CHAPTER 3. AVIATION FORECASTS

3.1 INTRODUCTION

Aviation demand forecasts help determine the size and timing of needed airport improvements. This chapter indicates types and levels of aviation activity expected at Independence State Airport during a 20-year forecast period. Projections of Airport aviation activity were prepared for near-term (2022), mid-term (2027), and long-term (2037) planning period. These projections are generally unconstrained and assume that ODA has opportunity to develop the various facilities necessary to accommodate based aircraft and future operations.

The primary objective of a forecasting effort is to define the magnitude of change in aviation activity expected over time. Because of the cyclical nature of the economy and aviation, it is essentially impossible to predict with certainty year-to-year fluctuations in activity, especially when looking 20 years into the future. However, trends can be identified and used to study long-term growth potential. While a single line shown on a graph is often used to express anticipated growth, it is important to remember that actual growth may fluctuate above and below this projected line. **Forecasts serve only as guidelines and planning must remain flexible to respond to unforeseen changes in aviation activity and resultant facility needs.**

Aviation activity at general aviation airports like Independence State Airport is typically measured by the number of based aircraft and by the number of annual aircraft operations (takeoffs and landings, including touch-and-go operations performed during flight training). Forecasts for the following aviation activity parameters are presented in this chapter:

- **Based Aircraft**: Number and type of based aircraft help determine future aircraft hangar, tiedown apron, and auto parking facility requirements.
- **Aircraft Operations:** An operation is defined as either an aircraft landing or taking off (e.g., an aircraft landing then taking off counts as two operations). Aircraft operation forecast data helps in analyzing runway capacity and determining runway, taxiway, and navigational aid requirements by providing input for computer modeling used to estimate future aircraft noise exposure.
- **Critical Aircraft and Airport Reference Code**: The critical aircraft, with its airport reference code, determines many airfield design requirements, such as runway / taxiway size and strength, as well as safety clearances around aircraft movement areas.

The FAA is responsible for reviewing and approving all aviation forecasts submitted to their agency in airport planning studies. The FAA reviews these forecasts with the objective to include them in its Terminal Area Forecasts (TAF) and the National Plan of Integrated Airport Systems (NPIAS).

3.2 METHODOLOGY

The objective of this forecasting effort is to develop realistic forecasts based on the latest available data that reflect the current conditions at the airport. Supported with additional information in this study, the following methodology, based on FAA guidance, was utilized to ultimately provide adequate justification for future airport planning and development proposals discussed later in this planning study.

Identify Aviation Activity Parameters To Forecast

The first step in the forecasting process is to determine and select the aviation activity parameters to forecast. The parameters selected to forecast at general aviation airports are generally selected based on the level and type of aviation activity expected at the airport. For Independence State Airport, the forecasting effort will be focused on based aircraft and aircraft operations.

Projecting aircraft operations is generally the most important activity forecast for airfield planning at general aviation airports. Understanding the existing aircraft operations will define the level and type of aviation demand generated at Independence State Airport (as measured by aircraft operations). It is this demand that defines the runway and taxiway requirements.

Based aircraft, which are defined as operational and airworthy aircraft that spend a majority of the year at the Independence State Airport, is also an important measure that will directly influence facilities at the Airport. Based aircraft forecasts are utilized to determine the type and number of aircraft storage facilities and apron tiedowns needed throughout the forecast the planning period.

Collect And Review Previous Airport Forecasts

The next step is to collect and evaluate previous forecast data developed from national, state, and local sources. The data collected should be current and relevant to the existing conditions for the airport as well as provide an overview of the national and regional aviation system.

Analyze Data

This step of the forecasting process expands on the previous two steps to insure that all relevant and pertinent data are being utilized for the forecasting process. Once the sources of forecast data have been determined and the data has been gathered, the next step in the forecasting process is to analyze the information to identify any trends or correlations in the data. It is also important to screen the data for reasonableness to determine if anomalies or errors in the data are present which could affect the outcome of the aviation forecasts. For general aviation airports like Independence State Airport the best sources for historical aviation forecasts are historical aviation data relevant to the Airport (operations and based aircraft), FAA Aviation Forecasts like the TAF, other FAA and aviation industry forecasts, and socioeconomic data.

Select Forecast Methods

The next step in preparing forecasts is to select the most appropriate method to develop the projections for the activities to be measured. A forecast for an airport can involve a number of different techniques. They include:

- Regression and Trend Analysis
- Share Analysis
- Exponential Smoothing
- Comparison with Other Airports
- Survey Techniques
- Cohort Analysis
- Choice and Distribution Models

While there are several acceptable techniques and procedures for forecasting aviation activity at a specific airport, as identified above, most forecasts at general aviation airports utilize basic techniques such as regression analysis or trend analysis.

Regression analysis is an econometric analysis that uses statistical methods to estimate the relationship between a dependent variable and one or more independent variables at a future point in time. Regression is most useful when forecasts of the independent variables are more readily available than the dependent variable to be forecasted. Most regression models for aviation demand at general aviation airports use gross economic measures like income, population, and employment.

Trend analysis is a method of projecting historic trends into the future. The trend analysis formula is similar to the regression analysis formula except time is the independent variable.

Apply Forecast Methods And Evaluate Results

After historical aviation activity and forecast data has been obtained and analyzed, appropriate forecast methodologies have been selected, the methods need to be applied in order to obtain the forecasts of aviation activity such as based aircraft and aircraft operations.

A useful medium to evaluate the reasonableness of forecast results is to graph the results and compare the data against historic trend rates or other relevant similar forecasts such as state system plans and FAA TAF forecasts.

Summarize And Document Results And Compare To FAA TAF

The final step in the forecast process is to summarize and document the results and compare the proposed preferred forecast to the FAA TAF. The planning forecast write-up should summarize each forecast element, explain the forecast methods used, highlight significant assumptions, clearly present the forecast results, and provide a brief evaluation of the forecast.

3.3 FORECAST DATA SOURCES

A summary of data sources and forecasting guidance references used to prepare forecasts in this chapter are described here.

FAA Terminal Area Forecasts (TAF)

The TAF is the official FAA forecast of aviation activity for US airports. It contains active airports in the NPIAS including FAA-towered airports, federal contract-towered airports, non-federal towered airports, and non-towered airports. Forecasts are prepared for major users of the National Airspace System including air carrier, air taxi / commuter, general aviation (GA), and military. Forecasts are prepared to meet the budget and planning needs of the FAA and provide information for use by state and local authorities, the aviation industry, and the public.

FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans

AC 150/5070-6B, Airport Master Plans, provides guidance for the preparation of airport master plans that range in size and function from small GA to large commercial service facilities. This AC contains the key guidance that explains steps required for development of master plans, including the preparation of aviation activity forecasts and which elements should be forecast.

Airport Cooperative Research Program Report (ACRP): Counting Aircraft Operations at Non-Towered Airports

Prepared for the ACRP, a research branch of the Transportation Research Board of the National Academies, this guidance provides methodologies used across the country to estimate operations at airports without an air traffic control tower, such as Independence State Airport.

ACRP Report: Airport Aviation Activity Forecasting

This document, also prepared by the ACRP, discusses methods and practices for aviation activity forecasting. This report identifies common aviation metrics, issues in data collection and preparation, and data sources.

Forecasting Aviation Activity by Airport

This document provides guidance for preparing airport activity forecasts. FAA also utilizes this guidance when developing the TAF.

FAA Aerospace Forecasts, Fiscal Years 2017-2037

The FAA annually prepares this document to explain the current economic and aviation outlook, as well as macro level forecasts of aviation activity and the US aircraft fleet. The Fiscal years 2017-2037 report was released in March 2017.

General Aviation Statistical Databook & Industry Outlook

The General Aviation Manufacturers Association (GAMA) publishes this document on an annual basis. The document contains the association's industry outlook for the coming year, as well as data on the GA fleet and flight activity, the US pilot population, airports, safety, international data, and forecast information. The report also contains the year-end shipments and billings for GA aircraft divided into four different segments: business jets, turboprops, piston engine airplanes, and helicopters.

Federal and State Data Sources

Historical and forecast socioeconomic data for the State of Oregon and Polk County was obtained from several sources including the US Census Bureau, the Bureau of Business and Economic Research, the US Bureau of Labor Statistics, and Portland State University.

Local Data Sources

Other sources of data, such as ODA's Oregon Aviation Plan (2007), County Comprehensive Plans and economic development information for the county and region, were obtained and researched to understand local economic issues. Airport users and community organizations were also contacted through phone interviews and questionnaires to understand how the Airport is used and viewed by these groups.

3.4 AVIATION TRENDS

Research has shown that trends in national, state, and local aviation activity can be correlated to the aviation activity at any particular GA airport. This section will assess these current trends and their possible influence on activity at the Airport.

3.4.1 National Trends and Forecasts

Independence State Airport is part of an air transportation system and, as such, is subject to national and regional aviation trends. This means that the Airport is directly affected by trends impacting these larger systems. As a GA Airport, Independence State Airport is mostly affected by trends in the GA segment of the industry. GA refers to a wide range of flight activity and, by general definition, is all flight activity excluding commercial airline and military aircraft.

The number of Sport Aircraft is expected to grow at 4.1% over the next 20 years while the average annual hours flown for these aircraft is projected to grow at a higher rate of 4.6%.

The number of Turboprop Aircraft is expected to grow at 1.4% over the next 20 years while the average annual hours flown for these aircraft is projected to grow at a higher rate of 1.6%.

The number of Piston Single-Engine Aircraft is expected to shrink at -0.8% over the next 20 years and the average annual hours flown for these aircraft is also projected to decline at a slower rate of -0.6%.

GA in the US peaked in the 1970s, then experienced years of decline until growth returned in the 1990s. The growth in the 1990s was due not only to an expanding economy, but also to the General Aviation Revitalization Act (GARA) of 1994. GARA effectively protected most aircraft manufacturers and aircraft parts from liability for accidents involving products that are 18 years old or older (at the time of the accident), even if manufacturer negligence was a cause. Setting these limitations spurred production of single engine piston aircraft, as reduced product liability costs reduced the purchase price to a point that was more affordable. Single engine piston is the aircraft type that currently accounts for the majority of the nation's GA activity.

The business aviation portion of GA grew rapidly in the 1990s and into the first part of the 21st century. Since 9/11, business aviation has benefited from the increased regulations and security processing required by airline travel. Additional imposed airline passenger and baggage security as well as reductions in air service, particularly to smaller communities, have stimulated business use of aircraft since the economic recovery. GA business aircraft ranges from small, single engine aircraft rentals to multiple aircraft corporate fleets supported by dedicated flight crews and mechanics. Airplanes used for business tend to be larger and faster than those typically chosen for personal use. Until 2008, business aviation grew rapidly as various chartering, leasing, time-sharing, fractional ownership, interchange agreements, partnerships, and management contracts emerged. Business aviation is predicted to show stronger

growth than the personal and recreational aviation segments, as businesses leverage the advantages of the time savings that GA offers.

General Aviation growth began to decline in 2008 and 2009, due primarily to the economic recession that began toward the end of 2007. Soaring fuel prices in mid-2008 only reinforced the decline. The recession dampened every aspect of GA, from flight training and aircraft production to the number of pilots and the hours aircraft were flown.

General Aviation aircraft are widely varied, although the majority of GA aircraft are piston-powered, fixed-wing airplanes. The FAA tracks individual aircraft in the fleet along with the number of hours flown by each aircraft type – common indicators of industry activity trends. Aircraft type is categorized by either body, fixed wing or rotorcraft, or engine type and number, piston or turbine. As the operational environment continues to evolve, the FAA Aerospace Forecast suggests that the timing and strength of a recovery in aviation demand remains highly uncertain, although the long-term outlook remains favorable due to growth in turbine aircraft.

National General Aviation Fleet

Table 3A summarizes FAA projections of the number of active GA aircraft in the nation. They anticipate 0.1% annual growth over the next two decades. The more expensive and sophisticated turbine-powered fleet (including helicopters) will grow at an average of 1.9% annually over the next two decades. Of that fleet,turbine jets will see the strongest growth of 2.3% annually. In contrast, the piston-powered aircraft fleet is projected to decrease at -0.8% annually. The decline in piston fixed wing aircraft does not include the relatively new category of light sport aircraft which is expected to experience 4.1% annual growth in the fleet. This is an important distinction that could influence future activity at Independence State Airport.

The FAA cautions its forecasts depend on many unknown factors. Some of these factors include the national and world economies, US unemployment, price of oil, and national fiscal issues.

National General Aviation Hours Flown

As depicted in Table 3B, with growth of the active aircraft fleet, the number of GA hours flown is projected to increase at 0.9% per year. FAA annual growth rate projections vary for hours flown, from a declining rate of -0.6% for piston fixed-wing aircraft, to a high growth of 3.0% for jet aircraft, and an even higher growth rate 4.6% for light sport aircraft.

Rotorcraft hours were relatively immune to the recession

Table 3A: National General Aviation Fleet Forecasts

Aircraft Type	2016 (Estimated)	2010-2016 Historical	2017-2037 Forecast
Total Piston Fixed Wing	140,020	-1.7%	-0.8%
Single Engine	126,820	-1.6%	-0.9%
Multi-engine	13,200	-3.1%	-0.5%
Total Turbine Fixed Wing	23,230	1.8%	1.9%
Turboprop	9,460	0.2%	1.4%
Turbojet	13,770	3.1%	2.3%
Total Rotorcraft	10,700	1.0%	1.6%
Piston	3,335	-1.2%	1.3%
Turbine	7,365	2.1%	1.8%
Experimental	28,475	2.3%	1.0%
Sport Aircraft	2,530	N/A	4.1%
Other	4,950	-2.3%	0.1%
Total GA	**209,905**	**-1.0%**	**0.1%**
National Piston Growth Rate	**-0.8%**	**-1.7%**	**-0.8%**
National Turbine Growth Rate	**0.7%**	**1.9%**	**1.9%**

Table 3B: National Average Hours Flown Forecasts			
Aircraft Type	2016 (Estimated)	2010-2016 Historical	2017-2037 Forecast
Total Piston Fixed Wing	12,794	-1.5%	-0.8%
Single Engine	11,191	-1.4%	-0.9%
Multi-engine	1,603	-2.1%	-0.1%
Total Turbine Fixed Wing	6,712	2.8%	2.5%
Turboprop	2,539	1.5%	1.6%
Turbojet	4,173	3.6%	3.0%
Total Rotorcraft	3,350	-0.3%	2.0%
Piston	784	-0.2%	1.7%
Turbine	2,565	-0.3%	2.1%
Experimental	1,335	1.4%	2.0%
Sport Aircraft	204	N/A	4.6%
Other	162	-1.8%	0.1%
Total GA	**24,558**	**-0.2%**	**0.9%**
National Piston Growth Rate	**1.4%**	**-1.4%**	**-0.6%**
National Turbine Growth Rate	**3.7%**	**1.9%**	**2.4%**

compared to other categories. Turbine fixed wing aircraft utilization was also less impacted from the GA decline related to the recession when compared to other categories because turbine aircraft are flown primary for business rather than recreational flying. Growth in both the number of aircraft and hours of operation of sport aircraft has continued since its introduction in 2005.

Single engine piston airplanes (not including light sport aircraft) represent nearly 62% of the active fleet but fly less than 47% of the total hours flown. The higher performance, more expensive aircraft often used for business represent a smaller portion of the fleet and a much larger portion of the total number of hours flown. For the first time in aviation history, turbine-powered aircraft are forecast to exceed piston-powered aircraft for total hours flown around the year 2025.

3rd Class Medical Reform

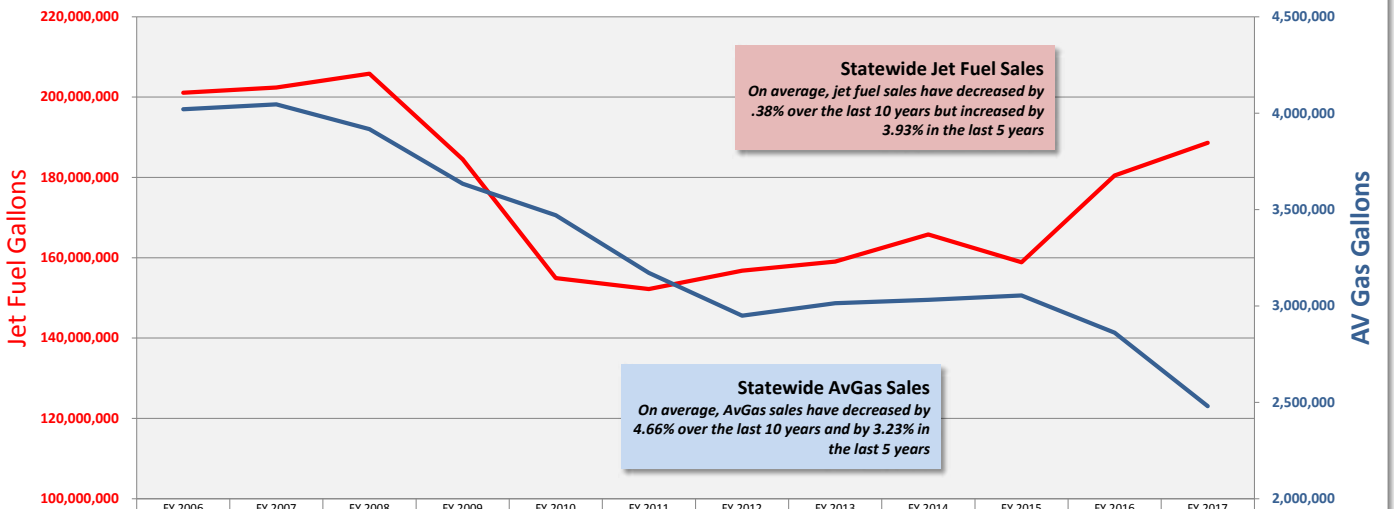
In July 2016, as part of the FAA Extension, Safety and Security Act of 2016, third-class medical reform was signed in to law. It was anticipated by many that the new law removing the third class medical requirement for private pilots would generate a boost in recreational flying opportunities and growth in GA and recreational flying overall.

Under the new provisions, pilots holding current driver's licenses and third-class medicals would never need to see an Airman Medical Examiner (AME) again. Instead, pilots would be required to visit their personal physician once every four years and make a notation in their logbook, as well as complete an online aeromedical test every two years and medically self-certify their fitness before each flight.

Pilots would be allowed to operate aircraft with up to six seats, up to 6,000 pounds (no limitations on horsepower, number of engines, or gear type) under day and night VFR and IFR with up to five passengers. Pilots cannot operate for compensation or hire, and are limited to altitudes of up to 18,000 feet msl and airspeeds up to 250 knots indicated airspeed.

Third class medical reform could have a significant and positive impact on operations at the Independence State Airport due to the recreational nature of the Airport, Airpark, and regular users of the facilities. Since the new medical standards were launched in early 2017, in the first 100 days more than 15,000 pilots nationwide have used the new rule to keep flying. This trend is expected to continue as the BasicMed procedure is more widely adopted.

Figure 3A: State of Oregon Annual Jet Fuel and Avgas Gallons Sold, FY 2006-2017



	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Jet Fuel Gallons	201,077,904	202,395,592	205,824,621	184,516,056	154,944,451	152,224,262	156,770,024	159,061,232	165,808,692	158,897,963	180,490,053	188,644,888
AV Gas Gallons	4,020,161	4,045,352	3,917,539	3,633,730	3,470,324	3,171,346	2,949,657	3,014,534	3,032,044	3,054,022	2,861,258	2,479,982

3.4.2 State Aviation Trends and Forecasts

While broad industry trends influence aviation activity at individual airports, regional and local factors may have a greater influence. Primary sources for discussion of state aviation trends is regional aviation activity information and data in the Oregon Aviation Plan (OAP) completed in 2007, and statewide historic fuel sales (To be updated in 2018).

The OAP describes the following trends impacting aviation demand in Oregon:

- Continued migration into the state – new residents who depend on air transportation to maintain ties with family and friends.
- Continued increases in socioeconomic indicators, such as total employment, per capita income, and retail sales.

As of 2013, there were 97 public-use and over 360 private-use airports in the State of Oregon; 96 of those airports were included in the state airport system in 2007. The airports in the state system had an estimated 4,875 based aircraft in 2005 (the base year for data). In comparison, the aircraft registry shows 7,594 aircraft registered in the State of Oregon as of March 2016. The 2007 OAP projected that based aircraft in the State would grow 1.23% by 2030. For the same time-frame, GA operations were projected to grow at an estimated 1.58%. These growth rates were prepared prior to the economic downturn of 2008 (To be updated in 2018).

Statewide fuel sales data available on an annual basis since FY 2006 (**Figure 3A**)may suggest a somewhat different picture of what has occurred in the State of Oregon since completion of the OAP in 2007. Avgas fuel sales, which can be an indicator of aircraft operations, throughout the State have experienced a steady decline (48%) since the recession. Consistent with national trends, GA Avgas sales are largely expected to continue to decline. Jet fuel sales statewide, however, only experienced a 20% decline due to the recession and has since rebounded and grown steadily since 2010 to pre-recession levels. Based on statewide fuel sales data it appears as though there has been a decline of piston driven aircraft operations and turbine aircraft operations experienced a dip but have rebounded or grown since the recession.

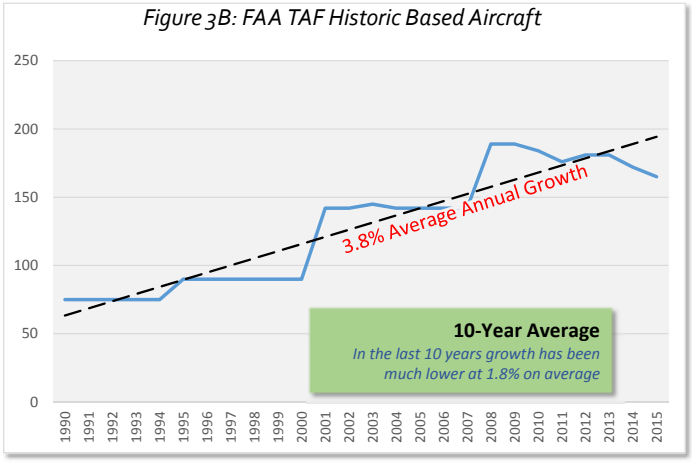
3.4.3 Local Aviation Activity and Trends

At many GA airports, it is difficult to obtain accurate operational data. The FAA's Terminal Area Forecast (TAF) serves as the primary source of information and contains estimates of historical and forecast data for airport operations, and based aircraft. It is prepared annually and generally reflects national trends shown in correlation with regional factors. In addition to the FAA TAF data, annual updates of the inventory data reported to the FAA, and annual fuel sales data will serve as the primary source of aviation activity and trend information.

Based Aircraft

Based aircraft are the number of aircraft that are stored at the Airport in a hangar, Airpark hangar home, or tied down on either a paved apron surface or a grassy area designated for such a use. Historical based aircraft numbers from 1990 through 2015, as reported in FAA's 2017 Terminal Area Forecast (TAF) show an overall increase in total based aircraft (**Table 3B**). Based on TAF information the number of based aircraft has grown 3.8% on average over the past 25 years and 1.8% in the last decade.

Figure 3B: FAA TAF Historic Based Aircraft



Regardless, the TAF is still a valuable source for historical based aircraft numbers from which to discern trends. However, in recognizing the importance of accurate based aircraft counts at each airport, the FAA established a National Based Aircraft Inventory Program. A website (www.basedaircraft.com) has been established to allow airport managers direct on-line entry of their based aircraft counts, which is then validated via cross-reference of aircraft tail numbers entered for other airports. For aircraft listed at more than one airport, there is a procedure for determining how the aircraft is counted.

In the latest based aircraft inventory update (**Table 3C**), ODA reports 197 actual based aircraft in 2017, which the Master Plan assumes to be accurate since it has been verified through the National Based Aircraft Inventory database. Of the based aircraft reported, 189 are single-engine piston aircraft, seven are multi-engine piston, and 1 aircraft is a helicopter. There are no turbine or turboprop aircraft based at the Airport. This baseline information will be used as the starting point for aviation activity forecasts projected to occur at the Independence State Airport over the planning period.

Table 3C: Based Aircraft at Independence State Airport

Aircraft Category	Number Based
Single-Engine Piston	189
Multi-Engine Piston	7
Jet/Turboprop	0
Helicopter	1
Total	**197**

At Planning Advisory Committee (PAC) Meeting #1 it was pointed out that there has been an increase in the number of gliders based and operating at the Airport. Gliders, ultra-lights, and other non-5010 type aircraft are not included in the based aircraft count. However, it is worth mentioning that the inventory updated by ODA indicated at least six additional aircraft at the Airport that consist primarily of gliders. Discussions with local operators indicated operations and the number of aircraft based in this category of aircraft is expected to grow as operations are moved from McMinnville to Independence State Airport permanently over the coming years.

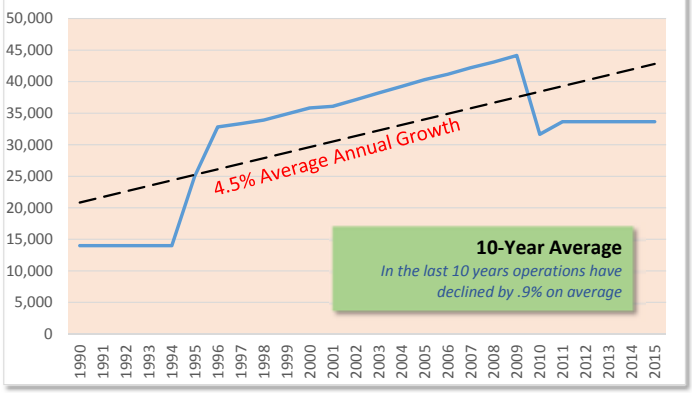
Historic Aircraft Operations

Annual aircraft operations are the total number of aircraft takeoffs and landings occurring at the Airport in a year. Airport operations are divided between local

and itinerant activity and further categorized by Air Taxi, General Aviation Local, General Aviation Itinerant, and Military. Local operations, such as a touch-and-go, which occurs during pilot training, counts as two operations. Touch-and-go operations are categorized as local, along with the other operations that remain within 20 miles of the Airport. Itinerant activity refers to all other operations that depart to or arrive from another airport.

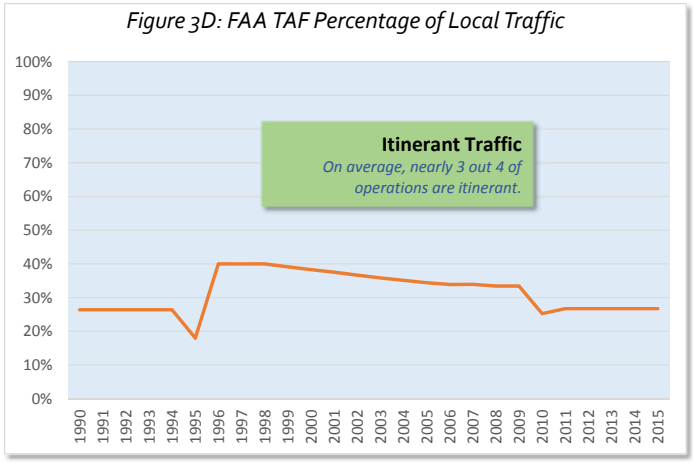
Aviation operations estimates from the FAA TAF depicts significant growth over the historical trend of operations at the Airport. In the last 25 years operations estimates have increased 4.5% on average. However, since the recession, growth at the Airport has slowed significantly to .9% on average (**Figure 3C**).

Figure 3C: FAA TAF Historic Aircraft Operations



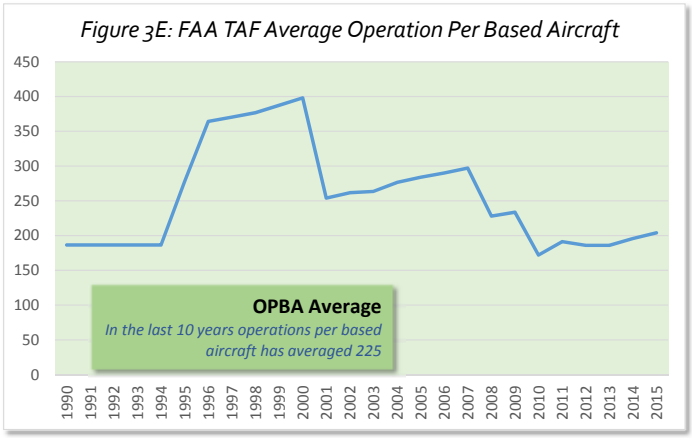
According the FAA TAF, nearly 3 out of 4 operations at the Independence State Airport are itinerant (**Figure 3D**). This sentiment was shared by the PAC at PAC #1 as many in attendance at the meeting confirmed the Airport is a destination airport and many people fly in just to get breakfast at the Starduster Cafe and fuel because it is consistently cheaper than other airports throughout the State.

Figure 3D: FAA TAF Percentage of Local Traffic



Another method used to count and estimate operations at GA airports is operations per based aircraft (OPBA). Historically, the FAA TAF has placed the OPBA count on average between 255 and 225. Over the past 10 years, the OPBA has averaged 225 (**Figure 3E**).

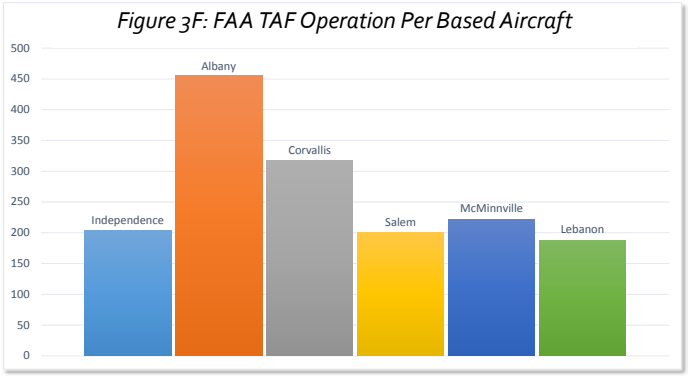
Figure 3E: FAA TAF Average Operation Per Based Aircraft



As a means to validate this relationship, OPBA at the Airport was discussed at PAC Meeting #1 to ensure an acceptable level of operational data was established before finalizing aviation activity data and forecasts. Due to the increase of actual based aircraft identified in the FAA TAF, the OPBA data needed to updated to help establish an updated operations count at the Airport.

OPBA data at area airports (**Figure 3F**) was compared and presented for a discussion amongst the PAC and stakeholders. Ultimately, it was determined by the State that 204 OPBA (as the forecast average OPBA established by the FAA in the TAF) is an acceptable level to help establish the latest operational data estimates to be used as the baseline starting point in the activity forecasts.

Figure 3F: FAA TAF Operation Per Based Aircraft



Historic Fuel Sales

There is 30,000 gallons of Avgas fuel capacity in three different tanks on the Independence State Airport. As previously mentioned, there is no JetA sold on the

Airport. Available fuel sales data can be one of the best indicators of aviation activity at a GA airport. Accurate sales data are maintained by operators and the State in an effort to collect a fuel sales tax, which is used to fund airport improvements throughout the system.

The historic fuel sales data at Independence State Airport presented in **Figure 3G** shows fuel sold at the airport from Fiscal Year (FY) 2008 through FY 2017 has been increasing on average. Overall, fuel sales receipts depict an average annual growth rate of 2.4% through FY 2017. However, there have been fluctuations over the past 10 years due largely to the recession and occasional temporary factors that can lead to variations in sales.

The average annual growth in fuel sales over the last decade indicates that Airport operations have continued to increase despite national and state trends that show a decrease in Avgas and piston-engine aircraft as a whole. At PAC Meeting #1, PAC members airport users indicated this was not a surprise because Independence State Airport has the cheapest price per gallon in the State. This trend is a strong indication for continued growth at Independence State Airport.

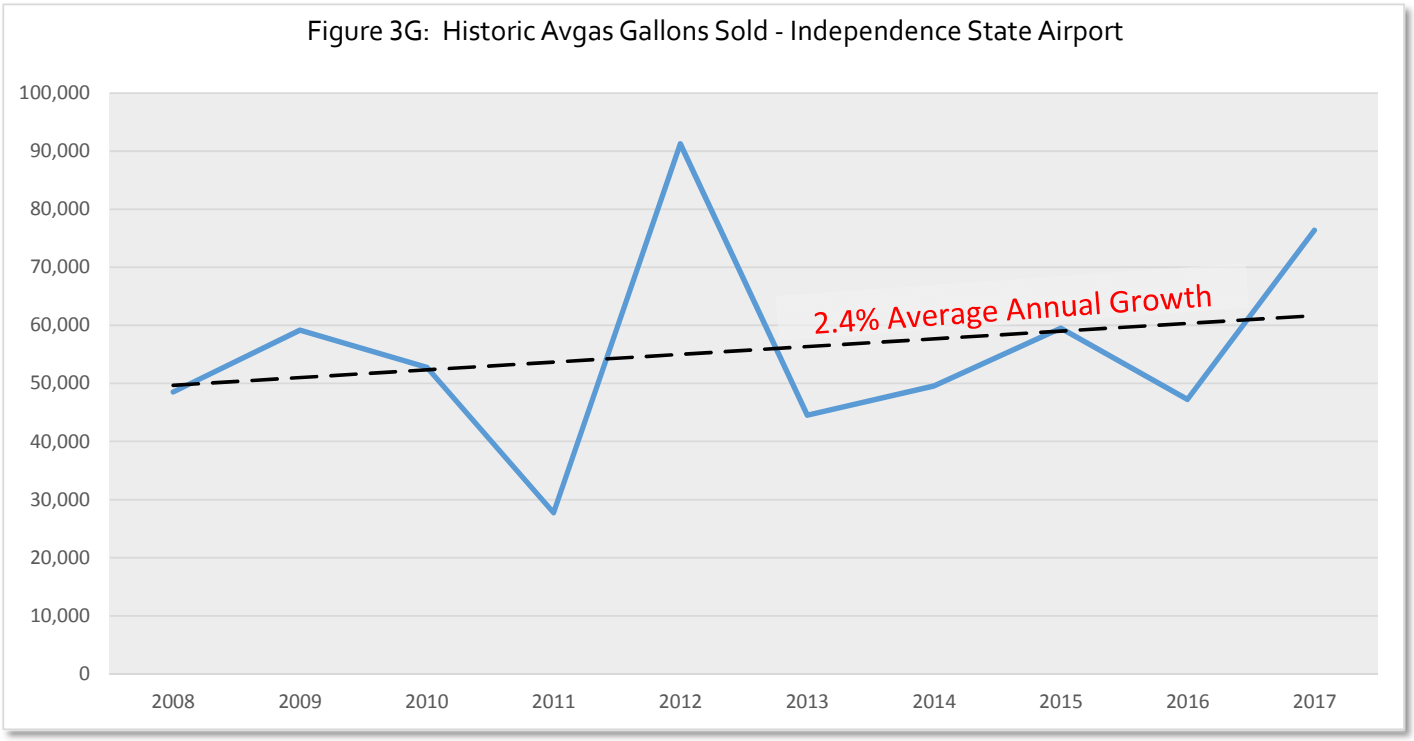
Estimated Aircraft Operations

With the updated based aircraft count of 197 total aircraft and the selection of 204 OPBA, the planning team has estimated the total operations at Independence State Airport to be approximately 40,500 annual operations.

Table 3D: Airport Operations Estimates last 12 Months	
	Operations
Air Taxi	215
General Aviation Itinerant	29,350
General Aviation Local	10,935
Military	0
Total	**40,500**

When distributed by operations type, as shown in **Table 3D** above, these relationships are consistent with the data in the FAA TAF. However, based on conversations with Airport users, FBO operators, ODA, and the PAC, it is the general consensus that Jets are not coming to the Airport and the number of Air Taxi operations at the Airport is considered to be significantly less than what is depicted in the TAF. Therefore, the number of Air Taxi operations has been reduced by an estimated 1,000 operations and is reflected in the General Aviation Itinerant category.

Figure 3G: Historic Avgas Gallons Sold - Independence State Airport



3.5 AVIATION FORECASTS (2018-2037)

The following forecasts provide insight into how aviation activity at Independence State Airport may change over the next 20 years, 2018-2037.

3.5.1 Based Aircraft Forecast

The number of aircraft based at the Airport is an important consideration when planning facilities. The based aircraft forecast will directly influence the type and number of aircraft storage facilities and apron tiedowns needed. Projections of based aircraft also provide one indication of the anticipated growth in flight activity expected to occur at the Airport.

The based aircraft forecast begins by determining and analyzing historical numbers of based aircraft. Then various forecast models prepared for the Airport are analyzed and presented through the forecast planning period.

Eight different forecasting models were analyzed to provide a range of possibilities for based aircraft. The average annual growth rates for these models range from -0.8% to 4.1%. After the analysis, six models that depicted different potential scenarios, but generally covered the full range of the models analyzed, were selected for consideration.

National Sport Aircraft Growth Rate Model (4.1%)

As General Aviation needs change to meet the needs of users, the growth of light sport aircraft is expected to experience a substantial increase over the course of the planning period. These type of aircraft are consistent with the type of aircraft currently based at Independence State Airport. Furthermore, based on historic trends, it is expected this trend will continue well in to the future at the Airport. If applied to the existing based aircraft count independently, the Sport Aircraft growth rate would increase the total based aircraft by 243 for a total of 440 by 2037.

Independence Fuel Trends (2.4%)

Historic Avgas fuel sales at the Airport indicate regular growth in operations at the Airport over the past decade. While fuel sales may not precisely correlate with an increase in based aircraft, applying the 2.4% growth rate to all based aircraft at the Airport would result in an increase of 120 additional based aircraft to a total of 317 by 2037.

Historic Trend (1.8%)

Using TAF based aircraft data trends from 2005 through 2015, the historic trend model projects a continuation of the based aircraft trends identified in the FAA TAF into the future. This model assumes the historical data are defensible and reasonable. As previously mentioned, there can be discrepancies with historic based aircraft counts as many aircraft nationwide were being double-counted at airports prior to online verification. Regardless, forecasting this historic growth rate trend out from the updated based aircraft count results in an additional 84 based aircraft that would base at the Airport for a total of 281 by aircraft 2037.

Terminal Area Forecast (1.4%)

The FAA's TAF for the Airport, prepared in 2017, projects an average annual growth rate of 1.4% out to 2037. This growth rate is equal to the National Turboprop average as well as the OAP 2007 growth rate identified for Independence State Airport. When this growth rate is applied to the updated based aircraft count of 199, the model projects an increase of 63 new aircraft over the 20-year planning period for a total of 260 aircraft.

National Experimental Aircraft (1.0%)

The National Experimental Aircraft model was selected for analysis due to the number of experimental aircraft currently based at the Airport. While this rate is significantly less than the Sport Aircraft growth rate mode, the correlation between these two models cannot be ignored. If the National Experimental Aircraft growth rate were applied to the updated based aircraft count of 199 independently, without consideration of any other model, the result would project a modest increase in based aircraft to a total 240 by 2037.

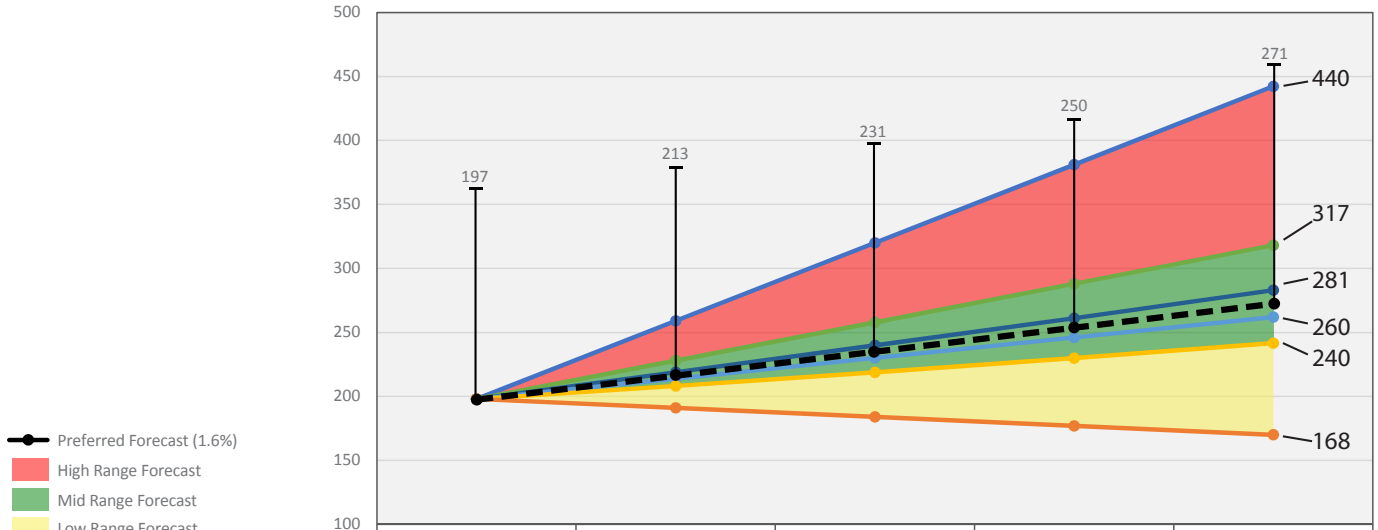
National Piston Growth Rate Model (-0.8%)

It is assumed that all of the airplanes based at the Airport now and in the past have been piston-powered. Therefore, it would appear reasonable to apply the same growth rate at the Airport as forecast for piston-powered airplanes nationwide. However, this model does not take into consideration the expected influx of more affordable light sport aircraft and new experimental aircraft into the Airport, as the national trends would indicate. This forecast model, which is unrealistic, would decrease the total based aircraft to 168 by 2037.

3.5.3 Preferred Based Aircraft Forecast

The National Sport, Independence Fuel Trends, National Experimental Aircraft, and National Piston forecasts were selected to represent three potential ranges (high, mid, and low) to depict future growth in based aircraft

Figure 3H: Based Aircraft Forecasts



	2017	2022	2027	2032	2037
National Sport Aircraft (4.1%)	197	257	318	379	440
Independence Fuel Trends (2.4%)	197	227	257	287	317
Independence Historic Based Aircraft (1.8%)	197	218	239	260	281
Independence TAF (1.4%) National Turboprop (1.4%) Oregon State System Plan (1.4%)	197	212	229	244	260
National Experimental Aircraft (1.0%)	197	208	219	229	240
National Piston (-0.8%)	197	189	182	175	168

at the Airport. Forecasting is not a precise science; it is an educated estimate based on approved methods and data. As such, in the event the Preferred Based Aircraft Forecast over or underestimates demand, the range of error will likely be accounted for in the selection of the "Preferred Range". If demand falls in line with any of the forecast ranges, it is anticipated there is land available for hangar development to accommodate the full range of projections.

While the Based Aircraft Forecasts exhibit presents the forecasts as increasing year-by-year according to average growth rates, actual growth over time will occur in phases as facilities are constructed and made available for based aircraft.

High Range Forecast

The High Range Forecast is the most aggressive of the forecasts and accounts for growth in the recreational aviation market generated primarily from the growing light sport aircraft market. The high range scenario could result in a based aircraft count of predominately light sport aircraft with a few small multi-engine turbine business aircraft. At the end of the 20 year planning period it is estimated the based aircraft count would fall between 317-440 based aircraft.

Mid Range Forecast

The less aggressive Mid Range Forecast falls in between the Independence Fuel Trends and the National Experimental Aircraft Forecasts. The mid range scenario presents low to moderate growth over the 20 year planning period from slow growth in both the light sport and other small business class aircraft. By the end of the 20 year planning period it is estimated the based aircraft count would range between 240-317 based aircraft.

Low Range Forecast

The least aggressive Low Range Forecast falls below the National Experimental Aircraft model but above the declining trend identified in the National Piston Forecasts. The low range scenario projects a largely declining trend in aviation at the Airport. By the end of the 20-year planning period it is estimated the based aircraft count would fall between 240 and 168 aircraft.

Preferred Based Aircraft Forecast

Each of the seven forecast models examined for Independence are summarized in **Figure 3H**. The preferred forecast range is the mid-range forecast, which is represented by the average of the forecasts in that range. The preferred forecast represents an average annual growth rate of 1.6% which is slightly above the FAA TAF growth rate and State system plan growth rate

but falls below the historic based aircraft data trend. The preferred model, when forecast out 20 years, could result in 74 additional based aircraft over the planning period for a total of 271 aircraft.

Forecast Based Aircraft Fleet Mix

The fleet mix of aircraft based at the Airport summarized in **Table 3E** may slightly change over the forecast period based on national trends and other changing conditions or unknown variables. However, it is expected that single-engine piston-powered type aircraft will remain the predominant aircraft.

Table 3E: Fleet Mix Forecast in 2037	
Aircraft Category	Number Based
Single-Engine	260
Multi-Engine Piston	8
Jet/Turboprop	1
Helicopter	2
Total	**271**

3.5.4 Aircraft Operations Forecast

Aircraft operation forecast data helps in analyzing runway capacity and determining runway, taxiway, and navigational aid requirements. Similar to the based aircraft forecast, various forecast models were then analyzed and presented through the forecast planning period. Forecast information presented in this section includes operations fleet mix, local vs. itinerant operations, peak activity, and critical aircraft and Runway Design Code (RDC).

The FAA Aerospace Forecast indicates that GA aircraft usage will increase. While the nationwide fleet is projected to grow 0.1% per year, hours flown are projected to grow 0.9% per year. For the piston fleet, however, the hours flown are expected to decrease by -0.8% annually – alternatively, the turbine fleet is expected to increase usage by 2.5% annually. Although the piston and turbine fleet forecasts diverge, the overall trend is that aircraft use will increase at a faster rate than the total number of aircraft. Therefore, logic dictates that aircraft operations at any given airport will grow at a faster rate than based aircraft.

Six different forecasting models were analyzed to provide a range of the possible scenarios to depict aircraft operations at the Airport. The average annual growth rates for these models range from -0.8% to 4.6%. After the analysis, five models that depicted different potential scenarios, but generally covered the full range of the models analyzed, were selected for presentation.

National Sport Aircraft Growth Rate Model (4.6%)

The National Growth Rate model for sport craft is the most aggressive of those analyzed. While the growth of sport craft operations is expected at Independence State Airport, an applied rate would more than double annual operations to nearly 100,000 from the current estimate of 40,500, which would likely overstate operations at the Airport.

Independence Fuel Trends (2.4%)

As discussed in the based aircraft forecast, historic Avgas fuel sales at the Airport indicate regular growth in operations at the Airport over the past decade. Applying the 2.4% growth rate to the existing operations estimate of 40,500 would result in an estimated 65,100 annual operations at the end of the 20-year planning period, which is not an unrealistic scenario.

National Experimental Aircraft (2.0%)

The National Experimental Aircraft growth rate of 2% is consistent with the Oregon Aviation System Plan (OAP) forecast growth rate for Independence State Airport. The OAP uses base data from 2005 to project 2.0% average annual growth in aircraft operations at the Airport, which may be somewhat outdated. When the growth rate is applied to the model, the projected growth in operations could potentially reach an estimated 60,200 operations at the end of the planning period.

Terminal Area Forecast (1.7%)

The FAA's TAF projects an average annual growth of 1.7% through 2037, which is an increase to 56,700 annual operations from the current estimate of 40,500.

National Piston Growth Rate Model (-0.80%)

Applying the piston-only growth rate would show a decrease in annual operations over the forecast period, which would not be consistent with local trends at the Independence State Airport.

3.5.5 Preferred Aircraft Operations Forecast

The National Sport, Independence Fuel Trends, TAF, and National Piston forecasts were selected to present three potential ranges (high, mid, and low) to depict future growth in aircraft operations at the Airport. As previously mentioned, forecasting is not a precise science; it is an educated estimate based on approved methods and data. As such, in the event the Preferred

Aircraft Operations Forecast over- or under-estimates demand, the range of error will likely be accounted for in the selection of the "Preferred Range".

While the exhibit below presents the forecasts as increasing year-by-year according to average growth rates, actual growth over time will occur in phases as facilities are constructed and made available for based aircraft.

High Range Forecast

The High Range Forecast is the most optimistic range of the scenarios presented and accounts for growth in the recreational aviation market generated primarily from the growing light sport aircraft market. The high range scenario would likely result in a mix of aircraft that consists primarily of light sport recreation aircraft with a moderate growth in small multi-engine piston and turbine business aircraft. At the end of the 20 year planning period it is estimated there would be a range of 65,100 to 99,600 operations per year.

Mid Range Forecast

The Mid Range Forecast presented falls in between the Independence Fuel Sales trend and FAA TAF. The mid range scenario presents moderate growth over the 20 year planning period primarily from steady growth in the light sport and experimental recreation markets along with a small increase in the number of small multi-engine piston and turbine business aircraft operating at the Airport. In this scenario at the end of the 20 year planning period it is estimated there would be a range of 56,700 to 65,100 operations per year.

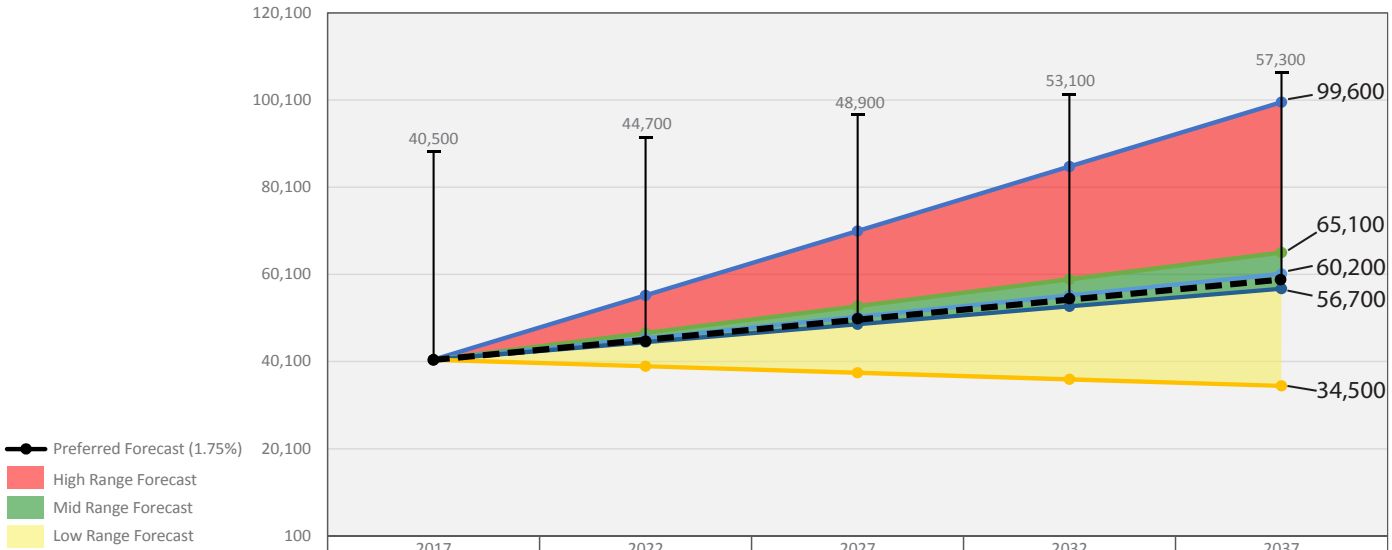
Low Range Forecast

The Low Range Forecast is the scenario that depicts the least optimistic forecast for the planning period. The low range scenario presented is below the TAF but above the declining trend identified in the National Piston Forecasts. In this scenario, at the end of the 20 year planning period it is estimated there would be a range of 34,500 to 56,700 operations per year.

Preferred Aircraft Operations Forecast

Each of the forecast models examined for Independence are summarized in **Figure 3I.** ODA selected the mid-range forecast as the preferred forecast growth scenario. A growth rate of 1.75% over the 20-year planning period, was chosen to represent the preferred aircraft operations forecast. This average annual growth rate is slightly higher than the FAA TAF but falls slightly below the State System Plan and National Experimental Aircraft operations growth rates. The selected growth rate result in 207 OPBA at Independence State Airport in 2037,which is consistent with the FAA TAF and within tolerances for ultimate FAA approval.

Figure 3I: Operations Forecasts



	2017	2022	2027	2032	2037
National Sport Aircraft (4.6%)	40,500	55,275	70,050	84,825	99,600
Independence Fuel Trends (2.4%)	40,500	46,650	52,800	58,950	65,100
National Experimental Aircraft (2.0%) State System Plan (2.0%)	40,500	45,425	50,350	55,275	60,200
Independence TAF (1.7%)	40,500	44,575	48,650	52,725	56,700
National Piston (-0.8%)	40,500	39,000	37,500	36,000	34,500

Local and Itinerant Operations

The local and itinerant share of the preferred forecast for aircraft operations is consistent with the selected average annual growth rates, updated operational estimates presented for 2017, and historic levels of itinerant traffic at the Airport (**Table 3F**). Independence State Airport experiences a significant amount of itinerant activity and that trend is expected to continue throughout the 20-year planning period.

Table 3F: Forecast Local and Itinerant Operations in 2037	
	Operations
Air Taxi	720
General Aviation Itinerant	41,110
General Aviation Local	15,470
Military	0
Total	**57,300**

Operations Fleet Mix

The projected fleet mix breakdown of the preferred forecast by single-engine piston, multi-engine piston, turboprop, turbojet, and helicopter in 2037 (**Table 3G**) reflects past trends and existing ratios on the Airport where the mix is predominately single-engine recreational type aircraft.

Table 3G: Forecast Operations Fleet Mix in 2037	
	Fleet Mix Forecast
Single-Engine Piston	55,675
Single-Engine Turbine	300
Multi-Engine Piston	875
Turboprop & Turbojet	175
Helicopter	275
Total	**57,300**

Peak Demand

Airport activity fluctuates from month to month, day to day, and hour to hour; therefore, airfield and landside facilities are traditionally designed to accommodate reasonable peak levels of use. Without clear airport operations data at the Airport it is difficult to determine exact ratios of peak daily or hourly demand. However, in conversations with Airport users, PAC members, and ODA, it is clear that the Airport is much busier in the summer months when weather is more suitable to VFR flying, and on the weekends when people are able to recreate and fly in for breakfast at the Starduster. Furthermore, the Airport is much busier in the mornings than in the afternoon during peak days.

During the development of the aviation forecats for the Indpendence State Airport, the values for average day peak month and for the peak hour were calculated using the standard methodology in FAA Advisory Circular 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities. Under this methodology, the average day peak month is derived by taking the number of operations calculated for the peak month and dividing that figure by the number of days in the peak month (31 days). Peak hour is assumed to be 15% of the day peak. The resulting forecasted peak operations data are summarized in **Table 3H**.

Table 3H: Peak Operations Forecasts	
	Peak Operations
Annual Operations (2037)	57,300
Peak Month (20% of Annual)	11,460
Design Day (31 days)	370
Design Hour (15% of Peak Day)	56

3.6 CRITICAL AIRCRAFT AND RUNWAY DESIGN CODE

According to FAA criteria, a runway's design is based on the characteristics of the critical aircraft, which is the most demanding aircraft that uses the runway "regularly" or "substantially." The FAA defines regular or substantial use as at least 500 annual itinerant operations. The Runway Design Code (RDC) can vary for individual runways by providing standards to serve different design aircraft on different runways and taxiways. The RDC also includes a component for instrument approach visibility minimums, which will be discussed further in the Facility Requirements chapter. The largest RDC at an airport dictates the overall Airport Reference Code (ARC) for a particular airport.

The RDC and ARC is defined by the Aircraft Approach Category and the Airplane Design Group of the critical aircraft. The Aircraft Approach Category is determined by the approach speed, or 1.3 times the stall speed of the aircraft in its landing configuration at its maximum landing weight, and is represented by the letters A, B, C, D, and E. The Airplane Design Group is based on the aircraft's wingspan or tail height, and is defined by Roman numerals I, II, III, IV, V, and VI.

The current ARC and RDC for Runway 16-34 is B-I (small)

and this designation is projected to remain throughout the planning period. However, historically the design aircraft selected to designate the "typical" aircraft using the Airport on a regular basis has been the twin-engine turboprop King Air B100. Based on the aviation activity analysis at Independence State Airport, discussions with airport users and ODA, there are very few actual turbine or turboprop aircraft that use the Airport. Therefore, it is more fitting that the critical aircraft reflect the actual "typical" aircraft seen at the airport on a regular basis. As such, the twin-engine piston driven Cessna 402, which is also a B-I(small) will be selected as the critical aircraft throughout the 20-year planning period.

3.7 SUMMARY OF FORECASTS

The long-term growth of the Airport will be influenced by national and regional trends outlined within this chapter. Elements of the aeronautical activity forecast for the Airport are summarized in **Table 3I**.

With this forecast data, the next step in the master planning process is to calculate the ability of existing facilities to meet the forecast demand. Additionally, the next chapter will identify needed enhancements of airside and landside facilities to accommodate forecast demand. It is important to note that the aviation industry tends to cycle through highs and lows. Actual growth may be more aggressive or passive at times over the forecast period. It is essential to identify opportunities within the forecast period and beyond so the Airport can proactively accommodate potential growth.

Table 3I: Summary of Preferred Aeronautical Activity Forecast				
Forecast Element	2017	2022	2027	2037
Based Aircraft				
Single Engine Piston	189	205	221	260
Multi-Engine Piston	7	7	8	8
Jets/Turboprop	0	0	0	1
Helicopter	1	1	2	2
Total	**197**	**213**	**231**	**271**
Aircraft Operations				
Air Taxi - Itinerant	215	340	470	720
GA - Itinerant	29,350	32,290	35,230	41,110
GA - Local	10,935	12,070	13,200	15,470
Military	0	0	0	0
Total	**40,500**	**44,700**	**48,900**	**57,300**
Operations Fleet Mix				
Single Engine Piston	39,010	43,015	47,355	55,675
Single Engine Turbine	50	75	200	300
Multi Engine Piston	1,215	1,340	975	875
Turboprop & Turbojet	25	50	125	175
Helicopter	200	220	245	275
Total	**40,500**	**44,700**	**48,900**	**57,300**
Peak Demand (Operations)				
Peak Month - (20%)	8,100	8,940	9,780	11,460
Design Day	261	288	315	370
Peak Design Hour (15%)	39	43	47	56
Preferred Based Aircraft Forecast vs TAF (Preferred/TAF)				
Preferred	197	213	231	271
TAF	197	212	229	260
Percent Difference	**0.0%**	**0.5%**	**0.9%**	**4.2%**
Preferred Operations Forecast vs TAF (Preferred/TAF)				
Preferred	40,500	44,700	48,900	57,300
TAF	40,500	44,550	48,600	56,700
Percent Difference	**0.0%**	**0.3%**	**0.6%**	**1.1%**