CHAPTER 5: AVIATION FORECASTS

5.1 INTRODUCTION

A key element in the development of a state airport system plan is projecting aviation demand at both the local and state level. The demand projections provide insight into how aviation activity is anticipated to change over time. The changes in activity are used to determine if facility and service improvements are needed to serve the projected demand. Future aviation demand forecasts may also suggest other needs related to airport roles. Details of aviation demand projections for this study's 24 public-use airports comprising the New Hampshire statewide airport system are presented in this chapter. Note that Alton Bay, a seasonal public-use facility on Lake Winnipesaukee is not included in the aviation projections included in this plan due to its seasonal nature and lack of based aircraft.

Both commercial and general aviation positively affect the U.S. economy. For purposes of the New Hampshire Statewide Airport System Plan (NHSASP), the focus on the aviation forecasts is on general aviation activities. General Aviation (GA) is defined as all aviation activity other than commercial airline and military operations. It encompasses a wide variety of aviation activities including private/recreational flying, flight instruction, business jet operations, emergency medical/air ambulance services, aerial vegetation management, photography, and surveying among others. GA operations are conducted through the use of a diverse group of aircraft ranging from gliders and single- and multi-engine piston driven aircraft, to high-performance, long-range business jet aircraft.

General aviation is an important transportation resource in the U.S. and the demand for business jet aircraft and services has grown in recent years. Safety and security concerns for corporate executive staff and flight delays at some U.S. airports have made on demand, corporate, and fractional ownership charter flights more prudent than traveling on scheduled air carriers for a certain segment of the population.

The Federal Aviation Administration (FAA) Aerospace Forecast for the period 2014-2034 indicates that while economic uncertainties still affect the business jet market, the rate of decline has slowed in the recent past and a recovery is expected in the near term, with a robust outlook in the long-term. This is due to overall higher corporate profits and the growth of worldwide GDP and the continued concerns about safety, security, and commercial flight delays that keep business aviation attractive. Industry expert predictions, and general aviation survey results also suggest that business use of general aviation aircraft will expand at a faster pace than that for personal and recreational use.

This chapter presents the aviation demand forecast in the following sections:

- Historical Airport Data and Activity Measures
- Forecast Methodology
- Airport Activity Forecasts
- Summary of Forecasted System Activity

5.2 HISTORICAL AIRPORT DATA AND ACTIVITY MEASURES

During the process of forecasting aeronautical activity at an airport, or in this case a system of airports, understanding the demand for aviation-related services is extremely important. Two key components in conducting this evaluation are drawing relationships between the number of based aircraft and the number of aircraft operations. For this system planning effort, an airport inventory for each airport was conducted. During this process, significant data was collected, including based aircraft and annual aircraft operations.

5.2.1 HISTORICAL BASED AIRCRAFT

The FAA defines a based aircraft as one that is operational and airworthy and which is typically operated from the airport for the majority of the year. According to New Hampshire Department of Transportation Bureau of Aeronautics (BOA) records, there were 1,066 registered based aircraft reported for the 24 study airports which for the purposes of this forecasting effort will be used to represent the current total based aircraft in New Hampshire, although based on the data collection survey used for this study, the inventory chapter indicated 1,134 based aircraft across the 24 airports. This discrepancy may indicate that some of the same New Hampshire based aircraft are being counted at multiple airports.

Evaluation of FAA's based aircraft data reveals that from 2009 to 2012 the number of aircraft based in New England and New Hampshire decreased. In fact, based on NH state data, since 2004 the total based aircraft in New Hampshire has been declining while New England as a whole saw growth in based aircraft from 2003 until 2009. As of 2013, New Hampshire bases roughly 18 percent of all aircraft in New England.

5.2.2 NEW ENGLAND REGIONAL TRENDS

A recent study of general aviation in the New England region (NERASP-GA) indicated that over an 11-year period from 2000 to 2010 the total number of active aircraft in New England varied cyclically from year to year, with a peak in 2004 and troughs in 2002 and 2006. There appears to have been a significant decline in the Region's active aircraft since 2007. Whether this is just another cyclical trough due to the recent economic recession or the start of a longer-term trend will not become clear until more recent data becomes available. During that 11 year period, the cyclical pattern varied by state, with Connecticut, Maine and New Hampshire having the greatest declines in 2002 and Maine having the greatest decline in 2006.

The NERASP study also indicated that the New England Region in total has a significantly lower ratio of active aircraft to population than the U.S., and in particular from 2008 to 2010 the ratio declined more steeply for New England than for the U.S. in total. The study also showed that from 2000 to 2007 the ratio of active aircraft to population was fairly stable, with some fluctuation from year to year, particularly the decline in the two years following the 2001 recession and during the steady increase in fuel prices from 2004 to 2006.

The combination of the dramatic increases in oil prices in the summer of 2008 and the Great Recession that began at the end of 2007 and lasted until mid-2009, resulted in a fairly steady decline in the ratio of active aircraft to population for both the U.S. and New England to levels in 2010 comparable to or below the lowest levels in the previous ten years. Recent data suggests that the decline has continued beyond 2010 which may have contributed from historically high fuel prices since 2010.

The NERASP study also indicated that the ratio of active aircraft per 100,000 people varies widely across the New England region from year to year, with the more urbanized states, Connecticut, Massachusetts, and Rhode Island, having significantly lower numbers of active aircraft per 100,000 people than the other three states. Although New Hampshire was shown to have the highest ratio of active aircraft to population of the New England states, the study showed a declining trend for New Hampshire over an 11-year period (2000-2010). Conversely, the ratio for Maine showed a slowly increasing trend over the same period.

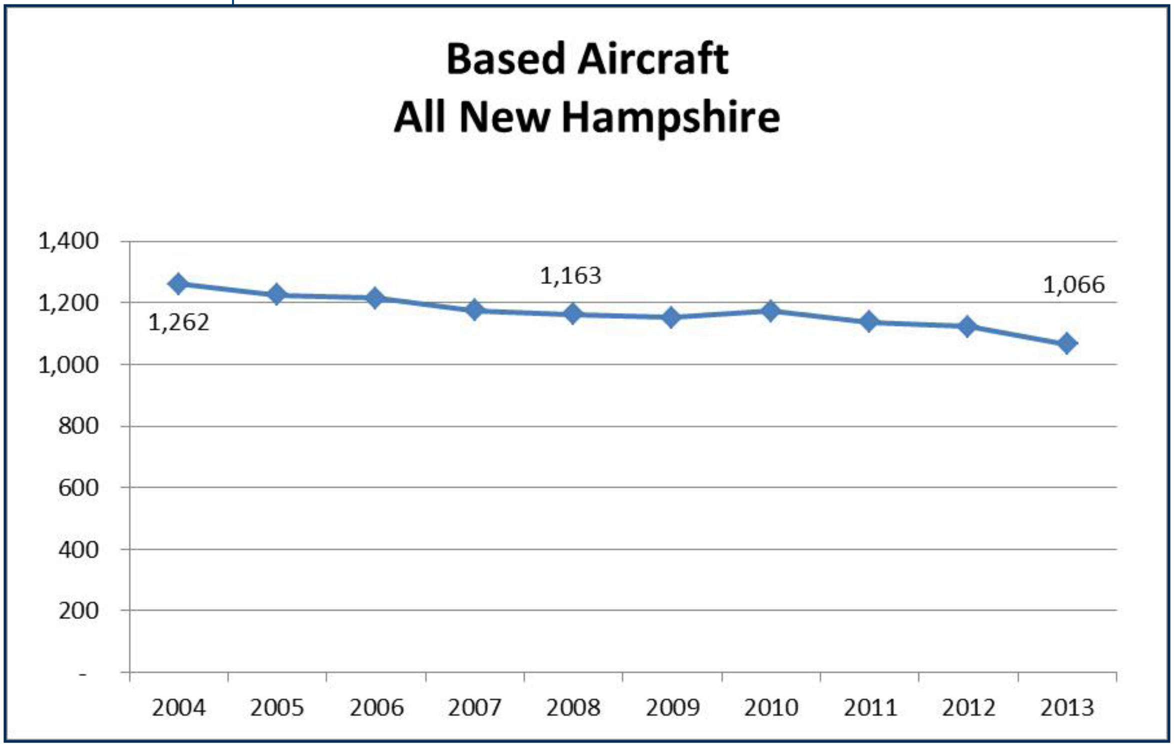
The study also looked at the average hours flown per year by active aircraft for the U.S. as a whole and New England overall. Average aircraft utilization for the U.S indicated a steadily declining long-term trend, with possibly a recovery starting in 2010. The long-term trend in average aircraft utilization for the New England region is less clear because of the effects of data anomalies and particularly high average utilization in Connecticut for a period of years. Excluding the data for Connecticut, the combined average aircraft utilization for the other five New England states with the exception of 2002, showed a declining long-term trend with values significantly below those for the U.S.

5.2.3 HISTORICAL NEW HAMPSHIRE TRENDS

Figure 5-1 illustrates historical based aircraft data in New Hampshire while **Figure 5-2** illustrates the relationship between based aircraft in New England and the number of based aircraft in New Hampshire. The figure displays historical based aircraft data since 2004. The similarities in based numbers on a regional and state level indicate there is a general correlation of aviation activity within the region and activity within the New Hampshire system of airports. New England region saw a 17 percent decline in based aircraft over the past ten years while New Hampshire saw a 15.5 percent decline.

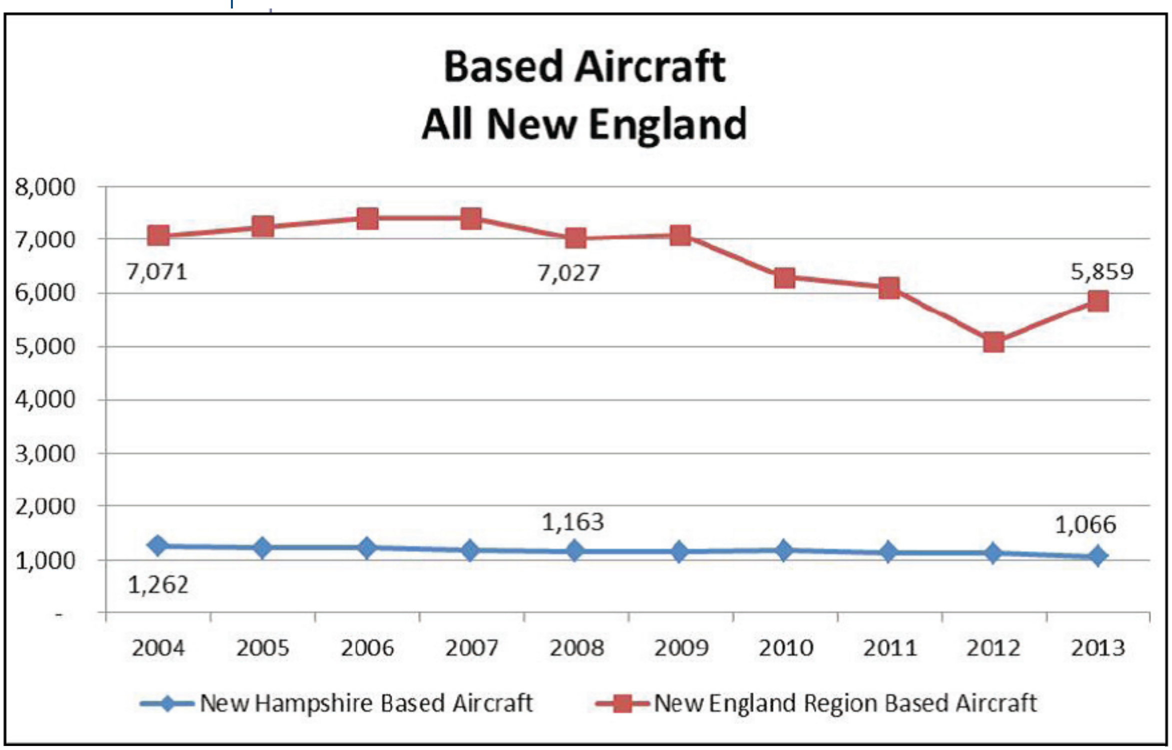
The General Aviation survey data used to produce the FAA Aerospace Forecasts showed that between 2010 and 2012 the number of active GA aircraft based on aircraft registration figures went down by 6.4 percent, from 223,370 to 209,034. During that same time period, New Hampshire experienced a 4.3 percent decline of registered aircraft from 1,173 to 1,122. From 2012 to 2013 New Hampshire saw a 5.4 percent decline. The FAA Aerospace forecast indicates that between 2012 and 201 the total national general aviation fleet declined by roughly 3 percent, from 209,034 to 202,865.

Figure 5-1 - New Hampshire Historical Based Aircraft (2004-2013)



Source: BOA Reported Data

Figure 5-2 - Based Aircraft Comparison (2004-2013)



Source: BOA Reported Data

5.2.4 HISTORICAL AIRCRAFT OPERATIONS

The FAA categorizes an aircraft operation, a takeoff or a landing, into varied groups. These categories include commercial operations (air carrier, air taxi and commuter), general aviation, and military activity. For the purposes of this study, general aviation operations are used and identify aircraft takeoffs and landings not classified as air carrier or military. Unless an airport has an air traffic control tower (ATC) facility, aircraft operations activity at airports is merely an estimate. Activity at airports with air traffic control towers are systematically recorded and reported.

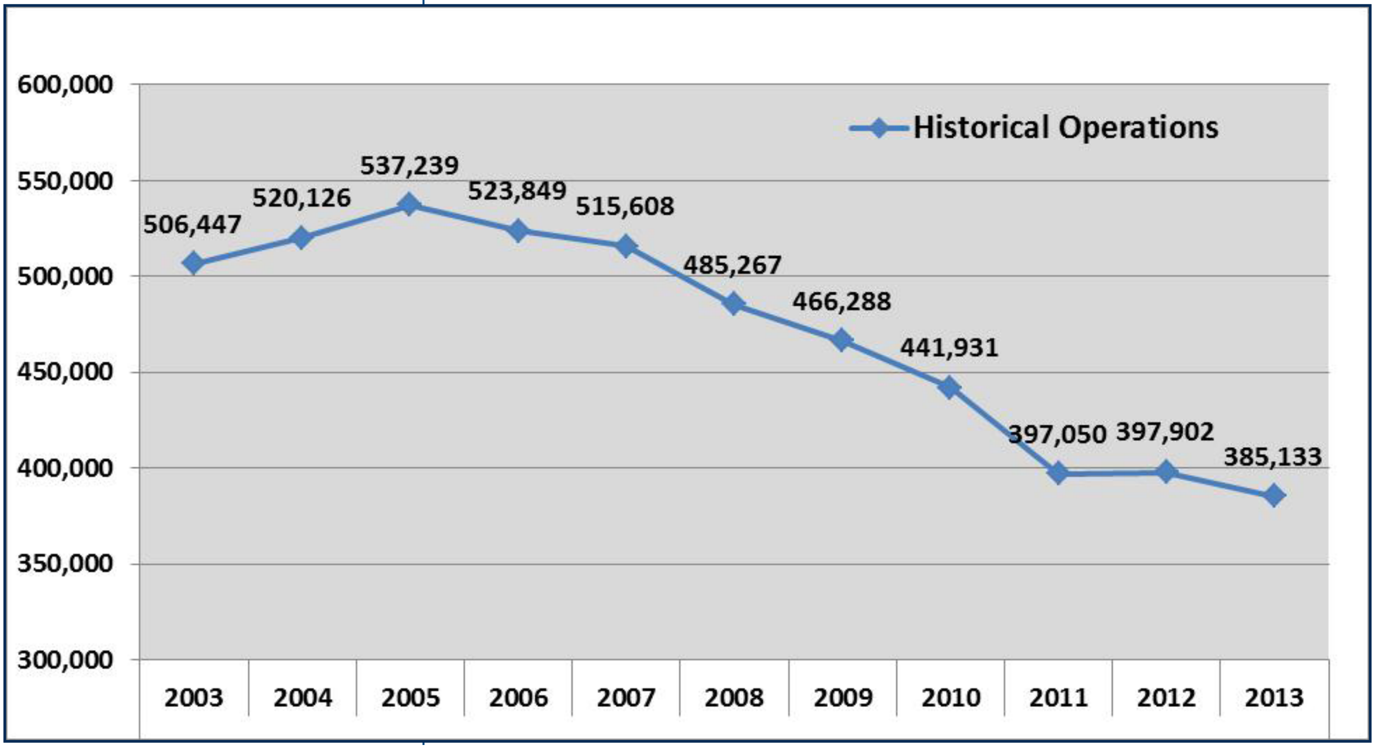
As with all of the data collected for the forecast, the operations data for the system airports was collected from various sources. As noted, most annual aircraft operations reported by the airports are estimates of activity. Since the FAA Air Traffic Activity Data System (ATADS) is most accurate, the ATADS data was used where available and supplemented with FAA Terminal Area Forecast Data for the airports without an air traffic control tower.

Of the 24 study airports considered for this forecast, historical aircraft operations data was readily available for 15 airports through the FAA Terminal Area Forecast or the ATADS system. These airports include:

- Berlin Regional
- Boire Field
- Claremont Municipal
- Concord Municipal
- Dean Memorial
- Dillant-Hopkins
- Laconia Municipal
- Lebanon Municipal
- Manchester-Boston Regional
- Mt. Washington Regional
- Portsmouth International at Pease
- Skyhaven
- Jaffrey Airport-Silver Ranch
- Parlin Field
- Plymouth Municipal

Figure 5-3 shows the historical trend of GA operations in New Hampshire from 2003-2013.

Figure 5-3 - Historical Operations (2003-2013)



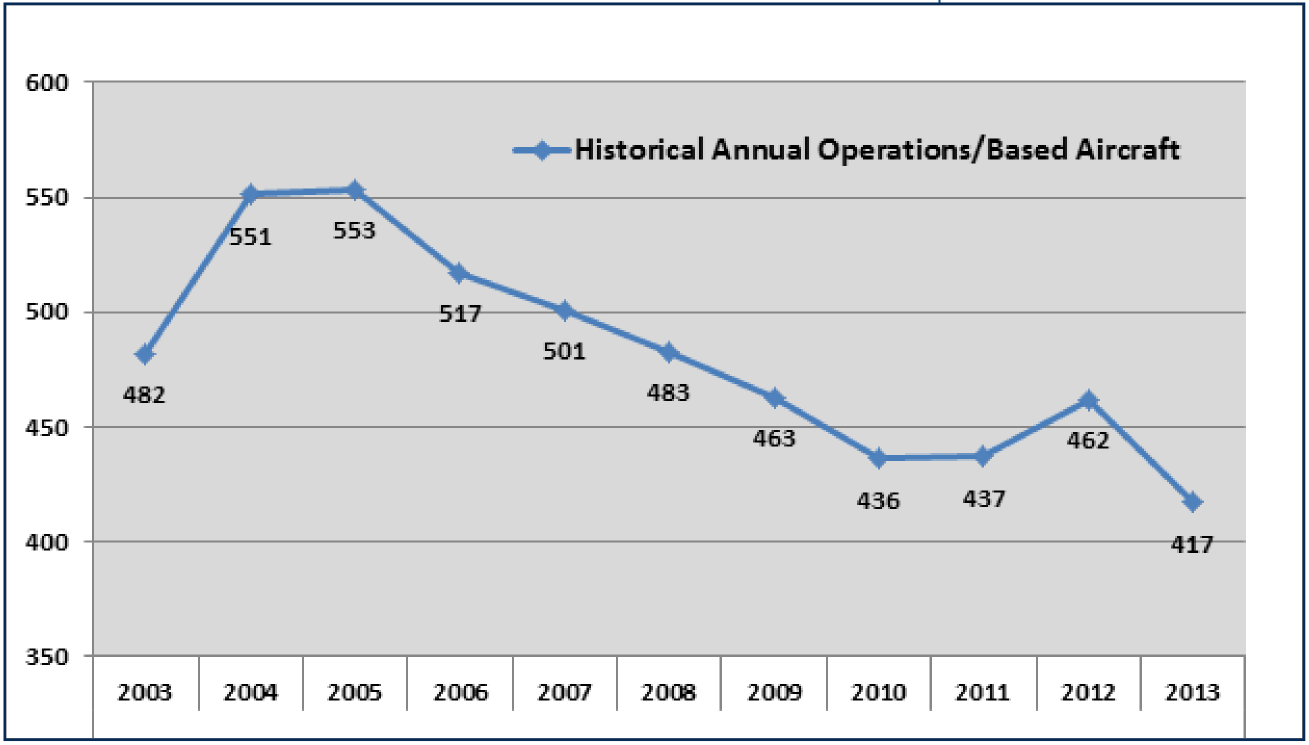
Source: FAA Terminal Area Forecast (TAF) database

There are many challenges associated with aircraft operations data at general aviation airports without air traffic control towers and oftentimes this data is developed based on a best guess by airport management. Historically, this has led to various data sources reporting aircraft operations numbers that differ. **Figure 5-3** indicates that New Hampshire experienced an average annual decline in operations of 4.7 percent from 2009-2013.

The operations data at towered airports can be used to derive historical operations per based aircraft (OPBA) ratios that are often a better indication of actual activity across an entire system of airports. To develop this ratio, the number of based aircraft is divided into the total general aviation operations. **Figure 5-4** on the following page shows the average number of annual operations of based aircraft at towered airports from 2003-2013. These airports included:

- Boire Field
- Lebanon Municipal
- Manchester-Boston Regional
- Portsmouth International at Pease

Figure 5-4 - Historical Annual Operations per Based Aircraft at New Hampshire Towered Airports (2003-2013)



Source: Louis Berger Calculations

The historical data collected for this study shows a decline in based aircraft and operations data at many of the airports inventoried. Historical data also shows that passenger enplanement activity at the study airports has varied due to changes in air service and seasonal fluctuations. The FAA has indicated however, that as the economy recovers from the most recent serious economic downturn and a slow recovery, aviation activity will grow over the long run.

5.3 AIRPORT ACTIVITY FORECASTS

Forecasts of aviation activity are developed to enable airport operators and other entities involved in the development of aviation facilities to properly plan for the distribution of limited financial resources to enable the highest return on investment. Whether that funding is intended for a single airport or across a system of airports, the forecasts lay the foundation to identify the required facilities to meet future demand.

One of the most significant current challenges in the aviation industry, and general aviation in particular, is the slow rebound from the recent economic recession. The lack of capital for the purchase of aircraft as well as the increase in general operating costs makes general aviation a less inviting endeavor than in previous years. In addition to the recreational aviation activities, many corporate operations have experienced the crunch of the economy over the past several years with cutbacks to, or elimination of corporate flight departments. These types of fiscal constraints and decreased aviation activity can have a negative impact on revenue and budgets of small to medium-sized general aviation airports.

5.3.1 FORECASTING METHODOLOGY

Choosing the appropriate methodology is an important component to developing forecasts which allow for appropriate planning for future system needs. The general approach often used to develop forecasts requires the identification of specific historical relationships between regional, state, and individual airport forecasts as well as specific operational and based aircraft data. As mentioned, historical data at smaller airports without air traffic control towers is generally less reliable than airports with control towers. Consequently, it is more of a challenge to produce accurate quantitative forecasts.

Demand projections for general aviation aircraft operations and based aircraft for this effort were primarily developed through an analysis of historical trends nationally, regionally, as well as statewide. This historical trending analysis, combined with growth rates from the FAA Aerospace Forecast for Fiscal Years 2014-2034, were the chosen methodology for this forecast effort.

Utilizing this information for a system plan forecast is an industry accepted practice and an appropriate level of effort for this system plan. Other methodologies commonly used to forecast aviation activity (e.g., regression analysis) were not employed. These more rigorous methodologies are usually reserved for more in depth forecasts at the master planning level.

It is important to emphasize that aviation forecasting is not an "exact science", so experienced judgment and practical considerations ultimately influence the level of detail and effort required to establish a reasonable aviation forecast and the development of decisions that result from them.

This forecasting effort is presented in standard five, ten, and 20-year increments. Historically, the general aviation industry has been highly cyclical, exhibiting strong growth during economic expansions and negative growth during economic uncertainty.

5.3.2 BASED AIRCRAFT FORECAST

To forecast the number of based aircraft at each airport for the forecast periods of five, ten, and 20 years, each airport was inventoried for current and historical based aircraft. Actual airport and NHDOT based aircraft data was collected for the previous ten years (2004-2013). Analysis of this information provided a yearly growth percentage for each airport from which a Historical Average Annual Growth (HAAG) trend was derived.

It should be noted that the based aircraft forecast methodology for this study was chosen to fit within the constraints of the project. The based aircraft situation in New Hampshire and throughout New England is complex and dynamic and includes many variables. Notably, with the exception of the remote airports, aircraft owners in the region generally have flexibility with regard to their choice of where to base their aircraft due to the proximity of airports without regard to geo-political boundaries. This means that an owner who is a resident of New Hampshire can base an aircraft outside of the state such as airports in Maine, Vermont, or Massachusetts. Variables such as these were not considered when conducting this forecasting effort.

The HAAG data was analyzed and anomalies were evaluated and compared to ATADS and other data collected to determine the validity of the findings. Once the data was validated the airports were separated into two historical performance categories. These categories are based on the airport historically experiencing positive or negative average annual growth in the last ten years. They include:

- HAAG Category 1 – Negative Average Annual Growth
- HAAG Category 2 – Positive Average Annual Growth

Using the determined HAAG, the forecast considered applying either a negative Future Annual Growth rate of -0.3 percent (Category 1) or a positive growth rate of +0.5 percent (Category 2) to the general aviation operations. The negative 0.3percent rate is based on the projected decrease of active piston-powered aircraft through 2034 as indicated in the FAA Aerospace Forecast (2014-2034). Piston-powered aircraft are primarily the single-engine aircraft that utilize the system of airports. The positive 0.5 percent rate is based on the overall projection of the general aviation fleet through 2034 as also indicated in the FAA Aerospace Forecast. For Manchester-Boston Regional Airport and Portsmouth International Airport at Pease, a 2.7% annual growth rate for air carrier operations presented in the FAA Aerospace Forecast (2014-2034) was applied. For Manchester-Boston Regional Airport, Portsmouth International Airport at Pease, Dillant-Hopkins Airport , and Lebanon Municipal Airport a negative .1% annual decline was applied to air taxi operations. This forecast for air taxi operations is also consistent with the projections presented in the FAA Aerospace Forecast (2014-2014).

FAA TAF Forecasts of itinerant general aviation operations and local civil operations at FAA facilities are based primarily on time series analysis. Based aircraft data are collected by FAA inspectors, airport managers, and state aviation officials and reported on FAA Form 5010. The information collected by the FAA on this form is the description of the physical and operational characteristics of an airport that is kept on file with the FAA.

The information is maintained in FAA computers for record keeping purposes and use in airspace studies. The form includes the number of aircraft, mostly general aviation aircraft, permanently based at an airport.

For Non-NPIAS facilities, historic operations in the TAF are from the FAA Form 5010 database. These operation levels are held constant for the forecast unless otherwise specified by a local or regional FAA official.

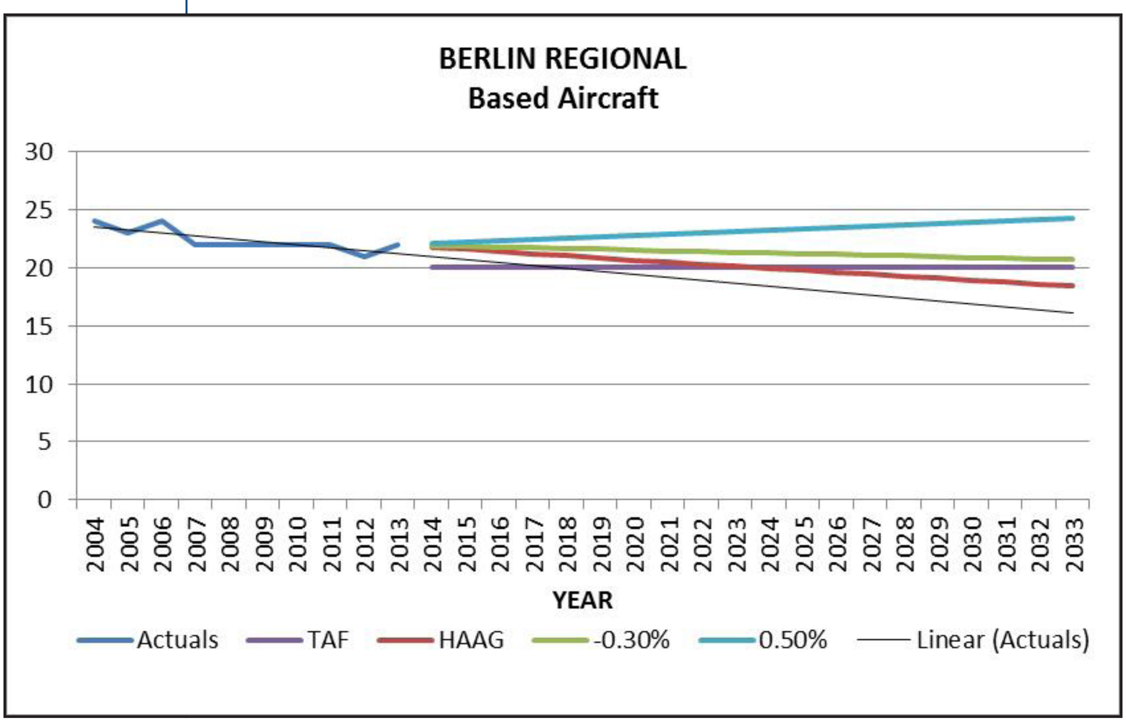
The forecast utilizing this methodology is presented for each airport on the following pages.

Berlin Regional Airport

As demonstrated in the following table and chart, the Future Annual Growth Category 2 produces the highest forecast and the HAAG rate produces the lowest. The HAAG rate calculated for Berlin Regional is -0.88 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes. In 2013 Berlin reported 22 based aircraft.

Berlin Regional Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	20	20	20
-0.30%	22	21	21
0.50%	23	23	24
HAAG	21	20	18



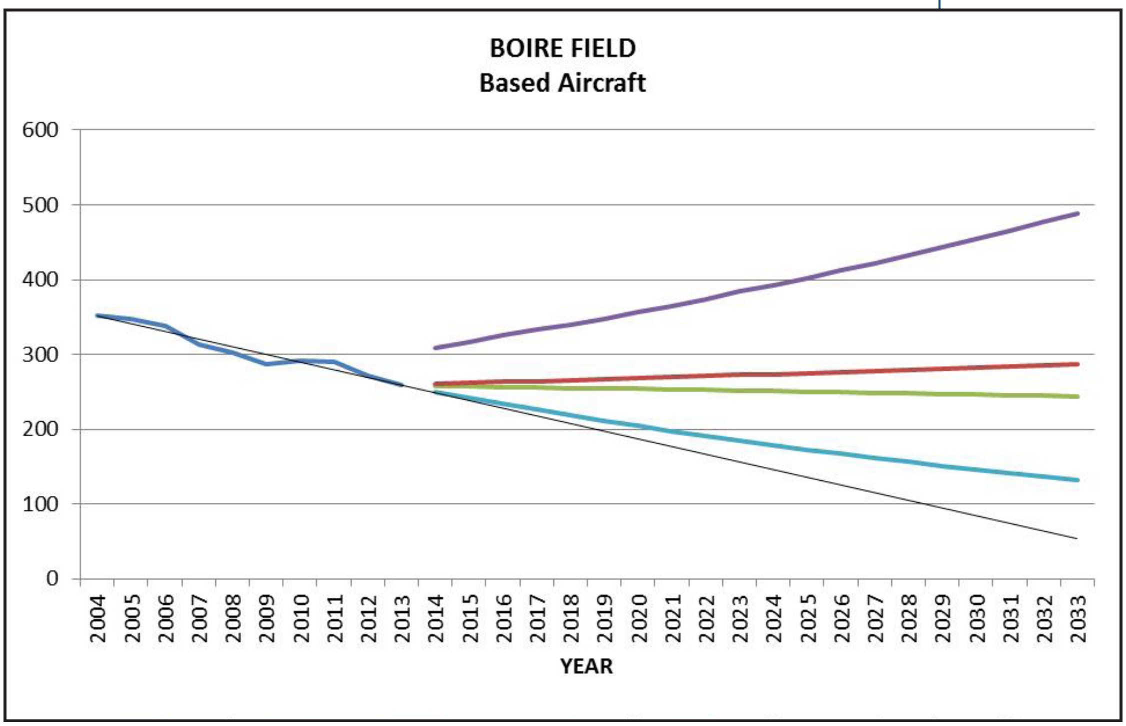
Source: FAA & Consultant Calculations

Boire Field

As demonstrated in the following table and chart, the TAF produces the highest forecast and the HAAG rate produces the lowest. The HAAG rate calculated for Boire Field is -3.31 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes. In 2013 Boire Field reported 234 based aircraft.

Boire Field Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	340	384	489
-0.30%	255	251	244
0.50%	266	272	286
HAAG	219	185	132



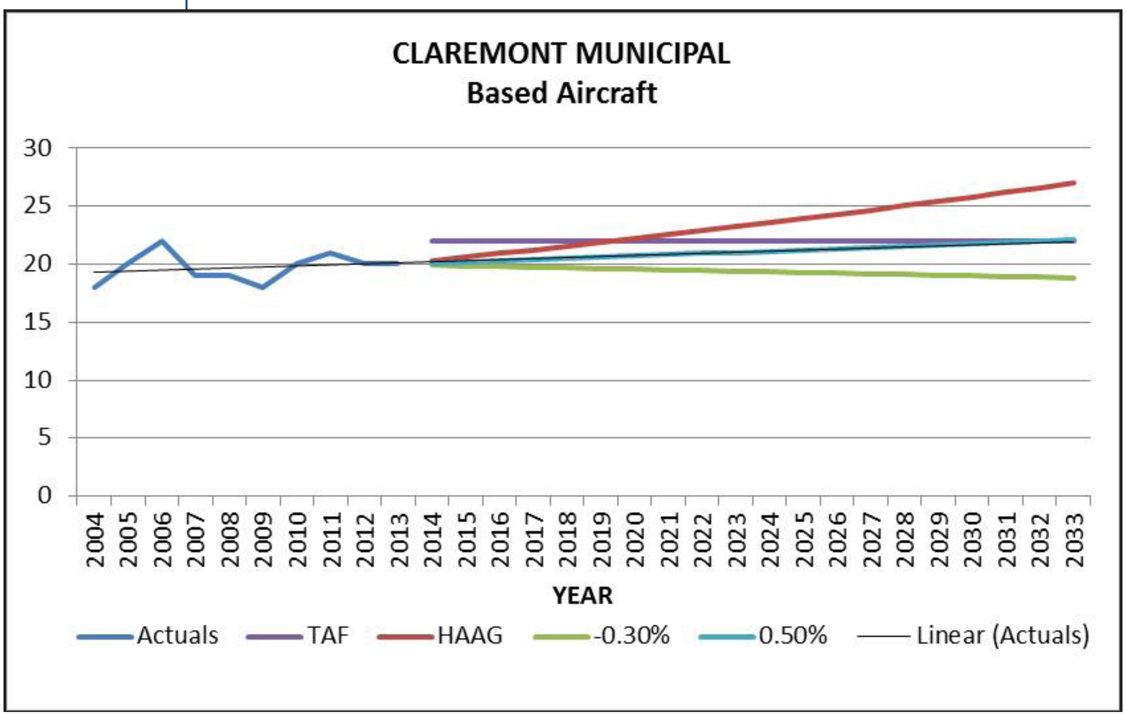
Source: FAA & Consultant Calculations

Claremont Municipal Airport

As demonstrated in the following table and chart, the HAAG produces the highest forecast and the Future Annual Growth Rate 1 produces the lowest. The HAAG rate calculated for Claremont Airport is 1.5 percent. The Future Annual Growth Category 2 is emphasized in the table below for planning purposes. In 2013 Claremont was reported to have 21 based aircraft.

Claremont Municipal Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	22	22	22
-0.30%	20	19	19
0.50%	21	21	22
HAAG	22	23	27



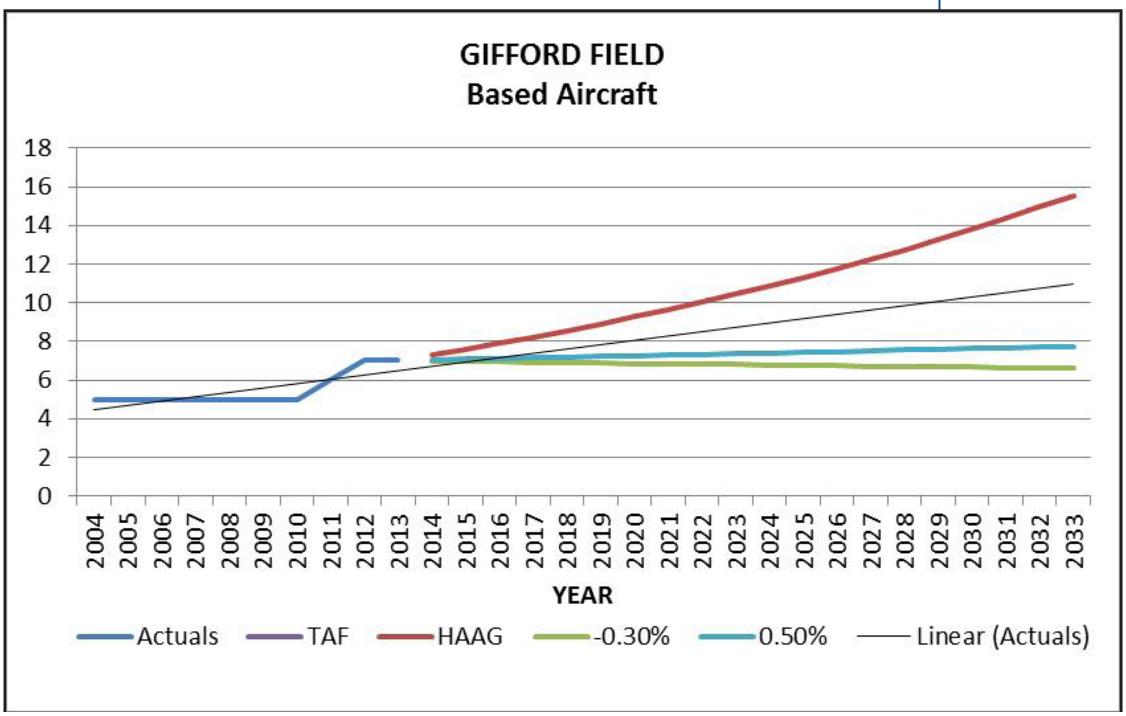
Source: FAA & Consultant Calculations

Gifford Field

As demonstrated in the following table and chart, the HAAG produces the highest forecast and the Future Annual Growth Rate 1 produces the lowest. TAF data was not available for Gifford Field. The HAAG rate calculated for Gifford Field is 4.1 percent and Future Annual Growth Category 2 is emphasized in the table below for planning purposes. In 2013 Gifford Field was reported to have seven based aircraft.

Gifford Field Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	7	7	7
0.50%	7	7	8
HAAG	9	10	16



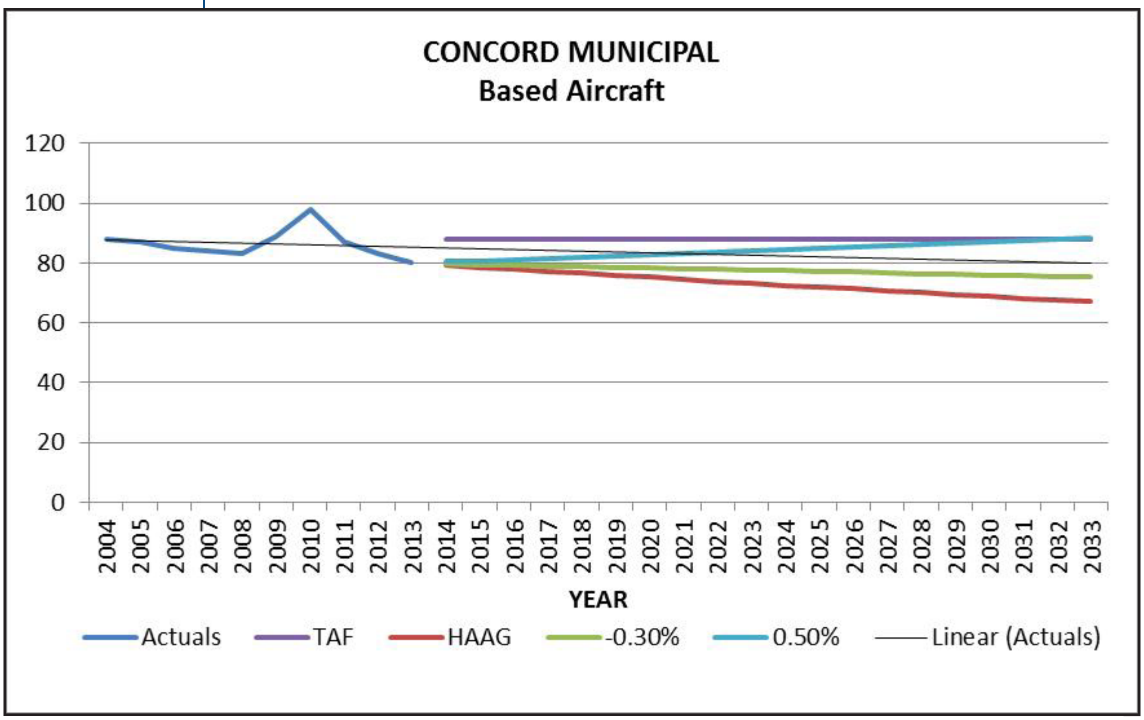
Source: FAA & Consultant Calculations

Concord Municipal Airport

As demonstrated in the following table and chart, the TAF produces the highest forecast and the HAAG rate produces the lowest. The HAAG rate calculated for Concord Municipal Airport is -0.88 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes. In 2013 Concord Municipal reported 90 based aircraft.

Concord Municipal Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	88	88	88
-0.30%	79	78	75
0.50%	82	84	88
HAAG	77	73	67



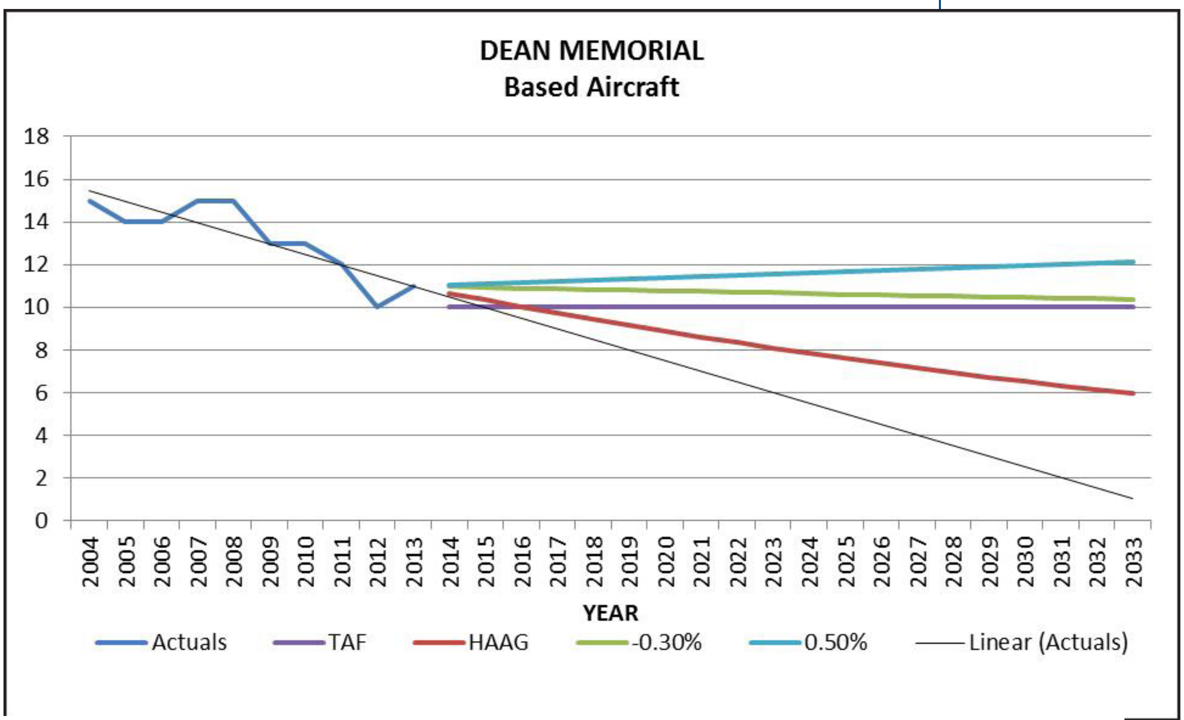
Source: FAA & Consultant Calculations

Dean Memorial Airport

As demonstrated in the following table and chart, similar forecasts exist for both the TAF and Future Annual Growth Rates 1 and 2. The HAAG rate produces the lowest forecast. The HAAG rate calculated for Dean Memorial is -3.0 percent and Future Annual Growth Category 1 is emphasized in the table below for planning purposes. In 2013 Dean Memorial was reported to have 12 based aircraft.

Dean Memorial Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	340	384	489
-0.30%	255	251	244
0.50%	266	272	286
HAAG	219	185	132



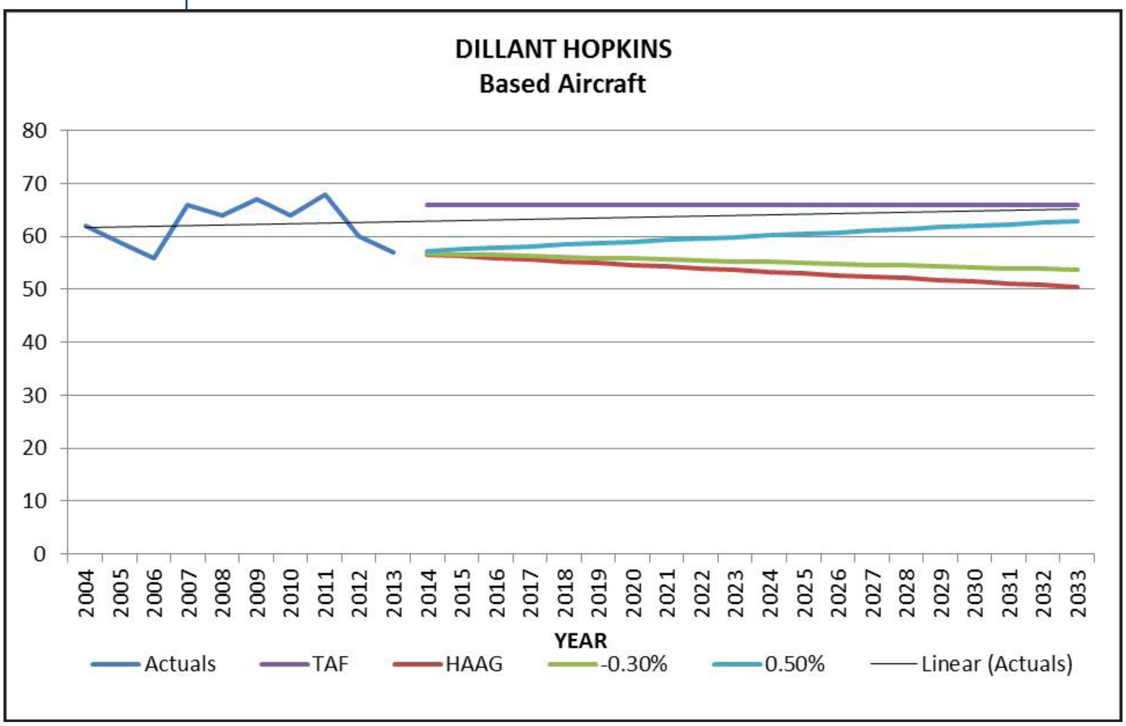
Source: FAA & Consultant Calculations

Dillant-Hopkins Airport

As demonstrated in the following table and chart, the TAF produces the highest forecast and the HAAG rate produces the lowest. The HAAG rate calculated for Dillant-Hopkins is -0.6 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes. In 2013 Dillant-Hopkins reported 80 based aircraft.

Dillant-Hopkins Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	66	66	66
-0.30%	56	55	54
0.50%	58	60	63
HAAG	55	54	51



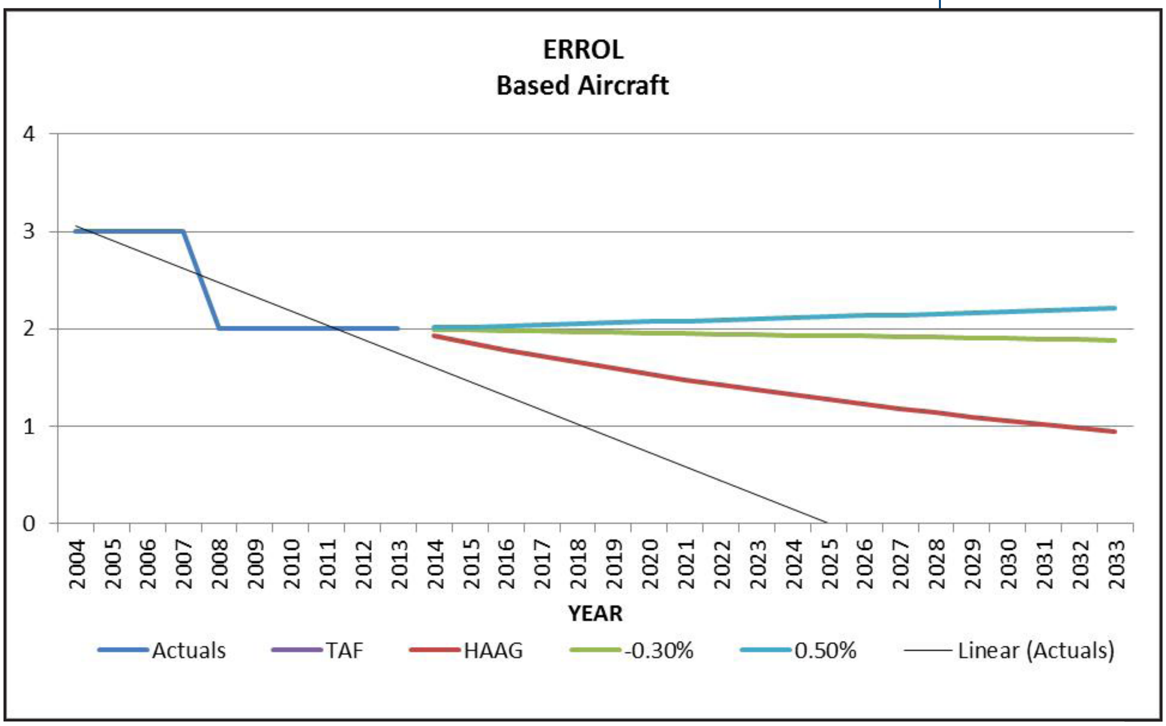
Source: FAA & Consultant Calculations

Errol Airport

As demonstrated in the following table and chart, Errol is expected to have very few based aircraft and TAF data was not available. The HAAG rate calculated for Errol is-3.7 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes. In 2013 Errol reported 2 based aircraft.

Errol Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	2	2	2
0.50%	2	2	2
HAAG	2	1	1



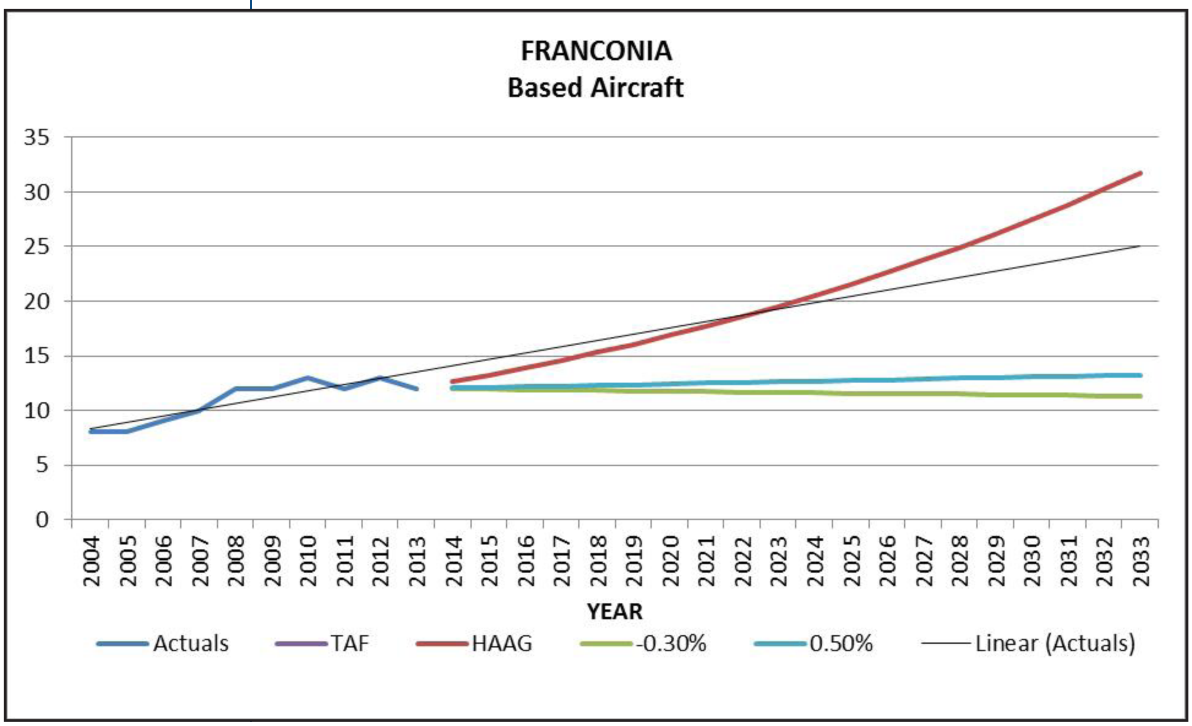
Source: FAA & Consultant Calculations

Franconia Airport

As demonstrated in the following table and chart, the HAAG rate produces the highest forecast and the Future Annual Growth Rate 1 produces the lowest. The HAAG rate calculated for Franconia is 5.0 percent. Future Annual Growth Category 2 is emphasized in the table below for planning purposes. In 2013 Franconia reported 12 based aircraft.

Franconia Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	12	12	11
0.50%	12	13	13
HAAG	15	20	32



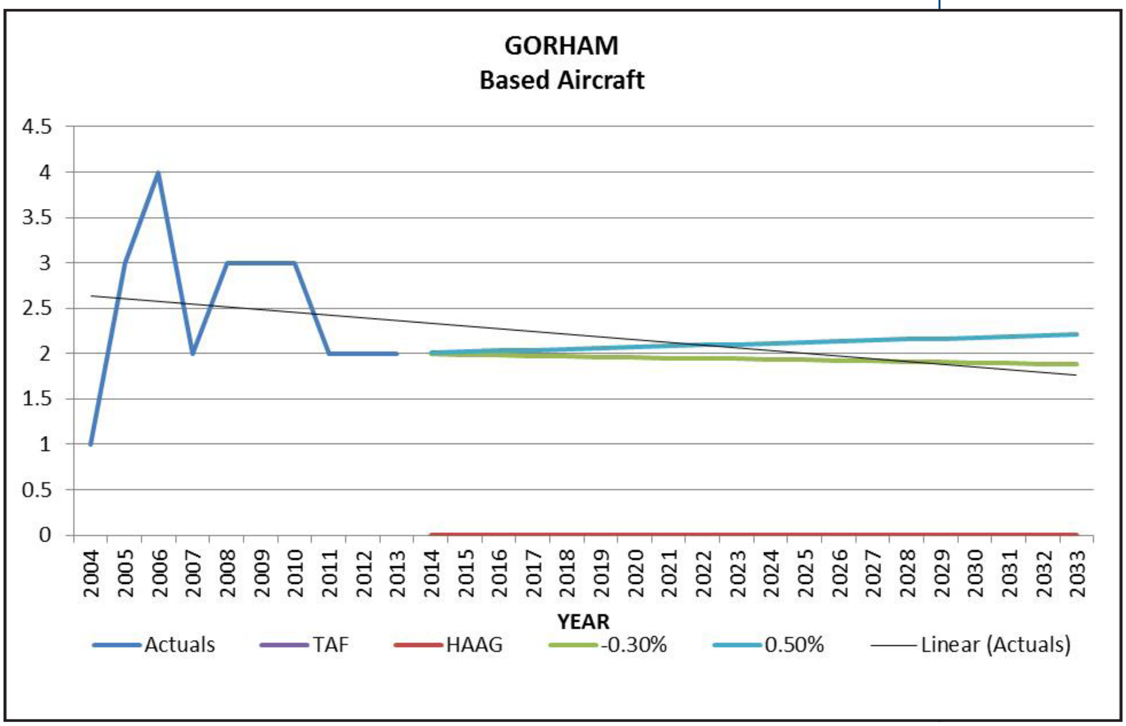
Source: FAA & Consultant Calculations

Gorham Airport

As demonstrated in the following table and chart, Gorham is expected to have very few based aircraft and TAF data was not available. The HAAG rate calculated for Gorham is 22.2 percent and produces an inflated HAAG rate forecast due to the relatively high rate but low initial volume. Since this percentage yields an unreasonable forecast, the HAAG has been omitted. Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Gorham Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	2	2	2
0.50%	2	2	2
HAAG	N/A	N/A	N/A



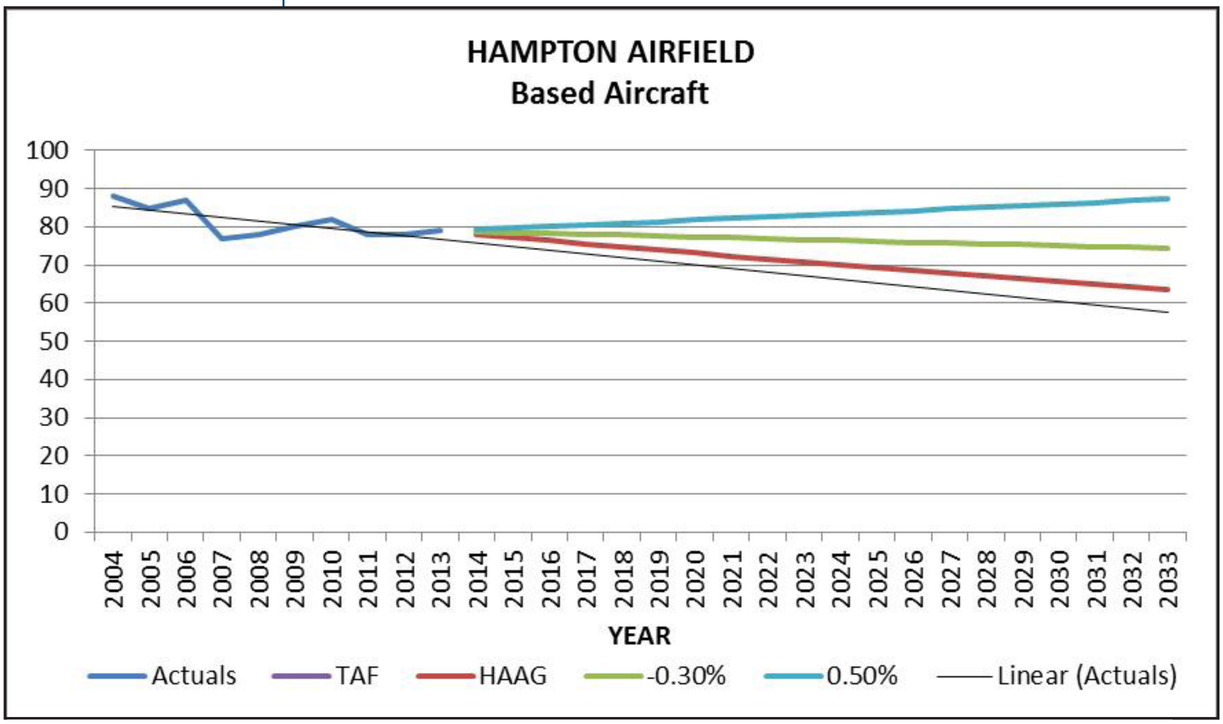
Source: FAA & Consultant Calculations

Hampton Airfield

As demonstrated in the following table and chart, the Future Annual Growth Rate 2 produces the highest forecast and the HAAG rate produces the lowest. TAF data was not available. The HAAG rate calculated for Hampton Airfield is -1.1 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes. In 2013 Hampton Airfield reported 82 based aircraft.

Hampton Airfield Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	78	77	74
0.50%	81	83	87
HAAG	75	71	63



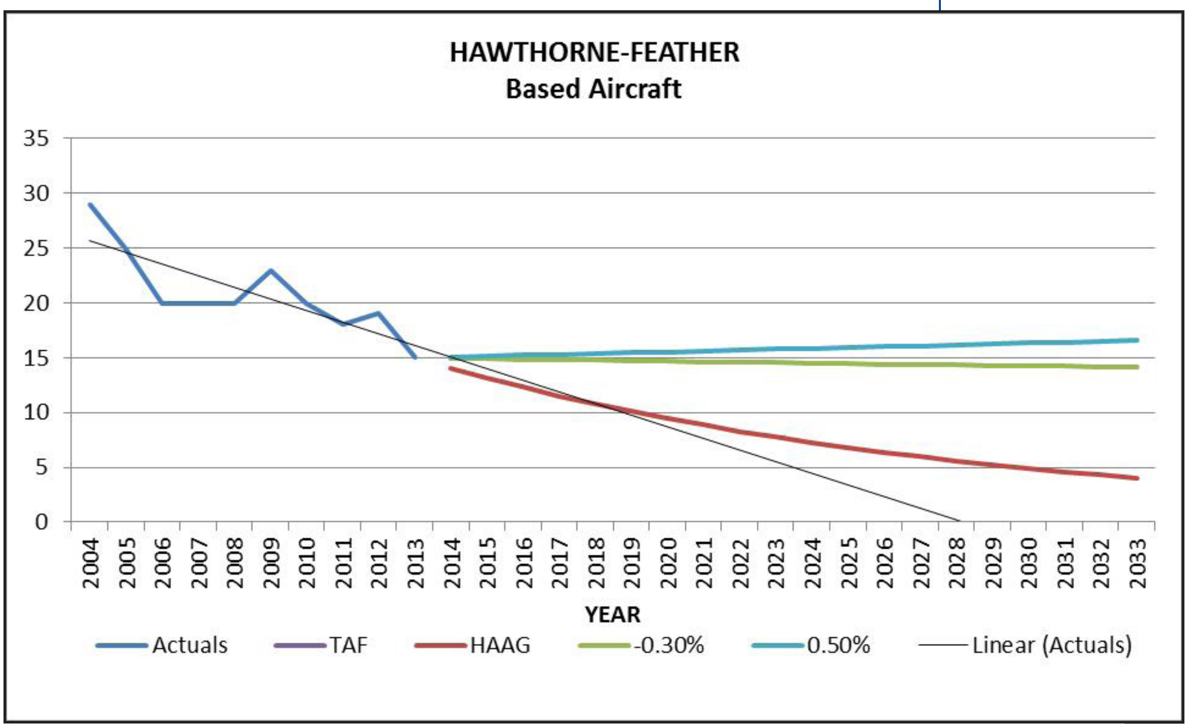
Source: FAA & Consultant Calculations

Hawthorne-Feather Airport

As demonstrated in the following table and chart, the HAAG rate produces the highest forecast and the Future Annual Growth Rate 1 produces the lowest. TAF data was not available for Hawthorne-Feather. The HAAG rate calculated for Hawthorne-Feather is -6.4 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Hawthorne-Feather Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	15	15	14
0.50%	15	16	17
HAAG	11	8	4



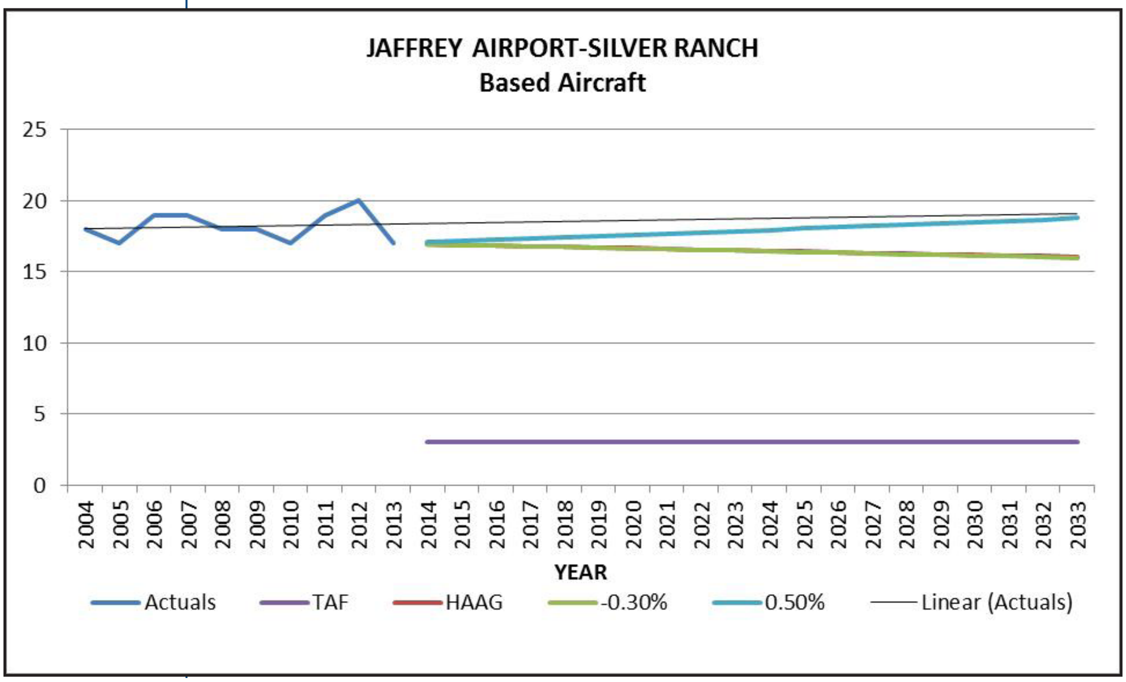
Source: FAA & Consultant Calculations

Jaffrey Airport - Silver Ranch

As demonstrated in the following table and chart, similar forecasts exist for the HAAG and Future Annual Growth Rates 1 and 2. The TAF rate produces the lowest forecast. The HAAG rate calculated for Jaffrey Airport - Silver Ranch is -0.29 percent and Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Jaffrey Airport-Silver Ranch Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	3	3	3
-0.30%	17	16	16
0.50%	17	18	19
HAAG	17	17	16



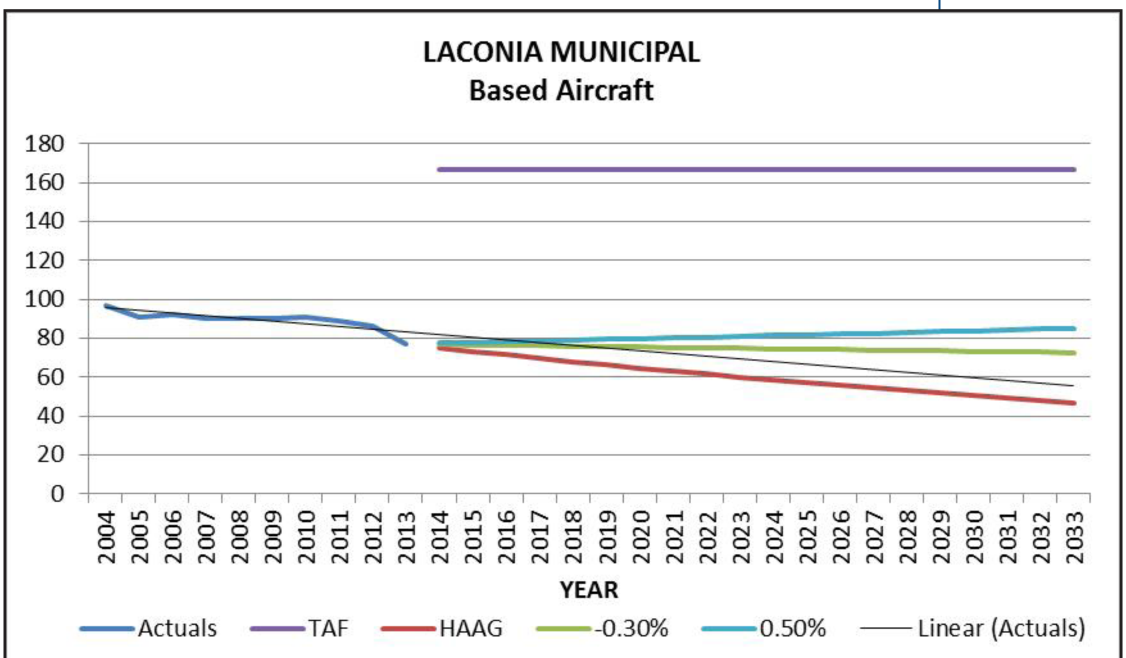
Source: FAA & Consultant Calculations

Laconia Municipal Airport

As demonstrated in the following table and chart, TAF data for Laconia Municpal is much higher than the other forecasts. There is a large discrepancy between TAF and NHDOT historical data. For this effort, NHDOT data was used to produce a forecast for planning purposes. The HAAG rate calculated for Laconia Municipal is -2.5 percent and Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Laconia Municipal Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	167	167	167
-0.30%	76	75	73
0.50%	79	81	85
HAAG	68	60	47



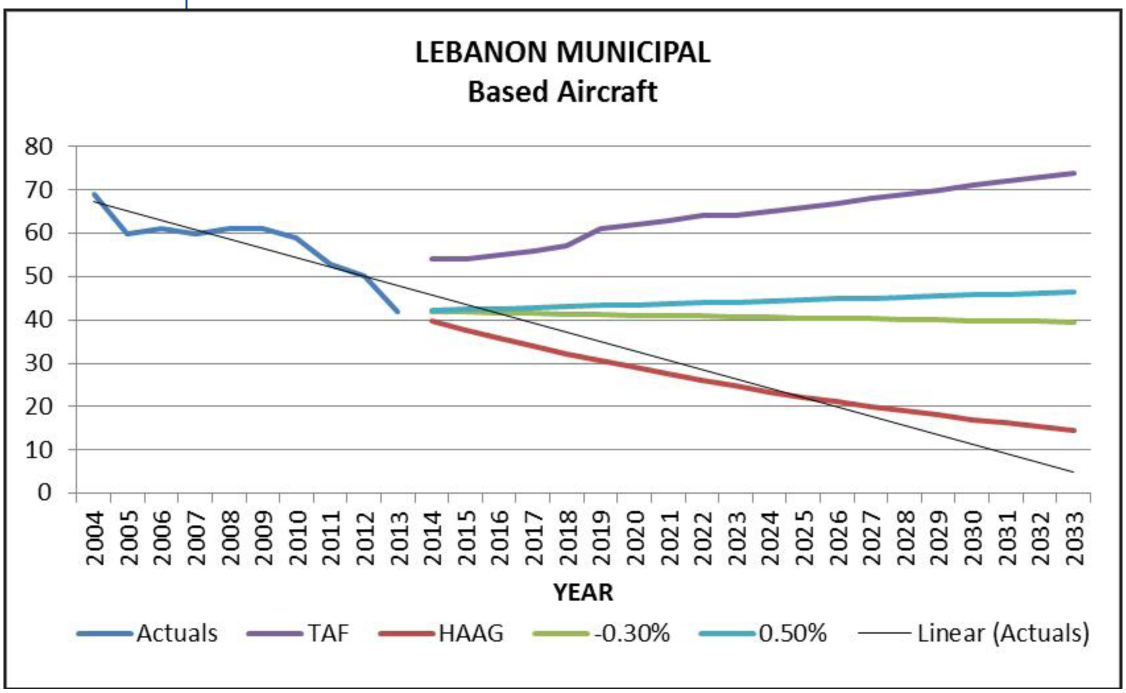
Source: FAA & Consultant Calculations

Lebanon Municipal Airport

As demonstrated in the following table and chart, the TAF produces the highest forecast and the HAAG rate produces the lowest. The HAAG rate calculated for Lebanon Municipal is -5.2 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Lebanon Municipal Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	57	64	74
-0.30%	41	41	40
0.50%	43	44	46
HAAG	32	25	15



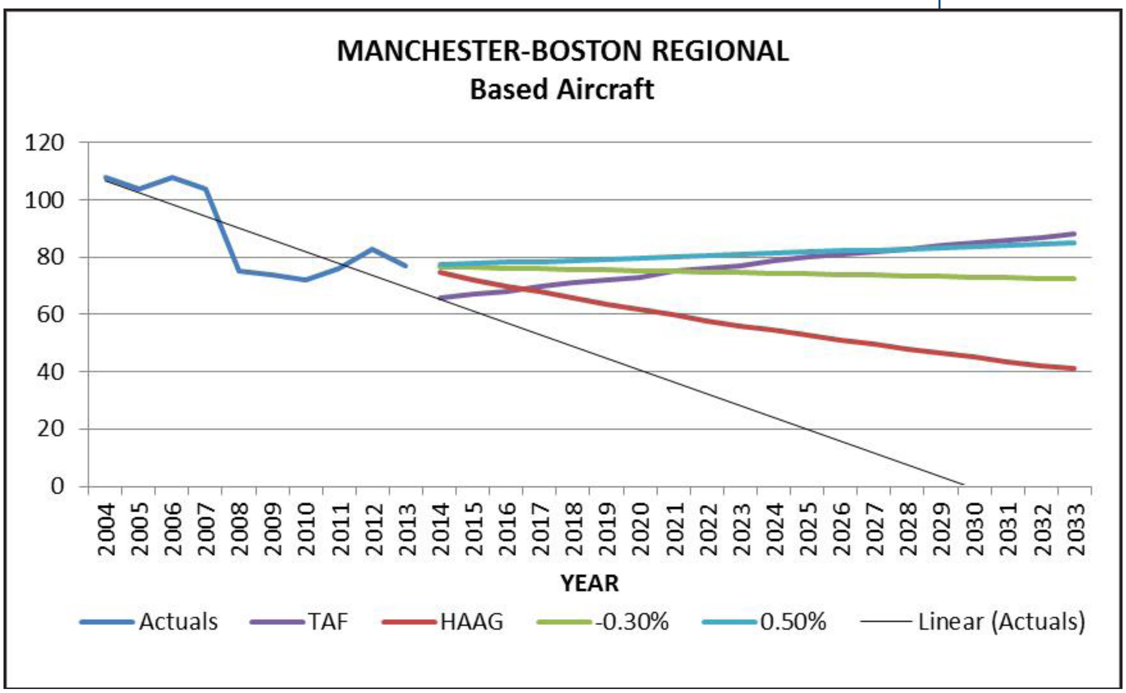
Source: FAA & Consultant Calculations

Manchester-Boston Regional Airport

As demonstrated in the following table and chart, the TAF produces the highest forecast and the HAAG rate produces the lowest. The HAAG rate calculated for Manchester-Boston Regional is -3.1 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Manchester- Boston Regional Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	71	77	88
-0.30%	76	75	73
0.50%	79	81	85
HAAG	66	56	41



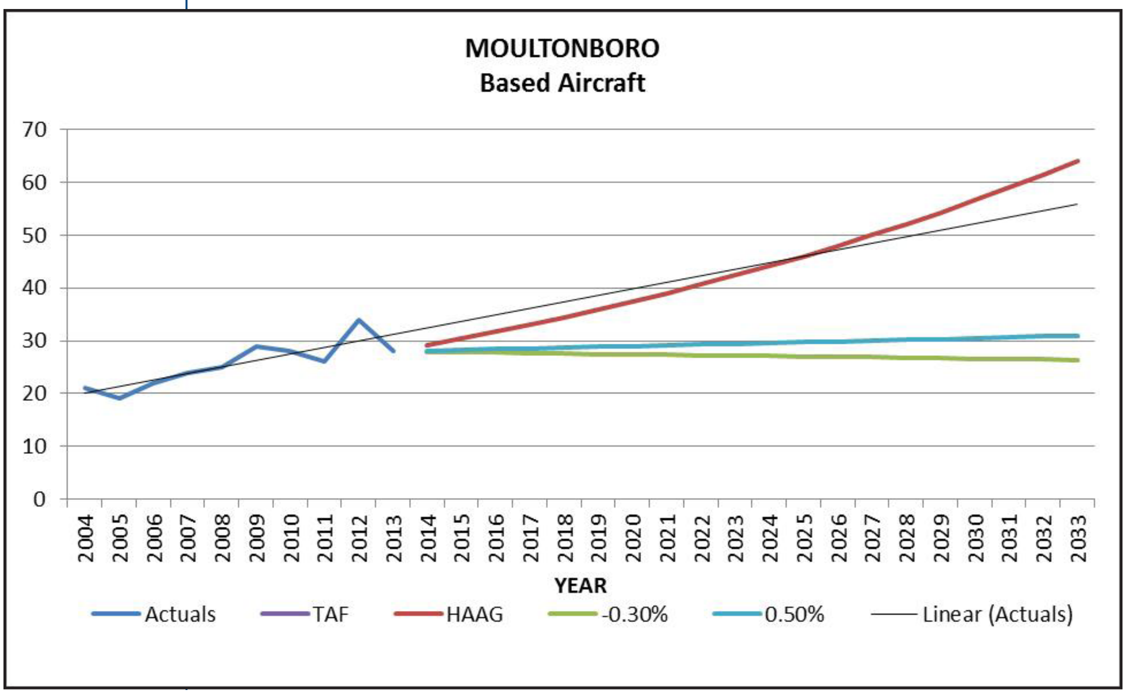
Source: FAA & Consultant Calculations

Moultonboro Airport

As demonstrated in the following table and chart, the HAAG produces the highest forecast and the Future Annual Growth Category 1 rate produces the lowest. The HAAG rate calculated for Moultonboro is 4.2 percent. Future Annual Growth Category 2 is emphasized in the table below for planning purposes.

Moultonboro Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	28	27	26
0.50%	29	29	31
HAAG	34	42	64



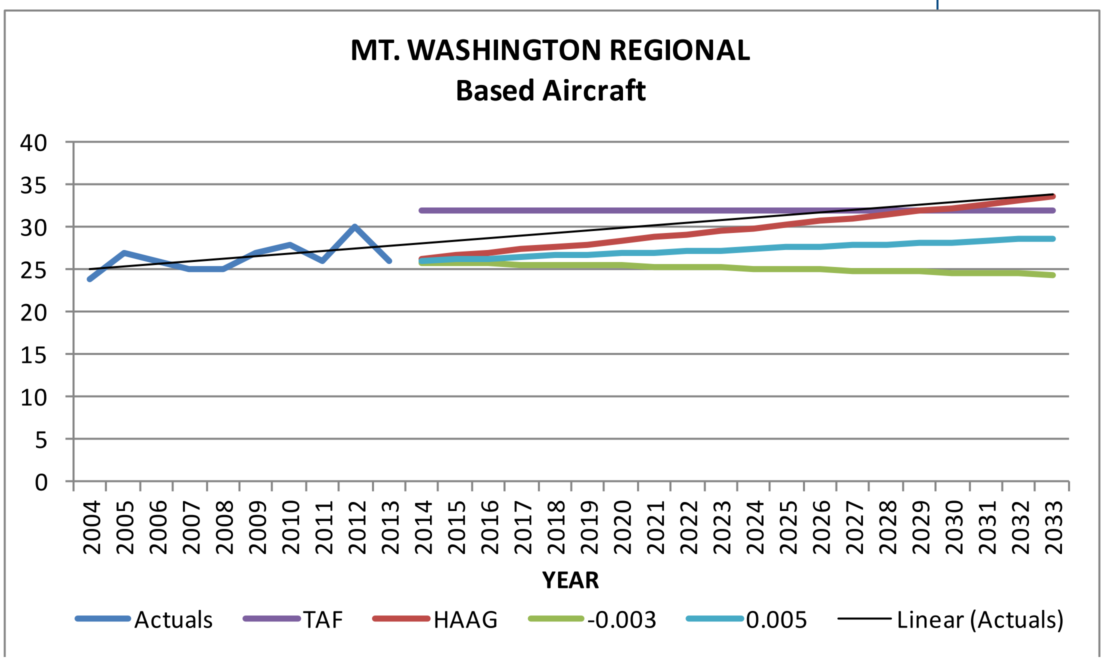
Source: FAA & Consultant Calculations

Mt. Washington Regional Airport

As demonstrated in the following table and chart, the HAAG produces the highest forecast and the Future Annual Growth Category 1 rate produces the lowest. The HAAG rate calculated for Mt. Washington Regional is 1.3 percent. Future Annual Growth Category 2 is emphasized in the table below for planning purposes.

Mt. Washington Regional Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	32	32	32
-0.30%	26	25	24
0.50%	27	27	29
HAAG	28	30	34



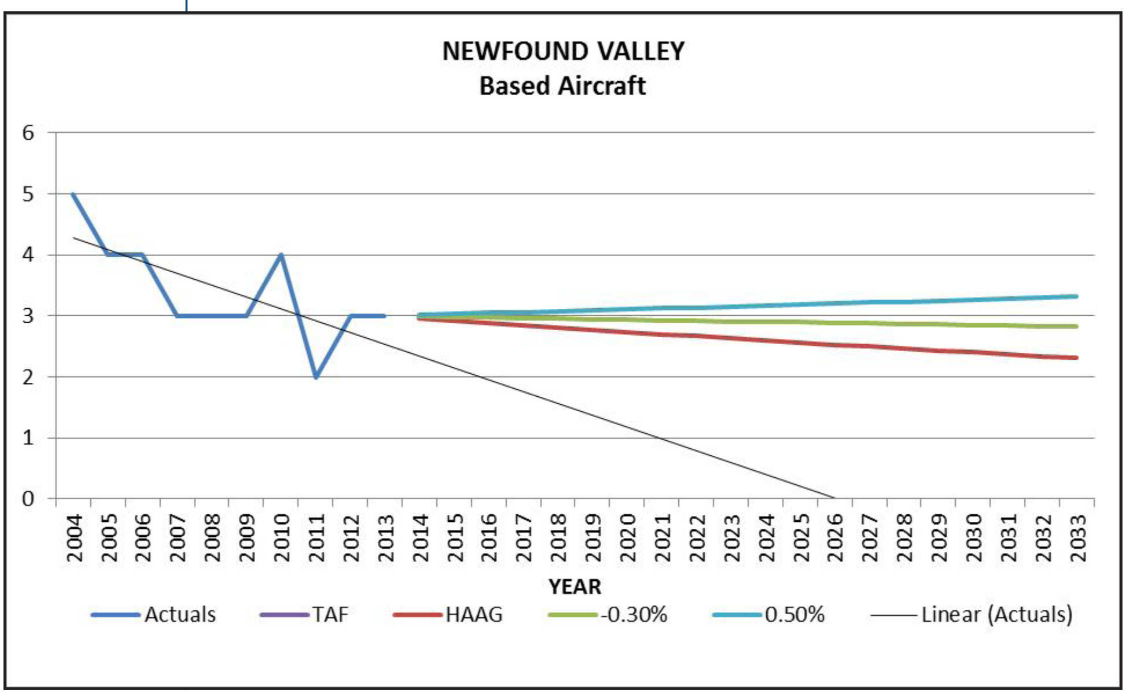
Source: FAA & Consultant Calculations

Newfound Valley Airport

As demonstrated in the following table and chart, Newfound Valley is expected to have very few based aircraft and TAF data was not available. The HAAG rate calculated for Newfound Valley is -1.3 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Newfound Valley Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	3	3	3
0.50%	3	3	3
HAAG	3	3	2



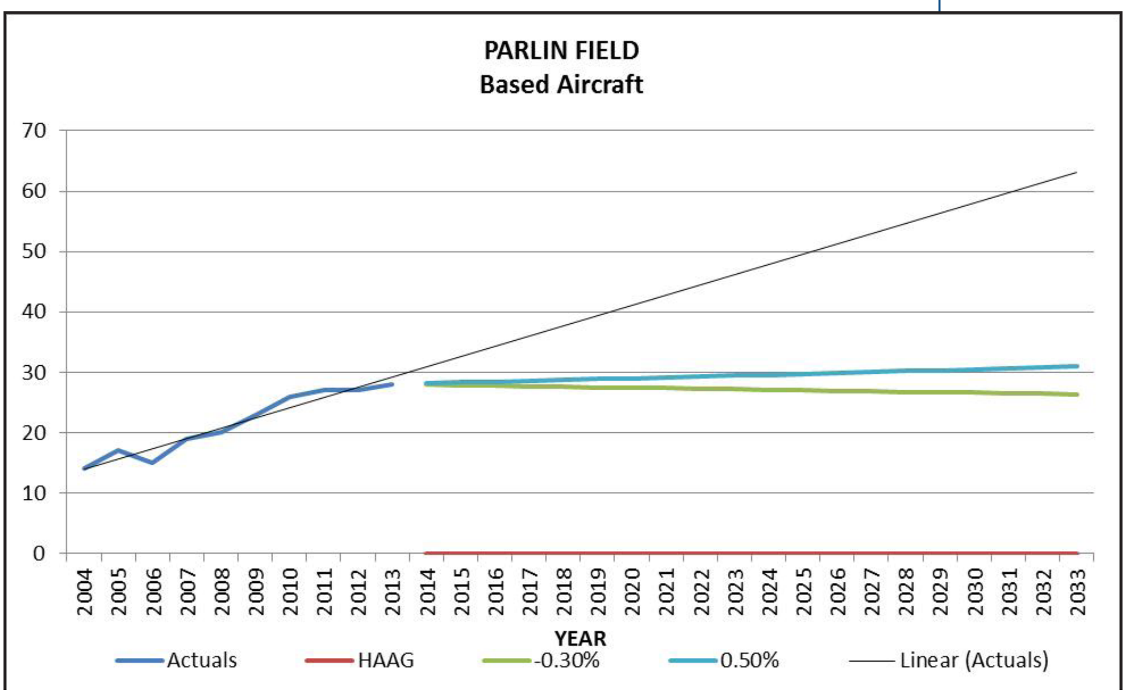
Source: FAA & Consultant Calculations

Parlin Field

As demonstrated in the following table and chart, TAF data for Parlin Field is much lower than the other forecasts. There is a large discrepancy between TAF and NHDOT historical data. For this effort, NHDOT data was used to produce a forecast for planning purposes. The HAAG rate calculated for Parlin Field is 8.6 percent and for the purpose of this forecast was considered unrealistic due to the numbers the growth percentage yielded. It has been omitted from the table and chart below. Future Annual Growth Category 2 is emphasized in the table below for planning purposes.

Parlin Field Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	2	2	2
-0.30%	28	27	26
0.50%	29	29	31
HAAG	N/A	N/A	N/A



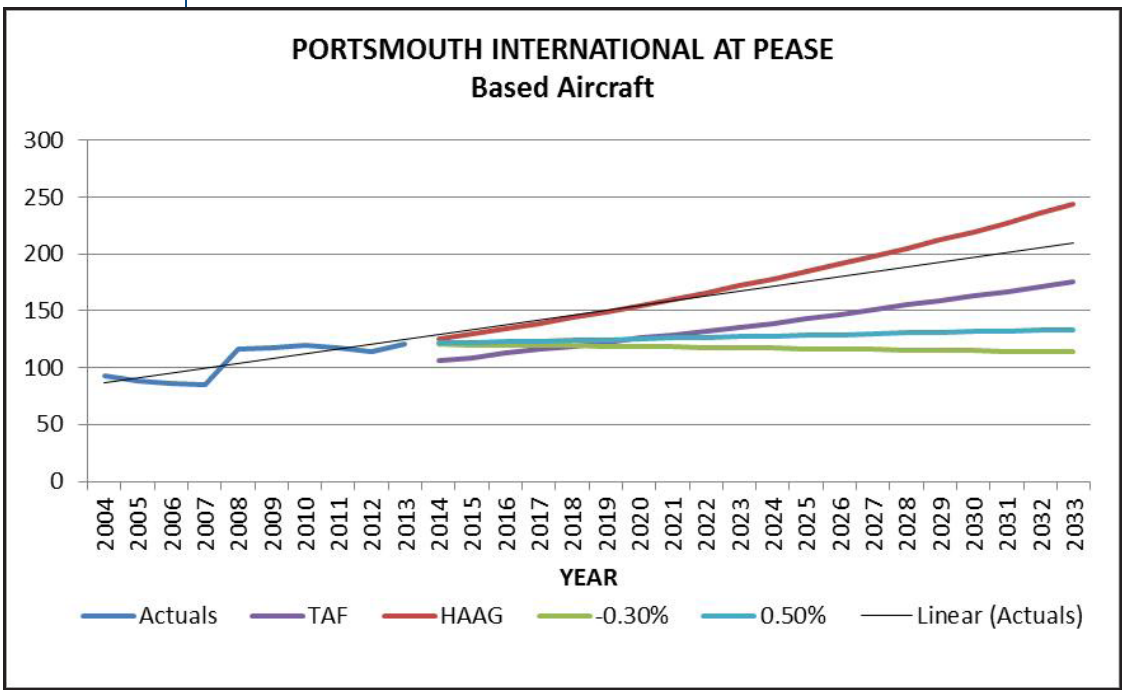
Source: FAA & Consultant Calculations

Portsmouth International Airport at Pease

As demonstrated in the following table and chart, the HAAG produces the highest forecast and the Future Annual Growth Category 1 rate produces the lowest. The HAAG rate calculated for Pease is 3.6 percent. Future Annual Growth Category 2 is emphasized in the table below for planning purposes.

Portsmouth International at Pease Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	119	135	176
-0.30%	119	117	114
0.50%	124	127	134
HAAG	144	172	244



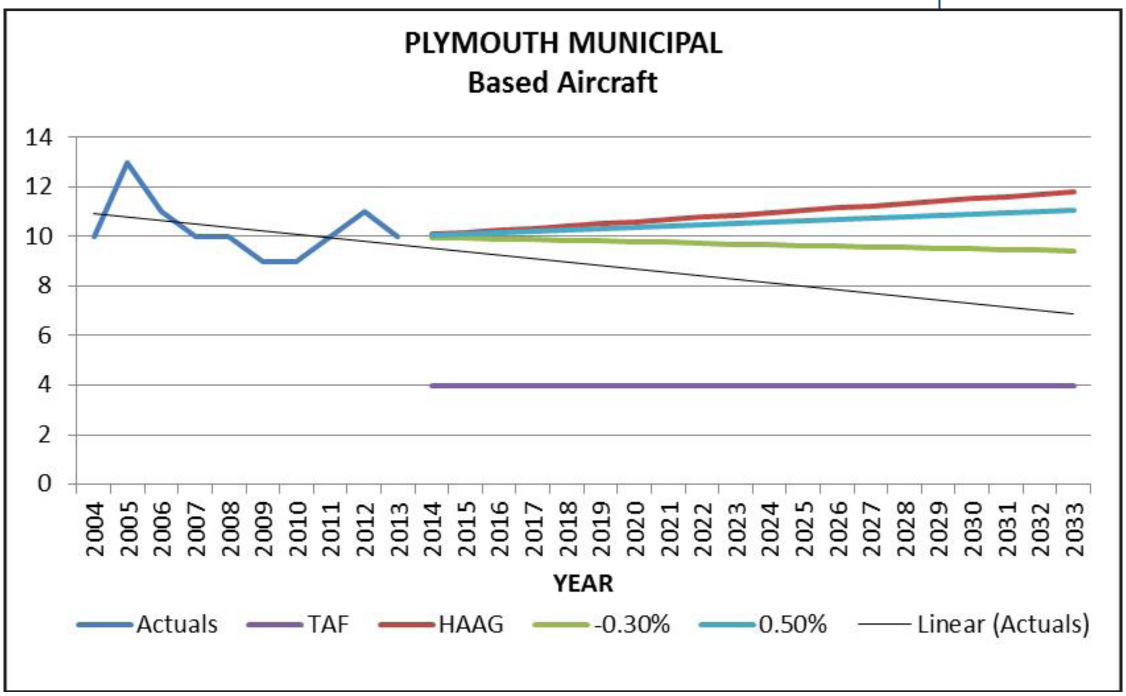
Source: FAA & Consultant Calculations

Plymouth Municipal Airport

As demonstrated in the following table and chart, the HAAG rate produces the highest forecast and the Future Annual TAF produces the lowest. The HAAG rate calculated for Plymouth Municipal is 0.8 percent. Future Annual Growth Category 2 is emphasized in the table below for planning purposes.

Plymouth Municipal Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	4	4	4
-0.30%	10	10	9
0.50%	10	11	11
HAAG	10	11	12



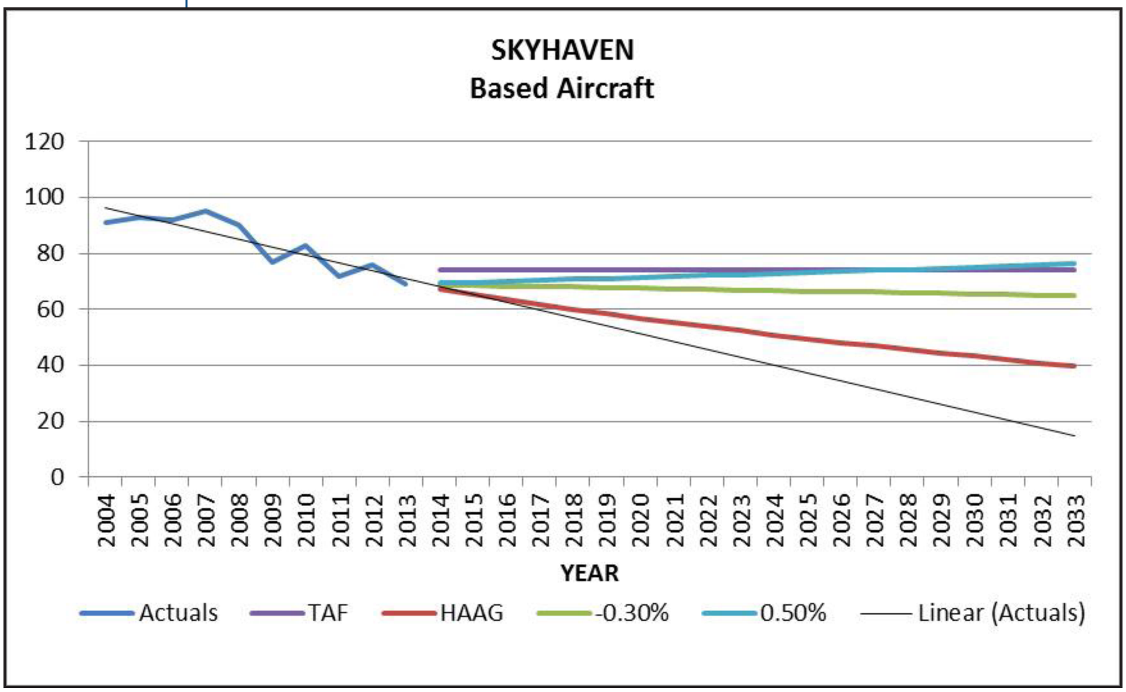
Source: FAA & Consultant Calculations

Skyhaven Airport

As demonstrated in the following table and chart, the Future Annual Growth Rate 2 produces the highest forecast and the HAAG rate produces the lowest. The HAAG rate calculated for Skyhaven is -2.7 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Skyhaven Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	74	74	74
-0.30%	68	67	65
0.50%	71	73	76
HAAG	60	52	40



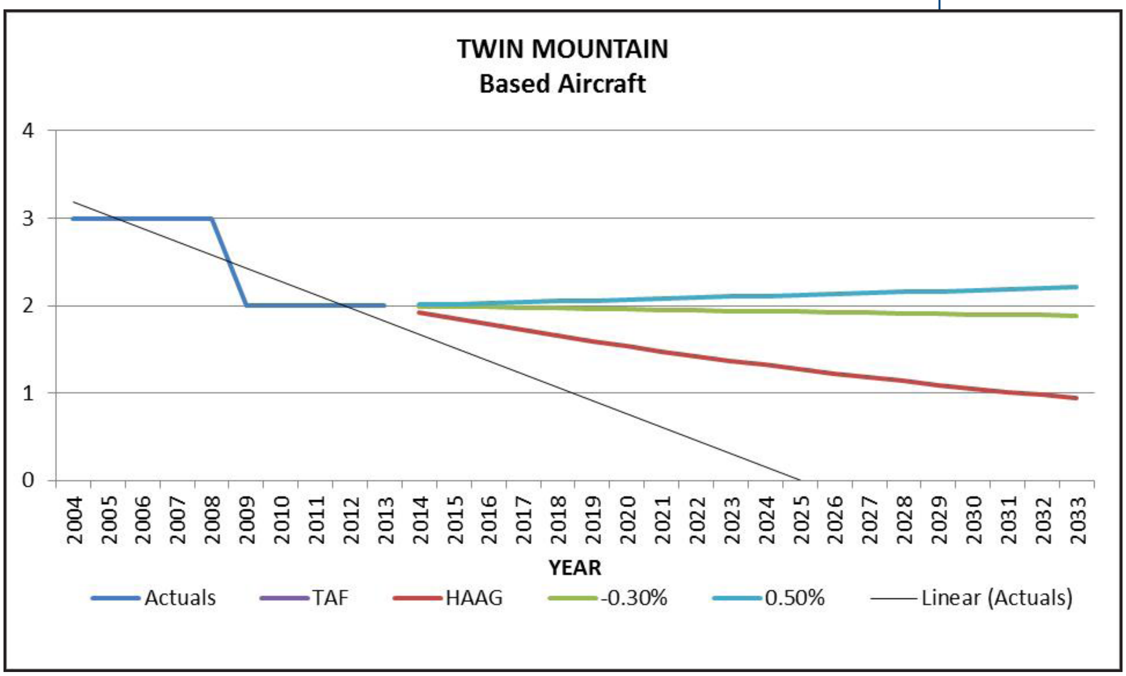
Source: FAA & Consultant Calculations

Twin Mountain Airport

As demonstrated in the following table and chart, Twin Mountain is expected to have very few based aircraft and TAF data was not available. The HAAG rate calculated for Twin Mountain is -3.7 percent. Future Annual Growth Category 1 is emphasized in the table below for planning purposes.

Twin Mountain Forecasted Based Aircraft

	5 Year	10 Year	20 Year
TAF	N/A	N/A	N/A
-0.30%	2	2	2
0.50%	2	2	2
HAAG	2	1	1



Source: FAA & Consultant Calculations

State-Wide Based Aircraft Forecast based on Airport Specific Growth Rates

The results of all individual airport forecasts based on either a positive or negative future annual growth through 2033 are shown below and provide total based aircraft forecasted for five, ten, and 20 year time frames. These results will be compared to forecasts prepared for the statewide fleet mix using the FAA Aerospace forecast projections for piston, multi-engine turbine, jet, and turbine powered rotorcraft in the next section.

Table 5-1 - Forecasted Based Aircraft – All Airports

Airport	2013	2018	2023	2033
Berlin Regional	22	22	21	21
Boire Field	259	255	251	244
Claremont Municipal	20	21	21	22
Gifford Field	7	7	7	8
Concord Municipal	80	79	78	75
Dean Memorial	11	11	11	10
Dillant-Hopkins	57	56	55	54
Errol	2	2	2	2
Franconia	12	12	13	13
Gorham	2	2	2	2
Hampton Airfield	79	78	77	74
Hawthorne-Feather	15	15	15	14
Jaffrey Airport - Silver Ranch	17	17	16	16
Laconia Municipal	77	76	75	73
Lebanon Municipal	42	41	41	40
Manchester-Boston Regional	77	76	75	73
Moultonboro	28	29	29	31
Mt. Washington Regional	26	27	27	29
Newfound Valley	3	3	3	3
Parlin Field	28	29	29	31
Portsmouth Intl at Pease	121	124	127	134
Plymouth Municipal	10	10	11	11
Skyhaven	69	68	67	65
Twin Mountain	2	2	2	2
Total	1066	1,062	1,055	1,047

Source: NHDOT Database

5.3.3 AIRCRAFT FLEET MIX FORECAST

In the FAA Aerospace Forecast the FAA forecasts the fleet of "active aircraft", one that flies at least one hour during the year, not total aircraft. They utilize a methodology that takes into account numerous industry factors as well as economic conditions. The following summarizes their most recent average growth rates for the general aviation fleet nationally and are applicable for this effort:

- Piston-powered Fleet (Negative 0.3%)
- Turbine-powered Fleet (2.6%)
- Turbine-jet Fleet (3.0%)
- Turbine Helicopter Fleet (3.1%)

Considering these FAA national forecasted growth rates, the FAA rates were applied to the 2014 based aircraft numbers and projected out to 2033. A fleet mix breakdown was performed using historical aircraft data provided by the state. The data provided suggests the following percentage of total based aircraft can reasonably be estimated for each category as follows:

- Piston-powered Fleet (90%)
- Turbine-powered Fleet (4%)
- Turbine-jet Fleet (3%)
- Turbine Helicopter Fleet (3%)

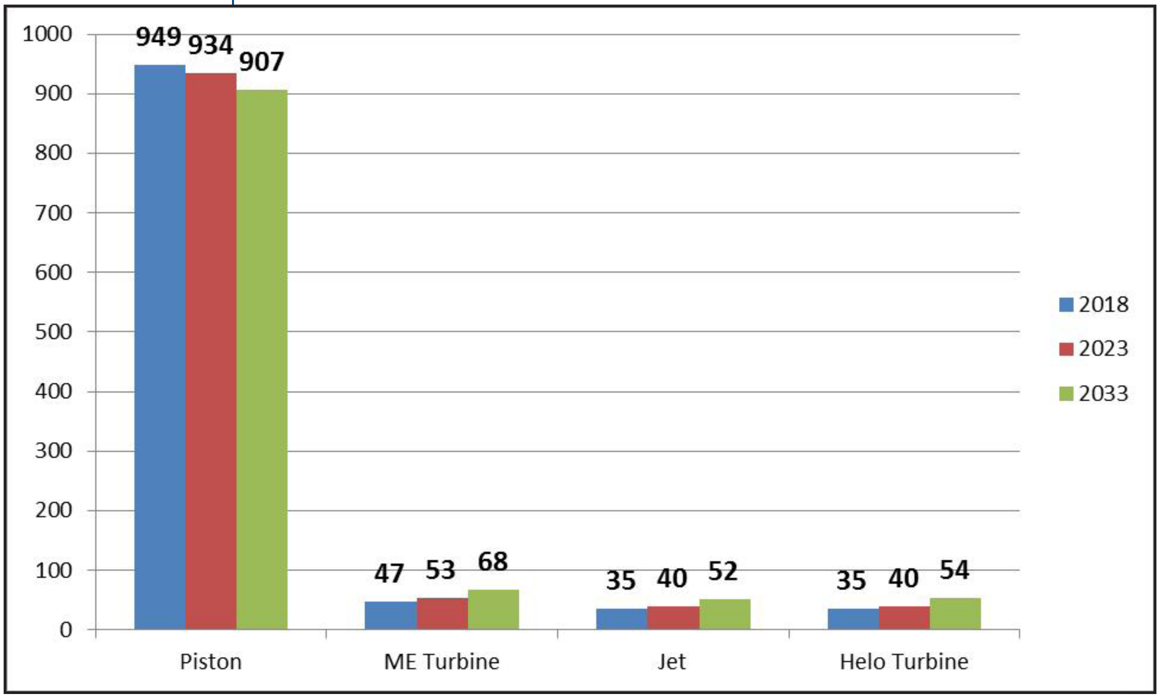
The FAA growth rates applied to the New Hampshire based aircraft fleet yield the following results for the five, ten, and 20-year periods.

Table 5-2 - Forecasted State Aircraft Fleet – All Airports

	2013	2018	2023	2033
Piston	960	949	934	907
ME Turbine	42	47	53	68
Jet	32	35	40	52
Helo Turbine	32	35	40	54
Total	1066	1066	1067	1081

Source: Consultant Calculations

Figure 5-5 - Forecasted State Aircraft Fleet – All Airports



Source: Consultant Calculations

5.3.4 STATEWIDE BASED AIRCRAFT FORECAST CONCLUSION

The relative small disparity in forecasted based aircraft using the FAA aerospace aircraft fleet growth rates compared to the forecasted based aircraft utilizing either a positive or negative growth rate determined for each airport verifies the methodology chosen to conduct the system forecast. Considering the two methodologies applied for based aircraft, the results suggest that over the next 20 years, New Hampshire may experience either a very slight decrease in based aircraft or a very slight increase in based aircraft over the next 20 years, with based aircraft over the next ten years remaining relatively flat across the airport system.

The following table presents the findings of the based aircraft forecast by airport category.

Table 5-3 - Forecasted Based Aircraft by Airport Category

Category	2018	2023	2033
Basic	188	188	186
Local	167	165	168
National	255	251	244
Primary	241	243	247
Regional	211	208	202
Total	1062	1055	1047

Source: Consultant Calculations

5.3.5 AIRCRAFT OPERATIONS FORECAST

In an effort to project future operations for these airports, a systematic method was used to calculate future aircraft operations through drawing a correlation between based aircraft and aircraft operations reported in the FAA TAF. The process uses the average of ten years of based aircraft and operations data by dividing the number of total operations by the number of total based aircraft which results in the Operations per Based Aircraft (OPBA). The OPBA is then multiplied by the projected number of based aircraft resulting in the projected operations for each forecast milestone.

As is typical with GA, airport data can differ substantially from year to year due to changes in management, ownership, or other circumstances which affect how the data is reported to the FAA. The OPBA method is generally used in instances where the historical operations data is questionable. While this methodology for determination of future activity is not always the most accurate, it does provide a sound basis for estimating future activity at the airport where no other methodology can be employed due to a lack of reliable data. Judgment of the study team based on experience with the reliability of historical general aviation airport data was used to evaluate the data and provide more likely estimates with respect to gaps or other anomalies. Adjustments were performed in a manner taking into account operational characteristics of the airport, its historical operations, and other pertinent information.

In order to determine the projected aircraft operations forecast for the airports, the based aircraft projections were multiplied by the average historical OPBA for the past ten years to derive the forecast for that particular year. As mentioned previously, there are four system airports with air traffic control towers. As a result, aircraft operations data from these airports is recorded daily and provides a higher level of accuracy in the data that ultimately results in a higher level of confidence in the OPBA derived for those airports.

The historical based aircraft, operations (where available) and average OPBA for each of the study airports utilized for the operations forecast

Table 5-4 - NHSASP – Historical Based Aircraft

Airport	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Berlin Municipal	24	23	24	22	22	22	22	22	21	22
Boire Field	352	347	338	314	303	287	292	290	271	259
Claremont Municipal	18	20	22	19	19	18	20	21	20	20
Concord Municipal	88	87	85	84	83	89	98	87	83	80
Dean Memorial	15	14	14	15	15	13	13	12	10	11
Dillant-Hopkins	62	59	56	66	64	67	64	68	60	57
Laconia Municipal	97	91	92	90	90	90	91	89	86	77
Lebanon Municipal	69	60	61	60	61	61	59	53	50	42
Manchester-Boston Reginal	108	104	108	104	75	74	72	76	83	77
Mt. Washington Regional	24	27	26	25	25	27	28	26	30	26
Portsmouth International at Pease	93	88	86	85	116	118	120	118	114	121
Skyhaven	91	93	92	95	90	77	83	72	76	69
Errol	3	3	3	3	2	2	2	2	2	2
Franconia	8	8	9	10	12	12	13	12	13	12
Gifford Field	5	5	5	5	5	5	5	6	7	7
Gorham	1	3	4	2	3	3	3	2	2	2
Hampton Airfield	88	85	87	77	78	80	82	78	78	79
Hawthorne-Feather Airpark	29	25	20	20	20	23	20	18	19	15
Jaffrey Airport-Silver Ranch	18	17	19	19	18	18	17	19	20	17
Moultonboro	21	19	22	24	25	29	28	26	34	28
Newfound Valley	5	4	4	3	3	3	4	2	3	3
Parlin Field	14	17	15	19	20	23	26	27	27	28
Plymouth Municipal	10	13	11	10	10	9	9	10	11	10
Twin Mountain	3	3	3	3	3	2	2	2	2	2
Total	1,246	1,215	1,206	1,174	1,162	1,152	1,173	1,138	1,122	1,066

Source: NHDOT

Table 5-5 - NHSASP – Historical Operations

Airport	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Berlin Regional	12,000	12,100	12,100	12,100	12,100	12,200	12,200	12,200	12,200	12,200
Boire Field	120,262	129,313	117,907	104,237	99,730	96,253	78,399	66,440	59,581	55,461
Claremont Municipal	10,459	10,603	10,500	10,500	10,500	10,500	10,500	10,500	10,500	10,500
Concord Municipal	89,926	89,926	89,926	89,926	89,926	90,000	90,000	60,000	60,000	60,000
Dean Memorial	N/A	4,000	4,750	4,750	4,750	4,750	4,750	4,750	4,750	4,750
Dillant-Hopkins	54,294	54,294	54,294	54,294	54,294	49,027	49,027	49,027	49,027	49,027
Laconia Municipal	35,343	35,343	35,343	35,343	35,343	35,343	37,527	41,643	41,643	41,643
Lebanon Municipal	61,834	63,360	62,248	62,705	53,779	45,285	38,126	35,181	35,324	31,671
Manchester-Boston Reginal	100,488	106,870	94,805	93,737	80,990	70,835	68,673	66,102	60,831	56,565
Mt. Washington Regional	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Portsmouth International at Pease	37,138	37,740	37,333	51,673	43,503	36,633	34,565	34,565	39,954	39,954
Skyhaven	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17,000
Errol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	636
Franconia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,200
Gifford Field	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	600
Gorham	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	730
Hampton Airfield	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	37,510
Hawthorne-Feather Airpark	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3,000
Jaffrey Airport-Silver Ranch	10,648	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300	7,300
Moultonboro	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4,700
Newfound Valley	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,510
Parlin Field	5,730	2,900	2,900	2,900	2,900	3,000	3,050	3,050	3,050	3,050
Plymouth Municipal	3,000	3,000	3,000	3,000	3,030	3,030	3,030	3,030	3,030	3,030
Twin Mountain	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	600

Source: FAA ATADS (Commercial Airports), FAA TAF (NPIAS Airports), FAA 5010 (Non-NPIAS Airports)

Table 5-6 - Operations per Based Aircraft (OPBA)

Airport	OPBA
Berlin Regional	555
Boire Field	204
Claremont Municipal	525
Concord Municipal	625
Dean Memorial	432
Dillant-Hopkins	676
Laconia Municipal	561
Lebanon Municipal*	616
Manchester-Boston Regional*	164
Mt. Washington Regional	269
Portsmouth International at Pease*	182
Skyhaven	246
Errol	318
Franconia	350
Gifford Field	86
Gorham	365
Hampton Airfield	475
Hawthorne-Feather Airpark	200
Jaffrey Airport - Silver Ranch	429
Moultonboro	168
Newfound Valley	503
Parlin Field	109
Plymouth Municipal	303
Twin Mountain	300

Source: NHDOT

Using the based aircraft derived for each airport using either the positive or negative future annual growth rate and the OPBA calculated in this section, annual operations were forecasted for the five, ten, and 20 year periods. These forecasts are presented in **Table 5-7**.

Table 5-7- Forecasted Annual Operations

Airport	2013	2018	2023	2033
Berlin Regional	12,000	12,210	11,655	11,655
Boire Field	52,910	52,020	51,204	49,776
Claremont Municipal	10,500	11,025	11,025	11,550
Concord Municipal	50,000	49,375	48,750	46,875
Dean Memorial	4,750	4,750	4,750	4,320
Dillant-Hopkins*	45,712	45,024	44,312	43,520
Laconia Municipal	43,193	42,636	42,075	40,953
Lebanon Municipal*	34,199	33,561	33,520	32,822
Manchester-Boston Regional*	63,819	68,016	72,875	84,888
Mt. Washington Regional	7,000	7,263	7,263	7,801
Portsmouth International at Pease*	28,616	29,199	29,816	31,277
Skyhaven	17,000	16,728	16,482	15,990
Errol	635	636	636	636
Franconia	4,200	4,200	4,550	4,550
Gifford Field	600	602	602	688
Gorham	730	730	730	730
Hampton	37,510	37,050	36,575	35,150
Hawthorne-Feather Airpark	3,000	3,000	3,000	2,800
Jaffrey Airport - Silver Ranch	7,300	7,293	6,864	6,864
Moultonboro	4,700	4,872	4,872	5,208
Newfound Valley	1,510	1,509	1,509	1,509
Parlin Field	3,050	3,161	3,161	3,379
Plymouth Municipal	3,030	3,030	3,333	3,333
Twin Mountain	600	600	600	600
	436,564	438,490	440,159	446,874

Source: Consultant calculations (Includes Air Carrier and Air Taxi Operations)*

Although the figures presented for each forecast period vary greatly from FAA TAF data, it is important to note that the TAF data only considers the 12 NPIAS airports. When OPBA calculations are applied to the 11 non-NPIAS airports, the results are likely more indicative of actual activity across New Hampshire's entire system of airports.

5.4 SUMMARY OF FORECAST SYSTEM ACTIVITY

As a result of applying the various methodologies identified in this chapter, the New Hampshire system of airports is forecasted to see an approximate 2.5% increase in total operations through 2033, this is mostly attributed to the forecasted growth of air carrier operations at Manchester-Boston Regional Airport. However, with regard to general aviation operations, the forecast suggests that operational levels will remain relatively flat through the end of the 20-year planning period. This forecasted trend beyond 2018 is caused by applying a negative growth over a 20 year period to the airports that are home to mostly piston driven aircraft which essentially nullifies the forecasted growth of the system airports that experience air carrier, and turbine aircraft operations. In other words, the projected increase in operations at airports projected to experience an increase in the level of operations is nearly negated by the airports projected to experience decreased levels.

As discussed earlier, forecasting operations at non-towered GA airports especially on a system-wide level is difficult due to the methods available to collect accurate historical data. Unfortunately, due to the nature of a majority of the New Hampshire system airports the most common method of collecting operational data is asking airport personnel. This method is also the most inaccurate. It is recommended that the state undertake a feasible method that will contribute to more accurate operational counts of the airport system. There are currently six different methods being used to sample aircraft traffic which include:

- Acoustical
- Airport guest logs
- Fuel sales
- Pneumatic
- Video image detection, and
- Visual

Industry studies suggest that the most accurate and cost-effective way to estimate aircraft operations at a non-towered airport is to sample traffic for two weeks for each of the four seasons and extrapolate that sample into an annual estimate. This is considered the best practice if year-round counts are not feasible. An acoustical counter provides a cost-effective, efficient, and accurate way to collect the sample, whereas the video image detection system, although more costly, adds additional information that may be useful to an airport. Pneumatic counters and inductance loop counters have several serious limitations and would only be useful at airports that have a most simple configuration of one runway and one entry taxiway. Airport guest logs and fuel sales have been determined unreliable and are also not recommended as a way to accurately count traffic. New technologies such as the General Audio Recording Device (GARD) are also being used at general aviation airports as a way to measure trends, record aircraft movements, and improve the overall reliability of airport data. Implementing such technologies should also be considered by the state.

In conclusion, since forecasting is not an "exact science", outside influences, the economy, or industry changes can impact New Hampshire's system of airports. Therefore, the state is encouraged to monitor some of the influences that could trigger impacts on the level of GA activity at the system airports. Some of these include but are not limited to:

- The rate of economic recovery and the economic well-being of New Hampshire
- Development in the vicinity of any system airport
- The price of oil
- The number of active general aviation pilots in New Hampshire throughout the forecast period
- The growth of the Unmanned Aircraft Systems (UAS) sector
- Statewide Aviation Policies and Practices