

Chapter Two

Forecasts



INTRODUCTION

Aviation activity forecasts serve as a guideline for the development of airport facilities. Development can be planned based on existing and expected demand, creating efficiencies and economies of scale. While forecasts serve an important purpose in planning, it is important to recognize the proximate nature by which they are formed. In aviation, forecasts represent a prediction of traffic based upon known operational inputs. Forecasts are subject to extraordinary or unforeseen events, called outliers. Consequently, forecasts describe only the general trend of average conditions expected during the forecast period. Forecasts are based upon historical, demographic and economic conditions.

Most general aviation airports are uncontrolled, meaning there are no air-traffic controller facilities located on site. At these uncontrolled airports, estimates of existing aviation activity are necessary in order to form a basis for the development of realistic forecast projections. Estimates of existing aviation activity are formed upon review of based aircraft, available historical data, periodic traffic counts, fuel sales records, state and national data and contacts with airport users.

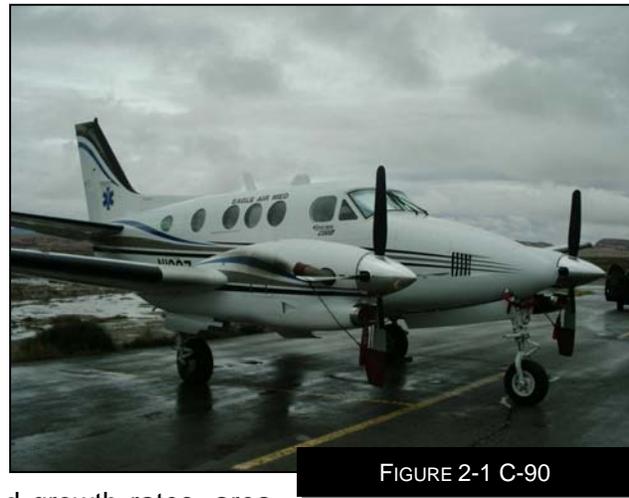


FIGURE 2-1 C-90

Projections are made based upon established growth rates, area demographics, industry trends and other important indicators. Forecasts are generally prepared for the short-term (0 to 5 years), medium-term (6 to 10 years) and long-term (11 to 20 years) time frames. Forecasts developed within these three periods allow airport improvements to be timed to meet demand in a timely and appropriate manner.

NATIONAL TRENDS

National trends are the first activity indicators to be analyzed. Air transportation systems by nature impact areas far beyond any local geographic region. Thus, aviation activity must be considered in a holistic sense to produce a confident assessment of activity.

There are four types of aircraft operations considered in the planning process. These are termed local, based, itinerant and transient and are defined as follows:

- Local operations are defined as aircraft movements (departures or arrivals) for the purpose of training, pilot currency or pleasure flying within the immediate vicinity of the airport. These operations typically consist of touch-and-go operations, practice instrument approaches, flight to and within local practice areas and pleasure flights that originate and terminate at the airport.
- Itinerant operations are defined as arrivals and departures other than local operations as described above. This type of operation is closely

tied to local demographic indicators such as local industry and business use of aircraft and usage of the facility for recreational purposes.

- Based aircraft operations are defined as the total operations made by aircraft based (stored on a permanent, seasonal or long-term basis) at the airport with no attempt to classify the operations as to purpose.
- Transient operations are defined as the total operations made by aircraft other than those based at the airport. These operations typically consist of business or pleasure flights originating elsewhere with termination or a stopover at the airport.



FIGURE 2-2 AIRCRAFT MIX

National activity levels fluctuate based upon socio-economic and political factors. Technological innovation can also greatly impact aviation. General aviation manufacturers are currently working with the National Aeronautics and Space Administration (NASA) to develop low-cost and efficient jets for use by private individuals. The Small Aircraft Transportation System (SATS) is expected to increase the proportion of turbine to piston aircraft in the long-term. These composite turbojet aircraft, most with ARCs of B-I, will be more affordable and capable of operating at most airports, including Kayenta. The expected impact will be an increase in airport utilization. The General Aviation Manufacturer's Association (GAMA) produces activity forecasts for the nationwide system. Table 2-1 shows the latest forecast produced for aviation activity.

TABLE 2-1 NATIONAL GENERAL AVIATION FORECAST
Hours Flown (in millions)

Year	SE	ME	TP	TJ	Total
2004	18.1	2.9	2.1	3.1	30.2
2005	18.3	2.9	2.2	3.3	30.7
2006	18.4	2.9	2.1	3.6	31.1
2007	18.6	2.9	2.1	3.8	31.6
2008	18.7	2.9	2.2	4.1	32.2
2009	18.8	2.9	2.2	4.4	32.7
2010	18.9	2.9	2.2	4.7	33.2
2011	19.0	2.9	2.2	5.0	33.7
2012	19.1	2.9	2.2	5.3	34.2
2013	19.2	2.9	2.2	5.6	34.7
2014	19.3	2.9	2.3	5.9	35.2

Source: General Aviation Manufacturer's Association 2003 Statistical Handbook

A significant decrease in general aviation activity resulted from the 2001 terrorist attacks. Known operations for 2003 rebounded to a 13% increase, meaning general aviation activity recovered.

One factor driving the increase in operations is the proliferation of used aircraft on the market. GAMA reports that fully 17% of business jets are for sale, meaning prices have softened considerably. Similar trends can be found for piston and turboprop markets. The excess supply of aircraft has reduced the cost of acquisition, meaning it is relatively cheaper to fly. This has a positive impact on aviation operations nationwide. Consequently, continued growth is expected as the greater economic outlook improves.

Aircraft Type	Tail Number
King Air C-90	N13GZ
King Air B-200	N888ZX

EXISTING ACTIVITY

There are various sources available for determining existing activity levels at an airport. These can include, but are not limited to, Federal Aviation Administration (FAA) Form 5010-1, FAA Terminal Area Forecast (TAF), State Aviation System Plans, on-site inventory and the airport sponsor's records.

An aircraft fleet mix analysis is used to evaluate the type of aircraft currently using and expected to use the airport. This evaluation aids the airport sponsor in implementing development plans to serve the type of aircraft the airport users prefer. The design criteria for runways and taxiways are typically based upon the weight, wingspan and speed of the aircraft that will use the airport facilities. Consequently, it is imperative to analyze existing and forecast users and their aircraft.

The FAA Airport Master Record, Form 5010, is the official record used to document airport physical conditions and other pertinent information. The information is collected via inspection and generally includes an annual estimate of aircraft activity as well as based aircraft. Unfortunately, the accuracy of the information contained in the 5010-1 Form varies according to the existing conditions surveyed at the time of submittal. This means the Master Record should not be used as a sole indicator of activity because its estimates can lag behind actual changes in activity. The current FAA 5010-1 Form for Kayenta Airport indicates three based aircraft and 4,700 annual operations.

The FAA also maintains active historical records and operational activity forecasts. The Terminal Area Forecast (TAF) is an historical record and forecast for based aircraft and annual operations. The 2004 TAF reports three presently based aircraft at the airport and 4,626 annual operations.

	2004 Form 5010	2004 FAA TAF	2004 Inventory
Based Aircraft	3	3	2
Air Taxi Operations	1,000	1,000	156
Local General Aviation	2,500	2,450	0
Itinerant General Aviation	1,200	1,176	4,368
Total Operations	4,700	4,626	4,524

* Estimated from airport user input

An on-site inventory conducted in September 2004 identified 2-based aircraft; both multi-engine turboprop aircraft used for air medivac operations. The airport manager confirmed this information. Table 2-3 summarizes existing based aircraft and activity estimates. These estimates were derived from local pilots and airport users. Eagle Air Med and Aero Care both utilize the field conducting an approximate average of three flights daily each, thus generating 12 air ambulance operations per day. The 156 air taxi operations were derived from air tour operator

estimates that stated they utilize the airport on an occasional basis approximately once a week. There are currently no Military operations taking place at the Kayenta Airport.

FORECASTS OF AVIATION ACTIVITY

BASED AIRCRAFT

Although the number of based aircraft at the airport is currently low, the potential exists for future air tour operators to use Kayenta and provide an increase in traffic from tourists. The volume and actual number of aircraft that will be based in Kayenta depends on many factors and the action taken to draw in additional services to the area.

The first method (Low) used a population trend projection of the current number of .38 aircraft per 1,000 people which was found by taking 2,000 and dividing it by 5,241 which is the number of people per based aircraft in Kayenta, the result gives Kayenta 3 based airplanes in 2025.

The second forecasting method (High) for based aircraft utilized a comparison analysis of other communities in Arizona and Utah with similar population and per capita income. The conclusion of the comparison is reflected in Table 2-4. Using the Kayenta Strategic Plan for Community and Economic Development, Kayenta is expected to enhance the quality of life for the people living there. The results of implementing the plan are anticipated to raise the Per Capita Income to levels that reflect the communities of similar size. The average number of airplanes per 1,000 people for the comparison communities is 3. The per capita based aircraft ratio was trended to 3 based airplanes per 1,000 people over the 20-year planning period and was then multiplied by the projected population for Kayenta. This calculation results in 25 based aircraft in 2025.

The third method (Medium) also used the comparison method; however, over the next 10 years it is reasonable to expect Kayenta to reach half of the comparative average of 3 airplanes per 1,000 giving them 1.5 based aircraft per 1,000 people in 2015. From that point the 1.5 based aircraft per 1,000 people is expected to remain constant and growth in based airplanes will correlate strictly with population growth, giving Kayenta 12 based airplanes in 2025. This method is the preferred method giving the most realistic and somewhat conservative projection for based aircraft over the next 20 years.

TABLE 2-4 AREA AIRPORT DATA

Name	Population	Per Capita Income	Based Aircraft	Operations	Based Aircraft per 1,000 people	Operations per 1,000 people
Benson, AZ	4,716	\$17,315	11	5,460	2.33	1,157
Kanab, UT	3,564	\$16,128	18	10,250	5	2,873
Holbrook, AZ	5,048	\$13,912	18	4,650	3.56	921
Chinle, AZ	5,366	\$8,755	5	2,400	.93	447
<i>Average:</i>	<i>4,674</i>	<i>\$14,027</i>	<i>13</i>	<i>5,690</i>	<i>3</i>	<i>1,349</i>
Kayenta, AZ	5,241	\$9,421	2	4,524	.38	457

Source: FAA Form 5010s, US Census 2003

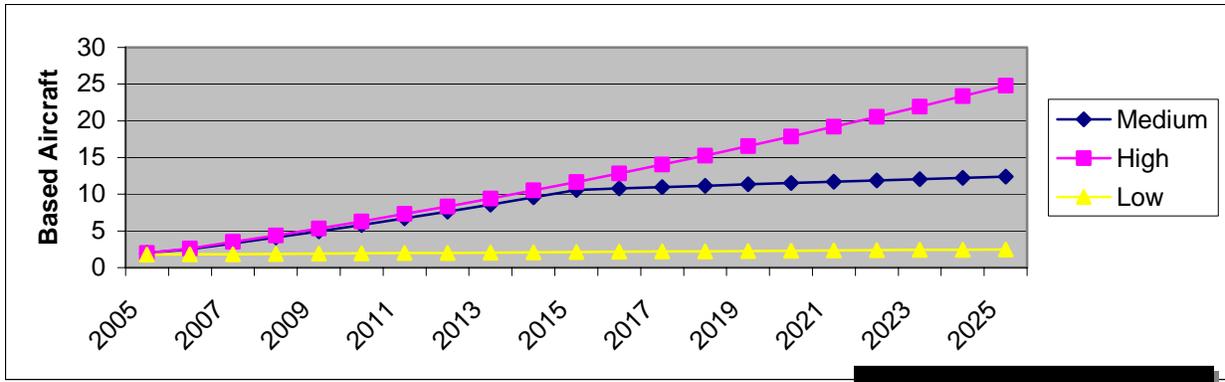


FIGURE 2-3 BASED AIRCRAFT

TABLE 2-5 BASED AIRCRAFT FORECASTS

	2005	2010	2015	2020	2025
Method 1(Low)	2	2	2	2	2
Method 2 (High)	2	6	12	18	25
Method 3 (Medium) (Preferred)	2	6	11	12	12

The third method (medium trend) forecast has been selected as the preferred forecast for planning purposes. This forecast is consistent with the Strategic Plan for Community and Economic Development and by reviewing economic and demographic trends for the areas seems to best predict the future number of based aircraft at the Kayenta Airport.

ANNUAL OPERATIONS FORECAST

The existing FAA Terminal Area Forecast (TAF) predicts a constant activity level of 3-based aircraft and 4,626 annual operations throughout the 20-year planning period.

In order to develop a preferred method of forecasting aircraft operations at the Kayenta Airport, a number of methods were analyzed. The first method (high) used the existing Kayenta level of operations per based aircraft (OPBA). This method divided 4,524 operations by 2-based airplanes resulting in 2,262 OPBA. The 2,262 OPBA was then multiplied by the forecasted number of Kayenta based aircraft to determine total forecasted operations and resulted in approximately 27,144 operations in 2025.

The second method (low) utilized the recommended OPBA from FAA Order 5090.3C Field Formulation of the National Plan of Integrated Airports Systems (NPIAS). FAA Order 5090.3C states that a general guideline of 350 operations per based aircraft for busier general aviation airports with a high volume of itinerant traffic is a reasonable method of forecasting operations. The 350 OPBA was then multiplied by the number of forecasted based aircraft. The number of operations for air ambulance was calculated separately. Given that air ambulance operations are based in Kayenta, but serve the entire Navajo Nation, air ambulance operations are forecasted to increase at the same rate as the population projections for the Navajo Nation. This growth was added to the operations forecast. The results of this were approximately 9,656 operations in 2025.

The preferred method (medium) was developed by using the average number of operations per aircraft from the comparison airports found in Table 2-4; this number (438) was then multiplied by the forecasted based aircraft. The air ambulance operations were then added to this number to give the 10,712 annual operations in Kayenta for the year 2025.

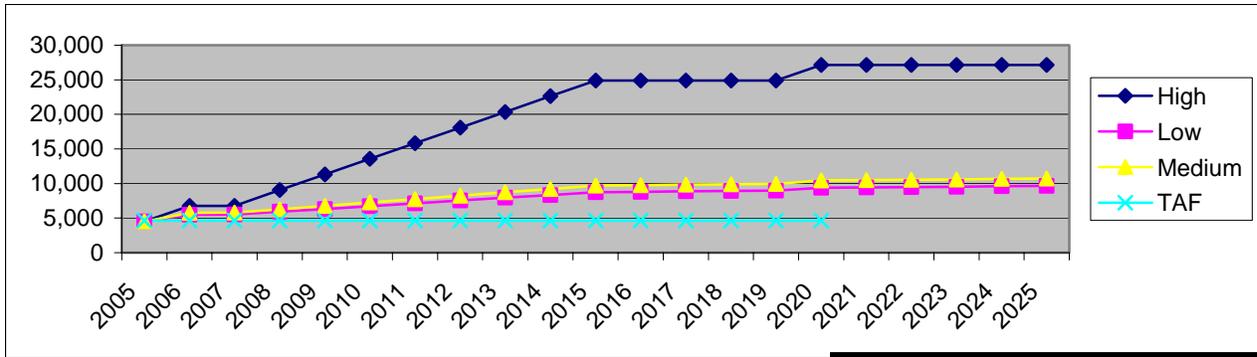


FIGURE 2-4. OPERATIONS FORECAST

TABLE 2-6 ANNUAL AIRCRAFT OPERATIONS FORECASTS

	2005	2010	2015	2020	2025
Method 1 (High)	4,524	13,572	24,882	27,144	27,144
Method 2 (Low)	4,524	6,725	8,747	9,379	9,656
Method 3 (Medium) (Preferred)	4,524	7,254	9,716	10,436	10,712

TABLE 2-7 ENPLANEMENT DATA

Year	Number
2001	72
2002	45
2003	1,265
2005	1,265
2010	1,404
2015	2,392
2020	3,380
2025	4,368

ENPLANEMENT FORECAST

Aircraft enplanements, as used in this report, refer to the loading of passengers onto commercial service, charter or air taxi aircraft. Kayenta Airport does not currently receive scheduled commercial aircraft service. The airport is however served by air tour operators on an irregular basis, when weather becomes poor and traffic is unable to land at the Monument Valley Airport. Aircraft that are usually associated with the air tours are multi-

engine and single engine aircraft that carry 8-12 passengers. Assuming the air tour operators start utilizing the airport on a regular basis, upon the completion of the anticipated improvements to Kayenta, year 2025 enplanements are projected to be 4,368 annually. This is assuming an average of 12 enplanements daily.

AIRPORT SEASONAL USE DETERMINATION

A seasonal fluctuation in aircraft operations may be expected at any airport. This fluctuation is most apparent in regions with severe winter weather patterns and at non-towered general aviation airports. The fluctuation is less pronounced at major airports with a high percentage of commercial and scheduled airline activity.

Non-towered airports generally experience a substantially higher number of operations in summer months than winter months. The average seasonal use trend for FAA towered airports from the 1979-1984 records (total aircraft operations handled by tower facilities nationally from *FAA Statistical Handbook of Aviation*) was used as a baseline for determining seasonal use trends. As discussed above, the seasonal fluctuation is more pronounced at non-towered airports than towered airports. The seasonal use trend for towered airports was adjusted to approximate seasonal use trends at non-towered airports. This is presented in Table 2-8 and in Figure 2-5.

TABLE 2-8 SEASONAL USE TREND

Month	Non-towered	Towered
January	3.5%	7.2%
February	4.0%	8.2%
March	4.8%	8.6%
April	7.5%	9.0%
May	11.3%	9.1%
June	13.5%	9.4%
July	14.8%	9.1%
August	13.0%	8.7%
September	10.0%	8.7%
October	8.0%	7.8%
November	5.8%	7.1%
December	3.8%	7.1%

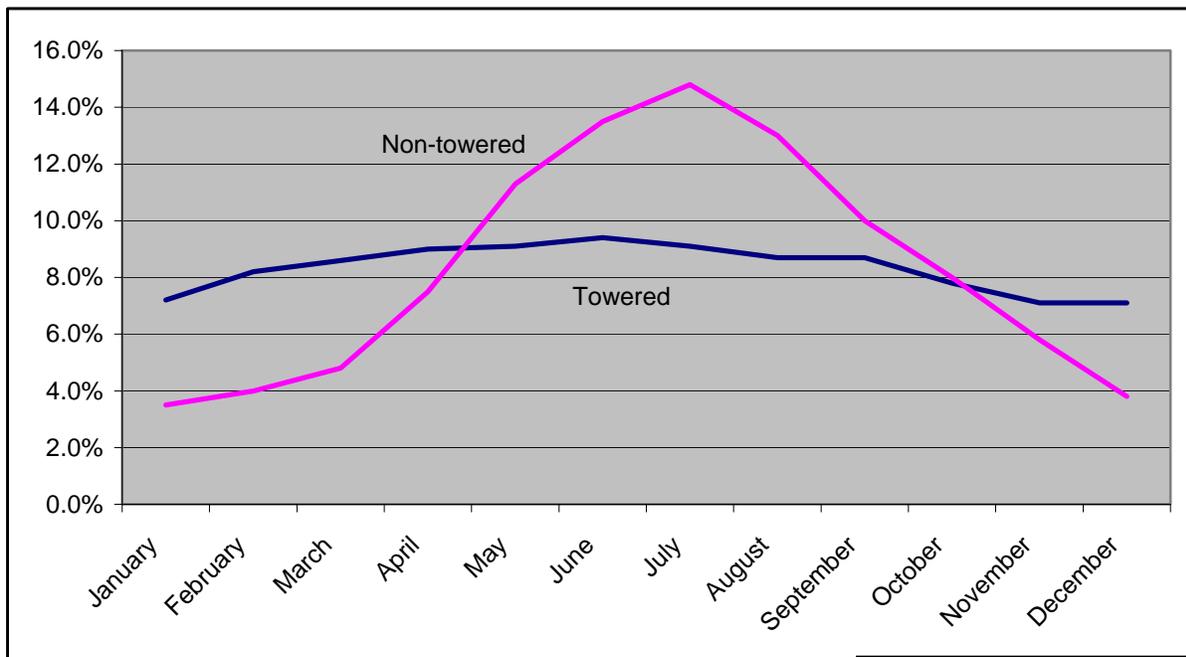


FIGURE 2-5. SEASONAL USE

HOURLY DEMAND AND PEAKING TENDENCIES

In order to arrive at a reasonable estimate of demand for the airport facilities, it was necessary to develop a method to calculate the levels of activity during peak periods. The periods normally used to determine peaking characteristics are defined below:

Peak Month: The calendar month when peak enplanements or operations occur.

Design Day: The average day in the peak month derived by dividing the peak month enplanements or operations by the number of days in the month.

Busy Day: The busy day of a typical week in the peak month. In this case, the Busy Day is equal to the Design Day.

Design Hour: The peak hour within the design day. This descriptor is used in airfield demand/capacity analysis, as well as in determining terminal building, parking apron and access road requirements.

Busy Hour: The peak hour within the busy day. In this case, the Busy Hour is equal to the Design Hour.

The Seasonal Use Trend Curve, as presented in Table 2-8, was used as a tool to determine the peaking characteristics for the Kayenta Airport. Using the Seasonal Use information, a formula was derived which will calculate the average daily operations in a given month, based on the percentage of the total annual operations for that month, as determined by the curve. The formula is as follows:

$$\begin{aligned} M &= A (T / 100) \\ D &= M / (365 / 12) \end{aligned}$$

Where

$$\begin{aligned} T &= \text{Monthly percent of use (from curve)} \\ M &= \text{Average monthly operations} \\ A &= \text{Total annual operations} \\ D &= \text{Average Daily Operations in a given month} \end{aligned}$$

Approximately 90% of total daily operations will occur between the hours of 7:00 AM and 7:00 PM (12 hours) at a typical general aviation airport, meaning the maximum peak hourly occurrence may be 50% greater than the average of the hourly operations calculated for this time period.

The Estimated Peak Hourly Demand (P) in a given month was, consequently, determined by compressing 90% of the Average Daily Operations (D) in a given month into the 12-hour peak use period, reducing that number to an hourly average for the peak use period and increasing the result by 50% as follows:

$$P = 1.5 (0.90D / 12)$$

Where

$$\begin{aligned} D &= \text{Average Daily Operations in a given month.} \\ P &= \text{Peak Hourly Demand in a given month.} \end{aligned}$$

The calculations were made for each month of each phase of the planning period. The results of the calculations are shown in Table 2-9. As is evident in the Table, the Design Day and Design Hour peak demand in the planning year occurs under VFR weather conditions in the month of July (highlighted in bold in each Table).

Table 2-9 Estimated Hourly Demand/Month

MONTHLY/DAILY/HOURLY DEMAND									
Planning Year: 2010 Operations: 7,254					Planning Year: 2015 Operations: 9,716				
Month	% Use	Operations			Month	% Use	Operations		
		Monthly	Daily	Hourly			Monthly	Daily	Hourly
January	3.5	254	8	0.9	January	3.5	340	11	1.2
February	4.0	290	10	1.1	February	4.0	389	13	1.5
March	4.8	348	11	1.2	March	4.8	466	15	1.7
April	7.5	544	18	2.0	April	7.5	729	24	2.7
May	11.3	820	27	3.0	May	11.3	1,098	36	4.1
June	13.5	979	32	3.6	June	13.5	1,312	43	4.8
July	14.8	1,074	35	3.9	July	14.8	1,438	47	5.3
August	13.0	943	31	3.5	August	13.0	1,263	42	4.7
September	10.0	725	24	2.7	September	10.0	972	32	3.6
October	8.0	580	19	2.1	October	8.0	777	26	2.9
November	5.8	421	14	1.6	November	5.8	564	19	2.1
December	3.8	276	9	1.0	December	3.8	369	12	1.4
Planning Year: 2020 Operations: 10,436					Planning Year: 2025 Operations: 10,712				
Month	% Use	Operations			Month	% Use	Operations		
		Monthly	Daily	Hourly			Monthly	Daily	Hourly
January	3.5	365	12	1.4	January	3.5	375	12	1.4
February	4.0	417	14	1.6	February	4.0	428	14	1.6
March	4.8	501	16	1.8	March	4.8	514	17	1.9
April	7.5	783	26	2.9	April	7.5	803	26	2.9
May	11.3	1,179	39	4.4	May	11.3	1,210	40	4.5
June	13.5	1,409	46	5.2	June	13.5	1,446	48	5.4
July	14.8	1,545	51	5.7	July	14.8	1,585	52	5.9
August	13.0	1,357	45	5.1	August	13.0	1,393	46	5.2
September	10.0	1,044	34	3.8	September	10.0	1,071	35	3.9
October	8.0	835	27	3.0	October	8.0	857	28	3.2
November	5.8	605	20	2.3	November	5.8	621	20	2.3
December	3.8	397	13	1.5	December	3.8	407	13	1.5

FLEET MIX

Kayenta Airport is currently an ARC B-II airport serving predominantly single-engine piston and turbo-prop aircraft, with some use by multi-engine piston and light turbojet aircraft.

Air Medivac Services: Air medivac provides essential emergency medical transport in life threatening situations and patient transfers from clinics to higher level care facilities throughout the Navajo Nation. These users utilize a variety of multi-engine turboprop and turbojet aircraft. Eagle Air Med bases one of their aircraft at the Kayenta Airport and is looking into constructing new hangar, office and fueling facilities at the airport. Eagle Air Med currently flies the King Air C-90 into Kayenta two to three times daily. Aero Care bases a King Air B-200 at the airport and also operates two to three times daily.

Air Tour Operations: Due to the close proximity to Monument Valley, which is a very large air tour attraction, air tour operators are flying into the Kayenta area. The majority of the aircraft they fly are single engine piston such as Cessna 182 and multi-engine turbo prop such as the Twin Otter and Jet Stream 32.

Business/Recreational Transportation: These users desire the utility and flexibility offered by general aviation aircraft. The types of aircraft utilized for personal and business transportation varies with individual preference and resources and generally include a mix of single-engine, multi-engine and turbojet aircraft.

Based on these types of uses, local operations are expected to be conducted by predominately air tour aircraft. Itinerant operations are expected to remain mainly turbo-prop; with increasing single-engine piston and turbo-jet operations after facilities are improved. The remaining operations are expected to trend towards the General Aviation Manufacturers Association (GAMA) forecast fleet mix of 65% single-engine, 11% multi-engine, 6% jet, 3% helicopter, 15% experimental and other. These trends were applied to the operations forecast to derive the forecast by aircraft type shown in Table 2-10.

	2005	2010	2015	2020	2025
Single Engine Aircraft	0	3	6	7	7
Operations	156	1,708	3,132	3,416	3,416
Multi Engine Piston Aircraft	0	0	1	1	1
Operations	0	289	529	578	578
Turbo-prop Aircraft	2	2	2	2	2
Operations	4,368	4,626	4,898	5,180	5,456
Turbo Jet Aircraft	0	0	1	1	1
Operations	0	158	289	315	315
Rotorcraft	0	0	0	0	0
Operations	0	79	145	159	159
Experimental & Other	0	1	1	1	1
Operations	0	394	723	788	788
Annual Operations	4,524	7,254	9,716	10,436	10,712

FORECAST SUMMARY

The combination of improved airport facilities and concerted effort by the Township to enhance Kayenta's image, quality of life and visitor experience is expected to lead to increased airport activity, including air tours; personal, recreational and tourism flights; business and government flights; and permanent air medivac facilities. A summary of forecasts of aviation activity is listed in Table 2-11.

Year	Annual Enplanements	Itinerant Operations			Local GA	Total Operations	Based Aircraft
		AT	GA	MIL			
2005	416	136	4,368	0	20	4,524	2
2010	1,404	260	6,954	0	40	7,254	6
2015	2,392	382	9,274	0	60	9,716	11
2020	3,380	505	9,851	0	80	10,436	12
2025	4,368	628	9,984	0	100	10,712	12

AT= Air Taxi/Commercial; GA= General Aviation; MIL= Military