passenger Airlines										
B737	1	544	C	III	3	130	117.42	41.58	46.58	22.92
A319	169	481	C	III	3	126	111.88	39.73	44.9	29.36
A320-1/2	82	567	C	III	3	136	111.88	39.63	50.2	29.36
EMB-175	2,028	8,461	C	III	3	124	85.3	32.12	41.6	20.34
Cargo Operations										
Boeing 757	543	1,396	C	IV	4	137	124.83	45.08	72	28

Source: Burlington Airport Commission, CHA, 2018.

3.8.3 Airport & Runway Classification

The FAA classifies airports and runways based on their current and planned operational capabilities. These classifications (described below), along with the aircraft classifications defined previously, are used to determine the appropriate FAA standards (per AC 150/5300-13A) for airfield facilities.

The Airport Reference Code (ARC) is an airport designation that represents the AAC and ADG of the aircraft that the airfield is intended to accommodate on a regular basis. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport. The Boeing 757 is identified as the current overall critical aircraft. The future critical aircraft for airfield and pavement design is expected to remain the Boeing 757 (AAC C-IV, TDG 4).

Per FAA requirements, an appendix (**Appendix D.6**) has been included that provides a condensed look at the various forecast levels and growth rates, which include peaks, as well as operational factors at BTV as presented in this chapter.