Lakeland Linder International Airport, Airport Master Plan Update

Aviation Activity Forecasts

September 2018

FlyLakeland
Lakeland Linder International Airport

ATKINS

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Chapter **Pages**

3. Aviation Activity Forecasts

This chapter presents projections of aviation activity that form the basis of future development needs for the Lakeland Linder International Airport (LAL). Previous activity forecasts, industry trends, socioeconomic conditions, and historic data were analyzed and applied to methodologies accepted by both the Federal Aviation Administration (FAA) and Florida Department of Transportation (FDOT) to develop these forecasts.

The standard planning period for an airport master plan is 20 years and the key planning periods include the five, ten, and 20-year horizons. Since this study was largely conducted in 2018, the forecasts are presented for 2023, 2028, and 2038. The forecasts primarily use data obtained through calendar year 2017, although in a few cases, the most recent 12 months of data were also considered. For a complete picture of operational activities and emerging opportunities at LAL, interviews were also conducted with the airport tenants, users of the airfield's facilities, airport businesses, and industry groups, as well as airport and air traffic control management.

3.1. Recent Projections of Aircraft Activity

The most recent local, state, and national forecasts for LAL include those prepared for the 1997 Airport Master Plan Update, FDOT's Florida Aviation System Plan (FASP), and the FAA's 2017 Terminal Area Forecast (TAF). Each forecast projects different levels of based aircraft and annual operations for the airport as summarized in the following sections. As required by the FAA, a direct comparison of the recommended forecasts must be made relative to the FAA TAF. This comparison is included at the end of this chapter.

3.1.1. 2011 Airport Master Plan Update

The 2011 Airport Master Plan Update included forecasts which were projected over a 20-year planning period using 2009 as the base year. The expected number of based aircraft and annual operations for the key planning horizons of that study are included in **Table 3-1** below. These figures have also been extrapolated out to 2038 to provide a basis of comparison with the forecasts generated in this study.

Table 3-1 2011 Airport Master Plan Update

	Based Aircraft	Annual Operations
Base		
2009	165	101,966
Forecast		
2014	185	108,420
2019	203	118,000
2024	223	126,980
2029	245	140,370
2038 (extrapolated)	293	162,085
Average Annual Growth Rate (2009 – 2029)	2.0%	1.6%

Source: 2011 Airport Master Plan Update.

3.1.2. Florida Aviation System Plan

The Florida Aviation System Plan (FASP) provides a comprehensive planning and development guide for the state's public airports. The FASP ensures that Florida has an effective statewide aviation transportation system. In support of these goals, FDOT's Aviation and Spaceports Office provides annual updates to historic aviation data and prepares forecasts of the based aircraft, annual operations, and passenger enplanements (as applicable) for each public airport in the state. The FASP information is included as part of the Florida Aviation Database with the most recent update providing historic data through 2015 and projections out to 2035. **Table 3-2** shows the FASP data for the key forecast horizons of this study, including an extrapolation to 2038. The FASP does not include any passenger enplanements for LAL.

Table 3-2 Florida Aviation System Plan

	Based Aircraft	Annual Operations
Base		
2015	253	106,339
Forecast		
2023	301	120,738
2028	336	130,711
2038 (extrapolated)	417	153,196
Average Annual Growth Rate (2015 – 2035)	2.2%	1.6%

Source: Florida Aviation Database, February 2018 and ESA analysis, 2018.

3.1.3. FAA Terminal Area Forecast

The Terminal Area Forecast (TAF) is prepared annually by the FAA to meet the budget and planning needs of the agency, as well as to provide information for use by state agencies, local authorities, the aviation industry, and the public. Projections in the FAA TAF are prepared for each airport in the National Plan of Integrated Airport Systems (NPIAS). The TAF projections detailed in **Table 3-3** are based on the federal fiscal year, which ends on September 30th. The 2017 TAF (issued in January 2018) utilizes a 2016 base year for based aircraft and a 2017 base year for annual operations. Projections of passenger enplanements in the 2017 TAF are not included in **Table 3-3** as they are flatlined at only 297 from 2017 to 2045.

Table 3-3 FAA 2016 Terminal Area Forecast

	Based Aircraft	Annual Operations
Base		
2016	232	114,198
Forecast		
2017	234	111,116[a]
2023	249	111,773
2028	259	112,168
2038	279	112,963
Average Annual Growth Rate (2016 – 2038)	0.8%	0.1%

[a] Actual base year for annual operations.

Source: 2017 FAA Terminal Area Forecast, issued January 2018.

3.2. Factors Influencing Forecast Approach

To guide the forecasting effort, an understanding of the relationship between industry trends and the airport operating environment is essential. Using historic information and data, it is possible to compare the effect changes in the general aviation industry and local area economics may have had on activity at LAL. The analysis of recent trends also allows educated assumptions to be made as to how the airport's service area and activity will be affected in the future.

National, regional, and local trends with the potential to impact existing or generate new general aviation activity were identified from several sources. In addition to the historic data and recent activity forecasts, information was collected from a number of reports, studies, and industry articles including, but not limited to:

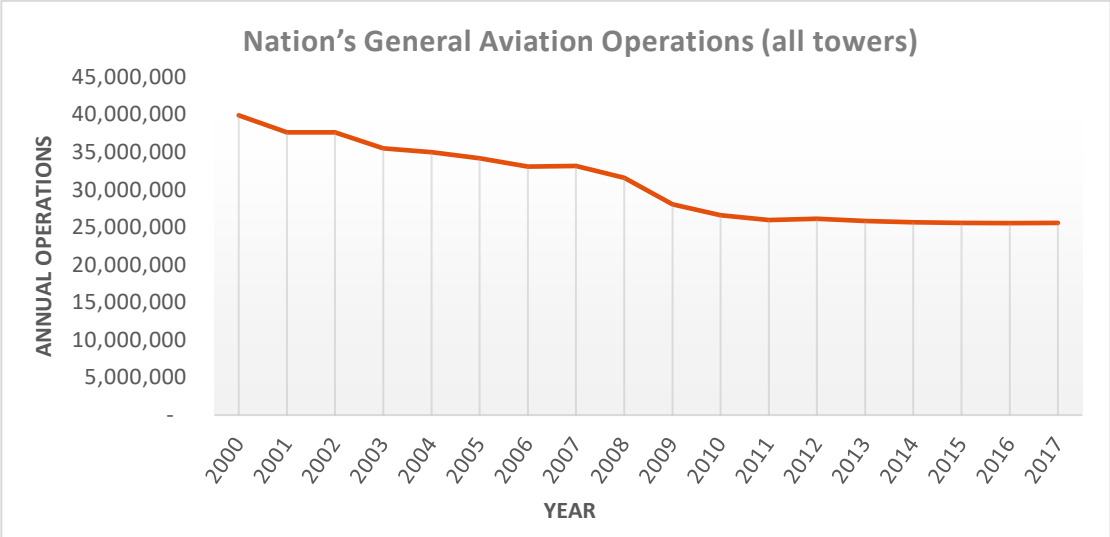
- FAA Aerospace Forecast (2018 – 2038)
- FAA Annual Business Jet Reports (2009 – 2017)
- Environmental Assessment for the LAL Aircraft Maintenance, Repair, and Overhaul Hangars and Air Cargo Facility (August 30, 2016)
- General Aviation Manufacturers Association (GAMA) Annual Aircraft Shipment Reports (2001 – 2017)
- Florida Statewide Aviation Economic Impact Study Update and Individual Airport Summary Reports (August 2014)

The information gathered frames LAL's role in the national air transportation network and provides insight into how activity at the airport may change over time.

3.2.1. State of the General Aviation Industry

General aviation encompasses all segments of the aviation industry, except for activity that is conducted by commercial airlines or the military. Examples include pilot training, law enforcement flights, medical transportation, aerial surveys, aerial photography, agricultural spraying, advertising, and various forms of recreation, not to mention business, corporate, and personal travel.

Historically, the general aviation industry has experienced some very significant fluctuations, both positive and negative. Looking back over the past two decades, the industry was severely impacted by the September 11th 2001 terrorist attacks. Nationally, general aviation activity declined every year through 2006.



Between 2003 and 2007, the industry experienced major advances in aircraft and navigation technologies, which created new product offerings and services during a period with an overall good economy. These included widespread use of Global Positioning Satellite (GPS) technology, the emergence of very light jet aircraft, and the introduction of an entirely new category; the light sport aircraft. These new product offerings and services bolstered most every segment of the general aviation industry. In spite of this, there was only limited growth in 2007.

By the end of 2008, most segments of the industry experienced losses as the overall national economy declined during the Great Recession. The very light jet industry was hit hardest as many manufacturers delayed development plans and/or went bankrupt. Data from the General Aviation Manufacturer's Association (GAMA) showed that general aviation aircraft manufactured in the U.S. fell from a high of 3,279 aircraft in 2007 to 1,334 in 2010. It was not until 2011 that GAMA reported the first increase in new general aviation shipments since 2007. While manufacturing has increased most every year since 2011, 2017 levels were still less than half of those before the Great Recession. Compounding this issue, the 2018 FAA Aerospace Forecast documents the decline in the number of aircraft in the nation's overall active general aviation fleet between 2007 and 2013. It is interesting to note that the greatest decline between 2011 and 2013 was attributed to the 2010 Rule for Re-Registration and Renewal of Aircraft Registration. According to the FAA, implementation of this rule removed cancelled, expired, or revoked records from the national database.

Overall, the 2018 FAA Aerospace Forecast projects general aviation growth over the next 20 years, despite the industry fluctuations that are likely to continue. While the number of active general aviation aircraft is only expected to increase slightly (less than a tenth of a percent annually) through 2038, this growth is not consistent across all segments of activity. The most common single-engine piston aircraft are expected to decline 1.0 percent annually for the period while jet aircraft are forecast to grow 2.2 percent each year. The number of hours flown by all general aviation aircraft is projected to increase at a rate of 0.8 percent each year. Similar to the fleet projections, the hours flown by turbine aircraft are forecast to grow 2.7 percent annually while the single-engine piston aircraft show a decline in activity of 1.1 percent each year. These turbine aircraft projections are supported by figures in the FAA's monthly Business Jet Reports which shows that operations conducted by general aviation jet aircraft have consistently increased since the low in 2009. They are however, still just below the level recorded for 2007, prior to the negative press during the 2008 and 2009 corporate bailouts, which resulted in a 20 percent decrease in total business jet activity by the end of 2009.

3.2.2. Local Socioeconomic Factors

A number of socioeconomic indicators were evaluated that typically have a direct relationship to the use of aviation and therefore to airport activity. Overall and average annual growth rates for Polk County, the State of Florida, and the U.S. are presented based on data obtained from Woods & Poole Economics, Inc. It should be noted that the Lakeland-Winter Haven Metropolitan Statistical Area (MSA) incorporates the same data as that for Polk County.

The Woods & Poole projections are updated annually, utilizing models which take into account specific local conditions based on historic data back to 1969. While the historic Woods & Poole data sets obtained in March 2018 for this study cover the period from 1969 to 2015, only data back to 2006 are shown in the tables that follow; reflecting the general trends over the past 10 years. Historic socioeconomic data prior to 2006 was utilized in the various analyses of aviation activity, especially as part of the regression models evaluated.

3.2.2.1. Population

Polk County has had overall and annual population growth rates greater than Florida's and the nation's (**Table 3-4**). For Polk County, this higher growth highlights the historic and ongoing development that has occurred along the Interstate 4 corridor. While large portions of northwest, southwest, and southeast Polk County remain undeveloped, it ranked 12th in the state for the percent of population change between 2010 and 2017. This is based on the University of Florida Bureau of Economic and Business Research's evaluation of data for all 67 counties. Continued growth for Polk County, albeit at a slightly lower rate, is expected to continue through 2038, outpacing the related rate for the nation.

Table 3-4 Total Population

	Polk County	State of Florida	United States
2006	568,324	18,166,990	298,379,873
2007	585,982	18,367,842	301,231,161
2008	594,801	18,527,305	304,093,924
2009	598,683	18,652,644	306,771,487
2010	603,192	18,849,890	309,346,806
2011	609,544	19,105,533	311,718,780
2012	615,584	19,352,021	314,102,549
2013	622,895	19,594,467	316,427,327
2014	635,264	19,905,569	318,906,933
2015	650,092	20,271,272	321,420,589
Overall Growth	14.4%	11.6%	7.7%
Average Annual Growth Rate (2006 – 2015)	1.5%	1.2%	0.8%
Forecast			
2023	710,805	22,756,779	345,864,633
2028	750,378	24,446,562	362,086,877
2038	826,024	27,929,895	393,507,447
Average Annual Growth Rate (2015 – 2038)	1.0%	1.4%	0.9%

Source: Woods & Poole Economics, Inc., March 2018.

3.2.2.2. Employment

Employment data can provide an indication of the economic stability of a geographic area. As shown in **Table 3-5**, Polk County employment has had slightly lower growth relative to the state and nation. However, as Polk County continues to expand its population base, so too will the employment levels to support the area's growth initially (such as real estate, banking, and construction) as well as afterwards (to include retail, health care, education, etc.). Woods & Poole's projections not only show employment levels for Polk County, the state, and nation continuing to increase, but at a higher rate for each over the course of the planning period, especially for Polk County.

Table 3-5 Total Employment (number of jobs, in thousands)

	Polk County	State of Florida	United States
2006	275,332	10,400,600	176,123,566
2007	277,098	10,557,493	179,885,663
2008	268,991	10,296,804	179,639,868
2009	259,023	9,879,404	174,233,663
2010	255,794	9,813,714	173,034,686
2011	258,397	10,048,434	176,278,692
2012	261,774	10,255,578	179,081,672
2013	266,910	10,544,028	182,408,047
2014	273,527	10,930,490	186,168,101
2015	281,099	11,287,609	190,195,370
Overall Growth	2.1%	8.5%	8.0%
Average Annual Growth Rate (2006 – 2015)	0.2%	0.9%	0.9%
Forecast			
2023	315,062	12,997,884	212,627,009
2028	337,088	14,091,999	226,668,566
2038	379,948	16,269,775	253,386,160
Average Annual Growth Rate (2015 – 2038)	1.3%	1.6%	1.3%

Source: Woods & Poole Economics, Inc., March 2018.

3.2.2.3. Income

Personal income per capita represents the ratio of total personal income, before income taxes, to the total resident population. Adjustments are made if the income was earned in a different area than where the person resides. While Polk County has had the same growth as the state (**Table 3-6**), the nation as a whole has had the most growth in personal per capita income over the last ten years. However, Polk County's personal income per capita is expected to have a higher average annual growth rate than the state and nation. For all three, the projected average annual growth rates through 2038 are significantly higher than the historic rates.

Table 3-6 Total Personal Income per Capita (in current dollars)

	Polk County	State of Florida	United States
2006	29,532	38,738	38,144
2007	29,738	39,788	39,821
2008	30,352	39,655	41,082
2009	29,010	37,065	39,376
2010	30,686	38,624	40,277
2011	32,386	40,476	42,453
2012	32,050	40,983	44,267
2013	32,030	40,771	44,462
2014	32,959	42,868	46,414
2015	33,723	44,429	46,414
Overall Growth	14.2%	14.7%	26.1%
Average Annual Growth Rate (2006 – 2015)	1.5%	1.5%	2.6%
Forecast			
2023	44,800	58,537	62,813
2028	56,879	73,729	78,738
2038	93,345	119,968	127,307
Average Annual Growth Rate (2015 – 2038)	4.5%	4.4%	4.3%

Source: Woods & Poole Economics, Inc., March 2018.

3.2.2.4. Households

Households represent the number of occupied housing units, which include homes, apartments, a group of rooms, or single rooms occupied as separate living quarters. The number of households does not include facilities such as retirement homes, college dormitories, military barracks, or prisons. The overall and average annual growth in the number of households for Polk County has been slightly higher than that for the state and nation (**Table 3-7**). Over the next 20 years, the number of households in Polk County will continue to increase, but at a lower average annual rate. A similar decrease is expected for the nation, while the rate for the state is expected increase.

Table 3-7 Total Number of Households

	Polk County	State of Florida	United States
2006	219,151	7,300,146	114,486,122
2007	225,867	7,389,493	115,939,528
2008	227,372	7,408,025	116,538,673
2009	226,776	7,393,209	116,761,870
2010	227,814	7,435,801	116,938,345
2011	233,248	7,617,373	119,315,163
2012	235,615	7,724,395	120,466,242
2013	238,413	7,845,644	121,834,231
2014	240,300	7,926,134	122,600,297
2015	243,310	8,047,925	123,951,413
Overall Growth	11.0%	10.2%	8.3%
Average Annual Growth Rate (2006 – 2015)	1.2%	1.1%	0.9%
Forecast			
2023	268,310	9,183,357	135,939,466
2028	278,535	9,745,715	140,818,385
2038	293,960	10,768,076	148,472,937
Average Annual Growth Rate (2015 – 2038)	0.8%	1.3%	0.8%

Source: Woods & Poole Economics, Inc., March 2018.

3.2.2.5. Gross Regional Product

Gross Regional Product (GRP) is based on the U.S. Bureau of Economic Analysis gross domestic product data for each state. The nation's figures represent a total for all states while the individual county data has been estimated by Woods & Poole. For the county data, this is done by allocating the state GRP to the counties based on the proportion of total state earnings by employees originating from a particular county. It is interesting to note that the GRP for Polk County has been relatively flat over the past ten years. However, much like employment, that trend is projected to change over the course of the planning period, with GRP for the county not only expected to grow, but at a significant average annual rate and in pace with both the state and nation.

Table 3-8 Gross Regional Product (in millions of 2009 dollars)

	Polk County	State of Florida	United States
2006	18,513,323	787,689,093	14,539,609,803
2007	18,578,211	792,792,112	14,820,650,448
2008	17,881,559	747,833,911	14,617,094,886
2009	17,569,386	721,755,001	14,320,115,008
2010	17,312,475	723,144,421	14,618,132,273
2011	16,912,587	711,917,545	14,792,271,661
2012	17,246,085	720,061,061	15,115,991,200
2013	17,731,765	737,537,661	15,415,697,651
2014	17,835,597	763,508,019	15,829,180,020
2015	18,561,241	809,155,373	16,501,907,789
Overall Growth	0.3%	2.7%	13.5%
Average Annual Growth Rate (2006 – 2015)	0.0%	0.3%	1.4%
Forecast			
2023	22,181,021	985,688,168	19,622,540,113
2028	24,637,449	1,103,966,014	21,688,340,142
2038	29,913,111	1,358,881,337	26,096,052,547
Average Annual Growth Rate (2015 – 2038)	2.1%	2.3%	2.0%

Source: Woods & Poole Economics, Inc., March 2018.

3.2.3. Aviation Fuel Prices

As noted previously, the general aviation industry was significantly impacted by both September 11th, 2001 and the Great Recession. This general period was also marked by dramatic increases in both Jet A and 100LL (AvGas) fuel prices, especially between 2003 and 2008. During this five-year period, Jet A prices increased an average of nearly 30 percent each year while 100LL increased nearly 17 percent each year. Since that time aviation fuel prices have fluctuated and overall, the general aviation industry has enjoyed lower Jet A fuel costs since 2012. For 100LL the lowest prices were prior to 2012, but have increased at much lower rates than in the past.

IHS Global Insight believes oil prices are at the bottom of their latest cycle and projects prices to increase as a result of growing demand and the higher costs of extraction. Using data from IHS Global Insight, the 2018 FAA Aerospace Forecast documents that the acquisition costs (dollars per barrel) for the crude oil required for aviation fuels will increase at an average annual rate of 4.4 percent through 2038.

In addition, the eventual phasing out of 100LL fuel will have an undetermined impact on every aircraft engine built from the 1920s until today that uses this leaded gasoline. Excluding experimental and light sport aircraft, many of which can use every day unleaded automobile gas (MoGas), the FAA's figures for 2017 show that nearly 70 percent of the 213,000 active general aviation aircraft are piston and use 100LL. While the costs to retrofit piston aircraft could be substantial, the ultimate cost of an unleaded aviation fuel has the potential to be much less than the current 100LL.

3.2.4. Potential for Commercial Passenger Service

Currently there is no regularly scheduled commercial passenger service at LAL. Regardless, the airport maintains its Title 14, Code of Federal Regulations (CFR), Part 139 Airport Operating Certificate required to accommodate scheduled and unscheduled air carrier operations. Because of this, the history of passenger service at the airport, and the existing terminal building facilities, airport management has had independent analyses conducted on the potential market for and economic impact of commercial passenger service at LAL. These included the following two studies:

- True Market / Leakage Study – August 2014
- Economic Impact of Proposed New Air Service – November 2015

These studies outlined the commercial passenger catchment area for LAL, how those passengers are currently being served, the challenges of securing scheduled commercial service, and the types of commercial passenger activity that could occur at LAL. A summary of these studies is included in **Appendix 1** as a reference to help ensure that the master plan considers and includes the flexibility to accommodate future commercial passenger service opportunities. However, passenger enplanements and the resulting commercial airline operations are not included as a part of the aviation activity forecasts being submitted to both FAA and FDOT for approval.

3.3. Forecast of Based Aircraft

Based aircraft are those aircraft that are operational, airworthy, and kept at the airport for a majority of the year (more than six months). Therefore, the number of aircraft owners projected to base their aircraft at LAL is an important consideration for airfield planning since it is a key indicator of the demand for facilities. Projections of based aircraft also provide an indication of the anticipated growth in general aviation activity.

Information on the aircraft based at general aviation airports is uploaded to the FAA's National Based Aircraft Inventory Program. The FAA determines if all of the aircraft reported have a current registration, then a check is made to see if any of the aircraft have been reported by another airport. This creates a validated number of based aircraft for a given airport. This validated count goes back to 2008 and includes a break out of single-engine, multi-engine, jet, and rotorcraft models. As shown in **Table 3-9**, the FAA's National Based Aircraft Inventory Program documents 247 aircraft were based at LAL in 2017.

It is worth noting that the National Based Aircraft Inventory Program does not count glider, military, or ultralight aircraft since these may not always have a tail number for registration. These categories of aircraft are included as part of the FAA Airport Master Record (Form 5010); however, only one glider has been included on the most recent 5010 forms for LAL. Also, while the nine National Oceanic and Atmospheric Administration (NOAA) based aircraft are recorded as military flights for operational counts, they each have a "N" number registration and are included in the count of validated based aircraft. Therefore, the historic level of based aircraft from the National Based Aircraft Inventory Program will be utilized to project future levels of based aircraft.

Table 3-9 Historic Based Aircraft

	Single-Engine	Multi-Engine	Jet	Rotorcraft	Total
2008	106	19	12	8	**145**
2009	121	23	12	8	**164**
2010	130	27	10	11	**178**
2011	130	26	10	11	**177**
2012	116	19	5	8	**148**
2013	144	25	20	8	**197**
2014	154	26	20	7	**207**
2015	151	24	32	6	**213**
2016	165	23	36	6	**230**
2017	162	34	42	9	**247**
Average Annual Growth Rate (2008 – 2017)					6.1%

Source: FAA's National Based Aircraft Inventory Program, 2018.

3.3.1. Historic Growth

Given the cyclical nature of the general aviation industry, it is important to analyze the overall changes that have occurred at the airport. Despite the challenges the industry has faced over the last decade, there has been an overall increase in the number of based aircraft since 2008. For any aviation forecast, such historic data should be considered when analyzing potential growth. However, in this case the average annual growth since 2008 (6.1 percent) is considered overly optimistic since it does not fully account for the cyclical nature of the industry, especially given the economic conditions that occurred prior to 2008. When applied to the current level of based aircraft, this historic average annual growth results in a projection of 856 based aircraft by 2038. Therefore, the historic growth was not considered as a reasonable forecast option.

3.3.2. Previous Growth Projections

As shown in **Table 3-1**, the 2011 Airport Master Plan Update projected 245 based aircraft by 2029, almost matching the current 2017 count of 247. While the FAA's national inventory program does not have data prior to 2008, historic data in the FASP and 2017 FAA TAF indicate that there were upwards of 30 based aircraft lost around the time of the Great Recession. As noted previously, the 2018 FAA Aerospace Forecast documents the decrease in the nation's overall general aviation fleet between 2007 and 2013. Regardless, the number of based aircraft at LAL recovered very quickly, increasing by just over 100 in the last decade. Even though this surpassed the projected growth in the previous master plan, that study's expected average annual growth rate (2.0 percent) is still considered reasonable for use and comparison purposes in this study. Applying this rate to the 247 documented in 2017 results in an estimate of 374 based aircraft at LAL by the end of the 20-year planning period (**Table 3-10**).

As mentioned, the FASP is updated each year, and therefore incorporates changes in the industry that can ultimately affect the level of based aircraft. The most recent data for the system plan projects an average annual growth of 2.2 percent for the based aircraft at LAL. Applied to the 2017 count, this would result in 390 based aircraft by 2038 (**Table 3-10**).

The current TAF projects a much lower average growth rate of 0.8 percent for the based aircraft at LAL. When applied to the current 2017 level, this would result in a projection of 292 based aircraft by 2038 (**Table 3-10**).

3.3.3. National Active Fleet Forecasts

Each year the FAA provides a long-term projection for the active general aviation fleet, with active being defined as any aircraft flying at least one hour during the year. Decreases in the nation's total active fleet occurred between 2007 and 2013. Since that period, there has been a four-year increase through 2017. In the 2018 FAA Aerospace Forecast, a slight increase is projected for 2018 and 2019, but then, a slow decline in the nation's total active general aviation fleet is projected through 2028. Afterwards very limited growth is expected with the current 2017 level not being re-achieved until 2036. This is primarily attributed to the fact that new aircraft deliveries are not keeping pace with the retirement of the aging general aviation fleet, especially in the single-engine piston category. Overall, there is little change expected by the FAA in the size of the nation's active general aviation fleet over the next 20 years. Given that LAL has experienced growth in the number of based aircraft since the last master plan and additional based aircraft are expected during the 20-year horizon of this study, the FAA's national active fleet projections were not utilized to create a based aircraft forecast.

3.3.4. Regression Analysis

Regression forecasting methodologies were also employed to estimate the future number of based aircraft. The regression models developed and tested incorporated three types of independent variables to identify correlations with historic based aircraft counts. The first independent variables included a number of the socioeconomic datasets previously summarized, which were applied based on assumptions made for each as to their potential correlation to based aircraft. For example, it was assumed that the tendency for aircraft to be based at LAL has a relationship to the number of people in the surrounding area. The FAA's data on fuel costs was also included as an independent variable, since this is such an important element of owning and operating any general aviation aircraft. In addition, an indicator independent variable was introduced to take into consideration the impacts associated with the Great Recession on the level of based aircraft at LAL. Indicator variables are used in regression models for events such as the recession that cannot be easily quantified.

A variety of models were evaluated using the different independent variables against the historic based aircraft data for LAL. Initially, simple regression analyses were conducted using the local socioeconomic and FAA fuel cost datasets, to verify the relationship between each variable and historic based aircraft levels. Multiple regression models where then evaluated using different combinations of the independent variables, including the Great Recession indicator variable. The R^2 calculated for the simple regression analyses is utilized as the coefficient of determination, while the models with multiple independent variables utilize an adjusted R^2, which corrects the coefficient of determination for additional variables. Both R^2 and an adjusted R^2 value of zero shows no relationship while values approaching 1.0 show a strong relationship and overall fit between the estimated regression equation and the sample data.

Typically, values of 0.95 or higher indicate a significant relationship. However, other statistics from the various regression models were also considered in addition to the adjusted R^2 value. These included the individual t-stats and P-values of the independent variables as well as the overall standard error of the equation (ability of the model to project accurately). Of the various multiple regression models analyzed, none showed very significant correlation. However, the simple regression analysis using population not only had the highest R^2 value at 0.85, the model results also showed the independent variable as being statistically significant and the resulting equation having a low standard error. Therefore, this simple linear

regression model was used to estimate the future level of based aircraft. The result is 442 based aircraft by 2038 which represents an average annual growth rate of 2.8 percent (**Table 3-10**).

3.3.5. Selected Based Aircraft Forecast

For the recommended based aircraft projection, the average annual growth rate of 2.2 percent projected by FDOT for LAL was adopted. This growth rate, which significantly exceeds the 2017 FAA TAF, is supported by the fact that the airport currently has a 100 percent occupancy rate for its hangar facilities and that there are 35 confirmed on the airport's hangar wait list (as of March 2018). In addition to the airport's list, interviews with Sheltair and Lakeland Executive Hangars revealed similar capacity shortages. Polk State College also acknowledged that they would be increasing their current based aircraft fleet from 16 to 20 over the next year, to accommodate the Fall 2018 enrollment in their flight training program and they plan for continued growth in the future.

Table 3-10 Comparison of Based Aircraft Projections

	Previous Master Plan[a]	Florida Aviation System Plan[a] (recommended)	2017 FAA TAF[a]	Regression Analysis
Base				
2017	247	247	247	247
Forecast				
2023	278	281	259	298
2028	307	314	270	347
2038	374	390	292	442
Average Annual Growth Rate (2017 – 2038)	2.0%	2.2%	0.8%	2.8%

[a] Applies previous master plan, FASP, and TAF growth projection to the current based aircraft count for 2017.

Source: ESA, 2018.

3.4. Forecast of Based Aircraft Fleet Mix

Projecting the types of based aircraft is necessary since different aircraft require different facilities. Overall, the future based aircraft fleet mix was determined by studying the projections of the national fleet, then comparing those to the current aircraft types at LAL. While the overall growth in the nation's active fleet was not utilized to forecast based aircraft, the individual projections of aircraft types are useful in predicting the future based aircraft fleet mix. Information obtained from interviews with the various airport tenants, as well as the current types on the hangar waiting list were also applied to determine the future mix of based aircraft.

3.4.1. The Nation's Active General Aviation Fleet

Every year, the nation's active general aviation fleet is published as part of the FAA Aerospace Forecast. In 2017, there were 213,050 active general aviation aircraft. As noted previously, this figure was on a decline between 2007 and 2013; however, has recovered some since. Even though the 2018 FAA Aerospace Forecast may only project limited growth in the overall active aircraft through 2038, their forecast provides insight on how the individual aircraft categories are expected to evolve over the next 20 years.

While the FAA provides counts for a number of aircraft categories, they have been simplified into the five major categories shown in **Table 3-11**. Within the single-engine grouping are the single-engine piston, experimental, and light sport aircraft categories. The multi-engine group contains both piston and turboprop

models, and the rotorcraft group contains both piston and turbine models. The jet category covers all ranges of turbojet general aviation aircraft, from the very light jets to the heaviest business jets.

The FAA projects considerable growth in the jet category. While the use of business aircraft fell after 2007, jet aircraft usage by smaller companies continues to increase as various charter, lease, time-share, partnership, and fractional ownership agreements provide more cost effective options for these aircraft users resulting in higher utilization rates. More businesses also rely on general aviation because it provides safe, efficient, flexible, and reliable transportation. Fractional ownership offers consumers a more efficient use of time by providing faster point-to-point travel, the ability to conduct business while flying, and more convenient enplaning and deplaning of flights (when compared to the airlines). While none of the current based aircraft at LAL are fractional aircraft, different fractional aircraft do conduct a number of operations at the airport.

Table 3-11 FAA Forecast of National Active General Aviation Fleet

	2017 Fleet Mix	2038 Fleet Mix	Average Annual Growth Rate
Single-Engine	75.5%	68.4%	-0.4%
Multi-Engine (piston & turboprop)	10.5%	11.5%	0.5%
Jet	6.6%	10.4%	2.2%
Rotorcraft	5.1%	7.4%	1.8%
Other (Gliders, Balloons, etc.)	2.3%	2.3%	0.0%

Source: FAA 2018 Aerospace Forecasts.

The continuing popularity of travel by general aviation aircraft is also due to the ability to use smaller, less-congested airports which are more convenient to the final destination. A large part of this is the result of the expanded application of GPS technologies in navigation, but more specifically, the myriad of new runway specific instrument approach procedures that have been established at even the smallest airports. In the FAA's projections, jet aircraft models (including the very light jets) are expected to replace a number of the piston aircraft in the future. This is just one of the reasons the single-engine (piston) category is on a decline and the multi-engine group shows limited growth. In all, jets are expected to represent over 10 percent of the active general aviation fleet by 2038.

3.4.2. Current and Future Based Aircraft Fleet Mix

The 2017 based aircraft fleet mix at LAL is comprised of 65.6 percent single-engine, 13.8 percent multi-engine, 17.0 percent jet, and 3.6 percent rotorcraft. Throughout the planning period, the mix of aircraft is expected to remain predominately single-engine, but they will account for a lower overall percentage of the based aircraft. The more significant changes are expected to occur in the number of jets based at the airport. This is reasonable considering that the FAA has predicted that turbojet technology is at the point where it is truly feasible as a replacement to the more traditional piston-powered fleet. The expected future based aircraft types shown in **Table 3-12** have been based on the national trends and tenant interviews, as well as the types of aircraft included on the airport's current hangar waiting list and Polk State College's future fleet plans.

Table 3-12 Forecast of Based Aircraft Fleet Mix

	2017	2023	2028	2038
Single-Engine	162	179	193	223
Multi-Engine (piston & turboprop)	34	39	44	62
Jet	42	51	60	82
Rotorcraft	9	12	17	23
Total	**247**	**281**	**314**	**390**

Source: FAA's National Based Aircraft Inventory Program and ESA analysis, 2018.

As with most airports, the single-engine category is predominantly comprised of Beech, Cessna, and Piper models, as well as others such as Cirrus and Mooney. Multi-engine aircraft tend to include the Beech King Air and Baron series; Cessna models, such as the 310 and 414 Chancellor; or Piper Aztec and Seneca aircraft. The multi-engine category also includes eight of NOAA's aircraft: two Lockheed WP-3D Orion Hurricane Hunters (Kermit and Ms. Piggy), four DeHaviland DHC-6-300 Twin Otters, one Beechcraft King Air 350, and one Gulfstream 695A Turbo (Jet Prop) Commander. As indicated previously, the national fleet of single-engine aircraft is expected to decline slightly while the multi-engine group is only anticipated to increase slightly in the future. While many of the additional single-engine aircraft are expected to be similar to those currently at LAL, additional aircraft in the multi-engine category are expected to be mostly turboprops.

Approximately 75 percent of the based jets at LAL are tactical ex-military aircraft operated by Draken International. These primarily include a mix of the Aero Vodochody L-159, Douglas A-4 Skyhawk, Aermacchi MB-339, and Aero L-39 Albatross aircraft. There is also NOAA's Gulfstream IV-SP (Gonzo) included in the count of based jets. The future based jets will continue to include a range of the business jet aircraft flying today. As with most of the current private jet based at LAL, the future small to medium-sized business jet aircraft will continue to include popular models from the Embraer, Bombardier Learjet, Cessna Citation, and Dassault Falcon series. Larger jet aircraft models will include those from the Beechcraft Hawker, Bombardier Challenger, Dassault Falcon, Bombardier Global, and Gulfstream series. Overall, the number of based jets at LAL is expected to nearly double over the course of the 20-year planning horizon. This increase is primarily based on additional private based jets, but also takes into consideration an expansion of Draken International's fleet, as well as the potential for a dedicated air cargo operator at LAL, which is described in a following section.

More than half of the based rotorcraft include Bell OH-58 Kiowas operated by Lance Aviation. There is also a Bell 206 Jet Ranger operated by the Florida Fish and Wildlife Conservation Commission. Future rotorcraft will include both piston and turbine powered models, such as the popular Bell, Eurocopter, and Robinson models.

While approximately 2.3 percent of the nation's active fleet fall within the "Other" category (gliders, balloons, and ultralights), as noted previously there has only been one glider included on the most recent FAA 5010 forms for the airport. While it is possible additional aircraft in this category could be based at the airport, none are included in the figures shown in **Table 3-12**, as the analysis was derived from the FAA's National Based Aircraft Inventory Program.

3.5. Forecast of Annual Operations

The FAA defines an aircraft operation as either a single aircraft landing or takeoff. Further, a touch and go operation is counted as two operations, since the aircraft technically lands and immediately takes off. The FAA's Operations Network (OPSNET) data provides the official activity counts based on the actual airport traffic control tower (ATCT) activity logs. The FAA classifies aircraft operations into four different categories for OPSNET as well as for their other datasets, airport traffic control tower logs, and Aerospace Forecast. These categories, which include air carrier, air taxi, general aviation, and military, are defined by the FAA as:

- Air Carrier - an aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation.
- Air Taxi - an aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation.
- General Aviation - all civil aircraft, except those classified as air carriers or air taxis.
- Military - all classes of military aircraft.

It was stated previously that general aviation encompasses all segments of the aviation industry except for the activity that is conducted by commercial airlines or the military. As such, general aviation also includes the air taxi operations. Additionally, it should be noted that the OPSNET data further details local versus itinerant general aviation and military operations. These categories will be described and analyzed in a later section. For now, **Table 3-13** reflects all of the general aviation and military counts, as well as the air carrier activity documented in the FAA's OPSNET database over the past 20 years.

Since 1998, there have only been a few air carrier operations recorded, with most occurring from mid-2011 to early 2012 when Direct Air was conducting flights at LAL. Previous studies have documented the commercial passenger activity that is generated from the areas surrounding the airport and how that market could be served out of LAL. These are summarized in **Appendix 1**.

Air taxi operations have only averaged 1.6 percent of the activity at LAL since 1998. As confirmed by ATCT management, the air taxi figures primarily reflect those operations that are being conducted by aircraft with an approved air taxi call sign. These typically include flights conducted by fractional aircraft or air charter operators. Even with the establishment of a U.S. Customs and Border Protection facility at LAL in November of 2017, it is not likely that the number of general aviation operations recorded in the air taxi category will increase. In fact, since air taxi call signs are only recognized in the U.S., any operator flying out of the country must utilize their registered tail or "N" number for the flight and would therefore be recorded as an itinerate general aviation operation.

Military operations have fluctuated between a high of 5,792 operations in 2002 and a low of 1,562 in 2015. And while recent military activity averaged about 1,600 operations each year between 2013 and 2016, 2017 saw an increase of more than 1,000 additional operations, most of which are associated with NOAA beginning operations out of their new facility at LAL on May 15, 2017. Interviews with the top officials at NOAA's new Aircraft Operations Center at the airport confirmed that estimating changes in the number of annual operations is difficult. For one, while NOAA's nine aircraft are based, maintained, and managed at LAL, the missions they conduct occur around the nation and other parts of the world. For the Hurricane Hunters, aircraft operations certainly depend on the activity of the Atlantic hurricane season. Similarly, the overall ability to accurately forecast military aircraft operations is complicated by a number of factors. Essentially, operational levels can fluctuate annually as they are dependent on unpredictable variables such as annual defense budgets, national security threats, global military needs, and even natural disasters.

Table 3-13 Past 20 Years of Aircraft Operations

	Air Carrier	General Aviation	Military	Annual Operations	Change over Prior Year
1998	4	197,925	3,515	201,444	2.8%
1999	-	216,149	3,564	219,713	9.1%
2000	8	188,715	4,820	193,543	-11.9%
2001	4	201,567	2,985	204,556	5.7%
2002	3	132,672	5,792	138,467	-32.3%
2003	4	138,715	2,648	141,367	2.1%
2004	6	124,116	3,283	127,405	-9.9%
2005	-	98,968	2,393	101,361	-20.4%
2006	-	115,620	3,093	118,713	17.1%
2007	34	131,837	2,128	133,999	12.9%
2008	4	114,487	2,746	117,237	-12.5%
2009	16	86,011	4,186	90,213	-23.1%
2010	18	63,764	4,056	67,838	-24.8%
2011	453	60,375	3,332	64,160	-5.4%
2012	289	72,676	2,343	75,308	17.4%
2013	109	82,849	1,690	84,648	12.4%
2014	29	103,774	1,656	105,459	24.6%
2015	24	104,753	1,562	106,339	0.8%
2016	31	113,922	1,618	115,571	8.7%
2017	14	113,940	2,699	116,653	0.9%
Average Annual Growth Rate (1998 – 2017)					-2.8%

Source: FAA OPSNET Database, 2018.

Given the information above, the future annual operations for LAL have been analyzed as a whole, since the only the military activity is not truly general aviation and can be accounted for within the overall projections given the future levels anticipated.

3.5.1. Historic Activity

As with based aircraft, the historic data should be considered when analyzing the potential growth in aviation activity for an airport. **Table 3-13** shows the level of annual operations at LAL has fluctuated over the past 20 years. When reviewing the historic data, these changes are quite dynamic and can increase or decrease significantly in short periods of time. While general aviation activity is certainly linked to the local area economy, major impacts to the overall industry have had the most significant impact.

A direct result of the events of September 11th, 2001, nearly a third of the airport's activity was lost the following year. In fact, 1999, 2001, and 1998 were the top three years, respectively, for total operations documented by the FAA in their entire OPSNET database for LAL. After 2001, activity remained between 100,000 and 140,000 annual operations until 2008 when another major decline in activity began as a result of the Great Recession. Between 2007 and 2011, over half of the annual operations were lost, resulting in the airport's lowest recorded operations level of 64,160. Since, activity has increased every year to nearly double the record low; however, the current level is still below what it was before the Great Recession. In order to create a projection based on historic levels, the period between 2005 and 2017 was selected. This

removes 2004 and previous years where the level of operations were much higher than 2017, so that the overall trend is not negative. This period, which includes the Great Recession, reflects an average annual growth of 1.2 percent. When applied to the current base year level, this rate results in a projection of 149,860 annual operations by 2038 (see **Table 3-14**).

3.5.2. Previous Growth Projections

Overall annual operations in the 2011 Airport Master Plan Update were projected to have an average growth rate of 1.6 percent through 2029 (**Table 3-1**). The previous master plan utilized tower records, but was based on the FAA's fiscal year (October 1 through September 31), hence the difference in activity levels for the study's base year of 2009 with that in **Table 3-13** for the same year. Regardless, the previous master plan forecasts did reflect the first years of decline that had occurred as a result of the Great Recession. And while the forecasts did not predict the ultimate decline through 2011, it is interesting to note that after 2011, the previous projections were within two to four percent of the actual recorded operations between 2014 and 2017. Therefore, the study's expected average annual growth rate (1.6 percent) is considered reasonable for use and comparison purposes in this study. Applying this rate results in an estimate of 162,804 annual operations at LAL by the end of the 20-year planning period (**Table 3-14**).

As with based aircraft, projections of annual operations in the FASP benefit from being updated on an annual basis. Not only does this help account for industry fluctuations, it also allows adjustments to be made to accommodate any local or regional changes. The most recent system plan forecast uses 2015 as the base year. General aviation operations are projected by FDOT to grow at 1.6 percent each year after 2015. Interestingly, this is the same average annual rate described above from the 2011 Airport Master Plan Update. Therefore, **Table 3-14** actually reflects the application of this rate from two different sources in order to provide an updated projection.

The annual operations in the 2017 TAF are based on the FAA's fiscal year (October 1 through September 31), which explains the difference with the calendar year data from the FAA's OPSNET in **Table 3-13**. Regardless, while the 2017 TAF documents the consistent year to year growth since 2010, the average annual growth through 2038 is limited to 0.1 percent. This rate results in a relatively flat overall projection, and only results in 119,127 annual operations by 2038. Because this 20-year projection only reflects an additional 2,500 annual operations by 2038, it was not considered realistic. This is addressed further in the direct comparison of the FAA TAF with the recommended forecasts at the end of this chapter.

3.5.3. Utilization of the General Aviation Fleet

Each year as part of their Aerospace Forecast, the FAA provides historic data and projections on the number of hours flown by general aviation aircraft. In the 2018 Aerospace Forecast, the FAA anticipates the utilization of the fleet to increase at an average annual rate of 0.8 percent between 2017 and 2038. This fairly limited growth is partly related to the long-term costs associated with aviation fuels, which the FAA documents as increasing 4.4 percent each year through 2038. As noted before, the most active aircraft types (and therefore higher utilization rates) will be those in the turbine fleet (both aircraft and rotorcraft) versus a number of piston aircraft which are not expected to be utilized as much.

The FAA's overall expectation on the general aviation hours to be flown have been applied to the current operations for LAL to create another forecast scenario. As shown in **Table 3-14**, this results in nearly 138,000 annual operations by the end of the planning period.

3.5.4. Market Share

A common methodology for forecasting aviation activity is the use of market share analysis. This approach allows a comparison to be made of the annual operations LAL has supported against a defined data set. In the 2018 Aerospace Forecast, the FAA documents and projects the operations conducted at all of the towered airports in the nation. A separate count and forecast for the general aviation operations are also included in the FAA data sets. It is important to note that just like LAL's historic data, the nation's level of general aviation operations also experienced double digit losses after the Great Recession. However, unlike the nation, LAL has recorded increases every year since 2011. At the national level, general aviation operations have been down for all but two years since 2011.

The aircraft operations for LAL since 2005 (prior to the Great Recession) were evaluated against the same general aviation data for the nation. Since the lowest point in 2011, LAL's share of the nation's general aviation activity has increased significantly each year. In fact, while the total number of operations have not recovered to the 2001 level, LAL's increased market share has nearly reached the highest share calculated since 2011. When historic increases in the annual market share were applied to estimate the future potential, the result is that by the end of the 20-year planning period, LAL will continue to outpace the nation. For the nation, the FAA expects general aviation activity to increase every year through 2038. When the expected local market share is combined with the FAA's projected increase, approximately 265,000 of those operations (**Table 3-14**) would be accommodated at LAL by the end of the planning period. This represents an average growth of 4.0 percent each year.

3.5.5. Regression Analysis

Regression modeling was applied to forecast the annual aircraft activity at LAL. As with the based aircraft, a variety of models were evaluated using the different independent variables against the historic annual operations data. The same methodology included simple regression analyses to first analyze the relationship between each variable and historic activity levels. Then multiple regression models where created using different combinations of the independent variables, including the Great Recession indicator variable.

Of the various multiple regression models analyzed, a number showed some significant correlations. With an adjusted R^2 of 0.93, the model selected also resulted in the most statistically significant independent variables and a low standard error for the final equation. The regression model selected utilized the independent variables of employment, households, GRP, and the Great Recession indicator variable. Using the final regression equation, the annual operations at LAL are forecasted to increase to 223,218 by 2038, resulting in an average annual growth rate of 3.1 percent (**Table 3-14**).

3.5.6. Selected Forecast of Aircraft Operations

Each of the projections shown in **Table 3-14** were generated using commonly accepted methods. Therefore, selection of a preferred forecast largely depends on the potential of the airport's existing and future users, as well as the associated assumptions on future airport activity. In addition, the selection of a preferred forecast also needs to take into account the airport improvements that have occurred and will continue to occur. Finally, no future projection should be selected if it does not account for past and future changes in the aviation industry.

Between 2000 and 2017, general aviation operations at the nation's towered airports decreased an average of 2.6 percent each year. Activity for Florida's towered airports over the same period only had an average annual decrease of 0.7 percent. Since 2010, the nation's general aviation activity at towered airports has declined 0.3 percent annually while Florida's has increased 1.6 percent. What is important to note is that for the same period, LAL has had an average annual growth of 10.5 percent. This demonstrates that Florida's general aviation industry, and in particular LAL's, has been recovering each year since 2011, reversing the national trend. This creates an optimistic outlook when coupled with the population and economic growth expected in Polk County, as demonstrated in the different local socioeconomic factors.

While each of the new projections utilized methods accepted by the FAA and FDOT, most have limited ability to reliably incorporate local conditions and trends. Since it is anticipated that aircraft activity in Florida will continue to exceed the national average, the projection based on utilization of the national fleet, the most conservative forecast, does not reasonably reflect the future potential for LAL. The historic growth, previous master plan, and FASP projections did reflect greater growth rates but are still considered constrained with respect to the airport's recovery over the past six years and its future potential. While the market share approach does capture the more recent growth, it results in the highest projection of activity and does so only using an overall general trend that is not directly tied to the local market drivers.

The regression model methodology was selected as the preferred annual operations forecast since it is based on estimating future aircraft activity using local variables with a demonstrated correlation to historic operations. In addition to the statistical relationships, the regression model projection reflects growth that is aligned with all of the facts supporting the assumption that the airport's varied aircraft activity levels will continue to increase. This is reinforced by all of the information obtained during interviews with a number of the tenants and users of the airport, to include Sun 'n Fun, Sheltair, NOAA, Polk State College, private aircraft operators, and aviation businesses. In addition, there are the current plans to construct aircraft maintenance, repair, and overhaul (MRO) hangars and an air cargo facility in the very near future (described in a following section). And finally, the opening of the on-airport U.S. Customs facility in November of 2017 expands the services provided to both existing and future users of the airport.

Table 3-14 Comparison of Projections for Annual Aircraft Operations

	Historic Growth (2005 – 2017)	Previous Master Plan and Florida Aviation System Plan[a]	Utilization of National Fleet	Market Share Analysis	Regression Analysis (recommended)
Base					
2017	116,653	116,653	116,653	116,653	116,653
Forecast					
2023	125,308	128,309	122,366	148,045	151,699
2028	133,009	138,908	127,339	179,647	177,925
2038	149,860	162,804	137,901	264,718	223,218
Average Annual Growth Rate (2017 – 2038)	1.2%	1.6%	0.8%	4.0%	3.1%

[a] Applies previous master plan and FASP growth projection to the 2017 annual operations count.

Source: ESA, 2018

3.6. Types of Aircraft Operations

The following sections present different categories or types of activity that will make up the forecasted operations. This includes a break out of the local, itinerant, and instrument operations. Further analyses include determining the operational aircraft fleet mix and estimates of activity peaks. For each section, the total recommended annual operations from **Table 3-14** have been rounded to the nearest hundred.

3.6.1. Local versus Itinerant Operations

The FAA categorizes aircraft operations as either local or itinerant. Local operations are those arrivals or departures performed by aircraft that remain in the airport traffic pattern or are within sight of the ATCT. Local operations are most often associated with training activity and flight instruction. Itinerant operations are arrivals or departures other than local operations, performed by either based or transient aircraft. Itinerant operations are generated by a wide range of recreational, business/corporate, and air charter/taxi flights.

Over the past 20 years, the historic split between operations has averaged 43 percent local and 57 percent itinerant. In 2013 and the years that followed, there was an increase in the percent of local activity. This is primarily the result of Polk State College's use of LAL for flight training, which began in 2013. As the only Florida public college to offer a Bachelor's Degrees in Aerospace, they opened the on-airport flight training facility in 2014. Since 2013, the split of operations has average 46 percent local and 54 percent itinerant.

Based on interviews with the Program Director from Polk State College, as well as the Lakeland Aero Club and other facilities conducting flight training operations, it is expected that the share of local operations will continue to increase over the planning period; however, this shift is estimated to peak at 50/50 split as shown in **Table 3-15**. In addition to the expected increases in flight training, growth in the number of local operations is also supported by the newer turf runway (Runway 8-26) which was activated in November 2016. Even though it is not utilized by Polk State College, the turf runway has been very popular for other aircraft operators.

Finally, it should be noted that while the share of local operations is expected to increase, the airport is also expected to serve an increasing number of itinerant operations given the overall growth in activity expected during the 20-year planning horizon. Increases in the number of itinerant operations is supported by the surrounding area growth, the increased utilization of business/corporate aviation, and the expected addition of activity by the planned MRO and dedicated air cargo facilities.

Table 3-15 Forecast of Local versus Itinerant Operations

	Local Operations		Itinerant Operations		Total
Base					
2017	51,307	44%	65,346	56%	116,653
Forecast					
2023	71,300	47%	80,400	53%	151,700
2028	85,400	48%	92,500	52%	177,900
2038	111,600	50%	111,600	50%	223,200

Source: FAA OPSNET database and ESA analysis, 2018.

3.6.2. Instrument Operations

A separate estimate of the instrument operations conducted is important when evaluating future facility requirements. Using FAA OPSNET data, the number of operations at LAL under instrument flight rules (IFR) was reviewed. Over the past 20 years, instrument operations have averaged 12 percent of the overall operations conducted. In 2008, the lowest level of five percent was recorded and likely the result of the significant drop in business/corporate aviation that occurred around that time. However, since the Great Recession, the airport has recorded its highest shares of IFR operations (17 percent) for multiple years, including most recently in 2017.

While the record number of operations conducted under IFR are related to the significant recovery the airport has experienced since 2011, this increasing trend is expected to be the norm in the future. This assumption is based on the expected growth in business/corporate aviation, increasing activity at LAL by fractional, charter, and other aircraft management operators, and the addition of new activity by MRO and dedicated air cargo operators. It is also related to the fact that even the smallest of general aviation aircraft now have fairly sophisticated instrument capability and conduct more IFR operations than they have in the past. Even though additional IFR operations are expected over the course of the planning period, the share has been limited to 20 percent of the total operations. The resulting estimate of future instrument operations are included in **Table 3-19**.

It should be noted that the percent of instrument operations is different from the actual percentage of the year that the airport actually experiences IFR conditions. Unlike the meteorological conditions documented in the **Inventory of Existing Conditions** chapter (instrument meteorological conditions approximately 7.0 percent of the time), the count and subsequent estimate of instrument operations include those conducted during actual instrument meteorological conditions as well as the ones simply under an IFR flight plan.

3.6.3. Military Aircraft Activity

Military operations are those conducted by aircraft from one of the U.S. military service branches. While there are no military aviation units based at LAL, the airport does accommodate some military aircraft as is documented in the historic FAA OPSNET (**Table 3-13**). As noted previously, since May of 2017 this activity includes the operations conducted by NOAA's current fleet of nine aircraft based at the airport. However, the military counts do not include the operations conducted by Draken International, even though their fleet consists of ex-military tactical aircraft. Aircraft operations generated by Draken International are counted as civil, general aviation operations.

The ability to accurately forecast military operations (even for a military air base) is complicated by a number of facts. This is even more difficult for the activity at a public airport like LAL. As noted previously, military activity can fluctuate annually due to a number of factors and even the NOAA aircraft based at the airport have varied missions and for part of their operation, are dependent on how active the Atlantic hurricane season is each year. While the future level of military activity has been accounted for in the overall airport projection of annual operations, the overall number each year is expected to increase somewhat. This is due to LAL being the home for NOAA's nine aircraft. Even after only a partial year of operations by NOAA, total annual military operations at LAL in 2017 were up 1,000 over the 1,600 average annual count recorded between 2013 and 2016.

3.6.4. Operational Fleet Mix

Operational fleet mix is an important factor in determining the needs for airfield improvements. However, even at airports with an ATCT, it is difficult to estimate the type of aircraft conducting operations since this information is not recorded by tower staff. Instead, the current operational fleet mix percentages were based on a combination of the 2017 calendar year operational counts, the FAA's Traffic Flow Management System Counts (TFMSC), FlightAware data, and interviews conducted with the users of the airport.

Information from the user interviews was also utilized with data from the 2018 FAA Aerospace Forecast to predict how the operational fleet mix would change over the next 20 years. In addition, current as well as future operational fleet mix data was obtained from the Aircraft Maintenance, Repair, and Overhaul Hangars and Air Cargo Facility Environmental Assessment (EA). Estimates of the existing and future operational fleet mix are provided in **Table 3-16**.

Table 3-16 Estimated Operational Fleet Mix

	2017	2023	2028	2038
Single-Engine	86,323	104,700	121,000	149,500
Multi-Engine (piston & turboprop)	19,830	26,500	29,400	35,700
Jet	7,000	15,200	19,600	27,900
Rotorcraft	3,500	5,300	7,900	10,100
Total	**116,653**	**151,700**	**177,900**	**223,200**

Source: FAA OPSNET, FAA Traffic Flow Management System Counts, FAA 2017 Aerospace Forecast, and ESA analysis, 2018.

As documented in the 2018 Aerospace Forecast, the FAA anticipates growth and increased utilization for every aircraft category with the exception of the single-engine piston and multi-engine piston types. The most significant growth and utilization is expected to occur in the jet and rotorcraft categories. Even though the overall percent of operations is expected to decrease for the single- and multi-engine categories, the total annual operations is still expected to increase given the large number of these aircraft at LAL and the expected increases in flight training at the airport. The significant growth shown for jet aircraft operations takes into consideration the expected level of based jets, as well as expected increases in the activity by corporate/business, air taxi, and fractional aircraft operators. Jet operations are also expected to increase as a result of the future MRO and air cargo facilities.

Overall, the general aviation jet activity will continue to include nearly every type of business jet aircraft flying in the nation. In the light to medium-sized business jets (maximum allowable takeoff weight between 10,000 and 60,000 pounds) this activity includes the Embraer Phenom and Legacy aircraft, Beechcraft Hawker, Bombardier Learjet, Cessna Citation, and Dassault Falcon type jet aircraft. For the larger and heavier business jet fleet over 60,000 pounds, typical examples include the Bombardier Global, larger Dassault Falcon, and Gulfstream series of aircraft. As described below, the future MRO hangars will be sized to primarily accommodate commercial aircraft in the Airbus and Boeing narrow-body fleets, while the air cargo facility is being planned for the operation of Boeing 767 sized aircraft. It is believed the initial activity documented in the recently approved EA for the Aircraft MRO Hangars and Air Cargo Facility could also be exceeded at some point within the 20 year planning period.

3.6.5. Critical Design Aircraft

The airport planning criteria and design standards for various airfield elements are based on the critical design aircraft that makes regular use of the airport. Regular use is defined as 500 annual operations, including both itinerant and local operations, but excluding touch and go operations. These aircraft classify airport facilities based on Approach Reference Codes, Departure Reference Codes, Runway Design Codes, and Taxiway Design Groups defined in FAA Advisory Circular (AC) 150/5300-13A, Change 1, Airport Design. These classifications and their associated standards will be addressed in the following chapter of the study.

Due to their size, weight, and performance requirements, jet aircraft are typically the design aircraft for most airfield facilities; however, there are also a number of large multi-engine turboprop aircraft that can also be very demanding and therefore representative of the critical aircraft group. The most recent year (July 2016 to June 2017) of the FAA's TFMSC data, the 2015 FlightAware data (utilized for the MRO and Air Cargo Facility EA), and information from the ATCT at LAL were applied to determine the current, most demanding group of aircraft with similar characteristics. These sources documented a wide range of large jet and turboprop aircraft that utilize LAL on a regular basis. These predominantly include the Airbus A319, Airbus A320, Boeing 727, Boeing 737, Boeing 757, and McDonnell Douglas MD-80 series commercial aircraft. Large military aircraft utilizing LAL on a regular basis included the Lockheed C-130 Hercules, Lockheed WP-3D Orion (NOAA's), and the Boeing P-8 Poseidon (Boeing 737 airframe) aircraft. As documented in the recent FONSI and ROD for the Aircraft MRO Hangars and Air Cargo Facility EA, this grouping of aircraft currently conducts more than 500 annual operations at LAL. With respect to the current critical aircraft, the Boeing 737-700 has been selected to represent the grouping of aircraft with similar characteristics which make regular use of the airport.

For the future critical design aircraft, it is expected that the same grouping of commercial and large military aircraft will continue to use the airport on a regular basis. However, slightly larger aircraft are also expected as described in the approved EA addressing the future MRO hangars and air cargo facilities at LAL. The EA documents that 100 commercial, 96 general aviation, and 5,840 air cargo aircraft operations are anticipated to be generated annually within the short-term planning period of this master plan. According to the approved EA, the new MRO hangars would service a variety of commercial aircraft, including the Airbus A321, Boeing 737, and Boeing 767, while the air cargo facility is being designed to accommodate an operator with Boeing 767 aircraft. The EA also documents that the airport has recently been approached by an air cargo operator that will establish daily air cargo operations at LAL once suitable facilities are available. As such, the EA documents that there will be 5,840 annual Boeing 767-300 Freighter operations at LAL by 2023. Therefore, this aircraft is considered to be the most critical future design aircraft for the airport in the short-term planning horizon.

3.6.6. Peak Activity Estimates

Annual projections provide a good overview of the activity at an airport, but may not reflect certain operational characteristics of the facility. In many cases, facility requirements are not driven by annual demand, but rather by the capacity shortfalls and delays experienced during peak times. Therefore, estimates of the peak month, the average day in the peak month, and the peak hour demand for aircraft operations are needed.

Review of the monthly FAA OPSNET data reveals that since 2009, operations have peaked in April for every year except 2012, when Sun 'n Fun was held mostly in March (March 27th to April 1st). The average of these Sun 'n Fun peak months was 14.4 percent of the annual operations. However, for the purposes of this study, the second busiest month each year was considered, since Sun 'n Fun is a unique event and therefore does not reflect how the airfield or its facilities operate on most any other given time of the year.

Therefore, the second busiest month was evaluated, with many occurring in March, prior to Sun 'n Fun, or later in the fall (October and November timeframe). Since 2009, the second busiest month each year averaged 9.5 percent of the overall operations. In 2017, the second busiest month was November and accounted for 9.7 percent of the annual operations that year. To estimate the future peak month activity, the

more recent 9.7 percent was applied. For the average day of the peak month operations, the peak month figures for 2017 and each future year were simply divided by 30.

For master plans, the evaluation of peak hour demand is based on the peak hour of the average day of the peak month. As noted in the FAA master planning criteria for design hour demand, this approach provides sufficient facility capacity for most days of the year, but recognizes there will be busier days with more congestion and/or delays, and that it is important that facilities are neither under nor overbuilt. The peak hour of the average day was based on the ATCT hourly traffic count report for November 29, 2017, when 102 operations were recorded in the busiest hour. This activity represented 17 percent of the total 611 operations conducted at LAL that day. Therefore, 17 percent was applied to the average day peak month operations to determine the peak hour of the average day operations for the base and future forecast years. With the exception of the peak hour of the average day, the resulting estimates in **Table 3-17** have been rounded to the nearest ten for the forecast years.

Table 3-17 Forecast of Peak Activity

	Total Annual Operations	Peak Month	Average Day Peak Month	Peak Hour of Average Day
Base				
2017	116,653	11,358	379	64
Forecast				
2023	151,700	14,710	490	83
2028	177,900	17,260	580	98
2038	223,200	21,650	720	123

Source: FAA OPSNET database, LAL ATCT Hourly Traffic Count Reports, and ESA analysis, 2018.

3.7. FAA Terminal Area Forecast Comparison

If an airport is included in the FAA TAF, any new forecasts need to be reviewed and approved by the agency before they can be applied to further analyses. During this review for general aviation airports, the FAA looks to see if the annual operations or based aircraft forecasts differ from the TAF by more than ten percent in the five year and/or 15 percent in the ten year planning periods.

In reference to the review, the FAA Airport Planning and Programming division published a guidance paper entitled, Review and Approval of Aviation Forecasts. This guidance states: “If the forecast is not consistent with the TAF, differences must be resolved if the forecast is to be used in FAA decision-making. This may involve revisions to the airport sponsor’s submitted forecasts, adjustments to the TAF, or both. FAA decision-making includes key environmental issues (e.g. purpose and need, air quality, noise, land use), noise compatibility planning (14 CFR Part 150), approval of development on an airport layout plan, and initial financial decisions including issuance of LOI’s and calculation of BCA’s.”

As shown in **Table 3-18**, the recommended forecasts for based aircraft are slightly higher than the FAA’s review criteria for consistency with the TAF. The base year level of aircraft recorded for calendar year 2017 were already 5.6 percent greater than the fiscal year 2017 count used in the TAF. If this difference is taken into consideration (adjustment shown in **Table 3-18**), then both the five and ten year recommended based aircraft forecast of this master plan are within the FAA’s review criteria for consistency with the TAF.

Table 3-18 also shows that the recommended forecasts for annual operations are much higher than the FAA’s review criteria for consistency with the TAF. Similar to the based aircraft, part of this has to do with the fact that annual operations recorded for calendar year 2017 were already 5.0 percent greater than the fiscal year 2017 count used in the TAF. If this difference is taken into consideration (adjustment shown in **Table 3-18**), then both the five and ten year recommended annual operations forecast are closer to the FAA’s review

criteria for consistency with the TAF. However, there is still a significant difference, which has to do with the fact that the 2017 TAF only projects an average annual growth of 0.1 percent for aircraft operations at LAL over the next 20 years. This is considered unrealistic, not only because of the double digit growth that has been recorded every year since 2011, but also due to the projections of the various economic indicators and the activity by the different airport tenants and users documented in this chapter and specifically addressed in Section 3.5.6.

As a point of reference, the 10-year level of operations projected in the TAF by 2028 has been exceeded a number of times at the airport, as documented in the historic OPSNET data. It should also be noted that the 2018 year to date figures (through July) in OPSNET are already 10,522 annual operations or 15.5 percent over the same period in 2017, further highlighting the continued growth in activity at LAL.

Table 3-18 Comparison of Forecasts to 2017 FAA TAF

	Recommended Forecasts	2017 FAA TAF[a]	Difference	Adjusted TAF for CY[b]	Adjusted Difference
Based Aircraft					
Base Year (2017)	247	234	5.6%	247	0.0%
5 Year (2023)	281	249	13.0%	263	7.1%
10 Year (2028)	314	259	21.2%	273	14.8%
Annual Aircraft Operations					
Base Year (2017)	116,653	111,116	5.0%	116,653	0.0%
5 Year (2023)	151,700	111,773	35.7%	117,343	29.3%
10 Year (2028)	177,900	112,168	58.6%	117,757	51.1%

[a] Issued January 2018 with data based on FAA fiscal year which ends September 30th.

[b] TAF based aircraft data for fiscal year FY2017 is 5.6 percent less than actual calendar year CY2017 data used for forecasting. Similarly, the annual operations data for fiscal year FY2017 is 5.0 percent less than actual calendar year CY2017 data.

Source: 2017 FAA TAF and ESA Analysis, 2018.

3.8. Aviation Activity Forecast Summary

Table 3-19 presents an overview of the recommended forecasts. The data and methods used to forecast aviation demand for the airport are consistent with those used by the FAA, FDOT, and other airports around the nation. These forecasts are considered to reasonably reflect the activity anticipated at LAL through 2038 given the information available during this study.

Table 3-19 Summary of Aviation Activity Forecasts

	2017	2023	2028	2038
Based Aircraft (Table 3-12)				
Single-Engine	162	179	193	223
Multi-Engine (piston & turboprop)	34	39	44	62
Jet	42	51	60	82
Rotorcraft	9	12	17	23
Total	**247**	**281**	**314**	**390**
Operations (Table 3-15)				
Local	51,307	71,300	85,400	111,600
Itinerant	65,346	80,400	92,500	111,600
Total	**116,653**	**151,700**	**177,900**	**223,200**
Instrument	19,277	27,300	33,800	44,600
Operational Fleet Mix (Table 3-16)				
Single-Engine	86,323	104,700	121,000	149,500
Multi-Engine (piston & turboprop)	19,830	26,500	29,400	35,700
Jet	7,000	15,200	19,600	27,900
Rotorcraft	3,500	5,300	7,900	10,100
Peak Operations (Table 3-17)				
Peak Month	11,358	14,710	17,260	21,650
Average Day of Peak Month	379	490	580	720
Peak Hour of Average Day	64	83	98	123

Source: FAA's National Based Aircraft Inventory Program, FAA OPSNET database, and ESA analyses, 2018.