3.0 Introduction

Aviation activity forecasts play an important role in airport planning. An airport's full potential resides in the phrase "unconstrained demand," describing the optimal environment in which the airport's resources can be maximized. Defining the reasonable level of unconstrained demand for an airport, or activity level that can be expected to occur over a long-term planning period, is the foundation of facility planning.

Forecasting is both an art and a science. Data collected for the airport and surrounding area is used to define the forecast levels of aviation activity during the planning period. Year-to-year variation, however, is difficult to predict with any level of certainty over a 20-year planning period. Many factors affect aviation activity at the local, regional, and national levels. While actual development investment is made based upon realized demand, the planning that precedes it should be made in an optimal environment that looks at full potential. Forecasts of future aviation activity are the basis for effective airport planning decisions. These projections are used to identify and preserve adequate space for facility expansion.

3.1 Activity History

Since opening in August 1946 as a potential landing field for World War II support aircraft, the Springfield-Beckley Municipal Airport evolved into a joint-use airport that supported a fleet of more than 20 F-16s operated by the Ohio Air National Guard (OANG) and more than 60 general aviation based aircraft primarily from Clark and Greene Counties. The City has historically partnered with the OANG to improve and expand airport facilities to support civil general aviation and the OANG mission. But in 2012 the OANG significantly changed its presence on the airfield by removing the F-16 flying mission. This event, as well as the introduction of RPA (remotely piloted aircraft) activities and associated NAS changes, changed the functionality of the airport. As a result, the SGH air traffic control tower also closed.

Because of these changes, the airport operations and based aircraft have declined overall since the last master plan, but are beginning to increase again. **Exhibit 3.1-1** provides the historic operations and based aircraft for SGH as shown in the FAA Terminal Area Forecast.[1]

[1] The Terminal Area Forecast (TAF) system is the official forecast of aviation activity at FAA facilities. These forecasts are prepared to meet the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public. The TAF includes forecasts for active airports in the National Plan of Integrated Airport System (NPIAS). Once published the TAF remains constant until its next publication with the only exceptions being significant traffic shifts by major airlines or the revelation of a significant historical data error. Any such change in an airport forecast will be noted on this page and in the airport "Notes" file.

Exhibit 3.1-1: FAA Historic Terminal Area Forecast for SGH

TERMINAL AREA FORECAST DETAIL REPORT

REGION: AGL **STATE:** OH **LOCID:** SGH

CITY: SPRINGFIELD **AIRPORT:** SPRINGFIELD-BECKLEY MUNI

	Enplanements			Aircraft Opertions									Aircraft
				Itinerant Operations					Local Operations				
Fiscal Year	Air Carrier	Com-muter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total	Total Ops	Based Aircraft
1995	0	0	0	0	3,030	20,500	10,500	34,030	30,000	0	30,000	64,030	91
1996	87	0	87	0	3,030	20,500	10,500	34,030	30,000	0	30,000	64,030	72
1997	87	0	87	0	3,030	20,500	10,500	34,030	30,000	0	30,000	64,030	95
1998	0	0	0	0	3,030	20,500	10,500	34,030	30,000	0	30,000	64,030	95
1999	0	0	0	0	3,030	20,500	10,500	34,030	30,000	0	30,000	64,030	92
2000	36	0	36	0	3,030	20,500	10,500	34,030	30,000	0	30,000	64,030	92
2001	0	0	0	0	3,030	20,090	10,500	33,620	29,400	0	29,400	63,020	91
2002	0	0	0	0	3,030	20,090	10,500	33,620	29,400	0	29,400	63,020	90
2003	0	0	0	0	3,030	20,090	10,500	33,620	29,400	0	29,400	63,020	89
2004	0	0	0	0	3,030	20,090	10,500	33,620	29,400	0	29,400	63,020	82
2005	0	0	0	0	3,030	20,090	10,500	33,620	29,400	0	29,400	63,020	81
2006	0	0	0	0	3,030	20,090	10,500	33,620	29,400	0	29,400	63,020	81
2007	0	0	0	0	3,030	20,090	10,500	33,620	29,400	0	29,400	63,020	81
2008	0	0	0	0	2,450	19,110	13,000	34,560	27,440	0	27,440	62,000	75
2009	0	0	0	0	2,450	19,110	13,000	34,560	27,440	0	27,440	62,000	75
2010	87	0	87	0	291	2,267	15,369	17,927	3,256	0	3,256	21,183	48
2011	0	0	0	0	291	2,267	15,369	17,927	3,256	0	3,256	21,183	48
2012	0	0	0	0	291	2,267	15,369	17,927	3,256	0	3,256	21,183	44
2013	0	12	12	0	248	1,590	1,769	3,607	5,638	0	5,638	9,245	59
2014	0	0	0	0	248	1,590	1,769	3,607	5,638	0	5,638	9,245	35

Source: FAA Terminal Area Forecast 2016

3.2 Forecasts

There are two primary measures of aviation activity at general aviation airports: based aircraft and annual operations. Based aircraft are those aircraft that are kept at the airport either in hangars or tied down when not in use. Annual operations are the total of all types of operations (takeoffs and landings) that occur at the airport in a year. Data have been collected for existing and historic levels of based aircraft and annual operations at SGH and are used as the starting point for preparing updated aviation activity forecasts.

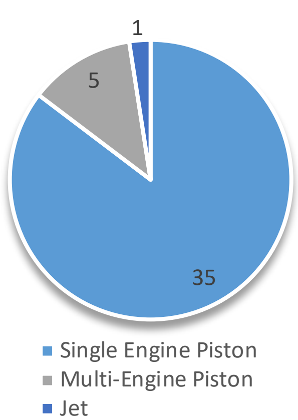
3.2.1 Based Aircraft

Methodology

Three types of forecast methods are examined: market share, trend, and regression. For each type of forecast, the results need to be realistic, correlated, and statistically significant, where appropriate, to be considered as a viable forecast for future activity. To begin the forecast, a starting point is established for the existing total number of based aircraft at the airport and the fleet mix. The total number of based aircraft at SGH was determined by consulting the FAA National Based Aircraft Inventory (NBAI). (See **Appendix C**.) According to the NBAI, the majority of aircraft based at SGH are single engine piston (SEP), followed by multi-engine piston. There is currently one jet based at the airport. **Exhibit 3.2.1-1** below shows the SGH starting point for forecast of total based aircraft and fleet mix.

Exhibit 3.2.1-1

NBAI - SGH Based Aircraft (Validated)	
Single Engine Piston	35
Multi-Engine Piston	5
Jet	1
Total	41



Source: FAA NBAI, 2016

Regression

Socioeconomic indicators:

Socioeconomic indicators for the Springfield Metropolitan Statistical Area (MSA), which is made up of Clark County, Ohio, were reviewed for later use in regression forecasts for SGH. (See **Exhibit 3.2.1-2**.) Three socioeconomic indicators traditionally have the potential to influence aviation activity in a region:

- Population – the higher the population, the more potential aircraft owners and operations
- Employment – the higher the employment level, the more potential aircraft owners
- Personal Income – the higher the personal income, the more potential discretionary income that may be used for aviation related activities

Historic data for Clark County socioeconomic indicators were obtained from the U.S. Department of Commerce, Bureau of Economic Analysis and the U.S. Bureau of the Census, Population Estimates and Population Distribution Branches.

Exhibit 3.2.1-2: Socioeconomic Indicators

SGH Historic Based Aircraft and Springfield MSA Socioeconomic Indicators

Year	Based Aircraft	Population (1000s)	Employment (1000s)	Income (1000s)
1997	95	146.27	6,500.12	$3,410
1998	95	145.74	6,597.28	$3,583
1999	92	145.16	6,674.57	$3,663
2000	92	144.74	6,779.84	$3,795
2001	91	143.8	6,713.42	$3,889
2002	90	143.23	6,636.34	$3,824
2003	89	141.76	6,616.81	$3,859
2004	82	141.38	6,660.87	$3,925
2005	81	141.37	6,706.65	$3,967
2006	81	140.67	6,745.47	$4,160
2007	81	139.83	6,797.68	$4,262
2008	75	139.4	6,731.25	$4,430
2009	75	138.78	6,465.58	$4,383
2010	48	138.33	6,400.24	$4,435
2011	48	137.76	6,503.48	$4,664
2012	44	137.19	6,584.38	$4,755
2013	59	136.74	6,658.44	$4,818
2014	35	136.48	6,753.00	$4,995

Source: U.S. Department of Commerce, Bureau of Economic Analysis; the U.S. Bureau of the Census, Population Estimates and Population Distribution Branches; FAA TAF

Regression forecasts predict the number of based aircraft at an airport using these characteristics of the area in which the airport is located. Accepted economic theory assumes that changes in certain variables may cause changes in other variables (e.g., an increase in income should lead to an increase in the demand for air travel).

Regression analysis is used to establish the relationship between the quantity being forecast (i.e., based aircraft) and other measures potentially associated with and possibly affecting that quantity. Then the estimated regression equation is used to forecast future values of based aircraft from separately forecast values of socioeconomic indicators.

Simple regression (one predictor variable per equation) has been found to be appropriate for forecasting the future numbers of based aircraft; multiple regression (more than one predictor variable per equation) is not due to the very high intercorrelations between the data (employment is related to population, income is related to population, etc.)

and multicollinearity (lack of independence among the predictors). With the existence of intercorrelations and multicollinearity, the resulting multiple regression relationships are likely to be randomly weighted rather than based on relationships in the data.

In addition, for a regression analysis to be viable, it has to represent a positive relationship with the predictor variable (R Square of at least 0.5) and be statistically significant at the 0.05 or less threshold. A positive relationship results in an increase in the number of based aircraft as population, employment, or income increases or in a decrease in the number of based aircraft with decreasing population, employment or income. When a negative relationship occurs, (i.e., based aircraft growing with declining socioeconomic indicators), the growth or decline of based aircraft is occurring for reasons other than socioeconomic factors. Therefore, any regression equations with a negative relationship between based aircraft and the socioeconomic indictors are considered illogical and discarded from consideration.

On review of the historic socioeconomic data for Springfield MSA, neither the socioeconomic indicators of employment or income provided for a positive relationship between the variables so they were not considered appropriate for forecasting. Additionally, while there is positive relationship between population and based aircraft levels (both declining), only the 10-year and 20-year analysis resulted in statistically significant and viable summary statistics. However, both of these forecast resulted in single digit or negative based aircraft over the 20-year forecast period. Accordingly, these forecast were also not considered valid since based aircraft have increased over the past year and the airport is currently building new hangars.

Trends:

Regression analysis was also performed on the 5-, 10-, and 20-year trends at SGH. The 5-year trend did not produce statistically viable or significant results. While the 10- and 20-year trends were considered statistically viable and significant, they were not considered valid for SGH because each had the airport declining to a negative number of based aircraft in 10 years.

Regression Summary:

None of the regression analysis produced realistic, and statistically viable and significant based aircraft results for SGH when trends, population, employment, or income was considered. In large part this may be because SGH’s past cannot be used to predict its future because in the past the OANG had a significant impact on the role of and activity at the airport. The OANG has moved away from traditional aircraft so the number of pilots has also been reduced at the airport. For these reasons, it is not likely that SGH’s historic activity can predict it future activity and a market share approach to forecasting based aircraft is a more realistic approach to projecting this feature.

Market Share

To forecast for SGH using market share, the historic and forecasted national market was identified from the Bureau of Transportation Statistics and the FAA Aerospace Forecast Fiscal Years 2016–2036. For the market share forecasts, only general aviation aircraft are included as opposed to the entire national fleet, which would include airliners.

The market share forecast incorporates the national forecast for general aviation aircraft, reflecting national trends. According to the FAA Aerospace Forecasts Fiscal Years 2016-2036, "the long term outlook for general aviation is favorable, led by gains in turbine aircraft activity. The active general aviation fleet is forecast to increase 0.2 percent a year between 2015 and 2036, equating to an absolute increase in the fleet of about 7,000 units. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed wing piston aircraft continues to shrink over the forecast. Although fleet growth is minimal, the number of general aviation hours flown is projected to increase an average of 1.2 percent per year through 2036, as growth in turbine, rotorcraft, and experimental hours more than offset a decline in fixed wing piston hours."[2]

Determining the appropriate historic market share to use to forecast SGH's share of the national forecast is essential if local trends are to taken into consideration. SGH's historic share of the total general aviation aircraft market is shown in **Exhibit 3.2.1-3** below. The existing market share is the lowest while the 20-year average is the highest.

Exhibit 3.2.1-3: SGH Historic Shares of Total General Aviation Aircraft Fleet

2016 Market Share	5-Yr. Average Market Share	10-Yr. Average Market Share	20-Yr. Average Market Share
0.0202%	0.0210%	0.0254%	0.0341%

Source: Woolpert 2016

On a local level, the MSA for SGH has been slow to recover from the last national economic downturn. While SGH's existing based aircraft levels are low, which results in a lower share of the overall national general aviation fleet, there has been a trend for growth in income and recent growth in employment. Just this year, Navistar announced it will add 600 jobs in Springfield in a second deal with GM, doubling the new jobs from the partnership.[3] Additionally, EF Hutton is expected to bring 400 jobs to Springfield as a result of the announcement to move their headquarters to the city.[4] Other major projects announced within the last 24 months include Yamada North America (100 new jobs, 73,000 square feet, $14.5 M investment), Parker TruTech ($13 M investment, 20,000 square feet expansion and 15 new jobs), KTH Parts ($30 M investment, 20 new jobs), Pentaflex ($4 M investment, 20,000 square feet expansion, 40 new jobs), Heroux Devtek- HDI Landing Gear ($24.5 M investment, 50 new jobs), Stanley Electric (600,000 square feet expansion 150 new jobs), Topre America ($10 M investment, 20,000 square feet, 20 new jobs), Speedway ($9.1 M office expansion/ acquisition, 350 new jobs). [5] Additional positive economic developments from 2016 include Winans Chocolates, United Senior Services, Mother Stewart's Brewery, Loft Apartments, and The Hatch (all for downtown Springfield), and Aldi Grocery, Kayes Jewelers, Dicks Sporting Goods, Hobby Lobby, IHOP, Kroger Market Place, Taco Bell, Burger King, Dunkin Donuts (all retail developments).[6]

It is important to note that the OANG mission movement away from traditional aircraft to remotely piloted aircraft also plays into the Springfield area's goal of economic development in this area. "The Ohio/Indiana Unmanned Aerial Systems Center and Test Complex, located in Springfield, has been tasked with supporting businesses and government entities

[2] *FAA Aerospace Forecasts Fiscal Years 2016-2036*, Forecasts and Performance Analysis Division (APO-100), Office of Aviation Policy and Plans.

[3] *Navistar to add jobs in Springfield with second GM deal*, Springfield News-Sun, June 9, 2016; Tom Franzen, Director of Economic Development, & Don Smith, Airport Manager (personal communication December 16, 2016).

[4] http://www.daytondailynews.com/business/economy/financial-firm-plans-move-downtown-springfield-add-400-jobs/xoB7g0TZb9WGNqkh4xOH2O/, accessed October, 2016.

[5] Tom Franzen, Director of Economic Development, & Don Smith, Airport Manager (personal communication December 16, 2016).

[6] Ibid.

to conduct research and commercialize technology. The center has 17 Certificates of Authorization, or COAs, that allow public entities to fly drones and conduct research."[7] Additionally, Spectra Jet (a Lear jet maintenance, repair, and overhaul company) is also planning expansion at the airport.[8]

Using SGH's 2016 existing market share produces a forecast that mirrors the National Forecast reflecting no local factors. (See **Exhibit 3.2.1-4**.) (Note, according to FAA Aerospace Forecasts Fiscal Years 2016-2036, the 10-year average annual growth rate (AAGR) for the total general aviation fleet is 0 percent while the 20-year AAGR is .2 percent.) This forecast results in almost no growth over the next 20 years. While there has been a decline in aircraft based at SGH over the last 20 years, local conditions are changing, and as described in the previous paragraph, job creation and business expansion is increasing in the area. The airport has added 6 aircraft over the last few years. While some aircraft have left SGH because of the poor conditions of the hangars, many with dirt floors, new hangars are being built, which will help bring even more aircraft back to the facility. There is currently a waiting list for hangars on the airport. Accordingly, the 2016 Market Share forecast is not a realistic forecast for SGH, but can be useful in developing the low end of a forecast envelope.

Exhibit 3.2.1-4: SGH Based Aircraft Forecast using Market Share

Year	2016 Market Share	5-Yr. Market Share	10-Yr. Market Share	20-Yr. Market Share
2016	41	41	41	41
2021	41	43	52	69
2026	41	43	52	69
2031	42	43	52	70
2036	42	44	54	72
Average Annual Growth Rate				
5-Yr.	0.0%	0.8%	4.7%	11.0%
10-Yr.	0.03%	0.44%	2.37%	5.42%
15-Yr.	0.10%	0.37%	1.65%	3.66%
20-Yr.	0.18%	0.38%	1.34%	2.84%

Source: Woolpert, 2016.

Exhibit 3.2.1-3: SGH Hangars in Poor Condition

Source: Woolpert 2016

[7] http://www.govtech.com/dc/articles/Springfield-Ohio-Could-Become-Nations-Leader-in-Drone-Research.html, accessed October, 2016.

[8] Tom Franzen, Director of Economic Development, & Don Smith, Airport Manager (personal communication December 16, 2016).

The high end of the forecast envelope is the forecast 20-Year Market Share Forecast, which results in 72 aircraft over the forecast period. The forecast envelope ranges from 42 based aircraft to 72 over the 20-year forecast period (reflecting low and high forecasts, with the baseline forecast produced by the 10-Year Market Share Forecast which results in 54 based aircraft. The forecast envelope uses interpolation for the years 2021 and 2026 for the baseline and high forecast to avoid the dramatic initial jumps shown in the 10-year and 20-year forecasts. (See **Exhibit 3.2.1-4: Based Aircraft Forecast Envelope**.)

In summary, the low based aircraft forecast represents a mature airport with no growth. However this is not the representative of the characteristics that exist at SGH since the surrounding community is beginning to see an increase in the economy since the recession. The airport's peak periods of activity were in the 1990s. While it has seen a decline in activity since then, that decline is now reversing. The base line forecast is the forecast using the 10-year market share for the airport. It represents a midrange that takes into account both national trends (it used the FAA forecast as its base) and local trends over the last 10 years (where there have been both declining and increasing airport activity). The high forecast represents a change in the airport system. There are two types of potential changes that could occur at airports within 10 NM of SGH: closure or stagnation. These airports are Kepes, Lisbon, Victory, Barnhart Memorial, and Hammond, with over 130 total based aircraft. Private airports are much more susceptible to closure or stagnation because there are no tax dollars to support them, they are less protected from the ever encroaching non-compatible land uses impacting airports, and they are more easily sold for other development. Since they are all within 10NM of SGH, relocation there would be logical. However, even if only 1/4th of the aircraft relocated there, that would still be major growth for SGH. If either of these happens at the five other airports surrounding SGH, major growth could occur at this facility.

Exhibit 3.2.1-4: Based Aircraft Forecast Envelope

Year	Low 2016 MS	Baseline 10-YR MS	High 20-YR MS
2016	41	41	41
2021	41	44	49
2026	41	47	56
2031	42	50	64
2036	42	54	72
Average Annual Growth Rate			
5-Yr.	0.0%	1.5%	3.5%
10-Yr.	0.03%	1.43%	3.24%
15-Yr.	0.10%	1.39%	3.02%
20-Yr.	0.18%	1.34%	2.84%

Source: Woolpert, 2016.

The low forecast (based on the 2016 Market Share) only shows growth of one (1) aircraft over the forecast period. The baseline forecast (based on the 10-Year Market Share) shows growth of 13 aircraft over the 20-year period, while high forecast (based on the 20-Year Market Share) 31 aircraft. The baseline forecast is the most realistic based on information available at this point in time and is, therefore, the preferred forecast.

3.2.2 Fleet Mix

The next step in forecasting based aircraft for SGH is identifying the forecast fleet mix. The existing fleet mix at SGH is portioned as shown previously in Exhibit 3.2.1-1. The future fleet mix for the preferred forecast is shown in **Exhibit 3-2.2-1.**

Exhibit 3-2.2-1: Fleet Mix Forecast Envelope

Fleet Mix Forecast						
	Baseline					
Year	SEP	MEP	TP	TJ	R	Total
2016	35	5	0	1	0	41
2021	37	5	1	1	0	44
2026	38	5	3	1	0	47
2031	39	5	3	2	1	50
2036	41	5	4	3	1	54
Average Annual Growth Rate						
20-Yr.	0.79%	0.00%	8.38%	5.65%	3.35%	1.39%

SEP = Single Engine Piston

MEP = Multi Engine Piston

TP = Turboprop

TJ = Turbo Jet

Source: Woolpert, 2016

The fleet mix forecasts' AAGR are slightly higher than the FAA fleet mix growth rates because the SGH forecasts assume a greater growth rate in total based aircraft. The fleet mix shown is a realistic mix of aircraft for the airport based on historic fleet mixes.[9] Again, the preferred fleet mix forecast is the baseline.

3.2.3 Operations

Since SGH does not have an airport control tower, there is no reliable source for operations data for the airport. The FAA Order 5090.3C, *Field Formulation of the National Plan if Integrated Airport Systems (NPIAS),* provides guidance of forecasting operations when data is not available:

> When forecast data of aircraft operations is not available, a satisfactory procedure is to forecast based aircraft using the statewide growth rate from the TAF and to develop activity statistics by estimating annual operations per based aircraft. A general guideline is 250 operations per based aircraft for rural general aviation airports with little itinerant traffic, 350 operations per based aircraft for busier general aviation airports with more itinerant traffic, and 450 operations per based aircraft for busy reliever airports. In unusual circumstances, such as a busy reliever airport with a large number of itinerant operations, the number of operations per based aircraft may be as high as 750 operations per based aircraft. An effort should be made to refine such estimates by comparing them to activity levels at similar airports or by conducting an activity survey.

Exhibit 3.1-1 shows historic operations and based aircraft according to the FAA Terminal Area Forecast. The resulting operations per based aircraft (OPBA) range from 157 to 827 when the tower was still open and counting aircraft from 1995 to 2014. The average during this time was 649. For this exercise, an OPBA of 350 because SGH could be considered a busier general aviation airport with more itinerant traffic. This is lower than the average historic OPBA, but seems appropriate considering the loss of all the military pilots that once used the airport for work and pleasure.

Applying the OPBA to the baseline based aircraft forecast results in the operations forecast shown in **Exhibit 3.2.3-1**. The fleet mix forecast, which is also included in Exhibit 3.2.3-1, reflects reasonable estimates based on a review of FAA flight plans for SGH.[10]

Exhibit 3.2.3-1: Fleet Mix Forecast

[9] SGH 2005 Maser Plan shows SGH Fleet mix in 2002 as SEP=48, MEP=5, TP=6, J=1, and F-16=20.

[10] FAA Traffic Flow Management System Counts (TFMSC), Aviation System Performance Metrics (ASPM) for 12 calendar months ending 8/1/16 show 607 approach category B aircraft and 659 approach category C aircraft operating on IFR flight plans during this time.

Fleet Mix Operational Forecast									
	Baseline								
	SEP	MEP	TP	TJ	R	Total	Local	Itinerant	Instrument
2016	11,250	1,600	150	1,300	50	14,350	61%	39%	16%
2021	12,055	1,600	500	1,300	50	15,505	9,458	6,047	2,467
2026	12,370	1,600	1,200	1,300	50	16,520	10,077	6,443	2,628
2031	12,615	1,600	1,200	1,650	400	17,465	10,654	6,811	2,779
2036	13,350	1,600	1,550	2,000	400	18,900	11,529	7,371	3,007
Average Annual Growth Rate									
20-Yr.	0.86%	0.00%	8.38%	2.18%	3.35%	1.39%			

Notes: 2016 is estimated

SEP = Single Engine Piston (e.g. Cessna 172, 182; Piper PA-28, PA-32)

MEP = Multi Engine Piston (e.g. Cessna Skymaster, 310)

TP = Turboprop (e.g. Beech King Air)

TJ = Turbo Jet (e.g. Cessna Citations; Lear Jet; Dassault Falcon)

Source: Woolpert, 2016

Local/Itinerant Operations

The local and itinerant split for total operations is estimated to be 61% local and 39% itinerant based on the TAF data for 2014, which is the last year the tower operated. It is also shown in Exhibit 3.2.3-1.

Instrument Operations

SGH does not have an air traffic control tower that tracks Instrument approaches, therefore, instrument approaches will not be forecast for the airport. Instrument operations, on the other hand, have been tracked at the airport. The FAA FAA Traffic Flow Management System Counts (TFMSC) database was reviewed for current IFR operations at the airport (last 12 calendar months ending July 2016). Analysis revealed that IFR operations were are on average approximately 16% percent of total estimated operations (based on 350 OPBA) at the airport. If this percentage is applied to the total operations forecast for the airport, the following IFR operations are forecasted (see **Exhibit 3.2.3-2**)

Exhibit 3.2.3-2: Instrument Operations

Year	Instrument Operations
2016	2,283
2021	2,467
2026	2,628
2031	2,779
2036	3,007

Source: Woolpert, 2016.

Peak Operations

Airports are similar to other facilities with fixed capacities, such as highways or parking facilities. An airport may be able to accommodate the overall annual operations demand, but may not be able to handle the peak hour traffic. The periods that will be used in developing facility requirements for this master plan include peak month, average day of the peak month (design day), busy day, and design hour operations.

- Peak Month – the calendar month when peak aircraft operations occur.
- Design Day – the average day within the peak month. Dividing the peak month operations by the number of days in the month calculates this indicator.
- Busy Day – the busy day in a typical week within the peak month. This indicator is used primarily for planning general aviation apron space.

- Peak Hour – the peak hour within the busy day. This indicator is used in airfield demand/capacity analysis and terminal building and access road requirements.

Without an air traffic control tower, no detailed operational records are available. Therefore, the general planning guidelines provided and professional judgment have been applied.

Peak Month – If the operations were spread equally over a year, each month would have 8.3 percent. However, at general aviation airports, the peak month typically occurs during good flying weather (spring to fall in regions with four seasons), most commonly in the summer. Therefore, the peak month has been assumed to be 10 percent of the annual operations. This represents a typical peak month and does not take into consideration extraordinary traffic that may be generated for a short period of time from an event like a fly-in or air show.

Design Day – The design day is the peak month operations divided by 30 days, for the average length of a month.

Busy Day – Historic practice for general aviation airports is to assume the busy day is 10 percent more active than the design day.

Peak Hour – Historic practice for general aviation airports is to assume the peak hour to be 10 percent of the busy day.

Exhibit 3.2.3-3 summarizes the forecast peak general aviation activity levels for the preferred forecast. This information will be used later as part of the facility needs determination.

Exhibit 3.2.3-3: Forecast Peak Activity Levels

2021	
Annual Operations	15,505
Peak Month	1,551
Design Day	52
Busy Day	57
Peak Hour	6
2026	
Annual Operations	16,520
Peak Month	1,652
Design Day	55
Busy Day	61
Peak Hour	6
2031	
Annual Operations	17,465
Peak Month	1,747
Design Day	58
Busy Day	64
Peak Hour	6
2036	
Annual Operations	18,900
Peak Month	1,890
Design Day	63
Busy Day	69
Peak Hour	7

Source: Woolpert, 2016.

3.3 Comparison to TAF

The FAA's TAF is the basis for FAA planning. As such, forecasts prepared by an airport need to be compared to the TAF. The FAA's most recent "Revision to Guidance on Review and Approval of Aviation Forecasts" was issued in December 2008. According to this guidance, locally-developed forecasts for operations and based aircraft at general aviation airports are considered consistent with FAA's TAF if they differ by less than 10 percent in the five-year period and 15 percent in the ten-year period.

SGH is a general aviation airport, and in 2016 it was the home base for 41 aircraft. (Note: FAA's National Based Aircraft Inventory was reviewed with the FAA at the time the forecasting exercise began to determine the baseline for based aircraft. See Appendix C.) By 2021 (the five-year mark), the preferred forecasts (which are based on the baseline forecasts) predict based aircraft to exceed 10 percent of the TAF. Likewise, by 2026 (the ten-year mark), forecasts also predict based aircraft to exceed 15 percent of the TAF. (See **Exhibit 3.2.3-3**.) While the baseline forecasts exceed the

TAF as indicted above, the TAF shows six (6) less based aircraft than exist at the airport today, so the TAF is already 17 percent lower than existing conditions. For the same forecasting period, the TAF shows no growth rate, which is unrealistic considering existing conditions at the airport. Had the TAF started with the current 41 aircraft, the baseline forecast would have been within the threshold limits. For operations, the forecasts also exceed 10% and 15% of the five and 10 year marks, respectively, but this is to be expected since the operations forecast uses the based aircraft forecast in the operations-per-based-aircraft forecasting methodology.

Exhibit 3.2.3-3: TAF Comparison

Difference from TAF					
		Preferred Forecast			
	Year	Aircraft	TAF	% Dif.	Ops.*
Base yr.:	**2016**	41	35	17%	14,350
Base yr. +5:	**2021**	44	35	27%	15,505
Base yr. +10:	**2026**	47	35	35%	16,520
Base yr. +15:	**2031**	50	35	43%	17,465
Base yr. +20:	**2036**	54	35	54%	18,900

*2016 Operations (Ops.) are estimated.

Source: Woolpert, 2016

3.4 Airport Reference Code

When considering future facility needs at SGH, in addition to identifying aircraft activity forecasts, it is important to identify what size of aircraft will use the facility. The FAA has developed a system to relate airport planning and design criteria to the operational and physical characteristics of the aircraft intended to use the airport. This system is known as the Airport Reference Code (ARC), and is detailed in FAA Advisory Circular 150/5300-13A, Airport Design.

The ARC is an airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third component (visibility) of the RDC. The three components of the RDC are the Aircraft Approach Category (AAC), which relates to the approach speed (landing speed) of an aircraft; the Airplane Design Group (ADG), which pertains to the design group determined by the wingspan or tail height of an aircraft; and the instrument approach visibility minimums. (See **Exhibit 3.4-1**.) The ARC is based upon the aircraft, or combination of aircraft, with the highest approach speed code and greatest wingspan/tail height that use, or are expected to make substantial use, of the airport. Per FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*, substantial use means 500 or more annual itinerant operations. An operation is a takeoff or landing by an aircraft. Exhibit 3.4-1 summarizes the various approach categories and airplane design groups. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport.

Exhibit 3.4-1: Runway Design Code (RDC) System

AIRCRAFT APPROACH CATEGORY (AAC)		
AAC	**Aircraft Approach Speed**	
A	Approach Speed less than 91 knots	
B	Approach speed 91 knots or more but less than 121 knots	
C	Approach speed 121 knots or more but less than 141 knots	
D	Approach speed 141 knots or more but less than 166 knots	
E	Approach speed 166 knots or more	
AIRCRAFT DESIGN GROUP (ADG)		
Group	**Tail Height (ft.)**	**Wingspan (ft.)**
I	< 20'	< 49'
II	20' - < 30'	49' - < 79'

III	30’ - < 45’	79’ - < 118’
IV	45’ - < 60’	118’ - < 171’
V	60’ - < 66’	171’ - < 214’
INSTRUMENT APPROACH VISIBILITY MINIMUMS		
RVR (ft.)	Visibility (statue mile)	
4000	Lower than 1 mile but not lower than ¾ mile (APV ¾ but< 1 mile)	
2400	Lower than ¾ mile but not lower than ½ mile (CAT-I)	
1600	1600 Lower than ½ mile but not lower than ¼ mile (CAT-II)	
1200	Lower than ¼ mile (CAT-III)	

Source: FAA AC 150/5300-13A

Exhibit 3.4-2 summarizes information from the FAA TFMSC and includes the various larger aircraft types that have filed instrument flight plans into or out of SGH for the last 12 calendar months ending July of 2016. **Exhibit 3.4-3** totals all these by ARC code.

Exhibit 3.4-2: IFR Flight Plans Filed to SGH

Aircraft	Total IFR Operations	AAC	ADG
C30J - C-130J Hercules ; Lockheed	2	D	IV
GALX - IAI 1126 Galaxy/Gulfstream G200	8	D	II
GLF4 - Gulfstream IV/G400	4	D	II
F16 - Lockheed F-16 Fighting Falcon	2	D	I
K35R - Boeing KC-135 Stratotanker	1	C	IV
GL5T - Bombardier BD-700 Global 5000	4	C	III
C650 - Cessna III/VI/VII	7	C	II
C680 - Cessna Citation Sovereign	5	C	II
C750 - Cessna Citation X	12	C	II
CL60 - Bombardier Challenger 600/601/604	35	C	II
G150 - Gulfstream G150	2	C	II
GLF3 - Gulfstream III/G300	4	C	II
H25B - BAe HS 125/700-800/Hawker 800	74	C	II
LJ25 - Bombardier Learjet 25	13	C	I
LJ31 - Bombardier Learjet 31/A/B	72	C	I
LJ35 - Bombardier Learjet 35/36	121	C	I
LJ40 - Learjet 40; Gates Learjet	8	C	I
LJ45 - Bombardier Learjet 45	104	C	I
LJ55 - Bombardier Learjet 55	4	C	I
LJ60 - Bombardier Learjet 60	174	C	I
LJ75 - Learjet 75	2	C	I
LR45 - Learjet 45	1	C	I
B350 - Beech Super King Air 350	5	B	II
BE20 - Beech 200 Super King	2	B	II
BE30 - Raytheon 300 Super King Air	1	B	II
BE40 - Raytheon/Beech Beechjet 400/T-1	38	B	II
BE9L - Beech King Air 90	52	B	II
C25A - Cessna Citation CJ2	50	B	II
C25B - Cessna Citation CJ3	9	B	II
C441 - Cessna Conquest	2	B	II
C501 - Cessna I/SP	4	B	II
C525 - Cessna CitationJet/CJ1	16	B	II
C550 - Cessna Citation II/Bravo	13	B	II
C560 - Cessna Citation V/Ultra/Encore	19	B	II
C56X - Cessna Excel/XLS	25	B	II
CL30 - Bombardier (Canadair) Challenger 300	71	B	II
CL35 - Bombardier Challenger 300	2	B	II
E110 - Embraer EMB110	2	B	II
E55P - Embraer Phenom 300	8	B	II
F900 - Dassault Falcon 900	2	B	II
FA50 - Dassault Falcon/Mystère 50	6	B	II
FA7X - Dassault Falcon F7X	2	B	II
BE10 - Beech King Air 100 A/B	4	B	I
BE58 - Beech 58	31	B	I
BE9T - Beech F90 King Air	2	B	I
C414 - Cessna Chancellor 414	5	B	I
C421 - Cessna Golden Eagle 421	8	B	I
C425 - Cessna 425 Corsair	2	B	I
C510 - Cessna Citation Mustang	10	B	I
E50P - Embraer Phenom 100	2	B	I
MU2 - Mitsubishi Marquise/Solitaire	2	B	I
PRM1 - Raytheon Premier 1/390 Premier 1	210	B	I
SW4 - Swearingen Merlin 4/4A Metro2	2	B	I
PC12 - Pilatus PC-12	38	A	II

Sources: Traffic Flow Management System Counts (TFMSC), Aviation System Performance Metrics (ASPM)

Exhibit 3.4-3: IFR Flight Plans by ARC Code

Code	Operations
B	607
C/D	659
II	480
III	4
IV	3
BI	278
BII	329
CI	499
CII	139
CIII	4
CIV	1
DI	2
DII	12
DIII	0
DIV	2
DV	0

Source: Woolpert, 2016.

It is important to understand that the TFMSC only includes flights that interact with the FAA's en route air traffic control system. While there are some exceptions, local flights that fly entirely under VFR (unless flying in controlled airspaces) or that fly only under the guidance of airport towers are not included in the TFMSC database. Therefore, Exhibit 3-4-2 and Exhibit 3-4-3 above represent only IFR traffic. With just the sample above, there are more than 500 annual operations (FAA's measure of critical aircraft) by a combination of AAC C and ADG II (CII) aircraft at SGH. The ARC on SGH's last ALP was D-IV. While there are some ADG III and IV aircraft, there are relatively few in these categories. In consideration of the above, the ARC for SGH is CII.

3.4 Forecast Summary

The preferred forecast for SGH is the baseline forecast, and it is based on SGH's historic 10-year market share applied to the FAA national forecast of general aviation. The operations forecast is a product of the applying 350 operations-per-based-aircraft to the based aircraft forecast. The local and itinerant ratio is based on the ratio that existed on the FAA TAF in 2014. The instrument operations forecast is based on the existing ratio of IFR flight plans filed to total operations. **Exhibit 3.4-1** includes the information for the ***"FAA Template for Summarizing and Documenting Airport Planning Forecasts"*** for SGH's forecast.

Exhibit 3.4-1: Forecast Summary

	Year	SEP	MEP	TP	TJ	R	Total	SEP	MEP	TP	TJ	R	Total	Local	Itin.	Inst.
Base yr.:	**2016**	35	5	0	1	0	41	11,250	1,600	150	1,300	50	14,350	8,754	3,414	2,283
Base yr. +5:	2021	37	5	1	1	0	44	12,055	1,600	500	1,300	50	15,505	9,458	6,047	2,467
Base yr. +10:	2026	38	5	3	1	0	47	12,370	1,600	1,200	1,300	50	16,520	10,077	6,443	2,628
Base yr. +15:	2031	39	5	3	2	1	50	12,615	1,600	1,200	1,650	400	17,465	10,654	6,811	2,779
Base yr. +20:	2036	41	5	4	3	1	54	13,350	1,600	1,550	2,000	400	18,900	11,529	7,371	3,007
Average Annual Growth Rate																
Base yr. +5:	2021	1.3%	0.0%	14.9%	0.0%	0.0%	1.6%	1.4%	0.0%	27.2%	0.0%	0.0%	1.6%	1.6%	12.1%	1.6%
Base yr. +10:	2026	0.88%	0.00%	14.87%	0.00%	0.00%	1.42%	0.95%	0.00%	23.11%	0.00%	0.00%	1.42%	1.42%	6.56%	1.42%
Base yr. +15:	2031	0.71%	0.00%	9.68%	4.73%	4.73%	1.32%	0.77%	0.00%	14.87%	1.60%	14.87%	1.32%	1.32%	4.71%	1.32%
Base yr. +20:	2036	0.79%	0.00%	8.38%	5.65%	3.53%	1.39%	0.86%	0.00%	12.39%	2.18%	10.96%	1.39%	1.39%	3.92%	1.39%

NOTES: 2016 operations are estimated

All operations estimated using OPBA of 350

Source: Woolpert, 2016.

Exhibit 3.4-1: Forecast Summary

	Year	SEP	MEP	TP	TJ	R	Total	SEP	MEP	TP	TJ	R	Total	Local	Itin.	Inst.
Base yr.:	**2016**	35	5	0	1	0	41	11,250	1,600	150	1,300	50	14,350	8,754	3,414	2,283
Base yr. +5:	2021	37	5	1	1	0	44	12,055	1,600	500	1,300	50	15,505	9,458	6,047	2,467
Base yr. +10:	2026	38	5	3	1	0	47	12,370	1,600	1,200	1,300	50	16,520	10,077	6,443	2,628
Base yr. +15:	2031	39	5	3	2	1	50	12,615	1,600	1,200	1,650	400	17,465	10,654	6,811	2,779
Base yr. +20:	2036	41	5	4	3	1	54	13,350	1,600	1,550	2,000	400	18,900	11,529	7,371	3,007
Average Annual Growth Rate																
Base yr. +5:	2021	1.3%	0.0%	14.9%	0.0%	0.0%	1.6%	1.4%	0.0%	27.2%	0.0%	0.0%	1.6%	1.6%	12.1%	1.6%
Base yr. +10:	2026	0.88%	0.00%	14.87%	0.00%	0.00%	1.42%	0.95%	0.00%	23.11%	0.00%	0.00%	1.42%	1.42%	6.56%	1.42%
Base yr. +15:	2031	0.71%	0.00%	9.68%	4.73%	4.73%	1.32%	0.77%	0.00%	14.87%	1.60%	14.87%	1.32%	1.32%	4.71%	1.32%
Base yr. +20:	2036	0.79%	0.00%	8.38%	5.65%	3.53%	1.39%	0.86%	0.00%	12.39%	2.18%	10.96%	1.39%	1.39%	3.92%	1.39%

NOTES: 2016 operations are estimated

All operations estimated using OPBA of 350

Source: Woolpert, 2016.