



Chapter 3: Forecast

Introduction

Forecasting provides an airport with a general idea of the magnitude of growth, as well as fluctuations in activity anticipated, over a 20-year forecast period. Forecasting helps determine facility needs based on future growth projections.

The forecasts evaluated in this appendix are prepared for based aircraft, general aviation, military and overall activity.

Forecast Rationale

Forecasting the demand for airport services is a critical step in the development of an airport. It allows an airport to examine its ability to satisfy the needs of the aircraft and people it serves, and to determine the approximate timing of necessary improvements by projecting airport user activity levels.

Forecasts developed for airport master plans and/or federal grants must be approved by the Federal Aviation Administration (FAA). It is the FAA's policy, listed in AC 150/5070-6B, Airport Master Plans, that FAA approval of forecasts at general aviation airports should be consistent with the Terminal Area Forecasts (TAF). Master plan forecasts for total operations and based aircraft numbers are considered to be consistent with the TAF if they meet the following criteria:

- a) Forecasts differ by less than 10 percent in the five-year forecast and 15 percent in the 10-year or 20-year period, or
- b) Forecasts do not affect the timing or scale of an airport project, or
- c) Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3, Field Formulation of the National Plan of Integrated Airport Systems.

Furthermore, in FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS), states forecasts should be:

- (1) *Realistic*
- (2) *Based on the latest available data*
- (3) *Reflect the current conditions at the airport*
- (4) *Supported by information in the study*
- (5) *Provide an adequate justification for the airport planning and development*

Factors Affecting Forecasts

The FAA AC 150-5070-6B, Airport Master Plans, states:

Planners preparing forecasts of demand or updating existing forecasts should consider socioeconomic data, demographics, disposable income, geographic attributes, and external factors such as fuel costs and local attitudes towards aviation.



For purposes of this forecast, the following defining factors have been used to develop the forecast:

1. Calendar year 2014 has been used as the base year for most of the aviation forecast projections.
2. The most recent projections of population, job growth and economic growth for South Dakota have been utilized.
3. The catchment area for Black Hills Airport - Clyde Ice Field has been developed using data from Lawrence County.

Forecasting Methods

Forecasts should not be considered predictions of the future, but rather an educated guess of future activity. Some of the following forecasting methods were applied for this analysis, including causal modeling, trend extension, market share and subjective judgment.

Regression Analysis

Regression analysis is a statistical technique for estimating the relationships among variables. It identifies correlations between known independent variables (e.g., population, per capita income and employment) and dependent variables (e.g., passengers and operations).

Trend Extensions

A trend extension forecast identifies historical growth patterns and projects those patterns into the future. Often, a trend line can be drawn through a graph of the historical data to reveal an overall trend, which can then be extended into the immediate future to develop a forecast.

Market Share Analysis

Market share analysis assumes a relationship between local and national/regional forecasts. The market share approach to forecasting is a top-down method where activity at an airport is assumed to be tied to growth in some external measure (typically a regional, state, or national forecast).

Socioeconomic Methodologies

Though trend line extrapolation and market share analysis may provide mathematical and formulaic justification for demand projections, many factors beyond historical levels of activity may identify trends in aviation and impact on aviation demand locally. Socioeconomic or correlation analysis examines the direct relationship between two or more sets of historical data. Based upon the observed and projected correlation between historical aviation activity and the socioeconomic data sets, future aviation activity projections are developed.

Professional Judgment

Judgmental methods are educated estimations of future events based on the personal knowledge, experience and intuition of the forecaster. This method permits the inclusion of a broad range of relevant information into the forecasting process, and is usually used to refine



the results of the other methods. In development of this forecast KLJ representatives reviewed FBO data, met with airport management and reviewed flight data from 2008-2014.

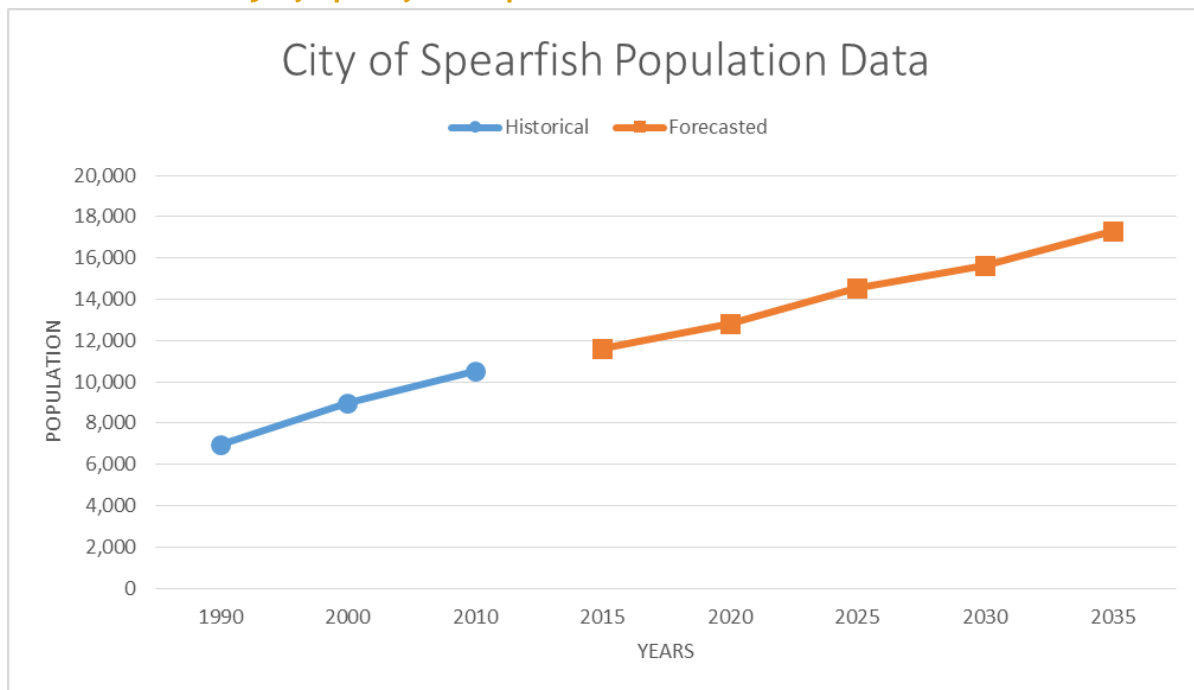
Socioeconomic Conditions

Socioeconomic information within the airport service area can provide insight into factors that affect aviation activity at an airport. Commonly evaluated metrics include population, income and employment. Historic trends, current data and forecast estimates are evaluated in this section to identify socioeconomic trends that may affect aviation activity forecasts at Black Hills Airport - Clyde Ice Field.

Population

Population is a basic indicator of the number of people who may utilize airport infrastructure. Since 1990, population of Spearfish has risen consistently with population growing at an average annual growth rate of 2.05 percent and the population of Lawrence County has risen at an average annual growth rate of 0.8 percent. Future population growth is projected to grow by 2.02 percent annually through the planning period for the City of Spearfish and annually by 0.49 percent for Lawrence County.

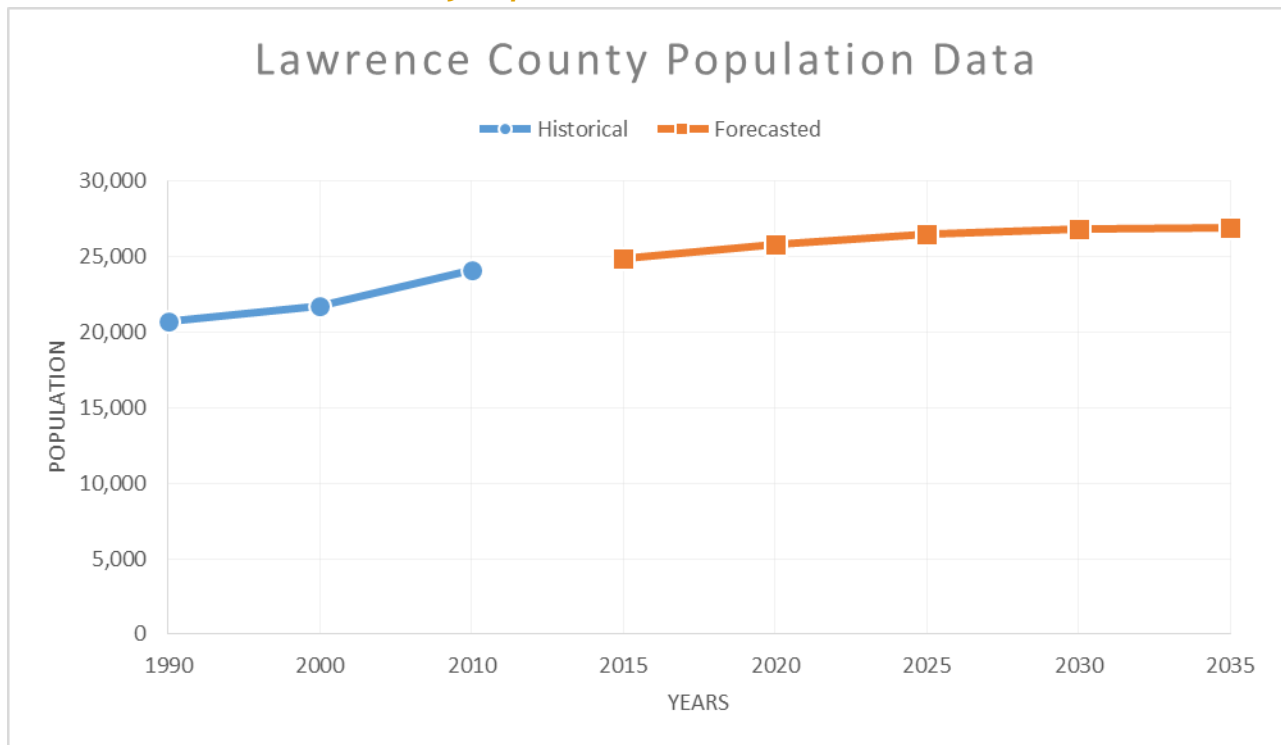
Exhibit 3-1 - City of Spearfish Population



Source: Woods & Poole Economics, City of Spearfish Comprehensive Plan 2013



Exhibit 3-2 - Lawrence County Population



Source: Woods & Poole Economics

Employment

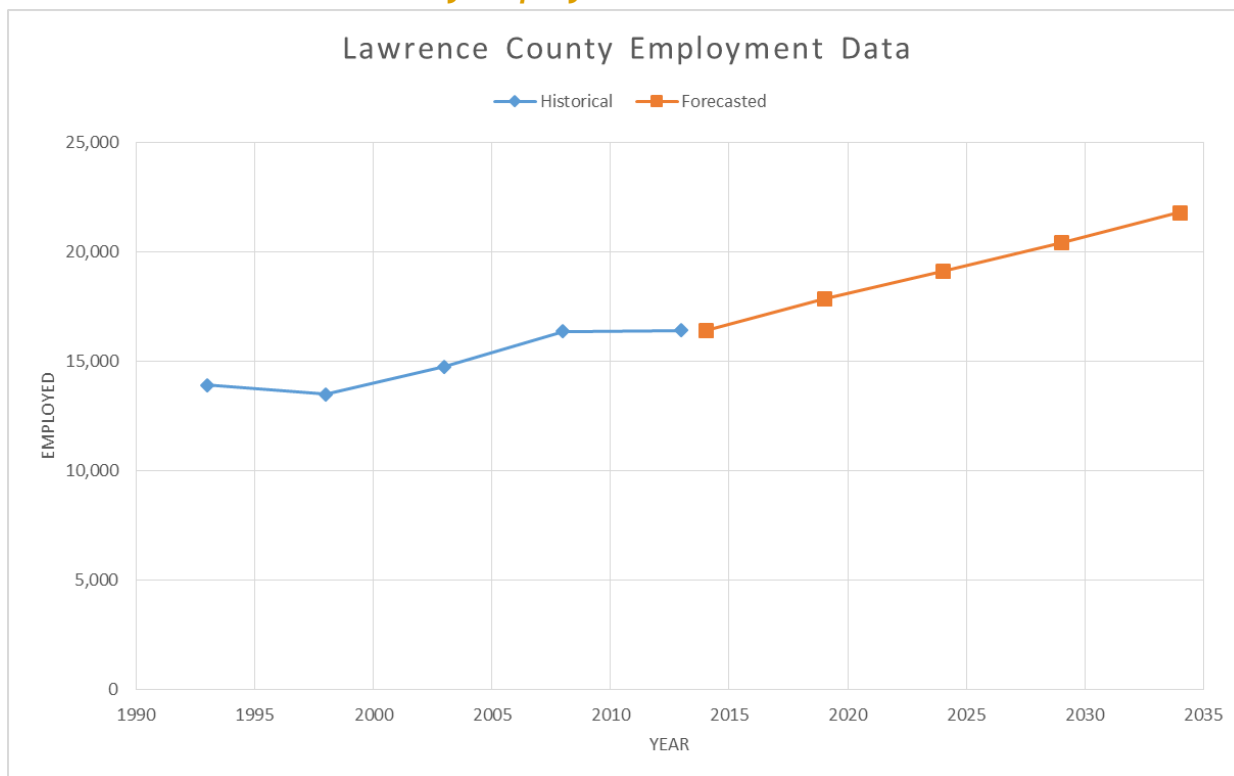
Employment figures are presented at the county level only since the airport serves as the only airport for Spearfish, Lead and Deadwood SD which each make use of the airport.

Employment has risen an average of 1.31 percent annually since 1998. Growth within the County has generally exceeded historical growth rates for the State of South Dakota and the United States over the same time period.

Spearfish has a mixed economy as a regional trade center with tourism, medical and education related jobs. Detailed information is located in **Appendix F - Airport Background**.



Exhibit 3-3 - Lawrence County Employment



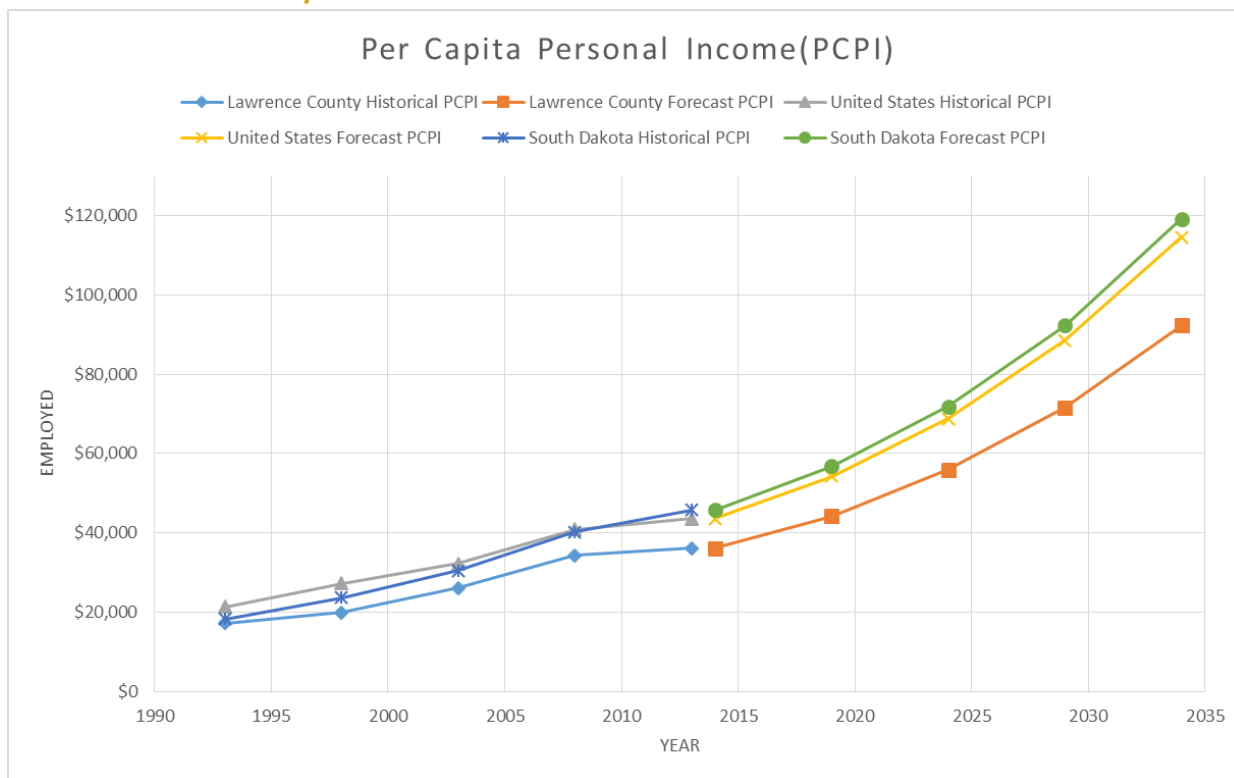
Source: Woods & Poole Economics

Income

Per Capital Personal Income (PCPI) was also considered as a factor affecting aviation activity. Those who have more disposable income may have a higher propensity to utilize the time savings of aviation. Growth in PCPI for Lawrence County is generally on par historically with state and national averages. Forecasts show income remaining slightly lower than state and national levels with comparable growth rates. The Lawrence County PCPI growth rate is forecast to be 4.01 percent annually assuming the current value of money.



Exhibit 3-4 - Per Capita Personal Income



Source: Woods & Poole Economics

Trends

Lawrence County has experienced predictable growth in the past. These same trends are expected to continue into the future resulting in a strong likelihood of aviation activity increasing at Black Hills Airport - Clyde Ice Field.

Based Aircraft Forecasts

A based aircraft is an operational and air worthy aircraft based at the airport for a majority of the year. Civil (non-military) based aircraft at Black Hills Airport - Clyde Ice Field are used for General Aviation operations. According to FAA Form 5010-1 Airport Master Record, there are currently 73 single-engine, 3 multi-engine and 0 jet aircraft for a total of 76 aircraft based at Black Hills Airport - Clyde Ice Field.

Trends

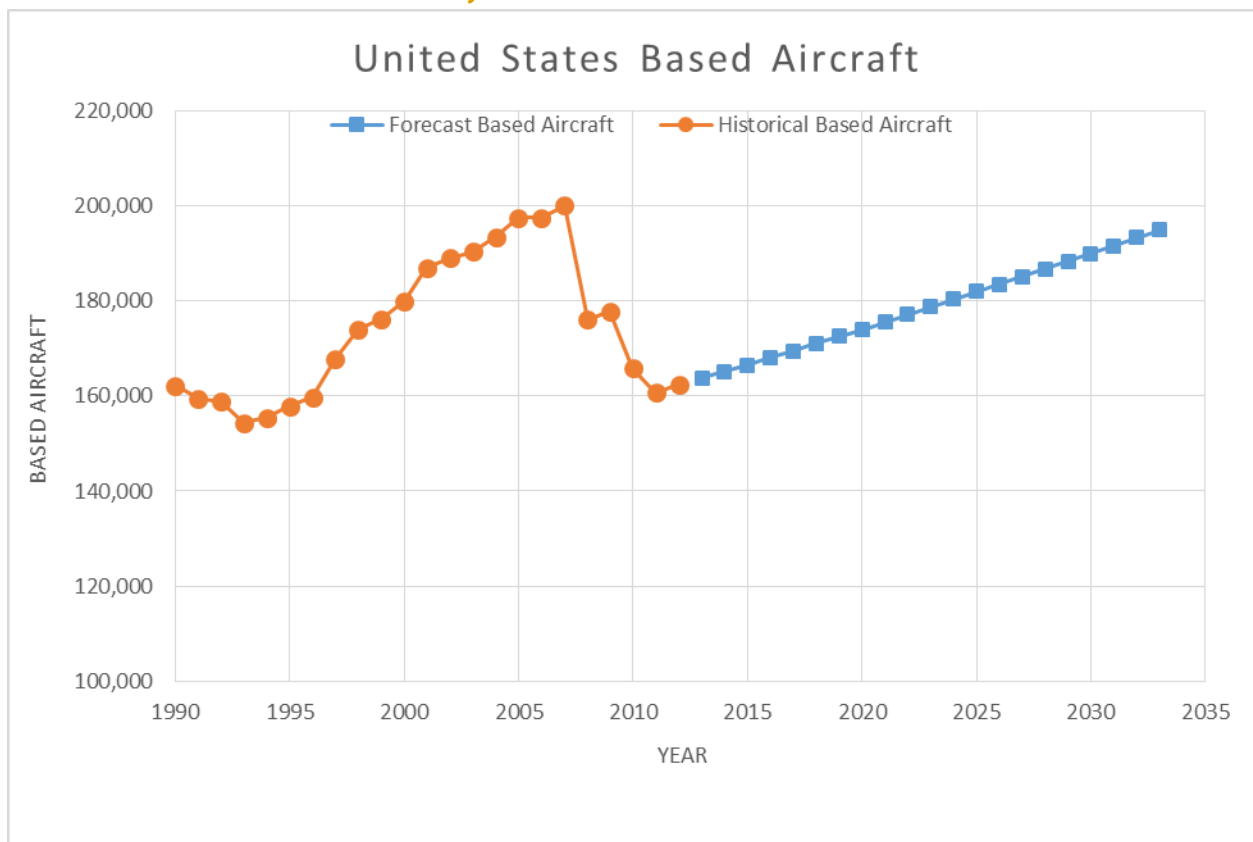
National

On a national basis, the 2013 FAA TAF indicated aircraft hit a 15-year low in 2011 after highs were achieved in 2007. The primary reason for the significant decline of based aircraft, beginning in 2007, was an FAA process of creating a comprehensive and verified National Based Aircraft database. Data in 2007 and prior was a sum of all based aircraft reported from individual airports with no verification. The FAA's National Based Aircraft database requires airports to verify specific aircraft and therefore removes duplication which was prevalent prior. Beginning in 2011, the data is much more accurate and following general historic



trends. The 2013 National forecast show a modest growth rate of 0.88 percent annually over the next 20 years.

Exhibit 3-5 - U.S. Based Aircraft



Source: 2013 [FAA Terminal Area Forecast](#)

Regional

All of the aircraft based at Black Hills Airport - Clyde Ice Field are small single and multi-engine GA aircraft used for flight training, recreational flying and business transport. Regionally based aircraft ownership has been holding steady, but as the population and the economy of the region continues to improve it is expected that there will be a slight increase in need for based aircraft space at airports in the region.

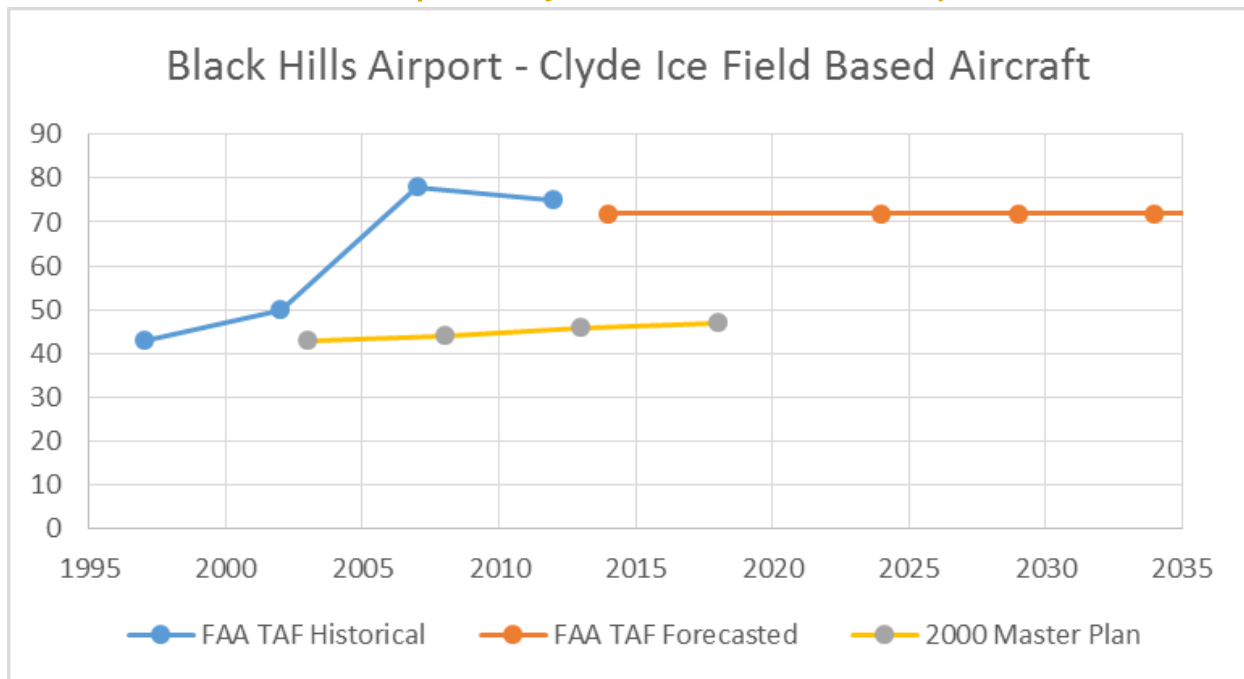
Airport

The FAA TAF for Black Hills Airport - Clyde Ice Field since 1990 (57) shows total based aircraft increasing until 2007 (78) and then slightly declining until 2013 (72). In discussions with the airport manager these slight variations were a result of when the 5010 inspections occurred (summer versus fall/winter counts). The 2014 FAA TAF published for SPF reports 72 based aircraft holding steady throughout the planning period and FAA Form 5010-1 *Airport Master Record* reports 76 (73 Single engine and 3 Multiengine) based aircraft in 2014. While based



aircraft figures vary from source to source, based on discussions with the airport manager we decided for this master planning effort to use 72 based aircraft as the baseline figure¹.

Exhibit 3-6 - Black Hills Airport - Clyde Ice Field Based Aircraft



Source: FAA Terminal Area Forecast, SPF Airport Master Record (2014)

Previous Forecasts

Airport Master Plan

The previous master plan was completed in 2000. At the time the master plan was completed the airport had 43 based aircraft. The master plan forecasted modest growth in based aircraft going from 43 to 47 total aircraft.

FAA Terminal Area Forecast (TAF)

As noted previously, the FAA's TAF shows that the airport has 72 based aircraft in 2014. The basis for the TAF is information on the 5010 report which is either administered by the State 5010 inspector or updated by the airport manager via the National Based Aircraft database (<https://basedaircraft.com>). The TAF² for Black Hills Airport - Clyde Ice Field, as is typical

¹ It was determined from further discussions with the Airport Manager that there are approximately 10 additional aircraft which are not listed as based at Spearfish. The owners of these 10 aircraft rent hangar space and do base their aircraft at Spearfish during parts of the year. The decision was made by the South Dakota Department of Transportation's Air, Rail & Transit Program Office to include these aircraft at other airports rather than at Spearfish. The Airport Manager will work with the FAA and through the National Based Aircraft Database to determine how these aircraft should be counted when they rent space and base their aircraft at Spearfish during portions of the year.

² While at the national level the FAA shows a steady growth rate in based aircraft, this is not reflected in any of the individual airport TAF reports which typically show no growth in based aircraft.



for general aviation airports, shows no growth in based aircraft over the planning period (20 years).

State Aviation System Plan

The 2010 South Dakota State Aviation System Plan forecasted that the airport would have 79 based aircraft in 2015. The system plan anticipated growth throughout its planning period with 83 aircraft in 2020, 88 aircraft in 2025 and 92 aircraft in 2030.

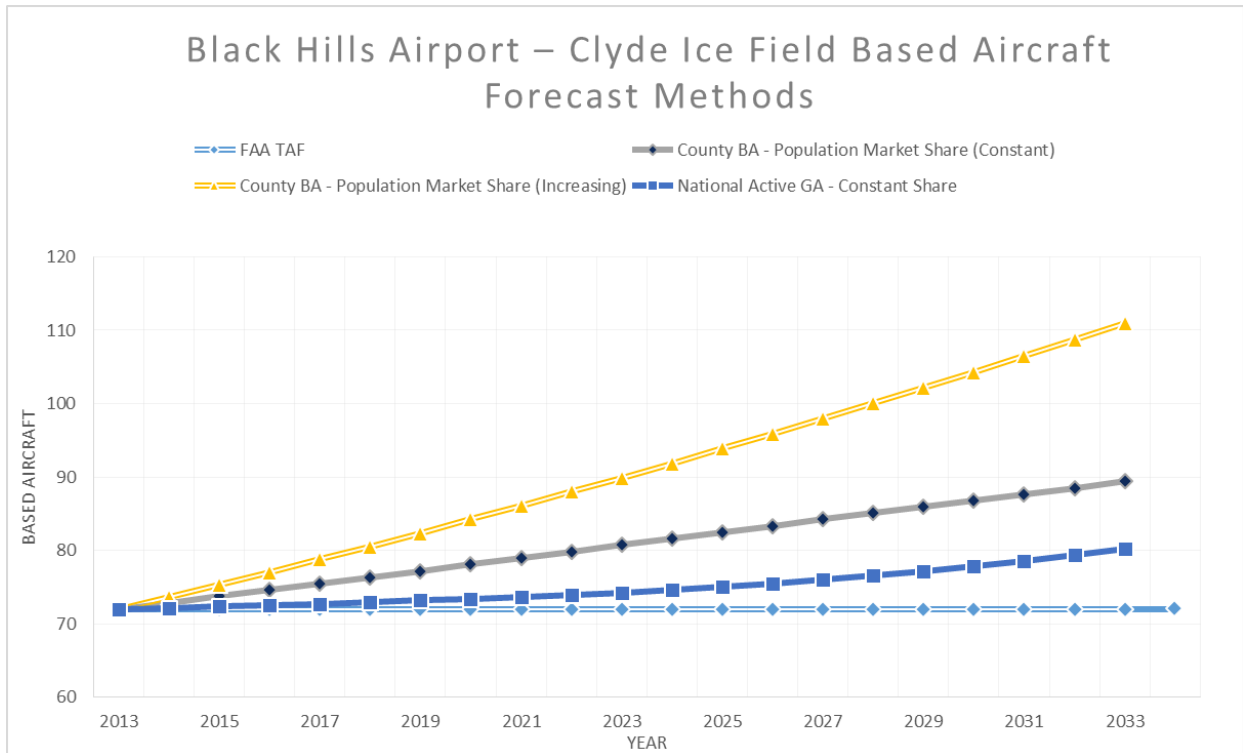
Proposed Forecast

Forecast methodologies evaluated include time series (trend) and market share analysis. Not enough accurate historic data is available for a regression analysis. Data used include based aircraft data from the airport records, FAA TAF, FAA Aerospace Forecasts, demographic and socioeconomic data.

Black Hills Airport - Clyde Ice Field based aircraft forecasts were first developed to determine the local demand for based aircraft facilities. Using FAA records there were 94 registered aircraft within Lawrence County. Several market share methods were reviewed to estimate future registered aircraft including constant population market share, decreasing population market share, national active GA and Air Taxi (AT) aircraft market share and historical trend using available data. The recommended method is a constant population market share which models the based aircraft growth per capita predicted in the FAA TAF for Black Hills Airport - Clyde Ice Field. In areas like Spearfish, which have a population base that is not only growing but growing with an affluent population, historically have a higher percentage of airport users, including more based aircraft. This, along with professional judgement, was the reason why constant population market was chosen as the recommended method for determining future based aircraft needs.



Exhibit 3-7 - Black Hills Airport - Clyde Ice Field Based Aircraft Forecast Methods



Source: *FAA Aircraft Registry, KLJ Analysis*

Table 3-1 - Based Aircraft Forecast

Based Aviation Forecasts Summary						
Metric	Base	Base+5	Base+10	Base+15	Base+20	CAGR
Total Based Aircraft	72	76	81	85	89	1.087%

Source: *KLJ Analysis*

Fleet Mix

It is anticipated that the fleet mix of based aircraft at Black Hills Airport - Clyde Ice Field will continue to be mostly comprised of single and multi-engine piston and turboprop aircraft over the planning period. However, as the local and regional economy continues to diversify it is expected that the airport will see more jet activity and at least one jet within the next five years. Ultimately it is anticipated that the airport will have 4 jet aircraft based at it.

Table 3-2 - Based Aircraft Fleet Mix Forecast

Based Aircraft Fleet Mix Forecast						
Metric	Base	Base+5	Base+10	Base+15	Base+20	CAGR
Single-Engine	65	67	69	70	70	0.37%
Multi-Engine*	4	6	7	9	11	5.19%
TurboJet	0	1	2	3	4	9.68%
Helicopter	0	0	0	0	0	NA
Other	3	3	3	3	4	1.45%
Total Based Aircraft	72	76	81	85	89	1.09%



Source: *SPF Airport Master Record (2014), KLJ Analysis*

**Includes multi-engine and all turboprop driven aircraft for size similarity purposes*

General Aviation Operations Forecast

Aircraft operations are split into two categories: local and itinerant. Local operations are performed by aircraft that remain in the local traffic pattern and stay within a 20-mile radius. Itinerant operations are performed by a landing aircraft arriving from outside the airport area, or a departing aircraft that leave the airport area.

Local Operations

Local operations typically include practice landings, touch-and-go's, practice approaches and maneuvering in the local area. Local operations are usually conducted by recreational and flight training aircraft.

Trends

According to the TAF local operations peaked in 2009 with 18,000 operations. In the 2010 TAF the FAA corrected the total number of local operations to 9,500; this number of operations is shown throughout the planning period (20 years). Since Black Hills Airport - Clyde Ice Field is a non-towered airport with an airport manager/FBO not available full time, operations (whether total or by specific aircraft type) are at best estimates. Through discussions with the airport manager/FBO it was determined that the current TAF local operations (9,500) is supportable based on relation to fuel sales and locally recorded activity.

Previous Forecasts

2000 Airport Master Plan

The 2000 Airport Master Plan forecasted 6,680 local operations in 2003, 7,013 local operations in 2008, 7,259 local operations in 2013 and 7,472 local operations in 2018. According to the master plan document, growth in local operations was predicted based on several factors including (but not limited to) national pilot training policies, growth in shared aircraft ownership and an increase in population and economic activity in the Black Hills area.

FAA Terminal Area Forecast

As described above, the TAF³ for Black Hills Airport - Clyde Ice Field shows no growth in local operations throughout the planning period. It is not uncommon for the TAF at specific airports to show no growth at general aviation airports. The TAF, which is primarily generated for Air Traffic planning purposes, relies on master planning efforts to identify growth. The master planning efforts focus on local metrics and therefore provide better justification to forecast growth.

³ While at the national level the FAA shows a steady growth rate in local operations, this is not reflected in any of the individual airport TAF reports which typically show no growth in local operations.



State Aviation System Plan

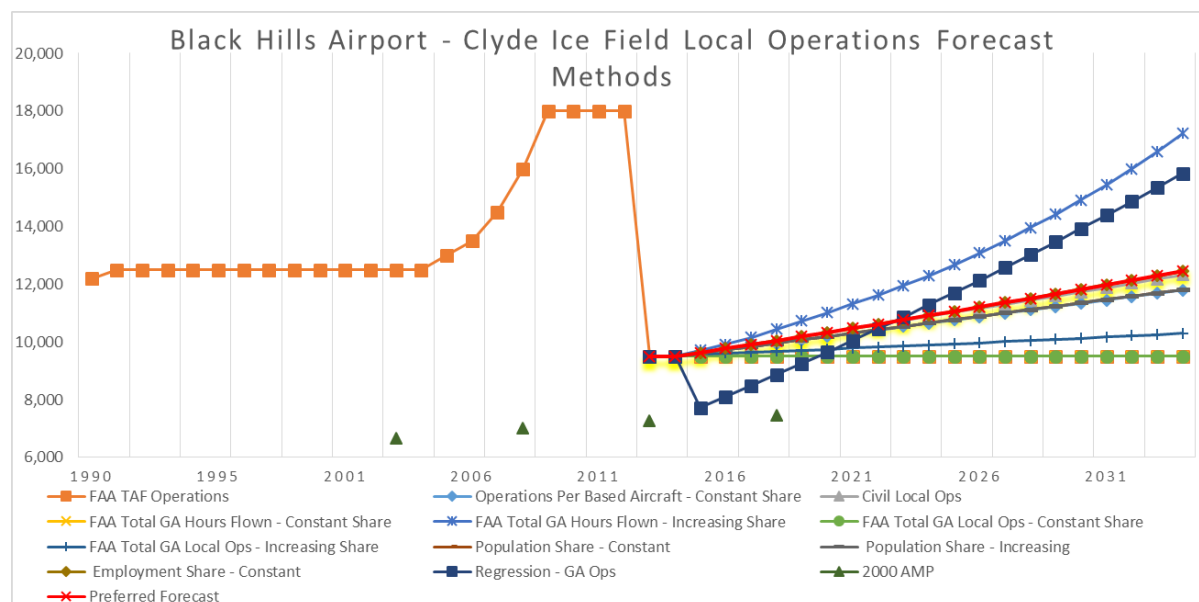
The 2010 South Dakota State Aviation System Plan did not break out operations into local and itinerant, rather it showed the total amount of operations. In 2015 the plan forecasted 25,988 operations, in 2020, 26,642 operations, in 2025, 27,321 and in 2030, 27,999.

Proposed Forecast

The share analysis forecast reviewed historical local operations in comparison to various metrics including Operations Per Based Aircraft (OPBA), total U.S. GA and AT hours flown, total U.S. local operations, County population and County employment in an attempt to develop a realistic forecast.

The preferred forecast (Employment Share) assumes modest growth of 1.36 percent annually over the next 20 years as the regional economy continues to evolve and the regional population continues to grow. With a diversifying economy and a larger population base the employment share forecast provided a balance of growth in line with what is typically seen at airports around the country, modest growth. Since operations will not drive the need for development at the airport, this modest growth, allows the airport to plan for the future but not overly anticipate development projects based on robust growth scenarios.

Exhibit 3-8 - Black Hills Airport - Clyde Ice Field Local Operations Forecast Methods



Source: FAA Terminal Area Forecast, 2000 SPF Airport Master Plan, KLJ Analysis

Table 3-3 - GA Local Operations Forecast

GA Local Operations Forecast						
Metric	Base	Base+5	Base+10	Base+15	Base+20	CAGR
Local Operations	9,500	10,194	10,915	11,671	12,456	1.36%

Source: KLJ Analysis



Itinerant Operations

Itinerant operations are those involving aircraft departing one airport and arriving at another airport. Air taxi is a form of itinerant operations and is defined as the scheduled and on-demand, commercial carriage of passengers, cargo or mail performed by a certificated operator.

Trends

Much like the discussion above in the *Local Operations* section TAF Itinerant operations peaked in 2009 with 11,000 operations. In the 2013 TAF, the FAA adjusted the number of GA itinerant operations to 3,800; this number of operations is shown throughout the planning period (20 years). Since Black Hills Airport - Clyde Ice Field is a non-towered airport with an airport manager/FBO not available full time, operations (whether total or by specific aircraft type) are at best estimates. Through discussions with the airport manager/FBO it was determined that the current TAF GA itinerant operation number per year (3,800) is supportable.

GA itinerant operations have been declining in the recent years with a high figure achieved in 2009 with 11,000 operations. This can be attributed in part to the decrease in overall GA activity as a result of higher operating costs and the loss of the local flight school. The 2013 FAA TAF projects future operations will steadily grow at about a 0.45 percent annual rate.

Previous Forecasts

2000 Airport Master Plan

The 2000 Airport Master Plan forecasted 2,285 itinerant operations in 2003, 6,143 itinerant operations in 2008, 7,047 itinerant operations in 2013 and 7,972 itinerant operations in 2018. According to the master plan document growth in itinerant operations was predicted based on several factors including (but not limited to) national pilot training policies, growth in shared aircraft ownership and an increase in population and economic activity in the Black Hills area.

FAA Terminal Area Forecast

As described above the TAF⁴ for Black Hills Airport - Clyde Ice Field shows no growth in itinerant operations throughout the planning period. It is not uncommon for the TAF for specific airports to show no growth at general aviation airports. The TAF, which is primarily generated for Air Traffic planning purposes, typically relies on master planning efforts to identify growth. The master planning efforts focus on local metrics and therefore provide better justification to forecast growth.

⁴ While at the national level the FAA shows a steady growth rate in itinerant operations, this is not reflected in any of the individual airport TAF reports which typically show no growth in itinerant operations.



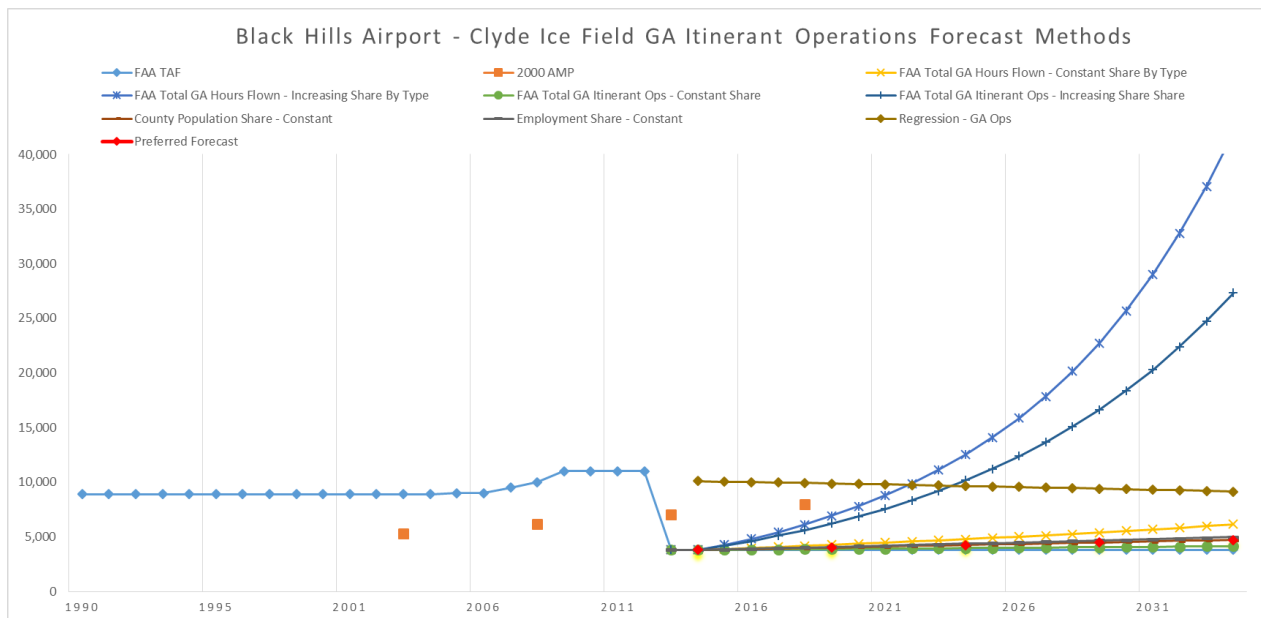
State Aviation System Plan

The 2010 South Dakota State Aviation System Plan did not break out operations into local and itinerant, rather it showed the total amount of operations. In 2015 the plan forecasted 25,988 operations, in 2020, 26,642 operations, in 2025, 27,321 and in 2030, 27,999.

Proposed Forecast

Several forecast methods were evaluated to estimate future operations including trend analysis and share analysis. Trend analysis reviewed trends over the past three, five and ten years. Share analysis reviewed historical GA itinerant operations in relation to various metrics including total U.S. GA and AT hours flown, total U.S. GA itinerant operations, County population and County employment to develop a realistic forecast considering available metrics.

Exhibit 3-9 - Black Hills Airport - Clyde Ice Field GA Itinerant Operations Forecast Methods



Source: *FAA Terminal Area Forecast, 2000 SPF Airport Master Plan, KLJ Analysis*

The preferred forecast (County Population Constant Share) assumes slight growth in itinerant operations over the planning period with an average annual growth rate of 1.09 percent.

Table 3-4 - GA Itinerant Operations Forecast

GA Itinerant Operations Forecast						
Metric	Base	Base+5	Base+10	Base+15	Base+20	CAGR
GA Itinerant Operations	3,800	4,078	4,366	4,668	4,982	1.36%

Source: *KLJ Analysis*

Fleet Mix

The overall GA operations fleet mix combines local and itinerant operations. Local operations are assumed to be almost exclusively GA. Single-engine piston operations are forecast to



increase share because of the return of more civil local operations in lieu of multi-engine piston aircraft. Turboprop operations still make up the majority of GA itinerant operations with an estimated 31 percent of total operations.

Table 3-5 - GA Fleet Mix Forecast

GA Fleet Mix Forecast						
Metric	Base	Base+5	Base+10	Base+15	Base+20	CAGR
Single-Engine Piston	65	67	69	70	70	0.37%
Multi-Engine Piston & All Turboprop	4	6	7	9	11	5.19%
Turbojet	0	1	2	3	4	9.68%
Helicopter	0	0	0	0	0	NA
Other	3	3	3	3	4	1.45%
Total Share	72	76	81	85	89	1.09%

Source: Black Hills Airport - Clyde Ice Field, KLJ Analysis

Table 3-6 - GA Operations Forecast Summary

GA Operations Forecast Summary						
Metric	Base	Base+5	Base+10	Base+15	Base+20	CAGR
Local Operations	9,500	10,194	10,915	11,671	12,456	1.36%
GA Itinerant Operations	3,800	4,078	4,366	4,668	4,982	1.36%
Total GA Operations	13,300	14,271	15,281	16,339	17,438	1.36%
Local Share	69%	69%	69%	69%	69%	NA
Itinerant Share	31%	31%	31%	31%	31%	NA

Source: KLJ Analysis

Military Operations

The FAA TAF showed 160 itinerant military operations for 2014. Since military operations are not consistent from year to year, based on availability and training requirements, this master planning effort choose to maintain 160 operations by military aircraft throughout the planning period.

Critical Aircraft

The critical design aircraft is identified as the most demanding aircraft or family of aircraft to regularly use the airport. The Airport Manager/FBO at the Black Hills Airport - Clyde Ice Field provided operational logs starting in 2008 which show the number of operations per month by aircraft type (Single, Light Twin, Turboprop, Turbojet and Helicopter). The logs provide a valuable measure of total operations but do not include sufficient information to determine the Airport Reference Code (ARC) for the aircraft.



Table 3-7 - Airport Manager/FBO Logs of Aircraft Operations

Airport Manager/FBO Logs of Aircraft Operations⁵							
Aircraft Type	Ops 2008	Ops 2009	Ops 2010	Ops 2011	Ops 2012	Ops 2013	Ops 2014
Single	4,912	5,530	5,871	6,398	6,962	5,081	3,989
Light Twin	278	225	256	185	186	218	171
Turboprop	402	364	570	612	705	543	627
Turbojet	153	154	237	191	234	242	265
Helicopter	148	126	128	198	299	251	196
Total	5,893	6,399	7,062	7,584	8,386	6,335	5,248

Source: KLJ Analysis, FBO Records

In addition, FAA Flight Plan data since 2008 was gathered. The FAA Flight Plan data included aircraft N-numbers and therefore the ARC could be determined. The FAA Flight Plan data was therefore used as the primary basis for determining the airports critical aircraft.

Table 3-8 - Historical Critical Design Aircraft IFR Operations

Historical Critical Design Aircraft IFR Operations							
ARC	Ops 2008	Ops 2009	Ops 2010	Ops 2011	Ops 2012	Ops 2013	Ops 2014
A-I	332	433	439	330	318	355	498
A-II	24	27	72	85	134	111	114
B-I	230	187	223	161	161	144	171
B-II	287	330	434	438	405	391	374
C-I	7	18	20	18	38	21	30
C-II	36	45	79	75	92	126	116
D-I	12	0	14	11	10	4	6
D-II	2	6	7	5	6	10	28
Total	931	1,046	1,290	1,123	1,164	1,162	1,337

Source: KLJ Analysis, FAA Flight Plan Data

In order to determine the total amount of critical aircraft types operating at the airport during the year the Single and Helicopter aircraft types were determined to be equal to the A-I ARC and were typically VFR. It was also determined by using the average Airport Manager/FBO Logs from 2008-2014 in comparison with the average FAA Flight Plan data from 2008-2014 that 80% of the total activity were with single engine aircraft (distributed between A-I and B-I). The remaining types (Light Twin, Turboprop and Turbojet) were allocated

⁵ The reports of activity from the FBO Logs provide a good breakdown of aircraft types including IFR and VFR activity. The total numbers however appeared to decrease in 2013 and 2014. In discussions with the airport manage this decline is attributed to changes in personnel resulting in a lower count most notably in 2014. Fuel sales from the FBO and the IFR Operations in Exhibit 3-17 show that the downturn in FBO Logs is not a trend in total operations.



proportionally based on the FAA Flight Plan data to A-II, B-I, B-II, C-I, C-II, D-I and D-II. This is the basis for how the base year allocation of critical design aircraft was generated.

Table 3-9 -Forecast Critical Design Aircraft Operations

Critical Design Aircraft Operations					
FAA ARC	Base	Base+5	Base+10	Base+20	CAGR
A-I	8,983	9,488	10,022	11,150	1.10%
A-II	385	420	458	544	1.74%
B-I	2,073	2,283	2,491	2,924	1.77%
B-II	1,808	1,978	2,154	2,558	1.77%
C-I	105	117	127	145	1.65%
C-II	385	418	456	530	1.65%
D-I	38	41	44	50	1.40%
D-II	43	46	49	57	1.40%
Total Operations*	13,820	14,791	15,801	17,958	1.36%

Source: KLJ Analysis Note: ARC = FAA Airport Reference Code. *total may be slightly different due to rounding.

Annual Instrument Approaches

Annual instrument approaches (AIAs) are defined as an approach to an airport conducted in actual instrument meteorological conditions. For purposes of this definition, an approach initiated when the observed visibility is less than 3 miles or the cloud ceiling is less than the final approach fix is considered an instrument approach.

To determine AIAs, the number of itinerant operations are totaled from the estimates and forecasts and compared to annual operations. The number of instrument flights are determined. Approximately 1.63 percent of itinerant flight operations are conducted under instrument flight rules (IFR) based on historic weather conditions. It is anticipated that as aircraft operating at the airport continue to increase in size and complexity more IFR operations will occur; this is represented in the table below. Total AIAs for the Airport are forecast to increase at a 1.81 percent annual rate.



Table 3-10 - Annual Instrument Approach Forecast

Annual Instrument Approach Forecast				
Aircraft Type	Base	Base+5	Base+10	Base+20
Annual Operations	13,820	14,791	15,801	17,958
Itinerant Operations	4,320	4,597	4,886	5,502
% IFR Itinerant Operations	40%	42%	42%	45%
IFR Itinerant Operations	1,728	1,931	2,052	2,476
IFR Approaches	864	965	1,026	1,238
Instrument Approach Weather	8.14%			
Annual Instrument Approaches	70	79	84	101
AIA as Percent of Itinerant	1.63%	1.71%	1.71%	1.83%

Source: *National Climatic Data Center, KLJ Analysis*

Peak Activity

The results of the peak activity forecasts will be used to determine the facility requirements primarily for apron space and itinerant storage. Peak periods evaluated include the peak month, design day and design hour peaking characteristics for aircraft operations.

Operations

Peak Month

The peak month of airport operations was determined by reviewing the prior three years of monthly airport operations figures from the Airport FBO/Airport Manager. This method evaluates historic patterns of airport operations activity to identify the peak month. The peak month was determined to be July 2012 with 13.67 percent of the annual operations for fiscal year 2012, consistent with the fiscal year periods evaluated in this forecast effort. Peak month airport operations forecast based on the three year historic operations peak outlined in the following table.



Table 3-11 - Historic Monthly Operations

Historic Monthly Operations ⁶						
Month	FFY 2012 Operations	Percent	FFY 2013 Operations	Percent	FFY 2014 Operations	Percent
October	598	7.18%	611	7.33%	475	8.96%
November	587	7.05%	631	7.57%	326	6.15%
December	434	5.21%	432	5.19%	238	4.49%
January	433	5.20%	339	4.07%	216	4.08%
February	634	7.61%	455	5.46%	219	4.13%
March	635	7.62%	415	4.98%	316	5.96%
April	527	6.33%	309	3.71%	407	7.68%
May	584	7.01%	501	6.01%	532	10.04%
June	834	10.01%	701	8.41%	555	10.47%
July	1,139	13.67%	917	11.01%	809	15.26%
August	1,024	12.29%	915	10.98%	620	11.70%
September	902	10.83%	744	8.93%	587	11.08%
TOTAL	8,331	100.00%	6,970	100.00%	5,300	100.00%

Source: FBO/Airport Manager, KLJ Analysis

Table 3-12 - Peak Month Operations Forecast

Peak Month Operations Forecast					
Metric	Base	Base+5	Base+10	Base+20	CAGR
Operations					
Annual	13,820	14,791	15,801	17,958	.97%
Peak Month (13.67)	1,889	2,022	2,160	2,455	.97%

Source: KLJ Analysis

Design Day

Design day is a day when the number of operations is in greater concentration than typical days. At Black Hill Airport - Clyde Ice Field this occurs because recreational and pilot training activities are concentrated on the weekends. For this analysis a factor of 4.0% of the peak month operations was used to determine the design day for the Airport. Based on discussions with the airport manager this percentage accounts for the majority of time peaking occurs at the Airport; however there are several days during the Sturgis Motorcycle Rally when there are more operations than are accounted for in the table below. With that said we cannot justify developing the airport based on a once a year event.

⁶ These historic monthly operations are totaled based on Federal Fiscal Year and therefore do not directly correspond with the FBO log calendar year totals in Table 3-7.



Table 3-13 - Design Day Operations Forecast

Design Day Operations Forecast					
Metric	Base	Base+5	Base+10	Base+20	CAGR
Operations					
Peak Month	1,889	2,022	2,160	2,455	.97%
Design Day	76	81	86	98	.97%

Source: KLJ Analysis

Design Hour

The design hour was developed by using the Peak Month Peak Day (98) and then discussing with the airport manager what percentage of operations occur during a typical day during the peak month. Based on this approach and using professional judgment an estimate of 20 percent of operations occur during the design hour.

Table 3-14 - Design Hour Operations Forecast

Design Hour Operations Forecast		
Peak Hour Operations	Daily Average	Percent of Daily
20	98	20%

Source: KLJ Analysis

Forecast Summary

The FAA templates to compare the proposed forecasts to the current published FAA Terminal Area Forecast are presented in the following pages as Table 3-15 and 3-16 with the FAA approval letter as Exhibit 3-10.



Table 3-15 - Airport Master Plan Forecast

Black Hills Airport - Clyde Ice Field Spearfish, SD Aviation Forecasts TABLE 3-15		Airport Master Plan Forecast 6/11/2015										
		Specify base year:					Average Annual Compound Growth Rates					
A. Forecast Levels and Growth Rates		2014	2019	2024	2014	2019	2024	2019	2024	2029	2034	Entire Period
		(Federal Fiscal Year)										
Operations												
Itinerant												
Commuter/Air Taxi		360	360	360	360	360	360	360	360	0.00%	0.00%	0.00%
Total Commercial Operations		360	360	360	360	360	360	360	360	0.00%	0.00%	0.00%
General Aviation - Fixed Wing		3,615	3,874	4,148	4,435	4,733	4,733	4,733	4,733	1.37%	1.37%	1.36%
General Aviation - Rotorcraft		185	204	218	233	249	249	249	249	0.00%	0.00%	1.50%
Military		160	160	160	160	160	160	160	160	0.00%	0.00%	0.00%
Total Itinerant Operations		4,320	4,597	4,886	5,188	5,502	5,502	5,502	5,502	1.23%	1.23%	1.22%
Local												
General Aviation - Fixed Wing		9,037	9,684	10,369	11,087	11,833	11,833	11,833	11,833	1.37%	1.37%	1.36%
General Aviation - Rotorcraft		463	510	546	584	623	623	623	623	0.00%	0.00%	1.50%
Military		0	0	0	0	0	0	0	0	0.00%	0.00%	0.00%
Total Local Operations		9,500	10,194	10,915	11,671	12,456	12,456	12,456	12,456	1.40%	1.38%	1.36%
TOTAL OPERATIONS		13,820	14,791	15,801	16,859	17,958	17,958	17,958	17,958	1.35%	1.33%	1.32%
Annual Instrument Approaches		70	79	84	93	101	101	101	101	1.73%	1.87%	1.81%
Based Aircraft												
Single Engine		65	67	69	70	70	70	70	70	0.50%	0.50%	0.37%
Multi Engine		4	6	7	9	11	11	11	11	5.56%	5.56%	5.19%
Turbojet		0	1	2	3	4	4	4	4	14.87%	14.87%	9.68%
Helicopter		0	0	0	0	0	0	0	0	-	-	-
Other		3	3	3	3	4	4	4	4	-	-	1.45%
TOTAL		72	76	81	85	89	89	89	89	1.15%	1.12%	1.09%
Local share		69%	69%	69%	69%	69%	69%	69%	69%			
Itinerant share		31%	31%	31%	31%	31%	31%	31%	31%			
GA operations per based aircraft		185	187	189	192	195	195	195	195	0.25%	0.26%	0.27%



Table 3-16 - Aviation Forecast TAF Comparison

Black Hills Airport - Clyde Ice Field Comparing Airport Planning and FAA TAF Forecasts TABLE 3-16		Master Plan Forecast 6/19/2015		
	<u>Year</u>	<u>Airport Forecast</u>	<u>FAA Terminal Area Forecast (TAF)</u>	<u>AF/TAF (% Difference)</u>
Passenger Enplanements				
Base yr.	2014	NA	0	NA
Base yr. + 5yrs.	2019	NA	0	NA
Base yr. + 10yrs.	2024	NA	0	NA
Base yr. + 15yrs.	2029	NA	0	NA
Base yr. + 20yrs.	2034	NA	0	NA
	<i>Growth Rate</i>	NA	NA	
Commercial Operations				
Base yr.	2014	360	360	0.00%
Base yr. + 5yrs.	2019	360	360	0.00%
Base yr. + 10yrs.	2024	360	360	0.00%
Base yr. + 15yrs.	2029	360	360	0.00%
Base yr. + 20yrs.	2034	360	360	0.00%
	<i>Growth Rate</i>	0.00%	0.00%	
Total Operations				
Base yr.	2014	13,820	13,820	0.00%
Base yr. + 5yrs.	2019	14,791	13,820	7.03%
Base yr. + 10yrs.	2024	15,801	13,820	14.34%
Base yr. + 15yrs.	2029	16,859	13,820	21.99%
Base yr. + 20yrs.	2034	17,958	13,820	29.94%
	<i>Growth Rate</i>	1.32%	0.00%	
Based Aircraft				
Base yr.	2014	72	72	0.00%
Base yr. + 5yrs.	2019	76	72	6.00%
Base yr. + 10yrs.	2024	81	72	12.10%
Base yr. + 15yrs.	2029	85	72	18.16%
Base yr. + 20yrs.	2034	89	72	24.13%
	<i>Growth Rate</i>	1.09%	0.00%	



Exhibit 3-10 - FAA Forecast Approval Letter



U.S. Department
of Transportation
**Federal Aviation
Administration**

Federal Aviation Administration
Dakota-Minnesota Airports District Office
Bismarck Office
2301 University Drive, Building 23B
Bismarck, ND 58504

Federal Aviation Administration
Dakota-Minnesota Airports District Office
Minneapolis Office
6020 28th Avenue South, Suite 102
Minneapolis, MN 55450

August 28, 2015

Mr. Ray Jilek, Airport Manager
Black Hills Airport – Clyde Ice Field
300 Aviation Place
Spearfish, SD 57783

Black Hills Airport – Clyde Ice Field
Spearfish, South Dakota
Approval of Master Plan Forecast

Dear Mr. Jilek:

The Airport Master Plan aviation forecast contained in the most recent revised draft forecasting spreadsheet prepared by KLJ Engineering dated June 19, 2015 (attached) has been approved.

The Federal Aviation Administration concurs with the use of the forecast contained on the above referenced spreadsheet for the remainder of your current master planning efforts.

If you have any questions, comments or concerns, please contact Mr. Scott Brownlee, Community Planner in our office at 701-323-7383.

Sincerely,

**ORIGINAL SIGNED BY
LAURIE J. SUTTMEIER**

Laurie J. Suttmeier, Assistant Manager
Bismarck Office

attachment

cc: Mr. Bruce Outka, Lawrence County
South Dakota Department of Transportation, Aeronautics
KLJ Engineering Inc. – Rapid City ✓