Chapter Three
AVIATION DEMAND FORECASTS

Forecasts of aviation demand are a key element in all airport planning. Demand forecasts, based upon the desires and needs of the service area, provide a basis for determining the type, size, and timing of aviation facility development at Fort Smith Regional Airport (FSM) and are a platform upon which this master planning study will be based. Consequently, these forecasts influence virtually all phases of the planning process. This chapter is organized to include the following sections:

- Purpose
- Aviation Demand Elements
- Approach
- Aviation Demand Forecasts
- Aviation Demand Forecast Summary
- Critical Aircraft
- Comparisons With Other Forecasts
- Airline Service and Passenger Leakage

A. PURPOSE

The aviation demand forecasts will serve four purposes in the development of this master plan. Specifically, they provide the basis for the following:

- Determining the necessary capacity of the airfield, passenger terminal area, general aviation area, and ground access system serving the airport;
- Determining the airport's future facility size and type of expansion needed;
- Evaluating potential environmental effects of alternative airport development layouts; and,
- Evaluating the financial feasibility of alternative airport development scenarios.

B. AVIATION DEMAND ELEMENTS

Forecasts of aviation demand can be developed for numerous elements. In the case of Fort Smith Regional Airport, the key demand elements focus on airline passenger traffic, airline operations, and general aviation descriptors such as based aircraft and operations. Other important elements are derived from these basic indicators. For this study aviation activity forecasts were prepared for the following:

- ***Airline Passenger Enplanements:*** Defined as air travelers who have boarded departing airline aircraft
  - Total Annual
  - Peak Hour
- ***Airline Aircraft Operations:*** A takeoff or a landing of an airline aircraft. A takeoff and landing are two operations.
  - Total Annual
  - Fleet Mix
  - Peak Hour
- ***Air Cargo Activity:*** Expressed as total enplaned and deplaned air cargo pounds, tonnage, this activity measures the volume of air freight and mail carried as "belly" cargo by the airlines.
- ***Registered Aircraft:*** Defined as being either fixed- or rotary-wing civil aircraft, operated in non-airline service with a current registration
- ***Based Aircraft:*** Defined as a general aviation aircraft which is stationed at an airport on a permanent basis
  - Based Aircraft Fleet Mix
- ***General Aviation Enplaned Passengers:*** Defined as air travelers who have boarded departing general aviation aircraft

- ***General Aviation Aircraft Operations:*** Takeoff or a landing of a general aviation aircraft
  - Total Annual
  - Local Versus Itinerant
  - Fleet Mix
  - Peak Hour
- ***Military Aircraft Operations:*** A takeoff or a landing of a military aircraft.
- ***Instrument Approaches:*** This type of operation is recorded only during Instrument Meteorological Conditions (IMC) by aircraft completing the Instrument Flight Rules approach procedures.

C. APPROACH

Generally, the approach used in developing aviation demand forecasts for Fort Smith Regional Airport focused on the examination of historical trends and the projection of these trends into future time frames. Key impacts in the Fort Smith airline passenger market in recent years have been the September 11, 2001, terrorist attack on the United States, the continuing development of Northwest Arkansas Regional Airport, and the low fares available in Little Rock and Tulsa from Southwest Airlines. Even with these impacts, enplanement activity at Fort Smith Regional increased in both 2003 and 2004. These increases reverse a downward trend that began in 1999. Fort Smith is currently enjoying economic expansion, and the airport enplanement totals reflect that growth.

The forecast approach uses a variety of methods. The results of these different methods were compared to see if "reasonable" or "consensus" projections of activity indicators emerged. Consideration of these factors, supplemented with interviews with airport management, provided the basis for selecting a preferred projection. If more than one projection appeared valid, or if the true forecast was believed to fall between an upper and lower range, the selected or preferred forecast became an average of the projections.

Forecasting techniques such as market share, socioeconomic regression, trend analysis, and the Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) comparison were used to project forecasts of demand.

1. Market Share Projection

Market share projections are developed by calculating historical shares of aviation activity measures and projecting these respective shares into future time frames. This method of projection reflects demand based upon trends occurring in Arkansas and Oklahoma and in the entire United States. (Socioeconomic and per capita projections, on the other hand, are based upon local factors.) Market share projections reflect historical trends and may include static (constant) or dynamic (increasing or decreasing) future market shares.

2. Socioeconomic Regression Analysis

The socioeconomic regression projection is based upon an assumed causal relationship between population, income, or employment and aviation activity in a particular area. To obtain this projection of demand, socioeconomic data are

related via regression analysis to aviation activity. The resulting set of regression equations, coupled with independent projections of future socioeconomic data, produces a projection of aviation activity. Socioeconomic variables collected for use in this study included population, income, and employment. Both historical and forecast variables were available for use in the forecasting model. Socioeconomic Regression Analysis was used in forecasting airline enplanements and general aviation registered aircraft.

3. Trend Analysis

Trend projections use historical data to formulate predictions of future activity. For this study, least squares linear trending was used to project demand. This method uses aviation activity regressed against time to produce a projection. No assumptions about the causes of trends are included in the trending methodology.

4. TAF Forecast Comparison

One test of the reasonableness of an aviation forecast is its relationship to FAA TAF projections of demand. Although master plan forecasts can differ from TAF projections, if the difference is greater than 10 percent, the master plan forecast must be reviewed by the FAA's aviation demand forecast experts. For this reason, the TAF was included as a projection within this forecasting framework.

D. AVIATION DEMAND FORECASTS

Aviation demand forecasts were developed for all of the demand elements listed earlier in the Aviation Demand Elements section. The following major components are addressed:

- Airline Demand Forecasts
- General Aviation Demand Forecasts
- Military Aircraft Operations Forecasts

1. Airline Demand Forecasts

The forecasts of airline demand for Fort Smith Regional Airport focus on enplanements as the driving force for all of the other components of airline demand. Thus, if the number of annual and peak hour enplanement forecasts is realistic, all of the other portions of demand should be reasonable, as well. Components of the airline forecast include the following:

- Airline Passenger Enplanements
  - Total Annual
  - Peak Month, Average Day of Peak Month, Peak Day, Peak Hour
- Airline Aircraft Operations
  - Total Annual
  - Fleet Mix
  - Peak Month, Average Day of Peak Month, Peak Hour
- Air Cargo Activity

Airline Enplanement Forecast

Because of its importance in the overall master planning process, the forecast of airline enplanements used several different means of projecting airline enplanements to see if consistent trends evolved. Methods used in the forecasting process included in the following:

- Market Share
- Socioeconomic Regression
- Trend Analysis
- FAA Terminal Area Forecasts (TAF)

Figure 3-1 shows the historical trend of scheduled passenger enplanements at FSM since 1990. As shown, historical levels of enplanements grew significantly until the high-water mark of 1998. Intermediate declines between 1993-1995 and 1998-2002 have interrupted an otherwise steady growth. Historically, air service at FSM has been provided by regional/commuter carriers of American, Delta, Northwest, and TWA Airlines. In the early 1990s, nonstop air service was available to Dallas, Memphis, Nashville, and St. Louis. American used 34-seat Saab 340s and Delta used 30-seat Embraer 120s, while Northwest and TWA commuters used 19-seat turboprop aircraft. In 1993, TWA abandoned the market, and with it their service to St. Louis. American then dropped Nashville service, and Fort Smith was reduced to Dallas and Memphis nonstops. Delta departed FSM in the second quarter of 2002. There was a brief restart of service to St. Louis in late 2002 by TWA's Trans States Airlines, but that service ended in 2003. The first regional jets were introduced into the Fort Smith market in the fall of 2002. By the end of 2004, all of the turboprops had been replaced and the two carriers, American and Northwest, served Fort Smith exclusively with regional jets.

Driving alternatives to other larger airports from the Fort Smith service area have increased with the development of better highways, greater service options, and lower fares at other airports. Other airports used by Fort Smith air travelers to begin the air portion of their trips include Northwest Arkansas Regional, Little Rock, and Tulsa.

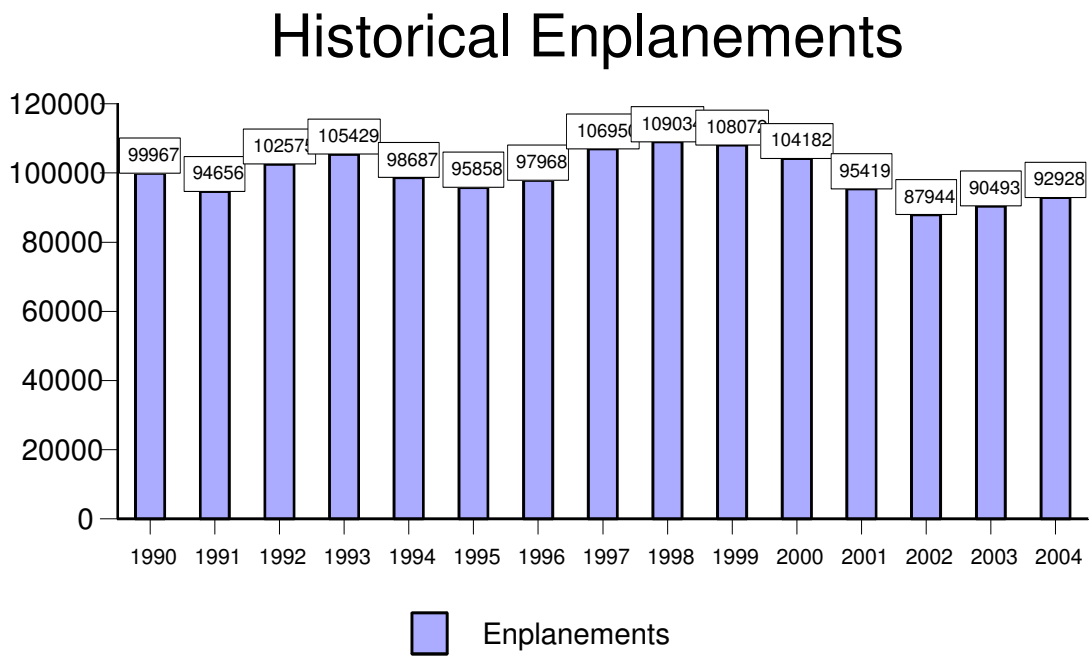
Market Share Projections

The market share projection examined historical enplanements at FSM and compared these numbers to the historical U.S. enplanement totals. This comparison revealed that the enplanement market share at FSM has decreased since the early 1990s. Factors creating this decline, such as air service quality and lower fares at other airports, and the local business climate, are not considered in the market share forecasting method -- only the trends for historical market share. Other causative factors are considered in subsequent projection methods. To obtain a forecast, projected market shares were applied to the FAA's latest forecast of total U.S. enplanements. Both static and dynamic market shares were evaluated. The static market share was calculated based upon the last year of available data carried forward into future time frames. The dynamic share was estimated using a modified trend projection of market shares for the 20-year forecast period. **Table 3-1** presents the market share projections of airline enplanement demand for FSM.

Socioeconomic Regression Projections

Three socioeconomic regression projections were developed for FSM. These projections are used to correlate causative factors and their historical growth to the growth of airline enplanements.

Figure 3-1
Fort Smith Regional Airport
Historical Airline Enplanements



The socioeconomic regressions used population, employment, and income statistics from the airline passenger service area (Fort Smith Metropolitan Statistical Area: Crawford, Franklin, and Sebastian Counties in Arkansas and LeFlore and Sequoyah Counties in Oklahoma). The socioeconomic statistics were regressed against airline enplanements, and projections were made based upon the resulting regression equations. Table 3-1 presents the socioeconomic regression projections of airline enplanements for FSM. Also presented are the coefficients of determination (R^2 values) for each projection.

It should be noted that all of the socioeconomic regression projections have low R^2 values. This indicates that there are relatively weak statistical relationships between these factors and the growth or decline of airline passenger enplanements at FSM.

Trend Projection

Trend projections use historical enplanement data to formulate predictions of future activity. As discussed previously, the trend projection used least squares linear trend analysis to extrapolate projections. Table 3-1 presents a summary of this projection and its resulting statistics.

FAA TAF

The FAA's TAF was used as a measure of reasonability for all of the other projections. It is included in Table 3-1 and shows the FAA's latest thinking on airline enplanement activity at FSM. Year 2025 for this projection was extrapolated by the consultant.

Table 3-1
Fort Smith Regional Airport
Summary of Airline Enplanement Projections

	2004	2010	2015	2025	R squared
Population	92,928	103,664	106,410	112,143	0.23
Employment	92,928	105,432	107,533	111,905	0.38
Income	92,928	110,514	115,983	126,922	0.23
Market Share					
Constant	92,928	116,737	136,956	195,938	
Dynamic	92,928	114,167	130,896	181,463	
Trend Analysis					
Linear Trend	92,928	112,892	119,101	131,520	0.28
FAA TAF*	88,983	101,931	112,163	132,627	
Preferred Forecast					
High/Low Average	92,928	110,201	121,683	153,922	
Multi-Average	92,928	109,334	118,435	141,788	
Individual Forecast	92,928	112,892	119,101	131,520	
Selected Forecast	**92,928**	**109,300**	**118,400**	**141,800**	

* Terminal Area Forecast Year 2025 extrapolated by consultant.

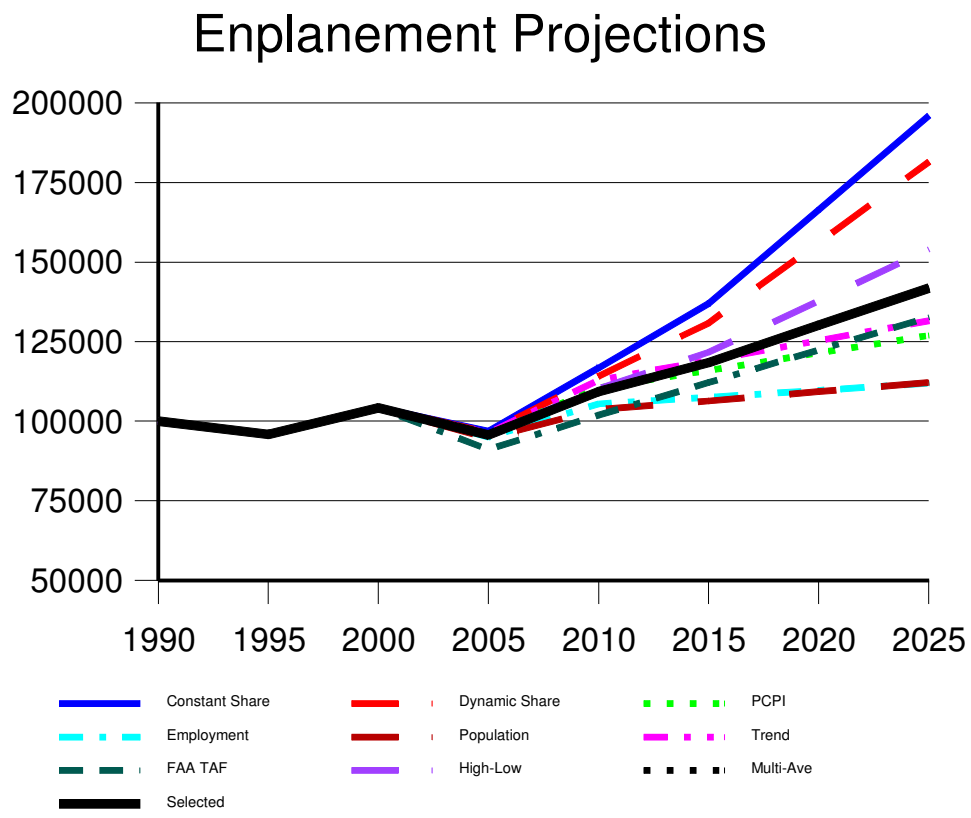
Selection of Preferred Enplanement Forecast

Table 3-1 presents a summary of all of the projections of airline enplanement demand at FSM. **Figure 3-2** graphically shows the same data. There is a wide range in the projection numbers, with a clustering of several projections in a mid-range area. In addition to the market share, socioeconomic regression, TAF, and trend projections, there are two derived projections: High/Low Average and Multi-Average. The High/Low Average projection was an average of the Constant Market Share and Population Regression projections, while the Multi-Average Projection included an average of all the projections.

In selecting a preferred forecast, a number of factors were considered. One factor, and the primary threat to continued growth in the FSM market, is competition from Northwest Arkansas Regional, Little Rock National, and Tulsa International Airports. Passenger leakage to these airports is discussed in a later section. However, it should be noted that even with low fare inducements and more flight destination selection, Fort Smith has held its own and has actually added passengers each year since 2002. Conversely, both Tulsa and Little Rock have had declines in passenger enplanements during that period. Northwest Arkansas Regional (XNA) has had strong growth and consequently poses the greatest competitive threat to FSM. The FAA's TAF predicts continued strong growth at XNA with slow recoveries for both Little Rock and Tulsa. If these projections are realized, enplanements at Fort Smith are likely to fall in the mid-range. Strong economic development in the

Fort Smith area is likely to provide XNA with some of its growth, but will also fuel continued moderate growth at FSM. For these reasons, the Multi-Average projection was selected as preferred. The Multi-Average projection is roughly 7 percent higher than the FAA's TAF projection and thus can be considered reasonable. The selected forecast predicts enplanement growth from the year 2004 level of 92,900 to 109,300 in 2010, 118,400 in 2015, and 141,800 by the year 2025.

Figure 3-2
Fort Smith Regional Airport
Enplanement Projections



Airline Aircraft Operations Forecast

A forecast of airline operations is required to assess the adequacy of the terminal and airfield system throughout the planning period and to help determine the financial impact and the environmental effects associated with future air traffic levels. Airline operations are defined as all scheduled airline takeoffs and landings.

Table 3-2 presents the historical level of airline operations, including several ratios: enplanements per departure, average number of seats per departure, and passenger load factors. The forecast of annual airline operations, each operation consisting of one takeoff or landing, was derived from the forecast of annual enplaned airline passengers. The methodology used

consisted of the following steps:

- Determine the historical ratio of enplaned passengers to airline departures ((enplanements/operations) times 2);
- Determine average passenger load factors by dividing the average number of seats per departure by the average number of enplanements per departure.
    - Project changes in load factors and in the enplaned passengers per departure ratios for the planning period;
    - Apply the projected enplaned passengers per departure ratios to the forecasts of annual enplaned passengers to calculate airline operations ((enplanements/enplanements per departure) times 2).

The key component of the forecast, therefore, is the projection of a reasonable load factor, which then results in a reasonable enplanement per departure ratio. In this regard, the historical record provides insight into the recent trends at FSM. In the period from 2000 to 2004, the number of enplanements per departure increased from 15.7 to 31.6. This growth is directly related to the introduction of regional jets into the market during the period. Those jets replaced Saab 340s, Embraer 120s, and Jetstream 41s. As a result, the average number of seats per departure was increased,

Table 3-2
Fort Smith Regional Airport
Forecast of Airline Operations

Year	Airline Operations	Enplanements	Enplanements Per Departure Ratio	Average Seats Per Departure	Passenger Load Factor
2000	13,241	104,182	15.7	32.9	0.48
2001	10,695	95,419	17.8	36.8	0.48
2002	9,093	87,944	19.3	34.0	0.57
2003	9,284	90,493	19.5	33.4	0.58
2004	5,880	92,928	31.6	48.3	0.65
2010	6,370	109,300	34.3	52.0	0.66
2015	6,450	118,400	36.7	54.0	0.68
2025	7,235	141,800	39.2	56.0	0.70

Source: Historical Airline Operations - Official Airline Guide schedules by month (2000-2004)
Historical Enplanements
Airport Management records.

permitting a higher number of enplanements per departure. At the same time, the number of airline operations declined as larger aircraft needed fewer trips to carry the same number of passengers.

For the future, the current service pattern will likely continue, with the introduction of some 70-seat regional jets into the market. With nine flights per day, peak period activity in the morning and evenings will require larger aircraft. Ultimately, three

large 70-seat regional jet departures and seven 50-seat regional jet departures per day are forecast (year 2025). The impact on airline aircraft operations is an increase from the 2004 level of 5,880 to 7,235 by the year 2025.

Airline Fleet Mix

Related to the number of airline operations at FSM is the size and makeup of each airline's fleet serving the market. Forecasting the airline fleet mix permits planners to estimate the need for airport facilities in terms of runway length, strength, and terminal building requirements. The current use of 50-seat aircraft will not affect the need for any of these facilities. For the future, the possible use of 70-seat regional jet aircraft in the market would increase the fleet size, but would not significantly change facility needs.

For the future, **Table 3-3** presents the forecast of fleet mix at FSM. As shown, there is a gradual introduction of 70-seat aircraft over the planning period. It is believed that up to 30 percent of the airport's airline operations will be conducted by 70-seat regional jets by the year 2025.

Table 3-3
Fort Smith Regional Airport
Airline Fleet Mix Forecast

Year	50- Seat Regional Jet	70-Seat Regional Jet	Total
2004 Operations	5,880	0	5,880
%	100.0%	0.0%	100.0%
Forecast			
2010 Operations	5,669	701	6,370
%	89.0%	11.0%	100.0%
2015 Operations	5,031	1,419	6,450
%	78.0%	22.0%	100.0%
2025 Operations	5,065	2,171	7,235
%	70.0%	30.0%	100.0%

Source: Historical Airline Operations - Official Airline Guide schedules by month.

The forecast trend of average airline airplane size, in terms of the number of seats per departure at FSM includes the following:

	Aircraft Size Average Seats/Departure
• 2004	48.3
• 2010	52.0
• 2015	54.0
• 2025	56.0

Peak Period Airline Activity

Airline activity is subject to peak period movements. Measures of this activity can include peak month, average day of the peak month, and peak hour operations and enplanements. These indicators are used by airport planners to estimate airfield layouts and terminal building and parking area size and configurations. Because airline operations are scheduled, it is easier to track peak period activity than to establish similar measurements for general aviation activity.

Peak Period Airline Operations

For this study, the Official Airline Guide schedule was consulted to determine FSM's peak period airline operations. From the schedule it was determined that with two carriers and nine departures per day, airline peak period operations are limited to four. That number is predicted to remain constant throughout the planning period. The monthly and daily peak period forecasts are include in **Table 3-4**, along with peak hour departures.

Table 3-4
Fort Smith Regional Airport
Airline Peak Hour Operations

Year	Annual Airline Operations	Peak Month Operations	Ave Day of Peak Month	Peak Hour Operations
2004	5,880	539	18	4
Forecast				
2010	6,370	584	19	4
2015	6,450	591	19	4
2025	7,235	663	21	4

Source: 2004 Airline Operations - Official Airline Guide

Peak Period Airline Enplanements

Peak period airline enplanements include the peak month, peak day, average day of the peak month, and peak hour enplanements. Peak month enplanements were assumed to be 10 percent greater than average month enplanements. The average day of the peak month was estimated by dividing the peak month by 30. Estimating the peak hour in a non-survey method is relatively simple using inputs already generated by this forecasting methodology. Normally, peak period departures times the peak number of enplanements per departure will yield peak hour enplanements. For this analysis, it was assumed that the peak number of enplanements per departure equaled 100 percent of available seating capacity per departure.

Table 3-5 presents the results of the peak period enplanement forecasts for FSM. For the forecast period, peak hour enplanements are anticipated to grow from 100 in 2004 to 140 by the year 2025.

Table 3-5
Fort Smith Regional Airport
Airline Peak Period Enplanements

Year	Annual Airline Enplanements	Peak Month Enplanements	Ave Day of Peak Month	Peak Hour Enplanements
2004	92,928	8,518	284	100
Forecast				
2010	109,300	10,019	334	120
2015	118,400	10,853	362	140
2025	141,800	12,998	433	140

Source: 2004 Enplanement data from Airport Management records

Air Cargo Activity

Air cargo is defined as all air freight, U.S. mail, and door-to-door small-package air express service. In effect, everything that goes into an air freighter or the cargo compartment on a passenger flight, except passenger baggage, is considered air cargo. Air cargo is transported by the following types of air carriers:

- Special air cargo airlines such as Federal Express, DHL, or United Parcel Service (UPS),
- Regularly scheduled passenger airlines and commuter carriers, using excess space in the baggage compartment (usually in the airplane's belly or tail section), and

- Contract or charter air cargo carriers.

Air cargo activity has grown significantly over the past 30 years. This growth has been possible as a result of the design, development, and production of increasingly larger and more efficient aircraft. For example, the DC-3 aircraft of the 1940s carried less than 8,000 pounds. Today's largest civilian air freighter, the Boeing 747-200F (all-cargo), can carry almost 250,000 pounds and has more than 24,300 cubic feet of cargo volume. Another key factor in the growth of air cargo has been the economic value of shipping by air versus competing ground transportation modes. Air cargo rates are described in cents per ton-mile. As the size and efficiency of aircraft have increased, the corresponding air freight rates have decreased on a ton-mile basis. Thus, air cargo has become more competitive, relative to trucking or other ground modes.

Between 1990 and 2004, air cargo ton-miles transported by carriers in the United States increased by 250 percent. This translates into a 6.6 percent annual rate of growth over a 14-year period. The highest growth period was 1992-1998. Currently, the outlook for air cargo growth is robust in both the domestic and the international markets. Locally, it is anticipated that FSM will experience slower growth than the national average regarding air cargo activity.

At FSM, air cargo is carried in the "belly" of passenger aircraft. All-cargo carriers such as FedEx, UPS, and DHL do not fly from Fort Smith Regional, but instead truck cargo to other airports such as Little Rock and Tulsa for air shipment. Thus, the historical air cargo statistics at Fort Smith represent a shrinking market share of total air cargo shipments. While the United States is predicted to grow at an annual rate of 5.1 percent in the future, the Fort Smith growth was projected at a much lower 2.0 percent growth. **Table 3-6** presents a summary of the recent history, along with a forecast of air cargo pounds enplaned and deplaned at the airport.

Table 3-6
Fort Smith Regional Airport
Forecast of Total Air Cargo Pounds

Year	Totals
2000	209,922
2001	154,094
2002	85,220
2003	70,955
2004	79,621
Forecast	
2010	89,670
2015	99,000
2025	120,680

Source: Consultant estimates

2. General Aviation Demand Forecasts

General aviation activity is defined as all flying except the airlines and the military. At FSM, general aviation accounts for most of the aircraft operations, with military and airline activity making up the balance. Forecasts of general aviation activity indicators are presented in the following sections:

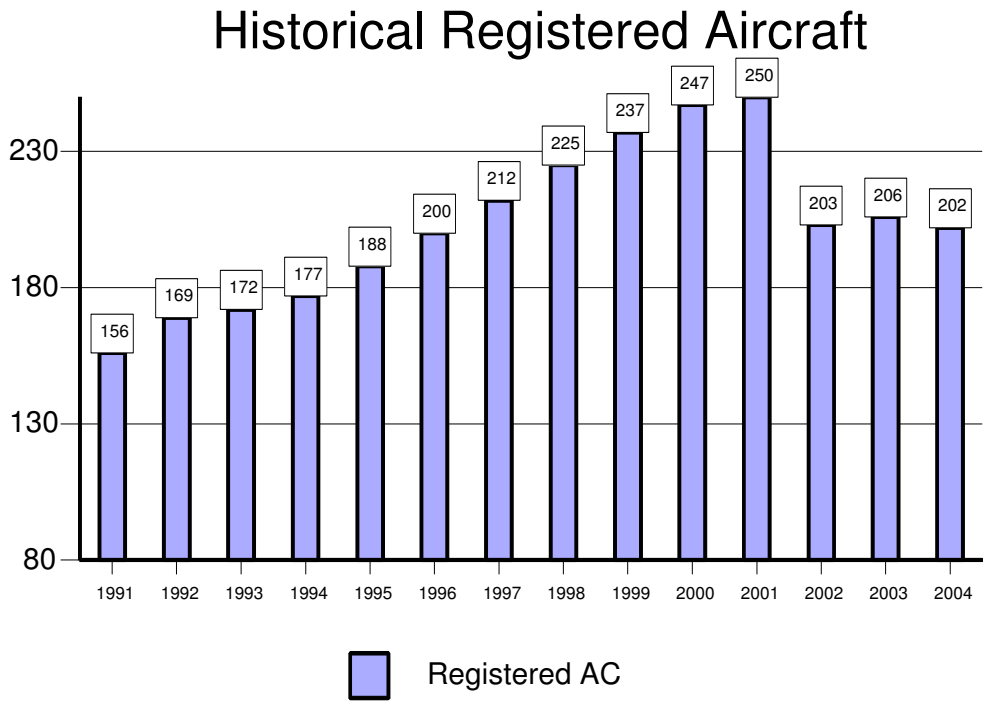
- Registered Aircraft
- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Aircraft Operations
  - Total Annual
  - Local Versus Itinerant
  - Fleet Mix
  - Peak Period
- General Aviation Enplaned Passengers
- Instrument Approach Operations

Study Area Registered Aircraft

The number of aircraft based at FSM is dependent, in part, upon the nature and magnitude of aircraft ownership in the study area surrounding the airport. Therefore, the first step in forecasting the number of aircraft based at FSM was to determine the number of registered aircraft within the study area.

For this study, the airport service area defined for general aviation users was the Fort Smith Metropolitan Statistical Area (MSA), which includes Crawford, Franklin, and Sebastian Counties in Arkansas and LeFlore and Sequoyah Counties in Oklahoma. A registered aircraft is defined as a civil aircraft, either fixed- or rotary-wing, that has been flown one or more hours during the previous calendar year. Excluded are aircraft owned and operated in regularly scheduled, nonscheduled, or charter service by commercial air carriers. Until 1994, the historical information used to develop the registered aircraft forecast was based on data compiled by the FAA and published annually in the **Census of Civil Aircraft** The FAA has discontinued publishing this data and since 1995, registered aircraft statistics have been gathered from private vendors that collect and distribute that information. **Figure 3-3** presents a graphic illustration of the study area registered aircraft growth trends since 1991.

Figure 3-3
Fort Smith Regional Airport
Historical Registered Aircraft



Source: Census of US Civil Aircraft (1991-1994), International Air CD (1995-2001), Avantext (2002-2004)

Preparation of the registered general aviation aircraft forecast for the study area began with a review of historical aircraft ownership within the area. Similar to the forecast of airline enplanements, seven projections were made using market share, socioeconomic regression, and trend analysis methodologies (see **Table 3-7**).

Table 3-7
Fort Smith Regional Airport
Projections of Registered Aircraft

Year	2004	2010	2015	2025	R squared
Socioeconomic Regressions					
Population	202	229	239	259	0.58
Employment	202	228	234	247	0.60
Income	202	248	266	301	0.47
Market Share					
Constant	202	220	232	251	
Dynamic	202	207	211	215	
Trend Analysis					
Linear Trend	202	251	269	306	0.47
Preferred Forecast					
High/Low Average	202	229	240	261	
Multi-Average	202	230	242	263	
Individual Forecast	202	220	232	251	
Selected Forecast	202	220	232	251	

In selecting a preferred forecast, a number of factors were taken into consideration, including the historical trend in the Fort Smith general aviation service area and the future outlook for the area. As a result, it appeared that the Constant Market Share of U.S. registered aircraft growth incorporated a slightly lower total than the High-Low Average or the Multi-Average projections. This conservative forecast of demand predicts that the year 2025 registered aircraft total will reach the year 2001 high-water mark set for the MSA. Thus, the Constant Market Share Projection was selected as Preferred. This forecast predicts the growth of registered aircraft to reach 220 by the year 2010, 232 by 2015, and 251 by the year 2025.

Based Aircraft

By definition, a based aircraft is a general aviation aircraft that is permanently stationed at an airport. Forecasting based aircraft at FSM ideally would proceed through the same process as all other demand elements: an analysis of historical data followed by forecasting into future years. Research into historical records for FSM revealed that one primary published

source was available: the Federal Aviation Administration's Form 5010-1, Airport Master Record, confirmed by Airport Management records. For 2004 based aircraft at FSM was estimated at 71 civil aircraft and 17 military aircraft.

For this forecast, civil based aircraft growth was assumed to occur at the same rate as that of registered aircraft in the study region. This natural growth represents a constant market share of overall demand. It is possible that proactive measures taken to increase the market share for Fort Smith Regional may increase the total number of based aircraft at the airport over the forecast period. That scenario and its implications will be addressed later in the business plan portion of the Master Plan. **Table 3-8** presents the forecast of based aircraft for FSM. As shown, civilian based aircraft are predicted to grow from 71 to 88, while military aircraft remain at a level of 20 throughout the forecast period.

Table 3-8
Fort Smith Regional Airport
Forecast of Based Aircraft

Year	Civilian Based Aircraft	Military Aircraft	Registered Aircraft	Civilian Aircraft Market Share
2004	71	20	202	35.15%
Forecast	**Static Share**			
2010	77	20	220	35.15%
2015	82	20	232	35.15%
2025	88	20	251	35.15%

Source: Airport Management Records

Based Aircraft Fleet Mix

An aircraft fleet mix refers to the characteristics of a population of aircraft. General aviation aircraft are classified with regard to specific physical traits such as aircraft type (whether fixed wing or rotorcraft), their weight, and number and type of engines. Aircraft having dissimilar physical and operating traits require varying types and amounts of airport facilities. For this reason, it is important to identify and estimate the types of general aviation aircraft that will be operating and based at FSM.

In the forecasting process, the based aircraft fleet mix can be used later to help determine operational fleet mix forecasts. Fleet mix categories included single-engine, multi-engine, turbojet, rotorcraft, and military. This information was collected from the on-site inventory taken at the airport. Projection of the fleet mix involved the consideration of the effects of the national trends in aircraft manufacturing, the service area registered aircraft fleet mix, and the projected role of FSM. These changes will involve a shift toward larger, more sophisticated aircraft, as reflected by manufacturing trends and the proliferation of fractional ownership of jets and large turboprop aircraft. **Table 3-9** presents the forecast of based aircraft fleet mix anticipated for FSM. As shown, there is growth anticipated in all but the military

category of aircraft.

Table 3-9
Fort Smith Regional Airport
GA Based Aircraft Fleet Mix

Year	Single Engine	Multi Engine	Turbo Jet	Rotorcraft	Military	Total
2004	43	16	11	1	17	88
%	48.9%	18.2%	12.5%	1.1%	19.3%	100.0%
Forecast						
2010	45	16	14	2	20	94
%	47.9%	17.0%	14.9%	2.1%	18.1%	100.0%
2015	47	16	17	2	20	99
%	47.5%	16.2%	17.2%	2.0%	17.2%	100.0%
2025	49	17	20	2	20	105
%	46.7%	16.2%	19.0%	1.9%	16.2%	100.0%

Source: Year 2004 - Airport Management records and FAA Form 5010

Annual General Aviation Operations

An aircraft operation is defined as either a takeoff or a landing. The annual general aviation operations forecast was derived for both local and itinerant operations through the use of an operations per based aircraft (OPBA) ratio. Typically, the OPBA ratios are calculated as an average of historical information.

For this study, both historical information and judgmental data were used to develop reasonable OPBA relationships that could be forecast throughout the planning period. For 2004, general aviation aircraft operations at FSM were 26,834, which corresponds to an OPBA of roughly 380. As shown in the 2004 information, local general aviation operations are significantly less in proportion to itinerant general aviation operations (23 percent/77 percent). Over the past 15 years, this split has averaged roughly 25 percent/75 percent split, local to itinerant operations. Future years show a combined local/itinerant OPBA remaining constant as the number of based aircraft increase for each of the forecast periods through the year 2025 (see **Table 3-10**). The aircraft utilization ratios yield forecasts of total general aviation operations of 30,800 in 2010, 32,800 in 2015, and 35,200 by the year 2025.

Table 3-10
Fort Smith Regional Airport
Annual General Aviation Operations Forecast

		Local Operations		Itinerant Operations		
Year	GA Based Aircraft	Number	OPBA	Number	OPBA	Total
2004	71	6,185	87	20,649	291	26,834
Forecast						
2010	77	7,700	100	23,100	300	30,800
2015	82	8,200	100	24,600	300	32,800
2025	88	8,800	100	26,400	300	35,200

Source: 2004 Operations - Airport Management records

GA Operational Fleet Mix Forecast

The GA operational fleet mix forecast tells a great deal about the operational character of the airport, and therefore can serve as a basis for developing airfield and landside facility designs. A forecast of the general aviation operational fleet mix was developed after consideration of the historical patterns at the airport. It was assumed that the forecast GA fleet mix levels, similar to the based aircraft fleet mix forecast, will continue to move slowly toward larger, more sophisticated aircraft. **Table 3-11** presents the results of this forecast process.

Table 3-11
Fort Smith Regional Airport
GA Operational Fleet Mix

Year	Single Engine	Multi Engine	Turbo Jet	Rotorcraft	Military	Total
2004	16,252	6,047	4,157	378	NA	26,834
2010	18,000	6,400	5,600	800	NA	30,800
2015	18,800	6,400	6,800	800	NA	32,800
2025	19,600	6,800	8,000	800	NA	35,200

Source: Consultant estimates

Peak Period Operations

Since many of the airport's general aviation and airfield facility needs are related to the levels of activity during peak periods, forecasts were developed for peak month, peak day, and peak hour general aviation operations. The approach used in developing the peak period operations forecasts is outlined as follows:

- ***Peak Month GA Operations:*** This level of activity is defined as the calendar month when peak aircraft operations occur. Peak Month percentages at FSM were estimated using the assumption that peak month operations are 10 percent greater than average month operations.

- ***Design Day Operations:*** This level of operations is defined as the average day within the peak month. This indicator can be readily developed by dividing peak month operations by 30.
- ***Peak Hour Operations:*** This level of operations is defined as the peak hour within the design day. For airports of similar size and activity as FSM, general aviation peak hour operations tend to be 20 percent of design day operations.

Table 3-12 presents the forecast of peaking characteristics for general aviation operations at FSM. As shown, general aviation peak hour operations are expected to grow from 16 to 22 during the planning period. It should be noted that forecast airline and military peak hour operations will be added to the general aviation segment to develop a total forecast peak hour operations potential for the airport.

Table 3-12
Fort Smith Regional Airport
General Aviation Operational Peaking Forecast

Year	Annual Operations	Peak Month Operations	Design Day Operations	Peak Hour Operations
2004	26,834	2,460	82	16
Forecast				
2010	30,800	2,823	94	19
2015	32,800	3,007	100	20
2025	35,200	3,227	108	22

Source: Consultant estimates

General Aviation Enplanements

Forecasts of annual general aviation enplaned passengers play an important role in shaping such landside facilities as access roads, the general aviation terminal building sizes, and the size and number of automobile parking areas. This activity indicator is often ignored due to the lack of historical data.

To forecast general aviation enplaned passengers, an aircraft occupancy rate was multiplied by the number of itinerant general aviation departures from the airport. In 1998 the Aircraft Owners and Pilots Association (AOPA) estimated that an average of 2.5 passengers per general aviation itinerant departure was a reasonable estimate of aircraft occupancy. For this study, this factor was applied to forecast general aviation itinerant departures in order to tabulate a forecast of general aviation enplanements. Local or touch-and-go operations were not included in the totals since they involve the same enplanements on a repeating basis. These enplanements would overstate the use of airport landside facilities if they were included in the forecast totals. **Table 3-13** presents a forecast of general aviation enplanements at FSM.

Table 3-13
Fort Smith Regional Airport
Forecast of General Aviation Enplanements

Year	Itinerant GA Departures	Average Occupancy Rate	Forecast of GA Enplanements
2004	10,325	2.5	25,813
Forecast			
2010	11,550	2.5	28,875
2015	12,300	2.5	30,750
2025	13,200	2.5	33,000

Source: Consultant estimates

Instrument Approach Operations

A necessary task in assessing the need for new or improved landing aids is a forecast of the levels of instrument approaches at the airport. An instrument approach can be defined as a series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually. It is important to note that instrument approaches are recorded only during Instrument Meteorological Condition (IMC) weather and only for aircraft that do not cancel Instrument Flight Rule (IFR) when they make visual contact with the airport. Thus, the number of recorded instrument approaches is always less than the number of instrument-assisted landings.

Presently, FSM has both precision and non-precision instrument approaches to its runways. Over the last five years, instrument approaches averaged almost 3.5 percent of total airport operations. Thus, a long-term average was derived for instrument approaches at FSM of 3.5 percent. Assuming that this ratio is used for future years, a forecast can be developed using the airport's total forecast operations (which include military operations from **Table 3-15**). **Table 3-14** presents the result of this forecasting process.

3. Military Aircraft Operations Forecast

Military activity shows little or no correlation to community socioeconomic data or other recognized air traffic indicators. The level of military activity is a function of Department of Defense policy and congressional funding. Therefore, it is difficult to accurately predict the level of military aircraft operations for FSM. Historically, both training and transport operations by military aircraft have occurred at FSM. The recent Base Realignment and Closure Commission has determined that the Air National Guard F-16 unit will be relocated and replaced with A-10 Warthogs. As a result, the forecast was simply the average of historical military operations from 1990 - 2004. Between 1990 and 2004, FSM has averaged near 24,500 annual military operations. For forecasting purposes, it was assumed that these operations would continue at the same level throughout the planning period. Therefore, an average of 24,500 operations was used in the forecast of military operations (**Table 3-15**). Also presented in Table 3-15 is a forecast of military peak hour operations.

Table 3-14
Fort Smith Regional Airport
Annual Instrument Approach Forecast

Year	Total Annual Airport Operations	Instrument Approach %	Instrument Approaches
2000	70,057	1.70%	1,189
2001	61,837	3.38%	2,088
2002	54,879	3.98%	2,183
2003	62,333	3.43%	2,140
2004	64,615	3.34%	2,155
Forecast			
2010	61,670	3.50%	2,158
2015	63,750	3.50%	2,231
2025	66,935	3.50%	2,343

Source: 2000-2003 Instrument Approach data from FAA Terminal Operations Data. Year 2004 extrapolated by consultant from first 5 months actual data.

Table 3-15
Fort Smith Regional Airport
Forecast of Military Operations

Year	Military Operations	Peak Hour Military Operations
1990	17,135	13
1995	27,257	21
2000	25,894	20
2004	31,901	24
2010	24,500	19
2015	24,500	19
2025	24,500	19

E. AVIATION DEMAND FORECAST SUMMARY

The major demand forecast elements of the study are summarized in **Table 3-16**. Demand elements from these forecasts will be used throughout the master plan to help in the development of facility requirements and the identification of alternatives.

F. CRITICAL AIRCRAFT

Based upon the forecast of airline and general aviation demand, a critical aircraft forecast was developed. Critical aircraft are defined as the most demanding aircraft type forecast to use airport on a regular basis. "Regular" is defined as 500 itinerant operations per year. Given these parameters, the largest airline aircraft predicted to use the airport within the

planning period is the 70-seat regional jet. Bombardier's CRJ-700 or Embraer's EMB-170 would qualify for designation as critical aircraft for airline use. For general aviation, either the Gulfstream V or the Boeing Business Jet (BBJ) would be the largest general aviation aircraft to use the facility. The BBJ is a modified Boeing 737 jet aircraft.

Although the civilian airport master planning process does not include planning for military aircraft, it is likely that the largest military aircraft to use the facility would be the C-5 Galaxy or C-17 transport aircraft. It is unlikely that those aircraft would use the facility on a regular basis.

Table 3-16
Fort Smith Regional Airport
Summary of Aviation Demand Forecasts

Aviation Demand Element	2004	2010	2015	2025
ENPLANEMENTS				
Airline (Annual)	92,928	109,300	118,400	141,800
Airline Peak Hour	100	120	140	140
General Aviation (Annual)	25,813	28,875	30,750	33,000
AIR CARGO				
Total Pounds (Enplaned and Deplaned)	76,621	89,670	99,000	123,680
AIRCRAFT OPERATIONS				
Airline	5,880	6,370	6,450	7,235
General Aviation	26,834	30,800	32,800	35,200
GA Local	6,185	7,700	8,200	8,800
GA Itinerant	20,649	23,100	24,600	26,400
Military	31,901	24,500	24,500	24,500
TOTAL AIRPORT	64,615	61,670	63,750	66,935
Annual Instrument Approaches	2,155	2,158	2,231	2,343
PEAK PERIOD OPERATIONS				
Airline Peak Hour	4	4	4	4
GA Peak Hour	16	19	20	22
Military Peak Hour	24	19	19	19
TOTAL AIRPORT POTENTIAL*	44	42	43	45
GENERAL AVIATION AIRCRAFT				
Service Area Registered Aircraft**	202	220	232	251
Based Aircraft (including Military aircraft)**	88	94	99	105

* The total potential applies only to the possible occurrence of all categories of operations experiencing a peak period simultaneously.
** Year 2004 used to reflect latest information.

G. COMPARISON WITH FAA'S TERMINAL AREA FORECASTS

One method of estimating the reasonableness of a set of forecasts is to compare them with other previous or existing forecasts. Only one comparable forecast is updated annually -- the FAA's Terminal Area Forecasts (TAF). For this section, then, a comparison was made between the most recent TAF and the forecasts generated in this Master Plan Update. Key comparisons involved the forecasts of airline enplanements and overall airport operations. These comparisons are shown in **Table 3-17**.

Table 3-17
Fort Smith Regional Airport
Forecast Comparisons

FORECAST/COMPONENT	2004	FORECAST		
FAA Terminal Area Forecasts (2005)	2004	2010	2015	2025*
Enplanements	88,983	101,931	112,163	132,627
Total Aircraft Operations	67,642	69,837	71,717	75,580
Master Plan Update (2005)				
Enplanements	92,928	109,300	118,400	141,800
Total Aircraft Operations	64,615	61,670	63,750	66,935

* Year 2025 extrapolated by consultant.

As shown, the FAA's 2005 Terminal Area Forecasts are lower for enplanements, but higher for total aircraft operations. The lower number of enplanements is within seven percent and thus can be considered reasonable. However, the difference in total aircraft operations is 12.9 percent. The primary cause of this difference involves the number of military operations projected into the future. While the TAF projects 31,091 into the future, the Master Plan Update projects 24,500 -- a difference of 7,401. If that difference were eliminated, the overall operations projections would be within 1.7 percent. Given the Base Realignment and Closure recommendation to change the military mission at Fort Smith Regional, a lower projection of military aircraft operations is reasonable.

H. AIRLINE SERVICE AND PASSENGER LEAKAGE

In order to make informed decisions concerning air service improvement actions, it is important to know the size and direction of airline passenger leakage from the local area to other competing airports. Three airports have been mentioned as possible recipients of Fort Smith area passenger demand: Northwest Arkansas Regional (XNA), Little Rock National (LIT), and Tulsa International (TUL). Low fares from Southwest Airlines are featured at LIT and TUL, while XNA has a wider selection of airlines and flight frequencies than FSM. **Table 3-18** presents a brief history of airline passenger enplanements at all four airports.

Table 3-18
Fort Smith Regional Airport
Historical Airline Enplanements

Year	FSM	XNA	LIT	TUL
1995	95,858	NA	1,273,827	1,576,745
1996	97,968	NA	1,269,469	1,648,056
1997	106,950	NA	1,266,632	1,720,901
1998	109,034	NA	1,266,303	1,725,286
1999	108,072	256,878	1,284,312	1,709,305
2000	104,182	359,000	1,290,529	1,728,358
2001	95,419	362,776	1,253,211	1,668,956
2002	87,944	371,322	1,101,456	1,429,700
2003	90,493	411,085	1,066,120	1,356,175
2004	92,928	537,489	1,100,189	1,306,145

As shown, the first year of operation of XNA (1999) corresponded with a drop in passenger enplanements at FSM. Decreases since 2001 at both LIT and TUL makes them less obvious competitive threats to FSM traffic. The continued rapid growth of XNA, on the other hand, makes XNA the primary threat from a passenger leakage standpoint. XNA features five airlines and 14 non-stop destinations, all of which are major hubs. FSM has two airlines and two hubs.

1. Airline Passenger Leakage Measurement

There are a number of methods of measuring airline passenger leakage from one market to another. The most direct method is a survey or census of airline passengers at each of the markets with questions concerning their place of origin. Other direct methods include license plate surveys in airport parking lots and airline ticket lifts from travel agencies. The primary goal of these studies is to estimate the number of passengers driving past one airport to go to another.

Because of the limited resources of this study effort, estimating techniques were used that did not involve direct surveys or ticket lifts. Instead the two methods used in this analysis both involved an estimation of the total actual passenger demand in the FSM market area. If the total number of potential passengers is known or estimated, it can be compared to actual enplanements and some estimate of "leaked" demand can be generated. Each of the methods used is described in the following subsections.

Comparative Analysis

A comparative methodology developed for air service studies was employed in this study. A comparative analysis examines historical performance of other airports that are similar in size and economic profile to FSM. Obviously, there are numerous factors that contribute to the success of an airline operation and no two communities are exactly alike. But there is value in looking at the common measures of airline demand, including the number of enplanements per capita that occur in different communities and the impact of larger nearby airports on demand. For this study, a model was used that estimates total potential air travel demand from small-to-medium sized cities located near major alternate airports. Because we know that large airports (or airports with low fares) attract a certain percentage of passengers from smaller airports, one way of estimating the effects of this phenomenon is to chart the information from many different airports concerning their number of enplanements, their population, and their distance to the nearest larger airport. A final level of comparison dealt with the types of airline service available and how that, in itself, either limits or enables local enplanement growth. Recent statistical information from 91 communities throughout the United States was gathered in developing the model. Information input to the model included enplanements, county population, distance to the nearest large hub air terminal, and type of airline service available (turboprop, jet, etc.).

The type of airline service available turns out to be a significant factor in measuring the actual ability of an airport to capture local airline passengers. Therefore, one estimate of demand that could be captured with good local service using regional jets was made. This number is based on the *average* performance of other cities across the United States.

- RJ potential capture: 126,600 annual enplanements

Given that 2004 actual enplanements were 92,928, it could be assumed from this estimate that roughly 33,700 passengers were lost to other competing airports. This translates into a leakage of 36 percent.

Excluded Forecast Effects

Another method of estimating potential leakage is to forecast FSM demand prior to the activation of XNA in 1999. Natural growth in the FSM market without the downward impacts of leakage to XNA would give some indication of leakage. Using the same methodology as employed in Table 1 for the forecast of enplanements, a revised forecast was generated. This revised forecast used FSM data only through 1998. The data is not repeated here, but the results indicated the following preferred forecast:

- Year 2025 Forecast of Potential Enplanements: 175,700
- Year 2004 Estimated Potential Enplanements: 119,500

Given that 2004 actual enplanements were 92,928, it could be assumed from the above estimates that roughly 26,500 passengers were lost to XNA. This translates into a leakage of 29 percent, which is within seven percentage points of the comparative analysis method. Because the effects of LIT and TUL were not removed from this estimate, it is very possible that the comparative analysis of 126,600 is accurate. If LIT and TUL attracted as few as 7,100 enplanements annually from the FSM market, the comparative analysis numbers are justified.

2. Summary

Two methods of estimating total potential demand and associated passenger leakage for FSM were examined. These methods generated the following total potential demand numbers:

- Comparative Analysis results: 126,600 Annual Enplanements
- Excluded Forecast Effects results: 119,500 Annual Enplanements

If this analysis is accurate, FSM is losing over one-third (36 percent) of its service area traffic to other airports, or about 33,700 enplanements. Thus, it is very important to find methods of re-capturing a percentage of the demand that is driving to alternate airports.

There are several methods of increasing the capture of local passengers:

- Lowering airline fares
- Increasing airline flight frequency
- Increasing the number of gateway hubs served

It is likely that working with incumbent carriers on these issues will yield only moderate results since they also serve XNA. Generally, the competitive process associated with attracting a third carrier is likely to have an impact on all three methods. Competition enhances the potential to lower airline fares, while at the same time increases the number of hubs served and flight frequencies.