4. Aviation Forecasts

4.1. INTRODUCTION

The purpose of aviation forecasting is to outline future growth of aviation activity over a 20-year period at the Delaware Coastal Airport (GED or the Airport). The Federal Aviation Administration (FAA) requires that all airport planning efforts be based upon an approved forecast methodology as the resulting analysis assists in determining the facility requirements for meeting future demand. The aviation demand forecasts will serve three primary purposes in the development of this Airport Master Plan. Specifically, they provide the basis for:

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

The key elements of this chapter include:

- Aviation Demand Elements
- Forecast Framework
- General Aviation Demand Forecasts
- Military Operational Activity Forecasts
- Summary of Aviation Demand Forecasts

This forecast was prepared prior to the impacts of COVID-19. The forecast approval is based in reference to the data and methodologies used and the conclusions at the time the document was prepared. However, consideration must still be given to the significant impacts of COVID-19 on aviation activity; as a result, there is lower than normal confidence in future growth projections. FAA approval of the forecast does not provide justification to begin airport development. Justification for future projects will be made based on activity levels at the time the project is requested for development, rather than this forecast approval. Further documentation of actual activity levels reaching the planning activity levels will be needed prior to FAA participation in funding for eligible projects.

4.2. AVIATION DEMAND ELEMENTS

Forecasts of aviation demand can be developed for a variety of activity indicators. In the case of GED, demand elements revolve primarily around existing and future general aviation activity. Military operations forecasts are presented, but these are a fraction of overall general aviation totals. Basic activity indicators include the type and number of aircraft operations, along with the number of aircraft based at the Airport. Other important elements are derived from these basic indicators. The Airport does not have scheduled air carrier service. Therefore, 20-year aviation activity forecasts were prepared for the following aviation elements:

- **Based Aircraft:** Defined as a general aviation aircraft which is stationed at an airport on a

permanent basis beyond seasonal variations.
  - Based Aircraft Fleet Mix
- **General Aviation Aircraft Operations:** This type of operation is either a takeoff or a landing of a general aviation aircraft.
  - Total Annual
  - Local Versus Itinerant
  - Fleet Mix
  - Peak Period (Monthly, Daily, Hourly)
- **Annual Instrument Approaches:** Defined as instrument flight rules (IFR) approaches to an airport, conducted during instrument meteorological weather conditions.
- **General Aviation Enplaned Passengers:** Defined as air travelers who have boarded departing general aviation aircraft.
- **Military Aircraft Operations:** This type of operation is either a takeoff or a landing of a military aircraft.
- **Critical Aircraft Determination:** This is the largest aircraft to regularly use the Airport.

Table 4-1 presents the historical aircraft operational activity at GED. There are currently 62 aircraft based at the Airport (as of May 2020).

Table 4-1: Ten-Year Historical Aviation Activity

Year[1]	Itinerant Operations					Local Operations			Total Ops
	AC	AT	GA	Mil	Total	Civil	Mil	Total	
2009	0	500	4,000	1,200	5,700	15,000	0	15,000	20,700
2010	0	500	5,400	100	6,000	20,000	0	20,000	26,000
2011	0	500	5,400	100	6,000	20,000	0	20,000	26,000
2012	0	500	5,400	100	6,000	20,000	0	20,000	26,000
2013	0	500	6,800	100	7,400	26,600	0	26,600	34,000
2014	0	500	6,800	100	7,400	26,600	0	26,600	34,000
2015	0	500	6,800	100	7,400	26,600	0	26,600	34,000
2016	0	500	6,800	100	7,400	26,600	0	26,600	34,000
2017	0	500	6,800	100	7,400	26,600	0	26,600	34,000
2018	0	500	6,800	100	7,400	26,600	0	26,600	34,000
2019	0	511	6,888	100	7,499	27,002	0	27,002	34,501
CAGR[2]	**N/A**	**0.2%**	**5.06%**	**-20.2%**	**2.53%**	**5.49%**	**N/A**	**5.49%**	**4.75%**

Source: FAA Terminal Area Forecast Issued January 2020.
Notes: AC = Air Carrier; AT = Air Taxi; GA = General Aviation.
[1]Fiscal Year: (October-September).
[2]CAGR: Compound Annual Growth Rate (2009-2019).

4.3. FORECAST FRAMEWORK

Forecasting future activity involves both analytical techniques and subjective considerations. The forecasting approach used in this analysis will be to identify several methodologies to project future aviation demand, apply those methodologies to each forecast area of interest, and identify a preferred forecast of activity growth at the Airport. This framework of developing consensus through consideration of a likely set of demand forecasts provides a variety of future activity levels which seek to manage, in some way, the inherent uncertainties of long-range forecasting. Some methods were based upon local socioeconomic factors, others were based on national forecasts, while others used historical trends. The benefit of using a variety of projection methods occurs when the results show a forecast consensus. That is, if a number of projections all point in the same direction, even though they were generated using different data and methods, greater confidence is gained in the resulting forecast.

To achieve a forecasting consensus, all projection methods employed traditional means of extrapolating historical aviation trends at the Airport or in the Airport service area into future time frames. In this regard, the airport service area for general aviation demand was assumed to be Sussex County. Therefore, the economic base of the County was used in generating growth rates for aviation activity at GED.

The forecasts prepared herein are developed using methodologies widely used throughout the industry including market share analysis, regression analysis, and trend line analysis. These methods have been applied to develop the most accurate forecast possible for GED and are described in more detail below.

4.3.1. Market Share Projection

Market share projections were developed by calculating historical shares of GED activity and projecting these respective shares into future time frames. This method of projection reflects demand based upon trends occurring in the service area and the entire United States (Socioeconomic and per capita projections are based upon local factors). Market share projections reflect historical trends and may include static (constant) or dynamic (increasing or decreasing) future market shares. This approach is essentially a "top-down" method of forecasting where other forecasts of activity for larger areas are used as drivers of the local share of that demand. Socioeconomic and per capita projections, on the other hand, are considered "bottom-up" methodologies and are based upon local factors.

4.3.2. Socioeconomic Regression Analysis

The socioeconomic regression projection is based upon an assumed relationship between population, income, or employment and the aviation activity in a particular area. This projection of demand is obtained by relating socioeconomic data via regression analysis to aviation activity. The resulting set of regression equations produces a projection of aviation activity when they are coupled with independent projections of future socioeconomic data. **Table 4-2** presents a summary of the historical and forecast socioeconomic variables used in developing the general aviation forecasts for GED.

This Forecast utilized population, income (in the form of Per Capita Personal Income - PCPI), and employment statistics as the independent socioeconomic variables. Historical data was obtained from the U.S. Department of Commerce, Bureau of Economic Analysis. Projections of population though 2038 were obtained from the Delaware Population Consortium. Projections of employment and PCPI were obtained from Woods & Poole Complete Economic and Demographic Data Source (2019 CEDDS).

Table 4-2: Service Area Socioeconomic Growth Projections

Year	Population[1]	PCPI[2]	Employment[3]
2008	191,991	37,630	100,866
2009	194,751	36,685	98,324
2010	197,908	36,540	98,907
2011	200,453	38,515	97,969
2012	203,306	40,430	99,186
2013	206,478	42,431	101,265
2014	210,676	44,153	104,988
2015	215,188	47,544	108,289
2016	220,093	47,192	112,225
2017	225,322	47,324	114,583
2018	229,084	48,923	117,192
Forecasts			
2023	242,507	59,953	128,078
2028	251,919	75,682	139,383
2038	265,909	120,945	162,388
CAGR 2018-2038:	**0.75%**	**4.6%**	**1.6%**

[1] Years 2008-2017 Source: Bureau of Economic Analysis, "Table CA1-1 Population" (accessed September 14, 2019). Years 2018-2038 Source: the 2018 Delaware population consortium projections.
[2] Years 2008-2017 Source: Bureau of Economic Analysis, "Table CA1-3 Per Capita Personal Income" (accessed September 14, 2019). Years 2018-2038 Source: Woods & Poole Complete Economic and Demographic Data Source (2019 CEDDS).
[3] Years 2008-2017 Source: Bureau of Economic Analysis, "Table CA25N Total Full-Time and Part-Time Employment by NAICS Industry" (accessed September 14, 2019). Years 2018-2038 Source: Woods & Poole Complete Economic and Demographic Data Source (2019 CEDDS).

4.3.3. Trend Analysis

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

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

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

4.4. GENERAL AVIATION DEMAND FORECASTS

General aviation is defined as all civil aviation not classified as commercial or military. Forecasts of aviation demand can be developed for a variety of activity indicators. Because GED's primary demand elements revolve around existing and future general aviation activity, activity indicators include the type and number of aircraft operations, along with the number of aircraft based at the Airport. Other important elements are derived from these basic indicators. These different elements were listed earlier and include:

- Based Aircraft Forecast
  - Based Aircraft Fleet Mix
- Annual Aircraft Operations
  - Total Annual
  - Local Versus Itinerant
  - Fleet Mix
  - Peak Period (Monthly, Daily, Hourly)
- Annual Instrument Approaches
- General Aviation Enplaned Passengers
- Critical Aircraft (Largest to use the Airport regularly)

It is noteworthy that at Delaware Coastal Airport, general aviation accounted for 99.7 percent of all aircraft operations while the military conducted 0.3 percent of operations in 2018.

4.4.1. Based Aircraft Forecast

A based aircraft is an aircraft that is operational, airworthy, and based at the facility for a majority of the year. Forecasting based aircraft at GED proceeded through an analysis of historical data followed by forecasting into future years. For this study, existing and historical based aircraft information was taken from the FAA's Form 5010-1, supplemented by input from airport management and the FAA's Terminal Area Forecasts (TAF).

Historical Based Aircraft Trends

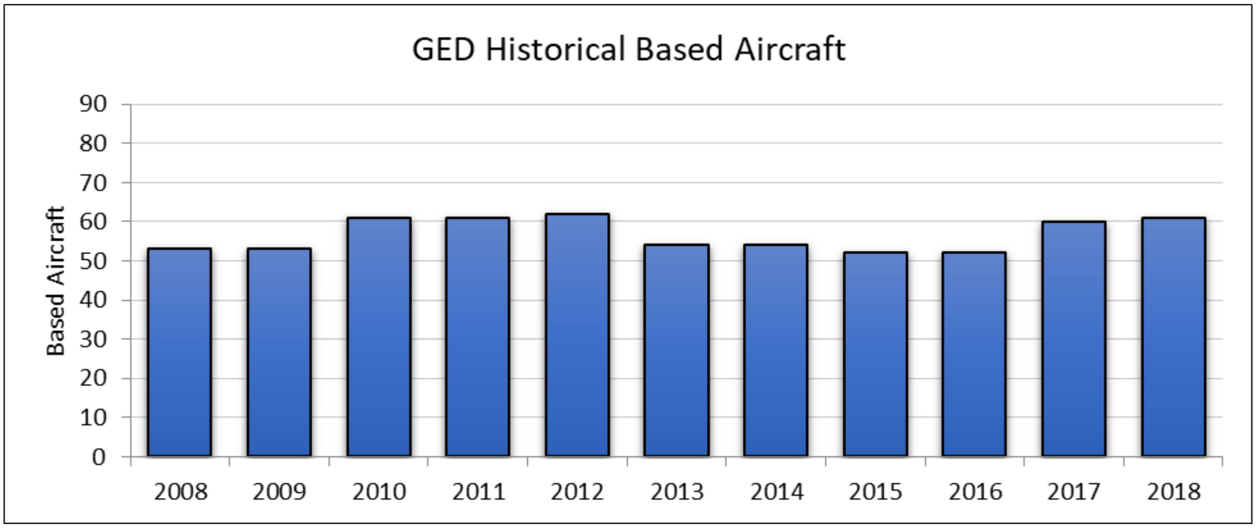
Figure 4-1 presents a graphic illustration of the based aircraft growth trends since 2008. Historical based aircraft at GED have fluctuated but have an overall average annual growth rate of 1.4 percent over the period.

Figure 4-2 shows the indexed trends in based aircraft compared to state and national based aircraft (TAF). The number of aircraft based at Delaware Coastal Airport is dependent, in part, upon the economic health of the region.

Forecast Projections of Based Aircraft

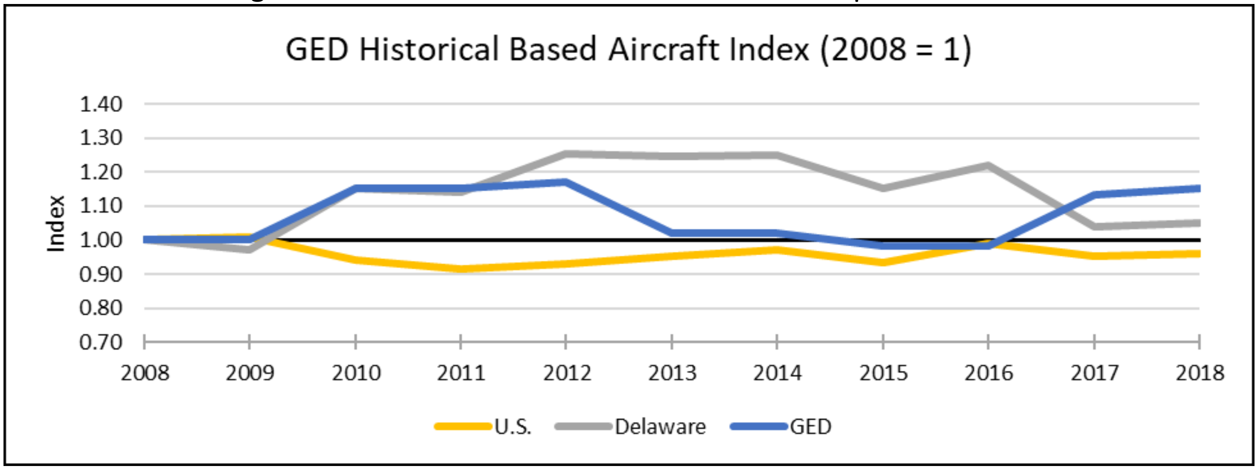
Table 4-3 presents a summary of 10 projections of GED based aircraft demand generated by this analysis. As shown, there are significant differences between the high (PCPI regression) and low (Constant Market Share) projections. Factors impacting the forecast selection process included the consideration of the County's plans to lengthen the runway by 500 feet to a total length of6,000 feet. Airport management indicated that when the runway was increased from 5,000 feet to 5,500 feet, the number of annual jet operations doubled. In fact, a new Gulfstream G-4 was recently based at the Airport. This action will not only increase jet operations, but it will also influence the selection of a critical aircraft for the Airport (described later in this Chapter).

Figure 4-1: Historical Based Aircraft



Source: FAA Form 5010-1, 2018 TAF, Airport management, 2019.

Figure 4-2: Historical Based Aircraft Growth Comparisons



Source: R.A. Wiedemann & Associates, Inc., 2019.

Airport management anticipates future based aircraft growth to be concentrated in business class aircraft. Because the airport is used by beach tourists and second-home owners, it will continue to have a large itinerant operation base. Given these growth factors, a mid-range projection was considered most realistic. The Multi Average Projection of based aircraft fits this definition and thus was selected as the preferred forecast. It's interesting that the Multi Average Projection shadows the FAA's TAF throughout the planning period. The agreement between these two forecasts provides greater confidence in the selection of the preferred forecast.

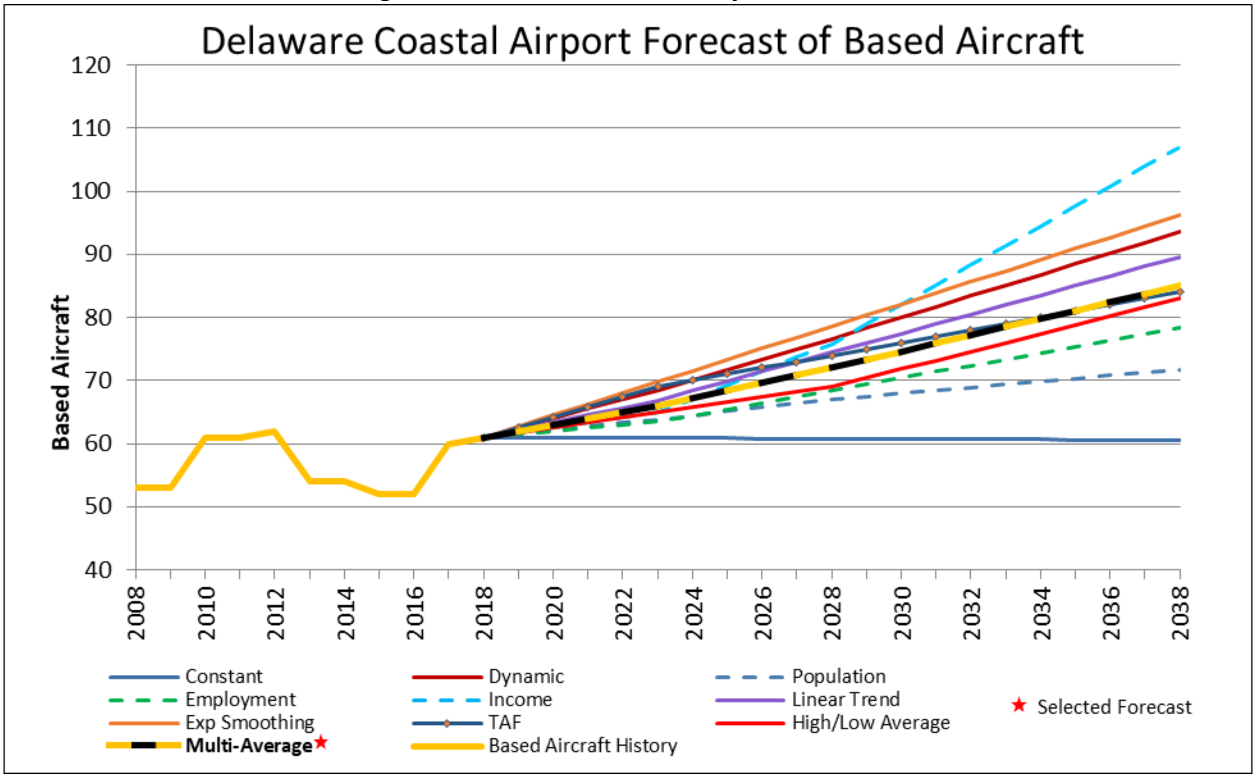
Based aircraft for the preferred forecast are anticipated to grow from 61 in 2018 to 85 by the year 2038- a 39.3 percent overall growth (1.7 percent annually) **Figure 4-3** shows the based aircraft projections in graphic form.

Table 4-3: Forecast of Based Aircraft

Projection/Forecast	2018	2023	2028	2038	Avg. Growth	New AC
Market Share						
Constant	61	61	61	61	0.0%	0
Dynamic	61	69	77	94	2.2%	33
Socioeconomic						
Population	61	64	67	72	0.8%	11
Employment	61	63	68	78	1.3%	17
Income	61	65	76	107	2.9%	46
Trend Analysis						
Linear Trend	61	67	74	90	1.9%	29
Exp Smoothing	61	70	79	96	2.3%	35
Other Forecasts						
TAF	61	69	74	84	1.6%	23
Derived Projections						
High/Low Average	61	65	69	83	1.6%	22
Multi-Average	61	66	72	85	1.7%	24
Selected Forecast	**61**	**66**	**72**	**85**	**1.7%**	**24**

Source: 2018 FAA TAF.

Figure 4-3: Based Aircraft Projections



Source: R.A. Wiedemann & Associates, Inc., 2019.

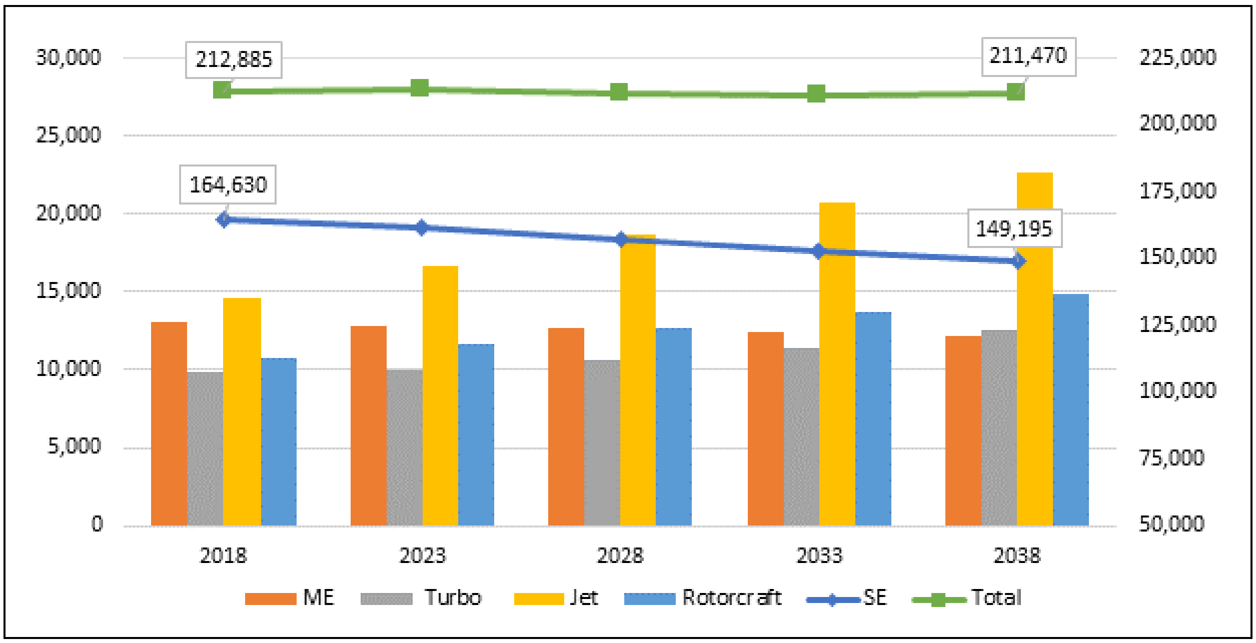
4.4.2. Based Aircraft Fleet Mix

An aircraft fleet mix refers to the characteristics of a population of aircraft. General aviation aircraft are classified with regard to specific physical traits such as aircraft type (whether fixed wing or rotorcraft), their weight, and number and type of engines. Aircraft having dissimilar physical and operating traits require varying types and amounts of airport facilities. For this reason, it is important to estimate the type of aircraft that will be operating and basing at GED.

In the forecasting process, the based aircraft fleet mix is used as one component to help determine operational fleet mix forecasts. It is also used to determine the future runway design category. Fleet mix categories included: single engine, multi-engine, turbojet, rotorcraft, and "other." The current fleet mix data was provided by airport management.

Projection of the fleet mix involved the consideration of the effects of the national trends in aircraft manufacturing, and the service area registered aircraft fleet mix. **Figure 4-4** shows the projected national fleet mix for general aviation aircraft. **Table 4-4** shows the forecast in tabular form for the 20-year period.

Figure 4-4: US Fleet Mix Active General Aviation and Air Taxi Aircraft Forecast



Source: FAA Aerospace Forecast 2018-2038.

Table 4-4: US Active Fleet Mix Forecast

Year	SE	ME	Jet	Rotorcraft	Other	Total
2016	164,605	17,876	13,751	10,577	4,986	211,794
2017	164,280	18,058	14,217	10,511	4,692	211,757
2018	164,878	18,003	14,585	10,705	4,715	212,885
Forecast						
2023	161,983	17,873	16,610	11,655	4,820	212,940

Year	SE	ME	Jet	Rotorcraft	Other	Total
2028	157,600	17,940	18,695	12,645	4,865	211,745
2038	150,583	18,413	22,660	14,925	4,890	211,470
CAGR[1]	**-0.45%**	**0.11%**	**2.23%**	**1.68%**	**0.18%**	**-0.03%**

Source: FAA Aerospace Forecast 2017-30.
Note: SE = single engine; ME = multi-engine.
[1] CAGR: Compound Annual Growth Rate (2018-2038).

The decline in single engine aircraft nationally will be reflected in GED as a much slower growth than the other categories of aircraft. Although the growth of total number of based aircraft will be significant, the based fleet will be moving toward a more sophisticated, larger, business-type aircraft mix. **Table 4-5** presents the forecast of based aircraft fleet mix anticipated for GED. As shown, the single engine aircraft numbers are anticipated to grow from the existing 40 to 51 by 2038. The most significant growth is anticipated to occur in the jet aircraft category, with an additional 7 jets in 20 years – growing from 3 to 10 over the period.

Table 4-5: GED General Aviation Based Aircraft Fleet Mix

Year	Single	Multi	Jet	Helicopter	Other	Total
2018	40	11	3	6	1	61
Forecast						
2023	42	12	4	7	1	66
2028	45	13	6	7	1	72
2038	51	15	10	8	1	85
CAGR	**1.22%**	**1.56%**	**6.20%**	**1.45%**	**0.00%**	**1.67%**

Source: Historical data from Airport Management, Forecast from Consultant estimates.

4.4.3. Annual General Aviation (GA) Operations Forecast

An aircraft operation is defined as either a takeoff or a landing. A takeoff and landing are considered two operations. The annual general aviation operations forecast was derived for both local and itinerant operations through the use of an operations-per-based-aircraft (OPBA) ratio. By definition, local operations are performed by aircraft that operate within the local traffic pattern or within sight of an airport. They can also be assigned to aircraft arriving or departing from local practice areas within 20 miles of an airport. In essence, local operations are associated with pilot training. Itinerant operations, on the other hand, are all other aircraft operations other than local operations.

For this study, historical operational data from the TAF were used to develop OPBA ratios that could then be forecast throughout the planning period. **Table 4-6** presents OPBA ratios for local and itinerant operations at GED.

Growth in the overall level of general aviation operations is expected to occur as the number of based aircraft, tourism use, and business/corporate use of the Airport increases. In addition, the business and tourist nature of the Airport will attract more itinerant operations in the future. The results of the general aviation operations forecast show a growth from 34,400 operations in 2018 to 47,900 operations in 2038.

4.4.4. GA Operational Fleet Mix

The operational fleet mix forecast presents a breakdown of aircraft operations by aircraft type. Table 4-7 presents the forecast of operational fleet mix for general aviation aircraft using the GED. The operational fleet mix forecast was derived from the based aircraft fleet mix. The process involved multiplying the operations per based aircraft (OPBA) utilization rate times the number of aircraft in each category.

Table 4-6: Forecast of Local and Itinerant General Aviation Operations

Year	Based Aircraft	Local		Itinerant		Total	
		Ops	OPBA	Ops	OPBA	Ops	OPBA
2013	54	26,600	493	7,300	135	33,900	628
2014	54	26,600	493	7,300	135	33,900	628
2015	52	26,600	512	7,300	140	33,900	652
2016	52	26,600	512	7,300	140	33,900	652
2017	60	26,600	443	7,300	122	33,900	565
2018	61	27,002	443	7,399	121	34,401	564
Forecast							
2023	66	29,215	443	8,005	121	37,221	564
2028	72	31,871	443	8,733	121	40,604	564
2038	85	37,626	443	10,310	121	47,936	564
CAGR	**1.67%**	**1.67%**	**0.00%**	**1.67%**	**0.00%**	**1.67%**	**0.00%**

Source: Historical Data from Airport TAF, Forecast from Consultant estimates.

Table 4-7: Forecast of General Aviation Operational Fleet Mix

Year	Single	Multi	Jet	Helicopter	Other	Total
2018	22,558	6,203	1,692	3,384	564	34,401
Forecast						
2023	23,686	6,767	2,256	3,948	564	37,221
2028	25,378	7,331	3,384	3,948	564	40,604
2038	28,761	8,459	5,640	4,512	564	47,936
CAGR	**1.2%**	**1.6%**	**6.2%**	**1.4%**	**0.0%**	**1.7%**

Source: Based aircraft fleet mix times OPBA.

4.4.5. GA Operational Peaking Characteristics

Since many general aviation landside and airfield facility needs are related to the levels of activity during peak periods, forecasts were developed for peak month, design day, and peak hour general aviation operations at GED. Typically, non-towered general aviation airports do not keep accurate records of peak period activity. Thus, an industry-accepted method of estimation was used to predict peak period activity that does not require a census of hourly operations totals. **Table 4-8** presents the forecast of peak hour and peak month operations at GED. The approach used in developing the peak period operations forecasts is outlined as follows:

- *Peak Month GA Operations:* This level of activity is defined as the calendar month when peak aircraft operations occur. Peak Month percentages were estimated using the assumption that peak month operations are 10 percent greater than average month operations.
- *Design Day Operations:* This level of operations is defined as the average day within the peak month. This indicator can be developed by dividing peak month operations by 30 or 31. For conservative forecasting purposes, a 30-day month was selected rather than a 31-day month.
- *Peak Hour Operations:* This level of operations is defined as the peak hour within the design day. For airports with between 50 and 300 design day operations, general aviation peak hour operations tend to be 20 percent of those design day operations. As the design day operations decrease, the peak hour percentage increases and vice versa.

Table 4-8: Forecast of General Aviation Peak Period Operations

Year	Annual GA Operations	GA Peak Month Operations	GA Peak Day Operations	GA Peak Hour Operations
2018	34,401	3,153	105	21
Forecast				
2023	37,221	3,412	114	23
2028	40,604	3,722	124	25
2038	47,936	4,394	146	29
CAGR	**1.67%**	**1.67%**	**1.66%**	**1.66%**

Source: TAF data for 2018. Forecast - Consultant estimates.

4.5. ANNUAL INSTRUMENT APPROACH FORECAST

The forecast of annual instrument approaches (AIAs) provides further guidance in determining requirements for the type, extent, and timing of future navigational aid (NAVAID) equipment, as well as dimensional standards for airfield design. Instrument approaches occur when instrument flight rules (IFR) operations are conducted during instrument meteorological conditions (IMC), which exist whenever the cloud ceiling is at or below 1,000 feet and/or visibility is lower than 3 miles. Many IFR operations (not approaches) occur in clear weather as a result of IFR flight plan filings by the pilots.

Table 4-9 summarizes the forecast of annual instrument approaches at GED throughout the planning period. The forecast was developed by using the relationship between total operations, instrument operations, instrument approaches, and IMC percentage of time (assumed at 10.0%). In 2018, total instrument operations were assumed to be close to 15 percent of total operations. IFR approaches during all weather conditions are one half of total operations (departures make up the other 50 percent). IMC conditions at GED exist approximately 10.0 percent of the time. This factor was used to reduce IFR approaches to those actual instrument approaches conducted at GED.

4.6. GENERAL AVIATION ENPLANEMENTS

Forecasts of annual general aviation enplaned passengers can be used by Airport management and FBOs to determine the need for such landside facilities as the general aviation terminal building sizes and the amount of automobile parking areas and access roads. This activity indicator is often ignored due to the lack of historical data.

Table 4-9: Forecast of Annual Instrument Approaches

Year	Total Operations	Instrument Operations	Instrument Approaches	Instrument Approaches in IMC Conditions
2018	34,501	5,050	2,525	253
Forecast				
2023	37,321	5,463	2,731	273
2028	40,704	5,958	2,979	298
2038	48,036	7,031	3,516	352

Source: FlightAware.com, Consultant estimates.

To forecast general aviation enplaned passengers, an aircraft occupancy rate was multiplied by the number of itinerant general aviation departures from GED. A number, long used by the FAA and the Aircraft Owners and Pilots Association (AOPA), estimated that an average of 2.5 passengers per general aviation itinerant departure was a reasonable estimate of aircraft occupancy. For this study, this factor was applied to all forecast itinerant departures and 10 percent of local departures. Local departures are considered training operations and do not add to the landside facility use. Therefore, only a fraction of those operations were counted as contributing passengers to the landside facility use. **Table 4-10** shows the projected number of general aviation enplanements, which include the corporate/air taxi plus smaller general aviation aircraft population.

Table 4-10: Forecast of General Aviation Enplanements

	2018	2023	2028	2038
Delaware Coastal Airport Enplanements	12,100	13,700	14,900	17,600

Source: FAA historical operational data. Consultant estimates based upon average occupancy times aircraft departures.
** Totals are rounded to nearest 100.*

4.7. SUMMARY OF MILITARY OPERATIONS

Military activity shows little or no correlation to community socioeconomic data or other recognized air traffic indicators. The level of military operations is a function of Department of Defense Policy and Congressional funding. The five-year average of historical activity was held constant throughout the planning period. Military operations can be seen in **Table 4-11**.

4.8. CRITICAL AIRCRAFT DETERMINATION

The "critical aircraft" at an airport is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is defined as 500 annual operations, excluding touch-and-go operations.

The Runway Design Code (RDC) used in airport planning is derived from the features of the most demanding aircraft using the airport on a regular basis coupled with the best available instrument approach minimums. The first component, depicted by a letter, is the Aircraft Approach Category (AAC) and relates to aircraft approach speed (operational characteristics). The second component,

Table 4-11: Forecast of Military Operations

Year	Itinerant Military Operations	Local Military Operations	Total Military Operations
2014	100	0	100
2015	100	0	100
2016	100	0	100
2017	100	0	100
2018	100	0	100
Forecast			
2023	100	0	100
2028	100	0	100
2038	100	0	100

Source: R.A. Wiedemann & Associates, Inc., 2020.

depicted by a Roman numeral, is the Airplane Design Group (ADG) and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by Runway Visual Range (RVR) values. **Table 4-12** through **Table 4-14** displays the RDC criteria used in airport planning.

Table 4-12: Aircraft Approach Category (AAC)

Category	Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

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

Table 4-13: Airplane Design Group (ADG)

Group	Tail Height (and/or)	Wingspan
I	< 20′	< 49′
II	20′ - < 30′	49′ - < 79′
III	30′ - < 45′	79′ - < 118′

Group	Tail Height (and/or)	Wingspan
IV	45′ - < 60′	118′ - < 171′
V	60′ - < 66′	171′ - < 214′
VI	66′ - < 80′	214′ - < 262′

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

Table 4-14: Visibility Minimums

RVR (feet)	Flight Visibility Category (statute mile)
5,000	Not lower than 1 mile
4,000	Lower than 1 mile but not lower than ¾ mile (APV ≥ 3/4 but < 1 mile)
2,400	Lower than 3/4 mile but not lower than 1/2 mile (CAT-I PA)
1,600	Lower than 1/2 mile but not lower than 1/4 mile (CAT-II PA)
1,200	Lower than 1/4 mile (CAT-III PA)

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

In reviewing data in **Table 4-15 and Table 4-16**, the existing critical aircraft is a variant of a B-II business jet. It was initially believed that potential opportunities for increased use by ALOFT AeroArchitects (possibly servicing additional aircraft beyond the 737 family), would increase the size of the design aircraft. However, discussions with ALOFT indicated that their annual operational demand at GED with large business jets is less than 60 operations per year. Clearly, the operational demand by category C or larger aircraft will come from the new based Gulfstream G-IV (D-II aircraft) along with the itinerant aircraft operations. In 2018, operations by category C or higher aircraft exceeded 300 in total. This was prior to the arrival of the Gulfstream G-IV based aircraft, which has seen an increase to exceed 400 annual operations in 2019 and 2021. Since GED is a non-towered airport, there are likely additional operations that were not counted.

Currently, the most demanding aircraft to use GED on a regular basis is the Cessna Citation Excel/XLS and Cessna Citation Latitude type aircraft which has an AAC-ADG of B-II. For the future, it is anticipated that the critical aircraft designation will be developed from a composite of large aircraft types. This is permissible under the new FAA Advisory Circular: AC 150/5000-17 "*Critical Aircraft and Regular Use Determination*". In this regard, the number of jet operations are anticipated to double over the next 10 years. This means that the 410 operations with category C aircraft or larger in 2019, and 404 operations in 2021 (through September) will continue to increase by 2028, thereby exceeding the 500 annual itinerant operations requirements for "regular use."

From a wingspan perspective, the category III or larger aircraft types recorded 79 operations in 2018, 108 operations in 2019, and 142 operations in 2021 (through September). Even tripling that number will not get to 500. Therefore, the designated future critical aircraft type for the primary runway at GED will be the C-II.

It is anticipated the crosswind Runway 10-28 will be utilized by smaller aircraft and designated as an AAC-ADG B-I runway for existing use and future planning. As such, the Embraer Phenom 100 is selected as the critical aircraft for Runway 10-28.

Table 4-15: IFR Operations by Aircraft Type for GED

Aircraft Design Type	2013	2014	2015	2016	2017	2018	2019	2020	2021*
A-I	1,696	1,584	2,184	1,606	1,378	1,458	1,370	1,338	1,364
A-II	78	28	94	136	98	72	96	66	54
A-III	0	0	0	0	2	0	0	0	0
B-I	380	382	460	452	396	380	390	378	404
B-II	580	620	648	712	820	818	860	710	784
B-III	6	14	14	34	24	16	8	6	24
B-IV	2	0	0	8	8	8	6	6	2
C-I	120	124	144	166	98	90	128	68	100
C-II	54	50	50	114	148	94	98	110	120
C-III	24	32	42	58	48	48	70	40	34
C-IV	2	2	2	4	0	0	0	2	2
C-VI	4	2	6	0	0	2	0	0	0
D-I	16	26	16	12	16	12	24	4	40
D-II	12	18	4	14	36	44	66	72	28
D-III	32	36	48	36	42	34	24	20	80
No Data-No Data	264	346	336	226	266	290	332	382	380
C/D Total	**264**	**290**	**312**	**404**	**388**	**324**	**410**	**316**	**404**
Grand Total	**3,270**	**3,264**	**4,048**	**3,578**	**3,380**	**3,366**	**3,472**	**3,202**	**3,416**

Source: FAA Traffic Flow Management System Counts.
** Operations Year to Date through September 2021.*

Table 4-16: 2019 Operations by Aircraft Type

Aircraft	2019	2021
B-II	**860**	**784**
B350 - Beech Super King Air 350	96	72
BE20 - Beech 200 Super King	88	30
BE30 - Raytheon 300 Super King Air	12	26
C208 - Cessna 208 Caravan	4	6
C25B - Cessna Citation CJ3	24	56
C25C - Cessna Citation CJ4	22	8
C441 - Cessna Conquest	16	4
C550 - Cessna Citation II/Bravo	2	10
C560 - Cessna Citation V/Ultra/Encore	28	38
C56X - Cessna Excel/XLS	136	120
C650 - Cessna III/VI/VII	10	6

Aircraft	2019	2021
C680 - Cessna Citation Sovereign	62	42
C68A - Cessna Citation Latitude	142	128
C750 - Cessna Citation X	14	26
E120 - Embraer Brasilia EMB 120	18	16
E545 - Embraer EMB-545 Legacy 450	2	10
E55P - Embraer Phenom 300	84	110
F2TH - Dassault Falcon 2000	76	20
F900 - Dassault Falcon 900	4	6
FA20 - Dassault Falcon/Mystère 20	4	6
FA50 - Dassault Falcon/Mystère 50	12	44
B-III	**8**	**24**
DH8A - Bombardier DHC8-100	2	6
DH8C - Dash 8/DHC8-300	2	2
FA7X - Dassault Falcon F7X	4	16
B-IV	**6**	**2**
C17 - Boeing Globemaster 3	6	2
C-I	**128**	**100**
H25B - BAe HS 125/700-800/Hawker 800	44	58
LJ31 – Bombardier Learjet 31/A/B	18	0
LJ40 - Learjet 40; Gates Learjet	0	2
LJ45 - Bombardier Learjet 45	18	14
LJ55 – Bombardier Learjet 55	24	0
LJ60 - Bombardier Learjet 60	22	22
WW24 - IAI 1124 Westwind	2	4
C-II	**98**	**120**
CL30 - Bombardier (Canadair) Challenger 300	22	20
CL35 - Bombardier Challenger 300	20	32
CL60 - Bombardier Challenger 600/601/604	32	24
CRJ2 – Bombardier CRJ-200	2	0
E145 - Embraer ERJ-145	0	2
G150 - Gulfstream G150	2	16
G280 - Gulfstream G280	8	18
GALX - IAI 1126 Galaxy/Gulfstream G200	2	2
GLF3 - Gulfstream III/G300	8	4
LJ75 - Learjet 75	2	2
C-III	**70**	**34**
B732 – Boeing 737-200/VC96	2	0
B737 - Boeing 737-700	52	26
GL5T – Bombardier BD-700 Global 5000	2	0

Aircraft	2019	2021
GLEX - Bombardier BD-700 Global Express	14	8
C-IV	**0**	**2**
C130 – Lockheed 130 Hercules	0	2
D-I	**24**	**40**
F22 – Boeing Raptor F22	2	0
LJ35 - Bombardier Learjet 35/36	22	40
D-II	**66**	**28**
GLF4 - Gulfstream IV/G400	66	28
D-III	**24**	**80**
B738 – Boeing 737-800	6	0
GLF5 - Gulfstream V/G500	16	68
GLF6 - Gulfstream	2	12

Source: FAA Traffic Flow Management System Counts (January – December 2019; January – September 2021).

4.9. SUMMARY OF FORECAST DEMAND

Table 4-17 presents a summary of the aviation demand forecasts for Delaware Coastal Airport. These forecasts are considered reasonable and achievable and will be used throughout the Master Plan to help in the development of facility requirements and the identification of alternatives.

4.10. COMPARISON WITH FAA TERMINAL AREA FORECASTS

A comparison of this Airport Master Plan forecast to the FAA's 2018 Terminal Area Forecast (TAF) is presented in **Table 4-18** and **Table 4-19**. The graphs of these comparisons are shown below each table. FAA guidelines indicate that forecasts are considered consistent with the TAF if differences are less than 10 percent in the first 5-year period and less than 15% in the first 10-year period. As shown, the FAA's 2018 Terminal Area Forecast has a based aircraft growth rate of 1.61 percent annually and an operations growth rate of 1.48 percent annually. In contrast, the master plan forecasts a 1.67 percent yearly increase in based aircraft and 1.67 percent increase in operations over the period. As a result, the forecasts are generally consistent with those identified in the TAF.

Table 4-17: Aviation Demand Forecast Summary

Element	Forecast Year				CAGR		
	2018	2023	2028	2038	5-year	10-year	20-year
GA Enplanements	12,100	13,700	14,900	17,600	2.5%	2.1%	1.9%
GA Operations							
Itinerant Operations							
Air Taxi	511	552	604	712	1.6%	1.7%	1.7%
General Aviation	6,888	7,453	8,129	9,598	1.6%	1.7%	1.7%
Military	100	100	100	100	0.0%	0.0%	0.0%
Local Operations							
General Aviation	27,002	29,215	31,871	37,626	1.6%	1.7%	1.7%
Total Operations	34,501	37,321	40,704	48,036	1.6%	1.7%	1.7%
OPBA	566	565	565	565	0.0%	0.0%	0.0%
Instrument Operations	253	273	298	352	1.6%	1.7%	1.7%
Based Aircraft							
Single Engine	40	42	45	51	1.0%	1.2%	1.2%
Multi Engine	11	12	13	15	1.8%	1.7%	1.6%
Jet	3	4	6	10	5.9%	7.2%	6.2%
Rotorcraft	6	7	7	8	3.1%	1.6%	1.4%
Other	1	1	1	1	0.0%	0.0%	0.0%
Total Based Aircraft	61	66	72	85	1.6%	1.7%	1.7%
GA Peaking Characteristics							
Peak Month Operations	3,153	3,412	3,722	4,394	1.6%	1.7%	1.7%
Peak Day Operations	105	114	124	146	1.7%	1.7%	1.7%
Peak Hour Operations	21	23	25	29	1.7%	1.7%	1.7%
Military Demand							
Military Operations	100	100	100	100	0.0%	0.0%	0.0%
Military Peak Hour Operations	10	10	10	10	0.0%	0.0%	0.0%

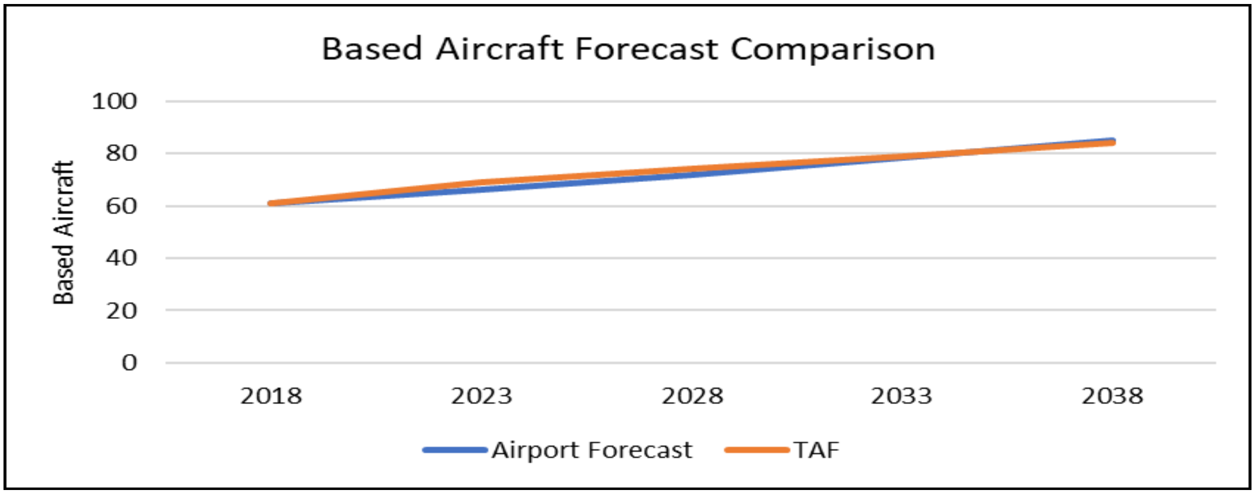
Source: R.A. Wiedemann & Associates, Inc., TAF historical data, FlightAware.com.

Table 4-18: Comparing Airport Planning and TAF Forecast of Based Aircraft

Based Aircraft	Year	Airport Forecast	TAF	(% Difference)
Base yr.	2018	61	61	0%
Base yr. + 5yrs.	2023	66	69	-4%
Base yr. + 10yrs.	2028	72	74	-3%
Base yr. + 15yrs.	2033	79	79	-1%
Base yr. + 20yrs.	2038	85	84	1%
CAGR		**1.67%**	**1.61%**	

Source: 2018 FAA TAF.

Figure 4-5: Based Aircraft Forecast Comparison



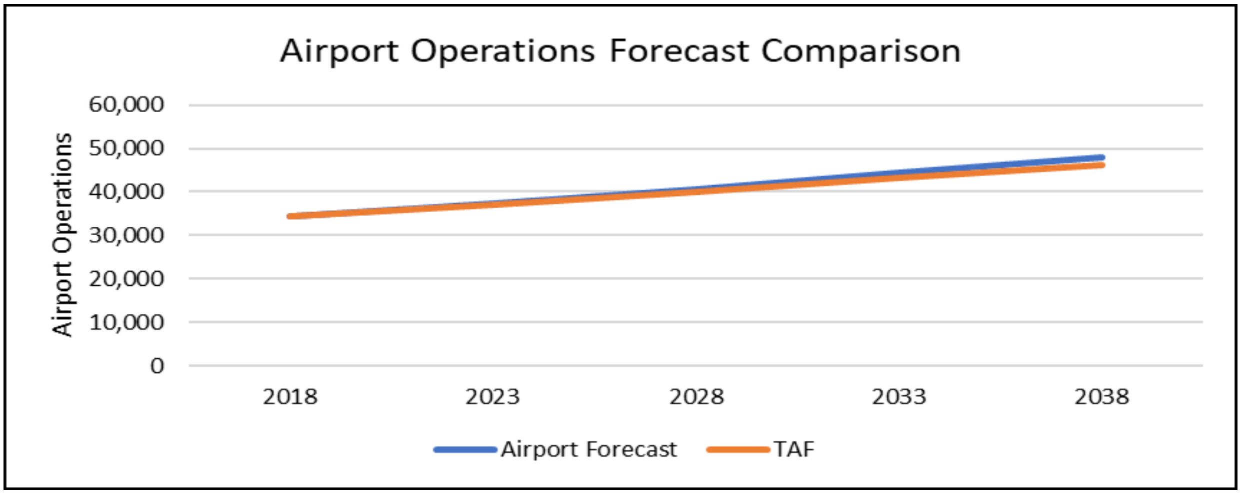
Source: 2018 FAA TAF.

Table 4-19: Comparing Airport Planning and TAF Forecast of Operations

Operations	Year	Airport Forecast	TAF	(% Difference)
Base yr.	2018	34,501	34,000	1%
Base yr. + 5yrs.	2023	37,321	37,122	1%
Base yr. + 10yrs.	2028	40,704	39,952	2%
Base yr. + 15yrs.	2033	44,370	43,120	3%
Base yr. + 20yrs.	2038	48,036	46,287	4%
CAGR		**1.67%**	**1.48%**	

Source: 2018 FAA TAF.

Figure 4-6: Airport Operations Forecast Comparison



Source: 2018 FAA TAF.