CHAPTER 4 – FORECASTS OF AVIATION DEMAND AND CAPACITY

In order to identify Airport facility needs during the planning period, it is necessary to accurately depict the current aviation use of the Airport, and to project future aviation demand levels. This chapter summarizes current aircraft usage at the Airport and documents the projected aviation demand for the Airport during the 20-year planning period of this study.

The forecasts presented in this chapter provide short-(0-5 years), mid-(6-10 years), and long-term (11-20 year) projections of aviation activity at CQX for the years 2023, 2028, and 2038. It is important, however, to view the projections independently of specific years and to consider the actual growth of activity as the impetus that influences the need for future airport facilities. Similarly, slower than projected growth may warrant deferment of planned improvements. Actual growth activity should be periodically (i.e. annually) compared to projected growth, so scheduled corrections can be identified and implemented.

4.1 OVERVIEW OF AVIATION FORECASTS

The objective of forecasting an airport's activity is to identify the factors that influence aviation demand so that future infrastructure and facility needs can be determined. The FAA's Terminal Area Forecast (TAF)[1] is the standard benchmark of an airport's future activity and serves as the basis for FAA planning. Therefore, this forecast uses the most recent TAF (2017-2045) as a starting point for analysis. In addition to the TAF, FAA Aerospace Forecasts[2], airport historic reports, and unique local factors will be reviewed and analyzed to further complement the TAF.

Forecasting aviation activity serves two primary purposes in the development of this master plan. Specifically, forecasts provide the basis for:

- Determining the necessary capacity of the airfield and terminal area; and
- Identifying the future facilities required to support demand, including determining the size and implementation thereof.

The demand for aviation facilities is typically expressed in terms of based aircraft and aircraft operations. Preparation of aviation activity forecasts is essential in assessing the needs and requirements for future aviation development. CQX's aviation forecasts serve as an overall planning guide for identifying airport capacity needs and as the basis for preparing airport alternatives. This forecast consists of layers of information that build upon each other to provide a sound foundation to support final conclusions. These layers include:

- Defining the various forecasting methodologies to be employed;
- Historical aviation data upon which forecasting methods rely;
- Analysis of the validity of the forecast; and
- Provision of a summary of the forecast's findings.

[1] FAA Terminal Area Forecasts (https://www.faa.gov/data_research/aviation/taf/)
[2] FAA Aerospace Forecasts (https://www.faa.gov/data_research/aviation/aerospace_forecasts/)

Once the aviation forecasts are complete, the relationship between aviation demand, airfield capacity, and facilities can be established. This is done in the next chapter, Chapter 5 – Facility Requirements.

The following terms are used frequently in airport forecasts, and their meanings are often confused with each other even though they are quite different. For clarification, the meaning of each of these terms is presented below.

Based Aircraft- this term refers to where an airplane makes its home or, in the case of CQX, an aircraft whose "home" is at the Airport.

Transient Aircraft- this term refers to an airplane whose "home" is at an airport other than the airport for which the forecast is being produced. In other words, any aircraft that uses CQX, but whose home base is at another airport is considered a transient aircraft.

Local Operation- a local operation is one where an aircraft operates within 20 nautical miles of the airport for which the forecast is prepared. A local operation can be performed by either a based or transient aircraft.

Itinerant Operation- an itinerant operation is one where an aircraft operates at a greater distance than 20 nautical miles of the airport for which the forecast is prepared. Again, an itinerant operation can be performed by either a based or transient aircraft.

4.1.1 TERMINAL AREA FORECAST

The TAF represents the FAA's forecast of aviation activity for U.S. airports and provides a summary of historical and forecast statistics on passenger demand and aviation activity. The TAF is prepared to meet the budget and planning needs of the FAA and provide information for use by state and local authorities, the aviation industry, and the public. Forecasts of itinerant general aviation operations and local civil operations at FAA facilities are based primarily on time series analysis. Because military operations forecasts have national security implications, the Department of Defense provides only limited information on future aviation activity. Hence, the TAF projects military activity at its present level except when FAA has specific knowledge of a change. For non-FAA facilities, historic operations in the TAF are taken from the Form 5010 (Master Airport Record) data. These operation levels are held constant for the forecast unless otherwise specified by a local or regional FAA official.

4.1.2 FAA AEROSPACE FORECAST

The second set of FAA forecasts consulted were the FAA Aerospace Forecasts, FY 2018-2038. The Aerospace Forecast provides an overview of aviation industry trends and expected growth for the commercial passenger carrier, cargo carriers, and general aviation activity sectors. National growth rates in enplanements, operations, fleet growth, and fleet mix for the general aviation fleet are provided over a 20-year forecast horizon.

In review of the FY 2018-2038 Aerospace Forecast, the forecast highlights that the general aviation industry recorded an increase of 4.2 percent in deliveries in 2017, with piston engine aircraft up by 9.5 percent and turbine aircraft about the same as the previous year, while business jet deliveries saw a slight decrease of 0.2 percent. General aviation activity at contract tower airports recorded a 0.1 percent

increase in 2017 as local activity rose 0.9 percent, more than offsetting a 0.5 percent decline in itinerant operations.

According to the 2018-2038 Aerospace Forecast, the long-term outlook for general aviation, driven by turbine aircraft activity, remains stable. The active general aviation fleet is projected to remain around its current level, with the declines in the fixed-wing piston fleet being offset by increases in the turbine, experimental, and light sport fleets. The total active general aviation fleet is estimated to increase by approximately 185 aircraft by 2038. The forecast expects continued growth of turbine powered fleet, including rotorcraft at an average rate of 2.0 percent per year.

4.2 AIRPORT SERVICE AREA

Determining CQX's service area is an important component in estimating future aviation demand. The service area for airports is heavily influenced by a number of factors, including but not limited to:

- Proximity of an airport to an aircraft owner's home or business;
- Level of convenience, services and capabilities available at the airport;
- Level of convenience, services, and capabilities available at competing airports; and
- Population and economic characteristics from which the airport draws its users, both existing and potential.

In an effort to define CQX's service area, this report relies on the home zip codes of each based aircraft owner. Based on the proximity of the home zip code of each based aircraft owner to the airport, the service area was determined to be the County of Barnstable, Massachusetts, as 80 percent of based aircraft owners reside in the County (see Figure 4-1).

The following public use airports exist within the Airport's Service Area:

- Barnstable Municipal Airport (HYA), Hyannis, MA: HYA is a towered airport with two paved runways – Runway 6-24 (5,425' x 150') and Runway 15-33 (5,253' x 150'). HYA offers a wide variety of services and facilities to GA aircraft operators, including several FBOs providing 100-LL and Jet-A fuel, aircraft maintenance, scheduled commercial service, charter airline service, air cargo service, and hangar rentals. The Airport also offers apron tie-down spaces and deicing capabilities. According to 2018 TAF data, HYA is projected to experience approximately 85,000 operations with over 7,000 of those being air carrier operations.

- Provincetown Municipal Airport (PVC), Provincetown, MA: Located at the tip of Cape Cod, PVC offers one paved runway – Runway 7-25 (3,502' x 100'). PVC offers scheduled daily flights to and from Logan International Airport (BOS), on-site rental car service, instrument and WAAS approaches, secure tie-downs, AWOS, and a terminal building with free Wi-Fi, vending machines, coffee, and restrooms. PVC also offers sightseeing flights and flight instruction.

- Falmouth Airpark (5B6), Falmouth, MA: 5B6 is an exclusive fly-in airfield with turf taxiways leading from Runway 7-25 (2,298' x 40') to private residences throughout a 50-acre subdivision. The Airpark offers 100-LL and 94-UL fuel, hangar and non-hangar properties, a private community building, and a tennis court.

- Martha's Vineyard Airport (MVY), Vineyard Haven, MA: MVY is a towered airport with two paved runways – Runway 6-24 (5,504' x 100') and Runway 15-33 (3,328' x 75'). MVY offers scheduled commercial service, as well as many conveniences to GA operators, including both 100-LL and Jet-A fuel, pilots lounge, Wi-Fi, flight planning workstations, aircraft towing, deicing, tie-downs, potable water, and catering. MVY also offers aircraft charter services.

- Nantucket Memorial Airport (ACK), Nantucket, MA: ACK is a towered airport with three paved runways – Runway 6-24 (6,303' x 150'), Runway 15-33 (4,500' x 100'), and Runway 12-30 (2,696' x 50'). ACK offers regularly scheduled service to Boston, MA (BOS); Hyannis, MA (HYA); New Bedford, MA (EWB); and New York City (LGA). Seasonal service is available to Arlington, VA (DCA); White Plains, NY (HPN); Teterboro, NJ (TEB); Newark, NJ (EWR); and Charlotte, NC (CLT). ACK also offers many GA services including, tie-downs, 100-LL and Jet-A fuel, aircraft cleaning and detailing, pilots lounge, catering, and charter flights.

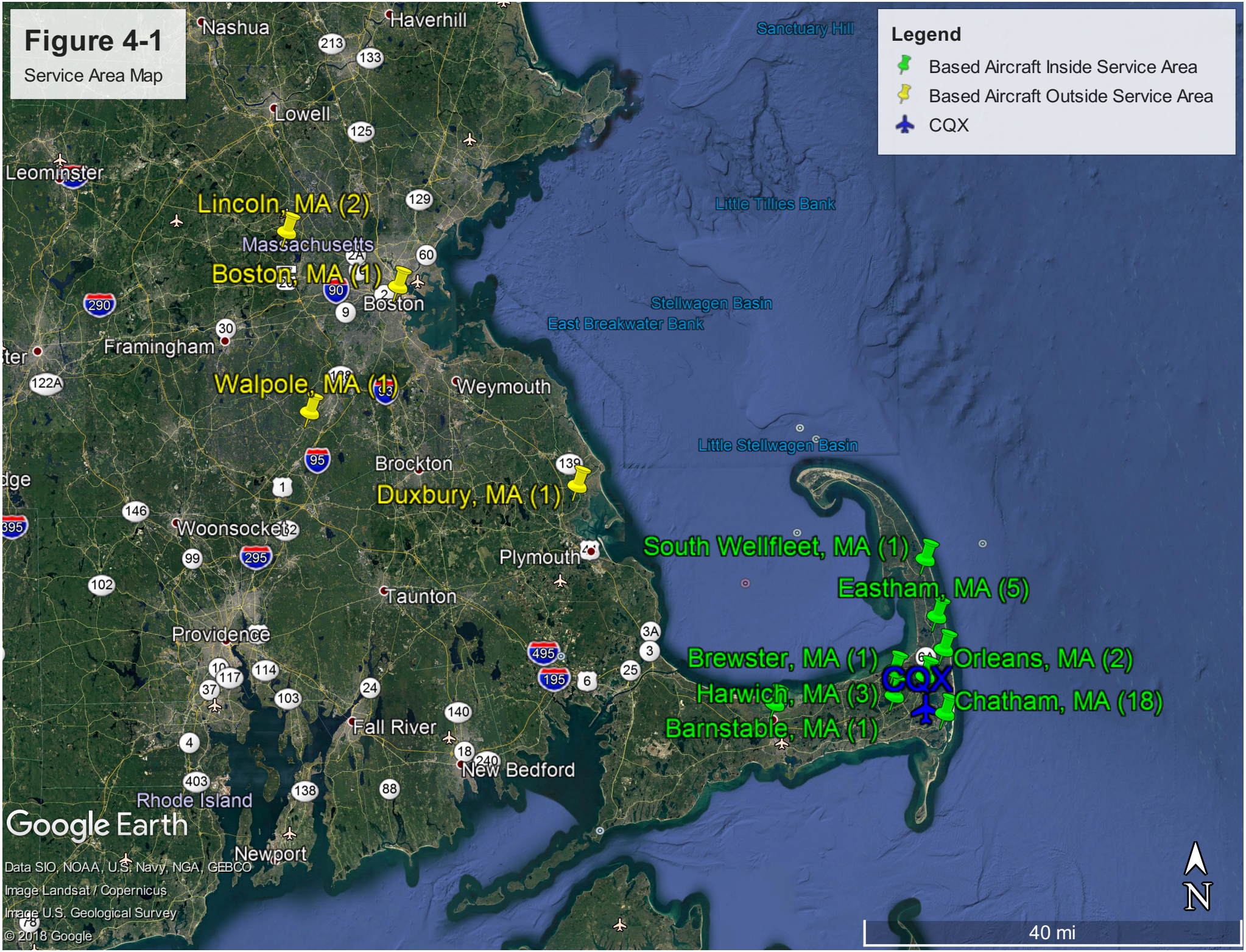


Figure 4-1
Service Area Map
Legend
Based Aircraft Inside Service Area
Based Aircraft Outside Service Area
CQX
Lincoln, MA (2)
Boston, MA (1)
Walpole, MA (1)
Duxbury, MA (1)
South Wellfleet, MA (1)
Eastham, MA (5)
Brewster, MA (1)
Orleans, MA (2)
Harwich, MA (3)
Chatham, MA (18)
Barnstable, MA (1)
CQX
Nashua
Haverhill
Lowell
Leominster
Framingham
Boston
Weymouth
Brockton
Plymouth
Taunton
Woonsocket
Providence
Fall River
New Bedford
Newport
Rhode Island
Massachusetts
Sanctuary Hill
Little Tillies Bank
Stellwagen Basin
East Breakwater Bank
Little Stellwagen Basin
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Image U.S. Geological Survey
© 2018 Google
N
40 mi

4.3 SOCIOECONOMIC TRENDS

While a small percentage of CQX's based aircraft owners reside in other counties, the overwhelming majority reside in Barnstable County. For purposes of this section, the socioeconomic trends affecting aviation demand at CQX (population, age, income, and employment) will rely on information gathered for Barnstable County, which will then be compared against state and national trends.

4.3.1 HISTORIC POPULATION

Historic population growth for Barnstable County, Massachusetts, and the U.S. from 2010-2017 were reviewed for the purposes of this study. According to the U.S. Census Bureau's Profile of General Demographic Characteristics[3], Barnstable County experienced a 2.9 percent decrease in population between 2000 and 2010. During the same period, Massachusetts experienced a 3.4 percent increase in population, while the U.S. experienced a 9.9 percent increase. The U.S. Census Bureau estimates that from 2010-2017, Barnstable County experienced an average annual growth rate (AAGR) of -0.16 percent in population while Massachusetts and the U.S. experienced an AAGR of 0.63 percent and 0.74 percent respectively (see Table 4-1 below).

Table 4-1: Historic Population Growth (2010-2017)

Year	*Barnstable County*	*AAGR%*	*Massachusetts*	*AAGR%*	*U.S.*	*AAGR%*
2010	215,877		6,564,943		309,338,421	
2011	215,340	-0.2%	6,612,178	0.7%	311,644,280	0.7%
2012	214,787	-0.3%	6,659,627	0.7%	313,993,272	0.8%
2013	214,566	-0.1%	6,711,138	0.8%	316,234,505	0.7%
2014	214,279	-0.1%	6,757,925	0.7%	318,622,525	0.8%
2015	213,773	-0.2%	6,794,002	0.5%	321,039,839	0.8%
2016	213,440	-0.2%	6,823,721	0.4%	323,405,935	0.7%
2017	213,444	0.0%	6,859,819	0.5%	325,719,178	0.7%
AAGR		**-0.16%**		**0.63%**		**0.74%**

Source: United States Census Bureau

While the population of both the state and nation are expected in increase steadily through 2035 (AAGR of Massachusetts 0.3 percent; AAGR of U.S. 0.7 percent), according the UMass Donahue Institute, population of Cape Cod and the Islands is projected to decrease at an average of 0.4 percent per year (see Table 4-2 below).

[3] https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml

Table 4-2: Projected Population Growth (2020-2035)

Year	Cape and Islands	AAGR%	Massachusetts	AAGR%	U.S.	AAGR%
2020	233,398		6,950,668		334,503,000	
2025	227,050	-2.7%	7,105,878	2.2%	347,335,000	3.8%
2030	222,232	-2.1%	7,231,126	1.8%	359,402,000	3.5%
2035	218,133	-1.8%	7,319,469	1.2%	370,338,000	3.0%
AAGR		-0.4%		0.3%		0.7%

Source: UMass Donahue Institute

4.3.1.1 Seasonal Population

Even though the full-time population of Barnstable County is projected to experience a decrease population through 2035, Town records indicate an increase in the number of seasonal residents purchasing second homes in Chatham. According to Town records, it is estimated that the population of Chatham increases by approximately 30,000 people during the summer months. Further, housing characteristic data indicates that in 2016, seasonal housing units accounted for 56 percent of total housing units in the Town, with year-round units making up 44 percent of total housing units[4]. According to the Barnstable Area Regional Trends (BART) study developed by the Cape Cod Commission, Barnstable County has the highest concentration of seasonal units per square mile of any county in the United States with 149 seasonal units per square mile. These seasonal inhabitants do not claim residency in Barnstable County, therefore creating an inaccurate picture of population numbers when considering U.S. Census data alone.

4.3.1.2 Median Age of Total Population

According to the U.S. Census Bureau, the median age of Barnstable County has been increasing at an average annual growth rate of 0.97 percent since 2010. During this same period, Massachusetts and the U.S. have also experienced an increase in median age of 0.15 percent and 0.30 percent, respectively (see Table 4-3). This sector has the potential to affect CQX as pilots are retiring at a higher rate than the rate at which student pilots are beginning to fly and become certified.

Table 4-3: Historic Median Age (2010-2017)

Year	Barnstable County	AAGR%	Massachusetts	AAGR%	U.S.	AAGR%
2010	49.9		39.1		37.2	
2011	50.4	1.0%	39.2	0.3%	37.3	0.3%
2012	50.9	1.0%	39.3	0.3%	37.5	0.3%
2013	51.4	1.0%	39.3	0.0%	37.6	0.3%
2014	51.9	1.0%	39.4	0.3%	37.7	0.3%
2015	52.4	1.0%	39.4	0.0%	37.8	0.3%
2016	52.9	1.0%	39.4	0.0%	37.9	0.3%
2017	53.4	0.9%	39.5	0.3%	38.0	0.3%
AAGR		**0.97%**		**0.15%**		**0.30%**

Source: United States Census Bureau

[4] 2018 Chatham Housing Production Plan

4.3.2 PER CAPITA PERSONAL INCOME AND WAGES

Per capita income (PCI) is a measure of the average annual income of individuals and is an indicator of positive economic conditions in a certain area, which has the potential to lead to an increase in GA participation. Per Capita Personal Income (historic) data on a county, statewide, and national basis was obtained from the Bureau of Economic Analysis[5].

The historical trend of PCI from 2006-2016 indicated relatively steady growth throughout the 10-year period. For Barnstable County, the PCI increased at an AAGR of 3.2 percent during this period. For the same period, Massachusetts and the U.S. experienced AAGRs of 2.9 percent, and 2.6 percent, respectively (see Table 4-4).

Table 4-4: Per Capita Personal Income (2006-2016)

Year	*Barnstable County*	*Massachusetts*	*U.S.*
2006	$48,255	$48,307	$38,144
2007	$49,463	$50,417	$39,821
2008	$51,499	$52,283	$41,082
2009	$50,752	$51,412	$39,376
2010	$52,374	$53,058	$40,278
2011	$55,191	$55,230	$42,463
2012	$57,993	$57,178	$44,283
2013	$58,995	$57,145	$44,489
2014	$61,256	$59,226	$46,486
2015	$64,379	$62,755	$48,429
2016	$65,770	$64,122	$49,204

Source: Bureau of Economic Analysis

4.3.2.1 Median Household Income

From 2000-2010, Barnstable County experienced a 31.3 percent increase in median household income from $45,933 to $60,317. During the same period, the Commonwealth of Massachusetts and the U.S. experienced increases of 27.7 percent and 23.6 percent, respectively. However, during the period from 2010-2016, household income for Barnstable County showed modest growth experiencing an AAGR of 1.4 percent with Massachusetts and the U.S. experiencing an AAGRs of 1.5 percent and 1.1 percent, as depicted in Table 4-5. Household Income has the potential to affect CQX as the cost of obtaining a pilot's license varies widely depending on a number of factors such as location, type of airplane, flight school, etc.

[5] https://w ww.bea.gov/regional/bearfacts/pdf.cfm?fips=25001&areatype=25001&geotype=4

Table 4-5: Median Household Income (2010-2016)

Year	Barnstable County	Massachusetts	U.S.
2000	*$45,933*	*$50,502*	*$41,994*
2010	$60,317	$64,509	$51,914
2011	$60,525	$65,981	$52,762
2012	$60,424	$66,658	$53,046
2013	$60,526	$66,866	$53,046
2014	$61,597	$67,846	$53,482
2015	$63,251	$68,563	$53,889
2016	$65,382	$70,594	$55,322
AAGR 2010-2016	**1.4%**	**1.5%**	**1.1%**

Source: United States Census Bureau

As noted in *Section 4.3.1.1 Seasonal Population*, the high concentration of seasonal residents in Barnstable County paints an inaccurate socioeconomic picture of the region. Chatham is conceptualized as a high-income area inhabited by wealthy residents, but in reality, most of its residents are working class and struggle to compete financially with their seasonal neighbors. This situation is most noticeably present when comparing household income data against home values. According to the U.S. Census Bureau, the median value of homes in Chatham in 2016 was $580,400 with median household income of $65,750 (homes valued at approximately 880 percent of median household income). These numbers are staggering when compared with state and national trends. In 2016, homes in Massachusetts were valued at $341,000 with median household income of $70,954 (homes valued at approximately 480 percent of median household income), where homes in the U.S. were valued at $184,700 with median household income of $55,322 (homes valued at approximately 330 percent of median household income).

Considering the increase in the number of seasonal units available in Chatham, and the significant disparity between home values and household income levels, it is reasonable to conclude that the full-time residents of Chatham will continue experience considerable cost of living increases into the future due in part to higher-income seasonal residents driving housing costs.

4.3.2.2 Unemployment

From 2000-2010, Barnstable County unemployment rate more than doubled from 3.0 percent to 6.2 percent. Similarly, Massachusetts and the U.S. experienced drastic increases in unemployment, with the rate in Massachusetts increasing from 3.0 percent in 2000 to 7.4 percent in 2010 and the rate across the U.S. increasing from 3.7 percent in 2000 to 7.9 percent in 2010. The rate of unemployment continued to increase at the county, state, and national levels until 2014. Similar to median household income, this sector has the potential to affect CQX as lower levels of unemployment indicate better economic conditions for business. In turn, this can potentially lead to an increase in aviation demand, and/or potential for pilots being able to financially support their flying activities.

Table 4-6: Percent of Population Unemployed (16 years and older)

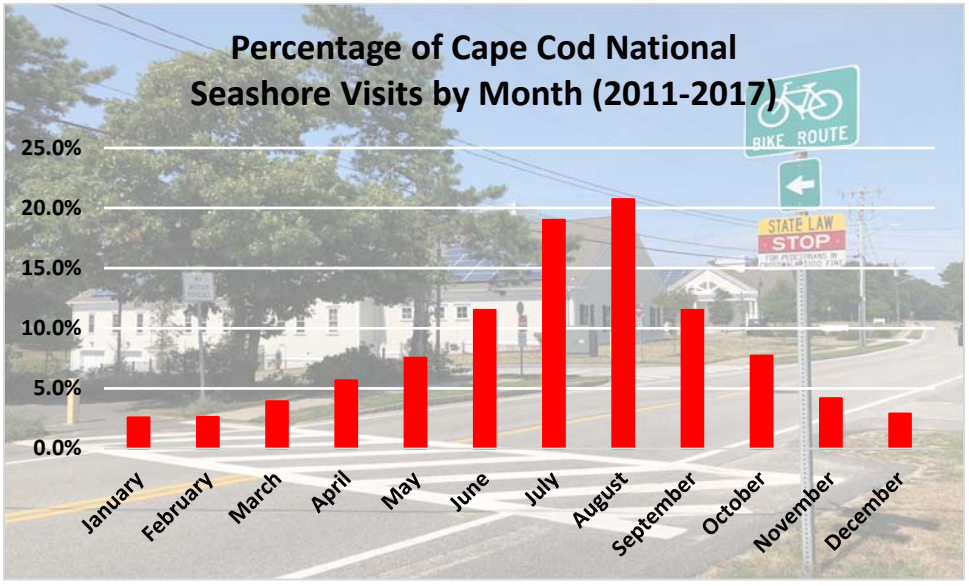
Year	Barnstable County	Massachusetts	U.S.
2010	6.2%	7.4%	7.9%
2011	7.0%	8.1%	8.7%
2012	7.5%	8.5%	9.3%
2013	8.2%	8.9%	9.7%
2014	7.9%	8.4%	9.2%
2015	7.0%	7.6%	8.3%
2016	6.3%	6.8%	7.4%
Average	**7.2%**	**8.0%**	**8.6%**

Source: United States Census Bureau

4.3.3 TOURISM

The Airport is in a unique situation due to its location in a seasonal tourist community, with the majority of visitors traveling to Cape Cod during the summer months. According to Cape Cod Chamber of Commerce records of seashore visits from 2011-2017, 78 percent of visits to the Cape Cod National Seashore occurred between the months of May and October, with 63 percent of visits occurring between June and September. Further, records of visitor attendance at the Route 6 Visitor Center in Hyannis, MA from 2011 to 2017 indicate more extreme trends with 90 percent of visits occurring between the months of May and October and 73 percent of visits occurring between June and September.

Table 4-7: Percentage of Cape Cod National Seashore Visits by Month



Source: Cape Cod Chamber of Commerce data 2011-2017

4.3.4 SOCIOECONOMIC CONDITIONS SUMMARY

Activity at General Aviation airports can be influenced by a number of factors including population, age, income, unemployment, and tourism. As indicated in the sections above, Barnstable County has seen population decline by approximately 3.95 percent between 2010 and 2017, where Massachusetts and the U.S. have experienced significant growth during that same period (8.04 percent and 15.74 percent, respectively). Unemployment and income trends remained consistent across Barnstable County, Massachusetts, and the nation between 2010 and 2016 with the unemployment rate increasing steadily from 2010 to 2013 before finally falling again in 2014. Household income rates have grown at a modest, yet consistent pace across the county (AAGR 1.4 percent), state (AAGR 1.5 percent), and nation (AAGR 1.1 percent) between the years of 2010 and 2016. During the same period, PCI also showed steady growth with Barnstable County experiencing an AAGR of 3.2 percent , Massachusetts experiencing an AAGR of 2.9 percent, and the nation experiencing an AAGR of 2.6 percent.

Though U.S. Census Bureau data indicates a decline in the population of Barnstable County and unemployment and income rates in line with state and national trends, it should be reiterated that there has been an increase in the number of seasonal housing units being built. While the full-time population appears to be declining, according to the Cape Cod Chamber of Commerce, the region continues to experience a significant influx of residents and visitors during the summer months[6]. Seasonal residents who own second homes in Barnstable County claim residency in other counties or states, so the U.S. Census Bureau reports for Barnstable county may not accurately include socioeconomic data for these individuals, making their contributions to the local economy difficult to quantify. Based on the information presented above, it does not appear that the socioeconomic conditions in Barnstable County suggest an unusual or greater than average demand for aviation overall; however, the seasonal nature of activity in the region is projected to result in higher peak month, day, and hour demand, which is further discussed in Section 4.8, *Peak Activity Estimates*.

[6] Cape Cod Chamber of Commerce Records of Cape Cod National Seashore Visits

4.4 HISTORIC AVIATION DATA

This section presents the historical aviation statistics for CQX including based aircraft and annual operations. This information is used to help identify and evaluate factors that influence aviation demand, which in turn is used to determine forecasts of future aviation activity.

4.4.1 BASED AIRCRAFT

Prior to 2009 and the integration of FAA's National Based Aircraft Inventory Program, airport managers were responsible for counting the number of based aircraft and reporting totals to the FAA and state inspectors. These totals would then appear on the airport's master record form, also known as the "5010". At the time, little guidance was provided on how the based aircraft counts should be determined, and there was no method of validating the counts. As a result, based aircraft counts were often unreliable, and duplicated.

The FAA defines "based aircraft" as an aircraft that is operational and airworthy, which is typically based at the facility in question for a majority of the year. Based aircraft categories include single-engine piston, multi-engine piston, jet, and rotorcraft.

According to the Massachusetts Department of Transportation Aeronautics Division (MassDOT/AD), "All airworthy aircraft based in Massachusetts or temporarily located in Massachusetts for sixty (60) or more cumulative days during a year must be registered with the MassDOT/AD by completing and submitting a registration form and paying the applicable annual registration fee".

Based aircraft are major economic contributors to the airport. They help generate revenues in part from tie-down fees, hangar leases, fuel sales, and maintenance. Based aircraft forecasts are used to evaluate the size of the apron, number of required tie-downs and hangars, and other facilities necessary to support the continued growth of based aircraft.

As previously mentioned, the vast majority of aircraft based at the airport are owned by individuals residing in Barnstable County, Massachusetts. According to the 2017 FAA TAF for CQX, the number of reported based aircraft at the Airport in 2017 was 35, while MassDOT/AD reported 40. Table 4-8 presents a comparison of based aircraft over the past 10 years at CQX.

Table 4-8: Based Aircraft History (2007-2017)

Year	FAA TAF Count	MassDOT/AD Count
2007	47	37
2008	36	40
2009	40	40
2010	34	41
2011	34	41
2012	29	41
2013	27	40
2014	31	40
2015	34	40
2016	35	40
2017	35	40
AAGR	**-2.1%**	**0.8%**

Source: FAA TAF 2017-2045, MassDOT/AD

4.4.2 REGIONAL BASED AIRCRAFT

According to FAA, the New England Region experienced a slight average annual decrease of 1.9 percent in based aircraft growth from 2007-2017. The FAA New England Region includes the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. Table 4-9 presents a comparison of based aircraft growth over the past 10 years in the FAA New England Region (ANE).

Table 4-9: New England Region Based Aircraft History

Year	ANE Based Aircraft History	AAGR%
2007	7,402	
2008	7,027	-5.1%
2009	7,077	0.7%
2010	6,285	-11.2%
2011	6,099	-3.0%
2012	5,803	-4.9%
2013	5,985	3.1%
2014	6,291	5.1%
2015	5,729	-8.9%
2016	5,956	4.0%
2017	6,012	0.9%
	AAGR	**-1.9%**

Source: FAA TAF 2017-2045

4.4.3 NATIONAL BASED AIRCRAFT

FAA TAF data indicates that, between 2007 and 2017, national based aircraft decreased at an average annual rate of approximately 1.2 percent. Table 4-10 presents national based aircraft growth over the past 10 years.

Table 4-10: National Based Aircraft History

Year	*National Based Aircraft History*	*AAGR%*
2007	199,551	
2008	175,533	-12.0%
2009	177,389	1.1%
2010	165,441	-6.7%
2011	160,343	-3.1%
2012	163,294	1.8%
2013	166,916	2.2%
2014	170,338	2.1%
2015	163,973	-3.7%
2016	173,765	6.0%
2017	175,325	0.9%
	AAGR	**-1.2%**

Source: FAA TAF 2007-2017

4.5 HISTORIC ANNUAL AIRCRAFT OPERATIONS

In airport planning terms, "airport operations" are defined as the number of arrivals and departures from an airport. Therefore, an airplane that arrives and then departs from an airport is considered to have made two operations. Operations are further classified as either local or itinerant.

- Local operations are performed by aircraft that: (a) operate in the local traffic pattern or within sight of the airport; (b) are known to be departing for, or arriving from, flight in local practice areas located within a 20-mile radius of the airport; (c) execute simulated instrument approaches or low passes at the airport.
- Itinerant operations are all aircraft operations other than local operations, such as landing or take off of a flight departing from or arriving at another airport greater than 20 miles away.

Aircraft operations are also defined by type, such as air carrier, regional/commuter, air taxi, general aviation, or military. Aircraft operations at CQX are predominantly general aviation with a small percent of air taxi, and military.

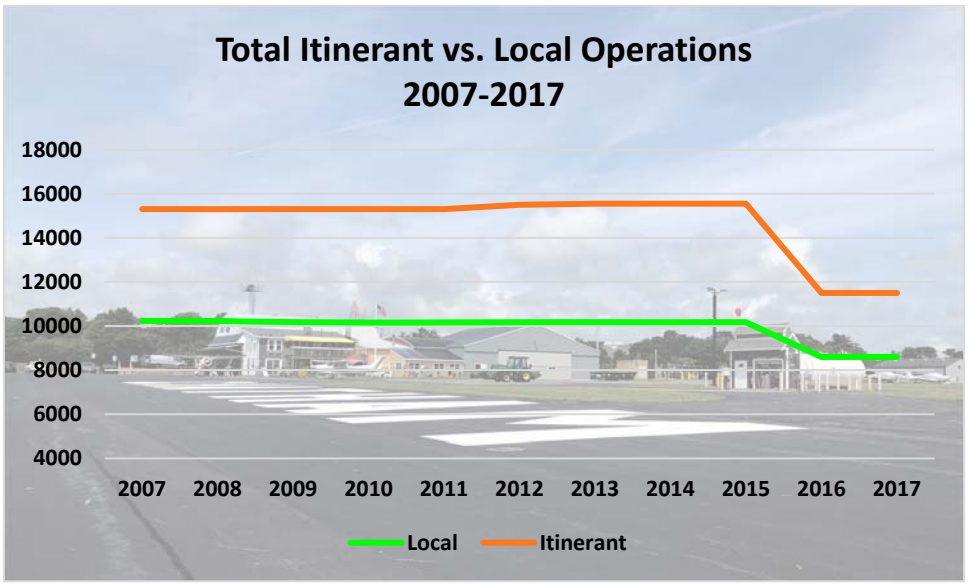
4.5.1 CQX HISTORIC OPERATIONS

Historic aircraft operations for CQX were obtained from the FAA TAF. According to the data shown in Table 4-11 below, total reported operations at the Airport appeared to decrease by 21.3 percent at an average annual decrease of 1.9 percent per year from 2007 to 2017. Over the same period, reported itinerant operations appeared to decrease by 15.9 percent, while local operations appeared to decrease by 24.8 percent. This apparent decline is attributed to operations estimations prior to the implementation of the GARD operations counting system during 2015 and is not representative of an actual decline in operations. Prior to the adoption of the GARD system, the Airport relied on operations estimates from Airport personnel, which left a margin for error. Since 2015, the Airport estimates that the GARD system has allowed for more consistent operations counts

Table 4-11: Total Operations from 2007-2017

Source: FAA TAF 2017

Table 4-12: CQX Itinerant vs. Local Operations

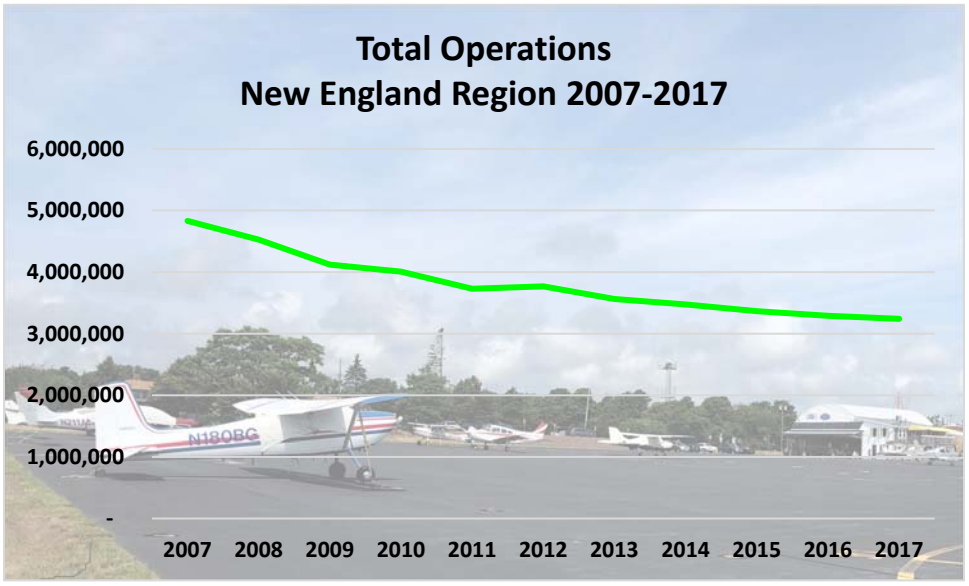


Source: FAA TAF 2017

4.5.2 NEW ENGLAND REGIONAL TRENDS

Historic aircraft operations for FAA New England Region were obtained from the FAA TAF. According to the data shown in Table 4-13 below, the New England Region experienced a decrease in operations from 2007-2017, losing approximately 32.9 percent of its operations over this period with an average annual loss of 3.9 percent per year.

Table 4-13: Total New England Region Operations from 2007-2017

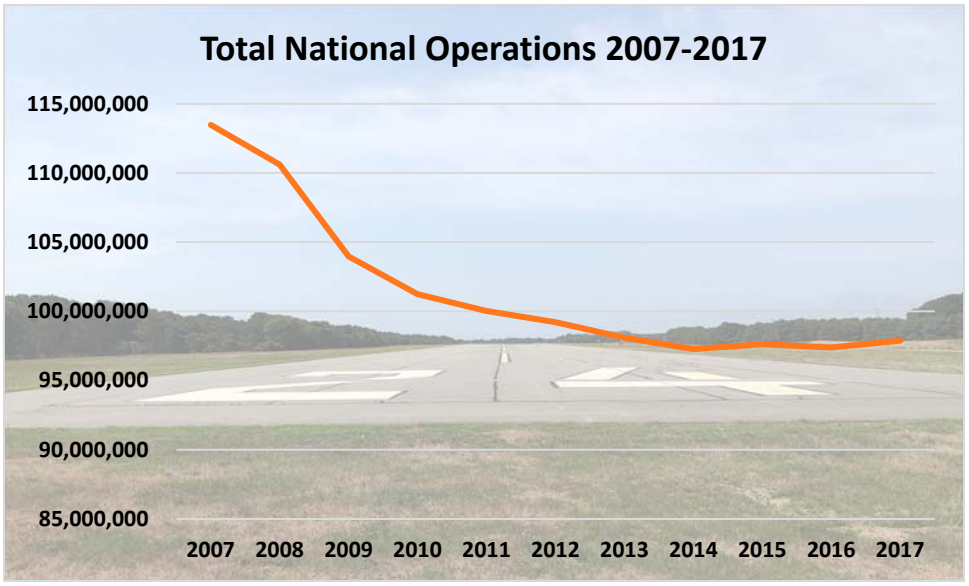


Source: FAA TAF 2017

4.5.3 NATIONAL HISTORIC TRENDS

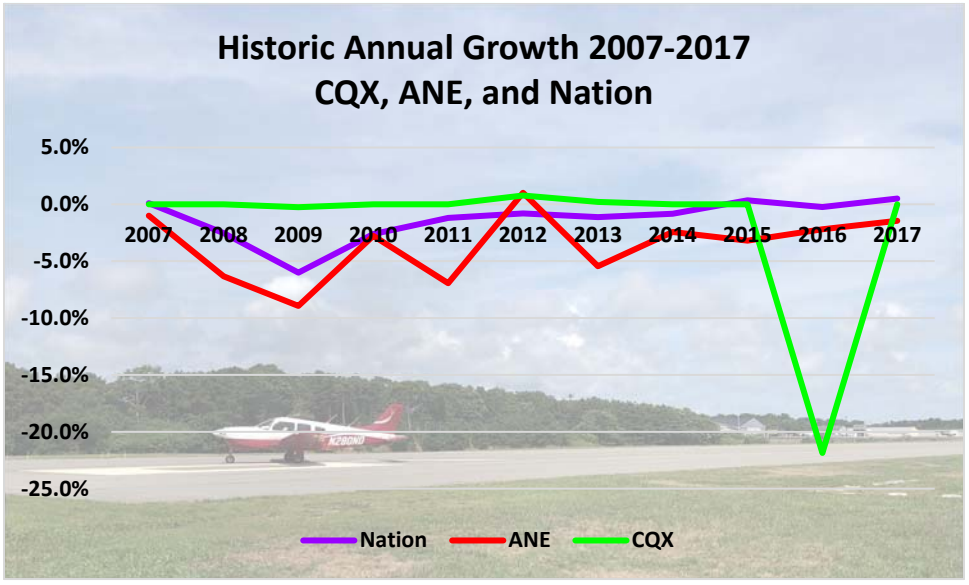
Historic aircraft operations for the Nation were obtained from the FAA TAF. According to the data shown in Table 4-14 below, the Nation experienced a decrease in operations from 2007-2017, losing approximately 13.7 percent of its operations over this period with average annual loss of 1.5 percent per year. A comparison of the historic annual growth for CQX, New England Region (ANE), and the Nation is highlighted in Table 4-15 below. As indicated in *Section 4.5.1 CQX Historic Operations*, the apparent drop in operations in 2016 is attributed to the implementation of the GARD operations counting system, which changed how information was gathered, and is not indicative of an actual loss of operations at CQX.

Table 4-14: Total Operations Nationally from 2007-2017



Source: FAA TAF 2017

Table 4-15: Historic Annual Growth CQX, ANE, and Nation



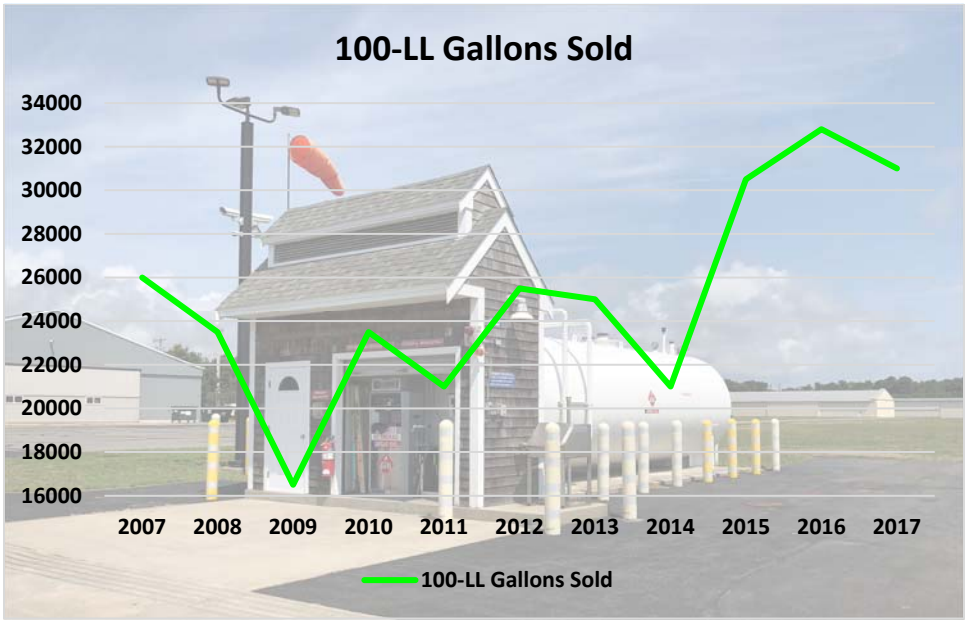
Source: FAA TAF 2017

4.6 AVIATION GASOLINE CONSUMPTION

4.6.1 HISTORIC CQX FUEL SALES

Historic fuel sales data from 2007 to 2017 was obtained from the Airport. Fuel sales are considered a good indicator of aviation activity at an airport and help determine future fuel storage needs. The data presented in Table 4-16 indicates a significant increase in 100-LL sales between 2007 and 2017. During this period, the number of gallons sold increased by 19.2 percent at an average annual compounded growth rate of 1.77 percent. In 2016, the Airport began offering Jet-A fuel via a fuel truck, selling 7,100 gallons in 2016, 7,000 gallons in 2017, and 11,095 gallons in 2018.

Table 4-16: CQX 100-LL Fuel Flow 2007 – 2017

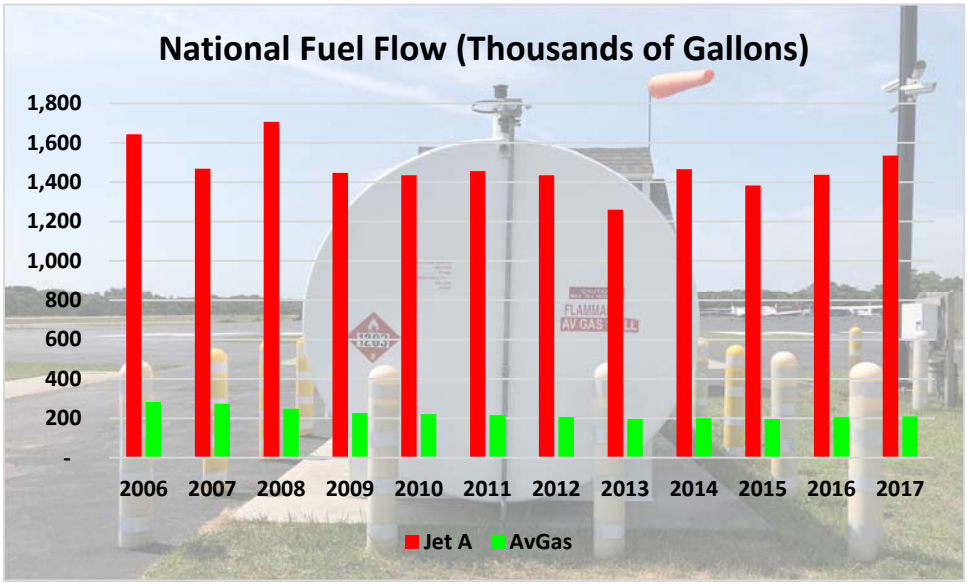


Source: Airport Records

4.6.2 FAA AEROSPACE FUEL SALES

As indicated in Table 4-17 below, the FAA Aerospace Forecast reported that, between 2006 and 2017, Jet-A fuel consumption for GA aircraft decreased by 6.6 percent with an average annual decrease of 0.1 percent. In contrast, AvGas was reported to have decreased by approximately 26.1 percent over the same period with an average annual decrease of 2.6 percent. The significant decrease in the national number of gallons of Jet-A and Avgas fuel sold occurred between 2007-2015, with the low points being 2013 and 2015, before slowly rising again, beginning in 2016. Through the planning period (2018-2038), the FAA Aerospace Forecast predicts a 0.6 percent average annual decrease in consumption of AvGas and a 1.7 percent average annual increase in Jet-A consumption.

Table 4-17: National Fuel Flow 2010-2017



Source: FAA Aerospace Forecast 2018-2038

4.7 AVIATION ACTIVITY FORECASTS

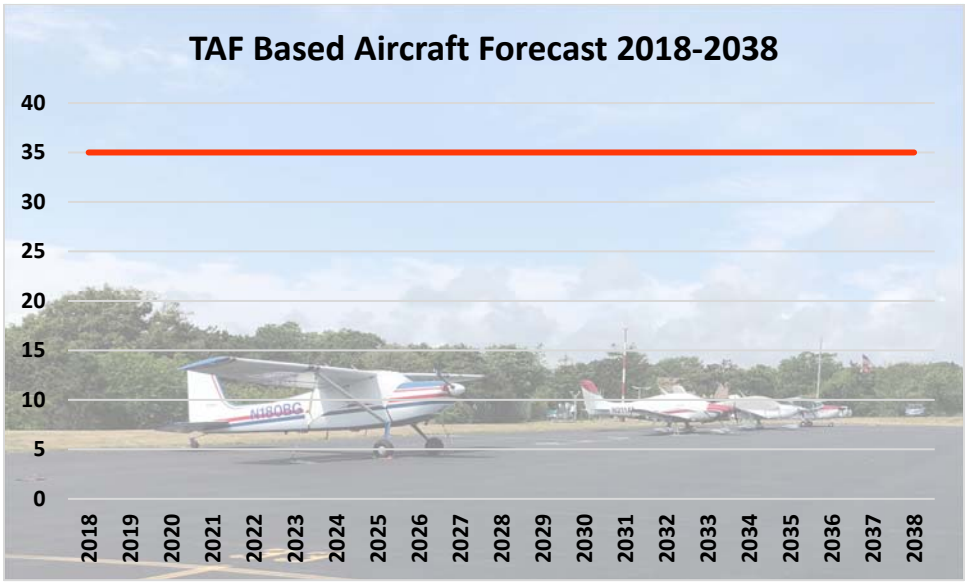
This section presents the aviation forecasts for CQX for the planning period of 2018-2038. The forecasts provide short-, mid-, and long-term projections for the years 2023, 2028, and 2038. These represent the 5-, 10-, and 20-year estimates of aviation activity at the Airport. Activity projections include based aircraft, itinerant operations, local operations, and total operations. Forecasts developed by the Airport are reviewed by the FAA and compared to FAA TAF projections. FAA AC 150/5070-6B provides guidance on the FAA review process, and states that the FAA will find a locally developed airport planning forecast acceptable if it meets any of the following three conditions for a general aviation and reliever airport:

1. The forecast differs less than 10 percent in the 5-year forecast period, and 15 percent in the 10-year forecast period;
2. The forecast activity levels do not affect the timing or scale of an airport project; or
3. The forecast activity levels do not affect the role of the airport as defined in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*.

4.7.1 TAF BASED AIRCRAFT FORECAST

According to the 2017-2045 TAF, based aircraft at CQX is expected to remain flat with a 0.0 percent increase through the planning period. This flat growth rate is expected to be outpaced by the New England Region (0.9 percent per year) and nation (0.8 percent per year). The *TAF Based Aircraft Forecast* uses the TAF 2017 based aircraft count as its baseline, with a total based aircraft count of 35 at CQX, and then applies the projected growth rate (0.0 percent year) out to 2038. Table 4-18 details the TAF projected based aircraft growth rate out to 2038.

Table 4-18: TAF Based Aircraft Forecast



Source: FAA TAF 2018 - 2038

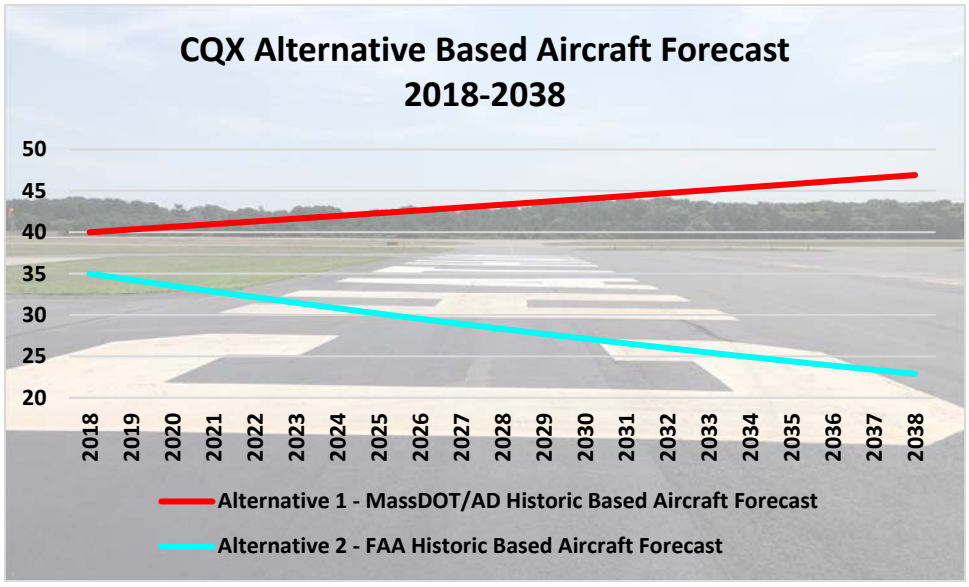
4.7.1.1 Alternative Based Aircraft Forecast

As previously discussed, based aircraft are major economic contributors to the airport. They help generate revenues from tie-down fees, hangar leases, fuel sales, and maintenance. Providing adequate facilities to accommodate based aircraft growth is important, as it influences the future development needs of the Airport. The Alternative Based Aircraft Forecast for CQX develops two forecast scenarios based on historic growth rates. As previously discussed, projections should be viewed independently of specific years, and the actual growth of activity should be considered as the impetus that influences the need for future airport facilities. Similarly, slower than projected growth may warrant deferment of planned improvements. Actual growth should be periodically (i.e. annually) compared to projected growth so scheduled corrections can be identified and implemented.

- **Alternative 1 – MassDOT/AD Historic Based Aircraft Forecast**: as detailed in Section 4.4.1, MassDOT/AD historic based aircraft counts for CQX indicate an AAGR of 0.8 percent from 2007-2017. This rate of growth is in line with expected growth for the New England Region (0.9 percent) and nation (0.8 percent). This rate is then applied to MassDOT/AD's 2017 reported based aircraft count of 40 for CQX in 2017 and projected over the planning period of 2018-2038.
- **Alternative 2 – FAA Historic Based Aircraft Forecast:** as outlined in Section 4.4.1, the FAA's historic based aircraft counts (from 2007-2017) indicate a decrease in based aircraft at an average annual decrease of 2.1 percent per year. This rate is then applied to the FAA TAF's reported based aircraft count of 35 for CQX in 2017 and projected over the planning period of 2018-2038.

As illustrated in Table 4-19, the Alternative 1 – MassDOT/AD Historic Based Aircraft Forecast projects the number of based aircraft to increase from 40 to 47 over the planning period, which equates to approximately 0.35 new based aircraft every year. The Alternative 2 – FAA Historic Based Aircraft Forecast projects a decrease in based aircraft from 35 to 23 during the planning period, or a loss of approximately 0.6 based aircraft per year.

Table 4-19: Alternative Based Aircraft Forecast



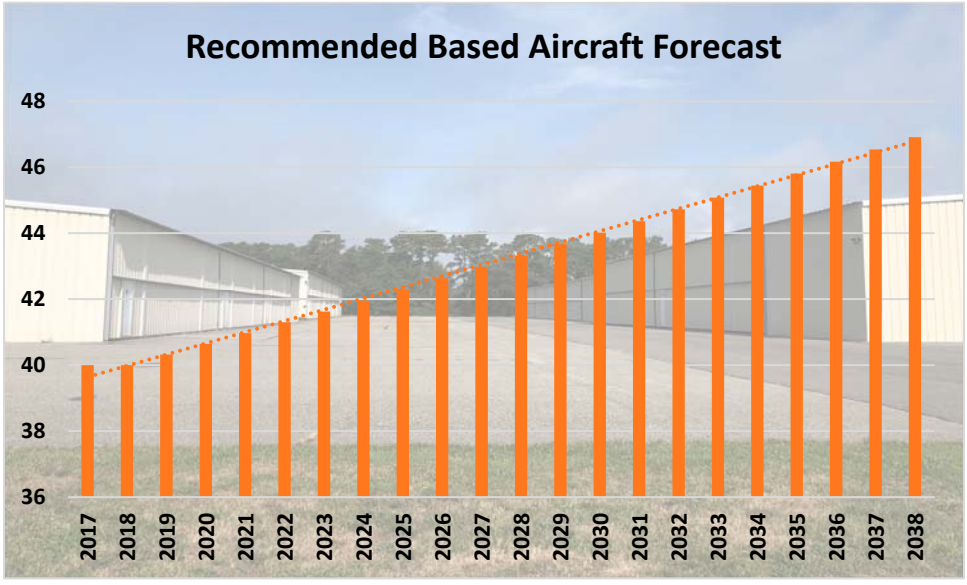
Source: FAA TAF 2007-2017; MassDOT 2007-2017 historic data

4.7.1.2 Recommended Based Aircraft Growth Rate

Although the 2017-2045 TAF projects flat based aircraft growth at CQX through the planning period, unique circumstances exist that suggest latent local demand. First, all 39 existing hangar spaces at CQX are occupied, and potential based aircraft owners have raised concern to Airport Management about the high salt content in the air causing rapid corrosion to aircraft stored outdoors. These potential aircraft owners have indicated that they prefer to store their aircraft indoors to prevent weather damage. According to Airport Management, the lack of available hangar units is a limiting factor to the Airport's ability to attract additional based aircraft. Second, a review of competing airports and others in close proximity to CQX are projected to experience increases. For example, HYA reported that hangar units are nearing capacity with only 2 available units out of 29 total units, and according to the TAF, based aircraft at HYA are projected to increase at an AAGR of 2.1 percent per year through the planning period. Third, the FAA TAF projects growth in the based aircraft fleet at both MVY (AAGR of 1.2 percent between 2018-2038, from 75 to 96 based aircraft) and ACK (AAGR of 1.0 percent between 2018-2038, from 22 to 27 based aircraft).

For these reasons, it is realistic to conclude that local demand for hangars is not currently being met, and that the Airport will likely experience an increase in based aircraft once hangar capacity is increased. Therefore, the Alternative 1 - MassDOT/AD Historic Based Aircraft Forecast growth rate of 0.8 percent was adopted as the preferred based aircraft growth rate for CQX through the planning period. Further, as outlined in Section 4.7.1, a based aircraft growth rate of 0.8 percent per year is right in line with what is expected regionally and nationally. As illustrated in Table 4-20 below, it is projected that CQX will experience an increase in based aircraft from 40 to 47 over the planning period.

Table 4-20: Recommended Based Aircraft Forecast



Source: MassDOT/AD, Gale Analysis

4.7.2 TAF AIRCRAFT OPERATIONS FORECAST

Total aircraft operations projections at CQX for the planning period 2018-2038 is presented in Table 4-21 below. Overall, the 2017-2045 TAF projects flat operations growth at CQX (0.0 percent growth rate) through the planning period. Lacking better baseline data, the TAF often assumes a zero-growth rate when forecasting future operations at non-towered airports. This flat growth rate is below the regional average of 0.6 percent, and national average of 0.6 percent. Further, this flat growth is far below similar tourist-community airports such as HYA (2018-2038 AAGR 0.9 percent), ACK (2018-2038 AAGR 0.9 percent), and MVY (2018-2038 AAGR 0.1 percent).

Table 4-21: CQX Total Projected Aircraft Operations Forecast

Year	*Itinerant Operations*				*Local Operations*			
	Air Taxi & Commuter	**GA**	**Military**	**Total**	**Civil**	**Military**	**Total**	**Total Operations**
2018	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2019	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2020	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2021	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2022	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2023	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2024	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2025	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2026	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2027	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2028	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2029	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2030	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2031	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2032	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2033	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2034	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2035	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2036	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2037	500	8,000	100	8,600	11,500	0	11,500	**20,100**
2038	500	8,000	100	8,600	11,500	0	11,500	**20,100**
AAGR	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Source: FAA TAF 2018-2038

4.7.2.1 Aircraft Operations Forecast (Local vs. Itinerant Split)

The FAA TAF provides the activity split between local and itinerant operations. As shown in Table 4-22, from 2007 to 2017 local operations on average accounted for 59.7 percent of total operations, while itinerant operations accounted for approximately 40.3 percent.

Table 4-22: Historic Itinerant vs. Local Operations

Year	Itinerant Operations	Itinerant Percent	Local Operations	Local Percent	Total Operations
2007	10,230	40.1%	15,300	59.9%	25,530
2008	10,230	40.1%	15,300	59.9%	25,530
2009	10,165	39.9%	15,300	60.1%	25,465
2010	10,165	39.9%	15,300	60.1%	25,465
2011	10,165	39.9%	15,300	60.1%	25,465
2012	10,165	39.6%	15,550	60.4%	25,665
2013	10,170	39.5%	15,550	60.5%	25,720
2014	10,170	39.5%	15,550	60.5%	25,720
2015	10,170	39.5%	15,550	60.5%	25,720
2016	8,600	42.8%	11,500	57.2%	20,100
2017	8,600	42.8%	11,500	57.2%	20,100
	10-Year Average	**40.3%**	**10-Year Average**	**59.7%**	

Source: FAA TAF 2007-2017

As described in Section 4.7.2, the TAF projects that itinerant and local operations will remain flat at CQX with an AAGR of 0.0 percent through the planning period (2018-2038) at a split of 42.8 percent itinerant operations and 57.2 percent local operations; however, recent observations by airport management and airport users indicate a split of 60 percent itinerant operations and 40 percent local operations. As such, this split will be reflected in future operations forecast projections in subsequent sections.

4.7.2.2 Baseline Operational Fleet Mix

The type of aircraft utilizing the airport plays a key role in planning future airport facilities. According to airport personnel, the Airport's annual operational fleet mix is estimated to be broken down into the following groups:

- Single engine fixed wing- 60%
- Multi engine fixed wing- 10%
- Turboprop (King Air, PC-12)- 20%
- Helicopter- 9%
- Jet- 1%

4.7.2.3 Projected Operational Fleet Mix

While CQX supports a variety of aircraft, the majority of current operations are estimated to be conducted by single-engine aircraft. As discussed in the previous section, the percent of operational fleet mix is based on estimates and through discussions with airport management. Utilizing the FAA TAF and observed local vs. itinerant operations, Table 4-23 projects the operational fleet mix over the planning period.

Table 4-23: Projected Operational Fleet Mix

Aircraft Category	Itinerant			Local		
	2023	**2028**	**2038**	**2023**	**2028**	**2038**
Single-Engine	7,236	7,236	7,236	4,824	4,824	4,824
Multi-Engine	1,206	1,206	1,206	804	804	804
Turbo Prop	2,412	2,412	2,412	1,608	1,608	1,608
Helicopter	1,085	1,085	1,085	724	724	724
Jet	121	121	121	80	80	80
Total	**12,060**	**12,060**	**12,060**	**8,040**	**8,040**	**8,040**

Source: FAA TAF 2017-2045, Gale 2018 Analysis

4.7.2.4 Alternative Projected Aircraft Operations Forecast

Projecting the number of annual operations at GA airports plays an important role in understanding potential sources of revenue, facility needs, and adequacy of existing facilities. The more activity generated at an airport, the more likely revenue streams from collection of tie-down fees, fuel sales, and other charges increase. As referenced in Section 4.7.2, the 2017-2045 FAA TAF predicts that CQX will experience no growth over the 20-year planning period (2018-2038); however, alternate data sources indicate moderate growth in both based aircraft (according to MassDOT/AD) and fuel sales (according to Airport records). Generally, growth in these sectors is an indicator of overall growth, which is why it is important to consider the following alternative development scenarios. The alternative projected aircraft operations forecast employs the AAGR from the following three sources: 1) FAA Aerospace Forecast, 2) Fuel Consumption Forecast, and 3) Operations Per Based Aircraft Forecast.

- **Alternative 1- FAA Aerospace Forecast:** The national forecasts for contract towered airports in the FAA Aerospace Forecast, FFY 2018-2038 show aircraft operations growing at an average annual rate of 0.9 percent over the forecast period. Average annual rates for this period, by user group, are as follows: air carrier, 2.2 percent; air taxi/commuter, -0.6 percent; itinerant general aviation, 0.3 percent; and local civil 0.3, percent. Table 4-24 illustrates the projected growth by applying the average FAA Aerospace Forecast growth rates to the appropriate user groups at CQX. The AAGR for the air carrier user group was excluded from this analysis as CQX does not have air carrier service.

Table 4-24: Alternative 1 – FAA Aerospace Forecast

Year	Itinerant				Local Operations			
	Air Taxi & Commuter	**GA**	**Military**	**Total**	**Civil**	**Military**	**Total**	**Total Operations**
2018	400	11,693	0	12,093	8,064	0	8,064	**20,157**
2019	397	11,728	0	12,125	8,088	0	8,088	**20,214**
2020	395	11,763	0	12,158	8,113	0	8,113	**20,271**
2021	392	11,799	0	12,191	8,137	0	8,137	**20,328**
2022	390	11,834	0	12,224	8,161	0	8,161	**20,385**
2023	388	11,869	0	12,257	8,186	0	8,186	**20,443**
2024	385	11,905	0	12,290	8,210	0	8,210	**20,501**
2025	383	11,941	0	12,324	8,235	0	8,235	**20,559**
2026	381	11,977	0	12,357	8,260	0	8,260	**20,617**
2027	379	12,012	0	12,391	8,284	0	8,284	**20,676**
2028	376	12,049	0	12,425	8,309	0	8,309	**20,734**
2029	374	12,085	0	12,459	8,334	0	8,334	**20,793**
2030	372	12,121	0	12,493	8,359	0	8,359	**20,852**
2031	370	12,157	0	12,527	8,384	0	8,384	**20,911**
2032	367	12,194	0	12,561	8,409	0	8,409	**20,971**
2033	365	12,230	0	12,595	8,435	0	8,435	**21,030**
2034	363	12,267	0	12,630	8,460	0	8,460	**21,090**
2035	361	12,304	0	12,665	8,485	0	8,485	**21,150**
2036	359	12,341	0	12,699	8,511	0	8,511	**21,210**
2037	356	12,378	0	12,734	8,536	0	8,536	**21,271**
2038	354	12,415	0	12,769	8,562	0	8,562	**21,331**
AAGR	**-0.6%**	**0.3%**	**0.0%**		**0.3%**		**AAGR**	**0.3%**

Source: FAA Aerospace Forecast, CQX, and Gale Analysis, 2018

- **Alternative 2- Fuel Consumption Forecast:** As indicated in Section 4.6, aviation gasoline sales at CQX have been increasing at an average annual compounded growth rate (AACGR) of 1.77 percent per year since 2007. As fuel sales are a good indicator of aviation activity at an airport, Alternative 2- Fuel Consumption Forecast below was developed to reflect that projected growth. The following methodology was used to arrive at the projected number of operations per gallon of fuel sold:
    - First, TAF operations for each year (from 2007 to 2017) were divided by the reported number of gallons of fuel sold for that same year to derive the number of operations per gallon of fuel sold for each year (see formula and Table 4-25 below).
        - TAF operations/gallons sold = projected operations per gallon sold
    - Second, the average number of operations per gallon of fuel sold was calculated by dividing the total number of operations per based aircraft by 11 years.

Table 4-25: Historic Operations Per Gallon of Fuel Sold

Year	*FAA TAF Historic Operations Count*	*100-LL Gallons Sold (Airport Records)*	*Operations Per Gallon Sold*
2007	25,530	26,000	0.98
2008	25,530	23,500	1.09
2009	25,465	16,500	1.54
2010	25,465	23,500	1.08
2011	25,465	21,000	1.21
2012	25,665	25,500	1.01
2013	25,720	25,000	1.03
2014	25,720	21,000	1.22
2015	25,720	30,500	0.84
2016	20,100	32,800	0.61
2017	20,100	31,000	0.65
	Average Operations Per Gallon		**1.02**

Source: FAA TAF, CQX Records, and Gale Analysis, 2018

- Third, the AACGR of 1.77 percent per year (see Section 4.6.1) was applied to reported gallons sold and projected through the planning period (2018-2038).
- Finally, the average rate of operations per gallons sold (from Table 4-25) was applied to the projected fuel forecast to project future airport operations by multiplying the number of projected based aircraft by 1.02 (see formula and Table 4-26 below).
    - Projected 100-LL Gallons Sold * 1.02 = Projected Operations

Table 4-26: Alternative 2 – Fuel Consumption Forecast

Year	*Projected 100-LL Gallons Sold*	*Projected Operations*
2018	31,549	32,180
2019	32,107	32,749
2020	32,675	33,329
2021	33,254	33,919
2022	33,842	34,519
2023	34,441	35,130
2024	35,051	35,752
2025	35,671	36,385
2026	36,303	37,029
2027	36,945	37,684
2028	37,599	38,351
2029	38,265	39,030
2030	38,942	39,721
2031	39,631	40,424
2032	40,333	41,139
2033	41,047	41,868
2034	41,773	42,609
2035	42,513	43,363
2036	43,265	44,130
2037	44,031	44,911
2038	44,810	45,706
	AACGR	**1.77%**

Source: Gale Analysis

- **Alternative 3- Operations Per Based Aircraft Forecast:** Though the 2017-2045 TAF projects flat growth through the planning period, preferred based aircraft projections indicate modest growth through the planning period (see Section 4.7.1.2 Recommended Based Aircraft Growth Rate). The development scenario presented below uses historic FAA TAF operations from 2007 to 2017 and historic MassDOT/AD based aircraft from 2007 to 2017. The following methodology was used to arrive at the rate of operations per based aircraft per year:
    - First, 40 percent[7] of TAF operations for each year (from 2007 to 2017) were used to determine the total number of historic local operations.
    - Historic local operations were then divided by the number of based aircraft reported by MassDOT for that same year to arrive at the number of local operations per based aircraft for each year (see formula and Table 4-27 below).
        - TAF historic local operations/historic based aircraft = operations per based aircraft
    - Next, the average number of operations per based aircraft was calculated by dividing the total number of operations per based aircraft by 11 years. This resulted in an average of 246 operations per based aircraft per year.
    - The rate of local operations per based aircraft was then applied to the recommended based aircraft forecast from Section 4.7.1.2 to project future airport operations by multiplying the number of projected based aircraft by 246.
        - Recommended Based Aircraft Forecast * 246 = Operations Per Based Aircraft
    - Finally, assuming the local vs. itinerant split observed at the Airport (see Section 4.7.2.1) of 40 percent local operations and 60 percent itinerant operations, the total number of future airport operations was projected. Table 4-28 illustrates operations projections per based aircraft through the planning period (see formula below).

[7] Although the TAF projects a local vs. itinerant split of 57.2 percent local operations and 42.8 percent local operations, as indicated in Section 4.7.2.1, recent observations by Airport management and users indicate a split of 40 percent local operations and 60 percent itinerant operations; thus, the local vs. itinerant split observed at the Airport has been used for the purposes of future operations projections.

Table 4-27: Historic Operations Per Based Aircraft

Year	FAA TAF Historic Local Operations Count	MassDOT/AD Historic Based Aircraft Count	Local Operations Per Based Aircraft
2007	10,212	37	276
2008	10,212	40	255
2009	10,186	40	255
2010	10,186	41	248
2011	10,186	41	248
2012	10,266	41	250
2013	10,288	40	257
2014	10,288	40	257
2015	10,288	40	257
2016	8,040	40	201
2017	8,040	40	201
	Average Operations Per Based Aircraft		**246**

Source: FAA TAF, MassDOT/AD, Gale Analysis

Table 4-28: Alternative 3 – Operations Per Based Aircraft Forecast

Year	Recommended Based Aircraft Forecast	Projected Local Operations	Projected Itinerant Operations	Projected Total Operations
2018	40	9,840	14,760	24,600
2019	40	9,840	14,760	24,600
2020	41	10,086	15,129	25,215
2021	41	10,086	15,129	25,215
2022	41	10,086	15,129	25,215
2023	42	10,332	15,498	25,830
2024	42	10,332	15,498	25,830
2025	42	10,332	15,498	25,830
2026	43	10,578	15,867	26,445
2027	43	10,578	15,867	26,445
2028	43	10,578	15,867	26,445
2029	44	10,824	16,236	27,060
2030	44	10,824	16,236	27,060
2031	44	10,824	16,236	27,060
2032	45	11,070	16,605	27,675
2033	45	11,070	16,605	27,675
2034	45	11,070	16,605	27,675

Source: MassDOT/AD, Gale Analysis

Table 4-28: Alternative 3 – Operations Per Based Aircraft Forecast (Continued)

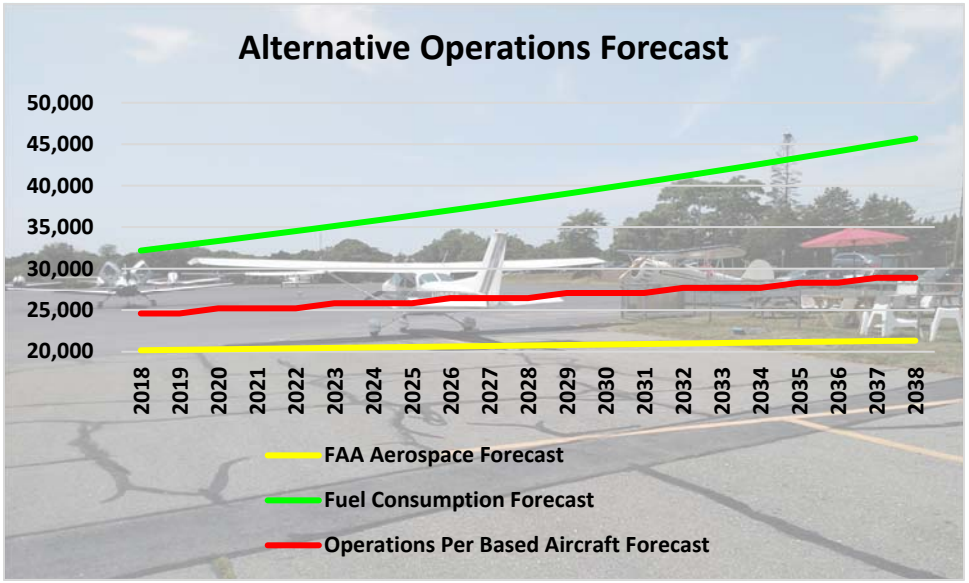
Year	*Recommended Based Aircraft Forecast*	*Projected Local Operations*	*Projected Itinerant Operations*	*Projected Total Operations*
2035	46	11,316	16,974	28,290
2036	46	11,316	16,974	28,290
2037	47	11,562	17,343	28,905
2038	47	11,562	17,343	28,905
			AAGR	**0.8%**

Source: MassDOT/AD, Gale Analysis

4.7.2.5 Recommended Aircraft Operations Forecast

As shown in Table 4-24, Alternative 1 – FAA Aerospace Forecast projects the total number of aircraft operations at the Airport to increase by 1,174 operations from 20,157 in 2018 to 21,331 in 2038. This represents a 5.8 percent increase in operations over the planning period with an AAGR of 0.3 percent. Alternative 2 – Fuel Consumption Forecast projects the total number of aircraft operations at the Airport to increase by 13,526 operations from 32,180 in 2018 to 45,706 in 2038. This represents a 42 percent increase in operations over the planning period with an AACGR of 1.77 percent. Alternative 3 – Operations Per Based Aircraft Forecast projects the total number of aircraft operations at the Airport to increase by 4,305 operations from 24,600 in 2018 to 28,905 in 2038. This represents a 17.5 percent increase in operations over the planning period with an AAGR of 0.8 percent. The three alternative operations forecast scenarios are illustrated in Table 4-29:

Table 4-29: Alternative Operations Forecast



Source: FAA Aerospace Forecast, MassDOT/AD, Airport Records, Gale Analysis

After comparing the total aircraft operations at CQX and applying the three alternative growth scenarios, it appears that there are several influencing factors that suggest a deviation from the TAF is warranted. As previously discussed, 100-LL fuel sales increased from 26,000 gallons sold in 2007 to 31,000 gallons sold in 2017, at an AACGR of 1.77 percent. Additionally, Airport records indicate latent demand for based aircraft hangars, as current hangar units are at capacity. Increases in fuel sales and based aircraft generally indicate overall positive growth at an airport; however, Alternative 2 – Fuel Consumption Forecast and Alternative 3 – Operations Per Based Aircraft Forecast have both been eliminated as projections derived from these two sources indicate unprecedented growth above and beyond the projected regional operations growth rate of 0.6 percent per year and the national operations growth rate of 0.6 percent per year.

The Alternative 1 – FAA Aerospace Forecast, on the other hand, projects steady, conservative growth of 0.3 percent per year through the planning period. This scenario is more accurately aligned with expected growth across the region and nation. Further, this Alternative represents growth of 1.4 percent in the 5-year period and 2.9 percent in the 10-year period, which meets FAA guidelines to remain within less than 10 percent of TAF projections in the 5-year forecast period, and within 15 percent of TAF projections in the 10-year forecast period.

Therefore, it is recommended that the Alternative 1 – FAA Aerospace Forecast of future aviation activity be applied to the following chapters to assess the capacity of existing facilities and determine improvements required to satisfy future activity levels. Although future aviation activity will rely on the FAA Aerospace Forecast projections, it is recommended that the Airport monitor actual growth activity annually so that scheduling of capital improvements can be accurately identified and implemented.

4.8 PEAK ACTIVITY ESTIMATES

Many airport facility needs are related to the levels of activity during peak periods. Peak characteristics are typically defined as peak month, average day, and peak hour activity. When projecting future activity levels at an airport, it is important to identify and project peak period activity levels. These projections help facilitate future planning decisions and highlight an airport's ability to accommodate future aviation activity demand.

In the case of Chatham, it is important to consider the seasonal nature of activity in the region. According to Airport accounts, approximately 65 percent of annual operations occur during peak season, between the months of May and October, with approximately 20 percent of those operations occurring during the month of August.

The values for average day peak month and for the peak hour have been calculated by taking the number of operations calculated for the peak month and dividing that figure by the number of days in the peak month. In speaking with airport users, August represents the peak month at CQX with 31 days. For planning purposes, the peak month will be calculated assuming it represents 20 percent of total annual operations. As the Airport experienced 20,100 annual operations in 2017, 4,020 operations (20 percent) would be expected to occur in the peak month. It is then estimated that 15 percent of the average day peak month would be represent the number of peak hour operations. The calculation of peak activity is illustrated in the formula below and in Table 4-30.

[(Total Annual Operations*20%)/31]*15% = Peak Hour (ADPM)

Table 4-30: Peak Activity Estimates

	Total Annual Operations	*Peak Month*	*Average Day in Peak Month*	*Peak Hour (ADPM)*
Base Year - 2017	**20,100**	**4,020**	**130**	**19**
Forecast				
2023	20,443	4,089	132	20
2028	20,734	4,147	134	20
2038	21,331	4,266	138	21

Source: FAA TAF, Gale Associates Analysis 2018

4.9 SUMMARY OF FORECASTS

A summary of the recommended forecast for aviation activity for CQX can be found in Table 4-31. This shows projected demand for the 5-, 10-, and 20- year planning periods discussed in Section 4.7.2.5. These projections will be used to assess the capacity of existing facilities and determine improvements required to satisfy future activity levels in subsequent chapters of this Master Plan.

Table 4-31: Summary of Recommended Forecast

Year	*Itinerant*			*Local*			
	Air Taxi	General Aviation	Military	Civil	Military	Total Operations	Based Aircraft
2023	388	11,869	0	8,186	0	20,443	42
2028	376	12,049	0	8,309	0	20,734	43
2038	354	12,415	0	8,562	0	21,331	47

Source: FAA TAF, Gale Associates Analysis 2018

4.9.1 DESIGN AIRCRAFT

As referenced in Chapter 2, *Section 2.1.1*, all airports are designed according to the dimensions of a "design aircraft", which is the most demanding aircraft type or grouping of aircraft with similar characteristics that make regular use of the Airport. Regular use is a minimum of 500 annual operations, with one operation being either a takeoff or a landing. According to the 2003 Airport Master Plan, the design aircraft at CQX was defined as the Beech Baron B-58, which has a wingspan of 37.83 feet, a tail height of 9.75 feet, and an approach speed of 96 knots. At the time, the characteristics of the Beech Baron B-58 required that the Airport be designed to B-I (small airplane) standards for all future improvements, consistent with FAA AC 150/5300-13A. Upon recent discussions with Airport Management, it was discovered that the Beech Baron B-58 and aircraft with similar characteristics remain the most demanding aircraft utilizing CQX, and therefore, it shall remain the design aircraft for the purposes of this Master Plan.