

Chapter 2: Aviation Demand Forecasts

Projecting aviation demand is a critical element in the overall planning process for an airport. The forecasting process establishes the demand, which ultimately defines an airport's ability to accommodate aircraft and operations and, thus determines the type, size, and timing of airside and landside facility development. Projections of aviation demand were prepared for the Yakima Air Terminal Airport Layout Plan (ALP) Update for the 20-year period through the year 2022. These forecasts are meant to serve as a supplement to the forecasts developed for the previous Airport master plan. The forecasts are intended to reflect the desires and needs of the service area populace and economy as it has developed since the previous forecasts for the Airport were developed. Ultimately, these forecasts will influence virtually all phases of the airport planning process.

Demand Forecast Summary

The major forecast elements of the ALP Update are summarized in Exhibit 1. Subsequent sections of this chapter describe the development of the various demand elements in detail. In summary, passenger enplanements are projected to continue to grow throughout the course of the planning period, from 59,522 in the year 2002 to approximately 128,300 by the end of the planning period. Total Airport operations are projected to increase from 43,737 in the year 2002 to a little more than 73,000 by the end of the planning period. Air cargo projections have been carried over from the air cargo forecasts developed for the previous airport master plan. The expectation is that the timeline of the air cargo activity projected in that document will be shifted to future years. Finally, based aircraft are projected to increase from the 141 aircraft based at the Airport in 2002 to approximately 169 aircraft based at the Airport in the year 2022. This represents an increase in based aircraft of a little more than 19 percent.

**EXHIBIT 1
 SUMMARY OF FORECASTS**

Activity Indicator	2002	2008	2013	2022
Enplaned Passengers				
Air Carrier	59,522	101,800	110,600	128,300
Peak Hour Enplanements				
Total	39	50	56	70
Annual Operations				
Total	43,737	64,637	67,972	73,839
Air Carrier	5,466	10,722	11,712	13,224
Air Freight	--	1,290	1,300	1,320
General Aviation	35,712	49,915	52,260	56,615
Military	2,559	4,000	4,000	4,000
Based Aircraft				
Total	141	149	156	169
Peak Hour Operations				
Total	31	45	48	52

Many of the factors influencing future aviation demand cannot necessarily nor readily be quantified. As a result, the forecast process should not be viewed as precise, particularly given the major structural changes that have occurred in the industry since airline deregulation. Actual future traffic levels addressed here may differ materially from the projections presented herein because of unforeseen or unrealized events.

Purpose

Aviation demand forecasts serve four purposes in ALP Update development. Specifically, the forecasts provide the basis for:

- Determining the needed capacity of the airfield, passenger terminal, general aviation area, and ground access system serving the airport;
- Determining the airport's role and the size and type of any facility expansion or new construction;
- Estimating the potential effects of the airport's operations on the surrounding environment including noise and air pollution; and
- Evaluating the financial feasibility of alternative airport development options.

Approach

The existing aviation demand forecasts for the Yakima Air Terminal were developed in the early 1990's. The demand projected for the airport at that time has not materialized due to a variety of reasons. Aviation demand forecasting is not an absolute science in the best of circumstances even when an abundance of detailed data is available for use in developing the forecasts. In the case of the Yakima Air Terminal, the airport service area economy has experienced numerous peaks and valleys since 1990. Historically, the Yakima area has been extremely dependent on agriculture. The agricultural industry has experienced some rough periods over the past few years due to a variety of circumstances. Prices of agricultural commodities have been deflated, which has had a negative effect on the local economy. Efforts have been undertaken to broaden the local economy. These efforts have focused on attracting other industries to the Yakima area to diversify the local economy. The high tech industry and tourism are segments that hold promise. The downturn in the high tech sector over the past year and the prospect of a lingering downturn, coupled with the slump in agricultural commodity prices will continue to impact the local economy. Tourism is a component that will take time to develop.

Aviation demand forecasting typically entails an analytical approach, which is followed by application of the forecasters judgment of local trends and issues. Historical aviation activity data are generally examined in order to identify past trends that may give an indication of future activity trends. Population growth, economic activity, income, employment, etc. are other indicators that are typically factored into the forecasting process.

The second phase of demand forecasting requires experienced professional judgment. The forecaster examines various growth projections for each demand element. The character and economy of the local community must be evaluated to assess how it will influence the particular demand element. Contributing factors within the regional, state, and national economies must also be taken into consideration. A final forecast can then be derived, based on all of these contributing factors.

Overview of Forecast Methodologies

The 1990 airport master plan investigated a variety of analytical methodologies in an attempt to develop forecasts for the Yakima Air Terminal. These included:

- Regression Analysis, which assumes that a specific outcome, in this aviation activity, is dependent on the effects or relationship of some characteristic of the local economy. In other words a relationship that is dependent on another independent variable.
- In aviation demand forecasting, aviation activity, such as airline passengers and based aircraft, are dependent variables. These dependent variables are stimulated by one or more independent variables, such as population, income, employment, and other socioeconomic data.
- Trend Analysis (Time Series Extrapolation) is probably one of the most widely used and accepted forecasting technique. Trend analysis assumes that the historical stimuli for aviation demand will continue to exert a similar influence on future demand levels.
- Market Share Analysis examines the local markets share of a larger regional, state, or national market.
- Survey Analysis relies on personal interviews, mail-back questionnaires, in-flight passenger surveys, mechanical or automatic counts, and structured personal observation to provide information that can be used to develop a forecast.

Aviation Demand Elements

The forecast elements to be developed for the Yakima Air Terminal, include the following:

- Commercial Activity
 - Enplaned Passengers
 - Aircraft Operations
 - Fleet Mix
 - Peaking Characteristics
- General Aviation Activity
 - Based Aircraft
 - Aircraft Operations
 - Peaking Characteristics
- Military Activity
- Instrument Operations
- Operational Fleet Mix

Commercial Carrier Forecast

The regional airline industry has shown continued strong growth since economic deregulation of the U.S. air transportation industry in 1979. The introduction of regional jets over the past 7 years has further fueled growth in the regional airline sector.

A review of the historical passenger activity levels at Yakima is useful in establishing trends in passenger enplanements. This review has been of value in projecting future passenger enplanements.

Exhibit 2 presents the historical passenger enplanements at the Airport from the period of 1980 through the first four months of the year 2001.

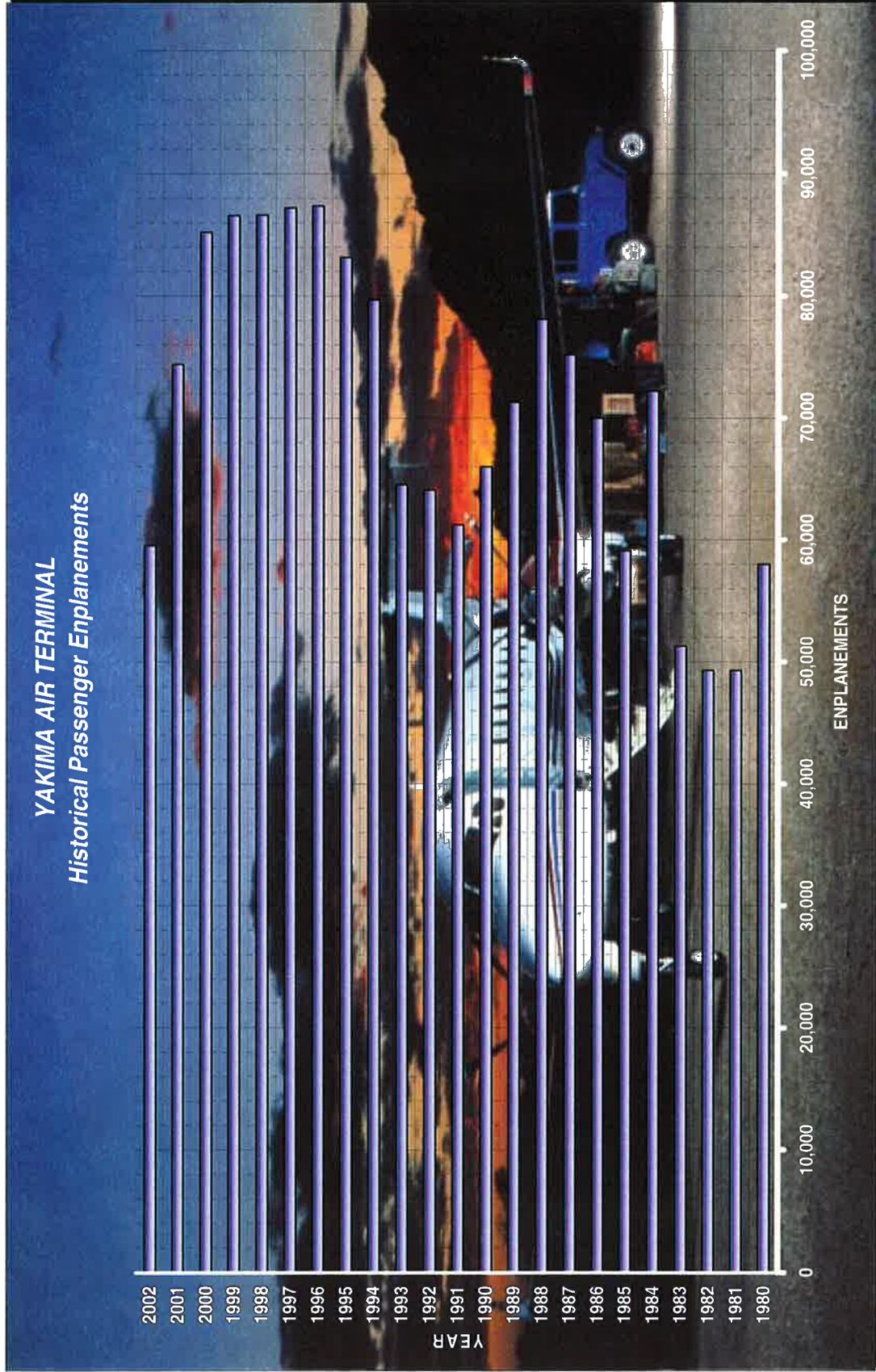
**EXHIBIT 2
 YAKIMA HISTORICAL ENPLANEMENTS**

Year	Enplanements	Year	Enplanements
1980	58,000	1992	64,085
1981	49,300	1993	64,534
1982	49,300	1994	79,697
1983	51,300	1995	83,181
1984	72,200	1996	87,379
1985	59,100	1997	87,235
1986	70,000	1998	86,636
1987	75,200	1999	86,581
1988	78,100	2000	85,239
1989	71,300	2001	74,416
1990	66,000	2002	59,522
1991	61,237		

Source: Yakima Air Terminal Boarding Records

Exhibit 3 graphically depicts these historical passenger activity levels.

EXHIBIT 3
HISTORICAL PASSENGER ENPLANEMENTS



As depicted in the previous exhibits, enplanements for the years 2001 and 2002 decreased significantly due to the events of September 2001 and Skywest Airlines discontinuing service at the airport. Enplanements are expected to rebound and stabilize in the future, therefore, the historic enplanements prior to 2001 have been used to project future enplanements and provide the most realistic forecast over the 20 years planning horizon.

During the period 1980-2000, the airport saw passenger enplanements increase by approximately 47 percent, or roughly 1.95 percent per year. Exhibit 4 depicts the annual percentage growth in passenger enplanements during this period. A review of Figure 2 shows the erratic growth pattern of passenger enplanements since 1980. Significant growth in one year is followed by steep declines stagnant growth the next. Since 1994, the Airport has experienced relatively slow growth in passenger enplanements.

Regression analysis and market share analysis were therefore considered to be too unreliable predictors of passenger enplanements, given the erratic pattern of historical passenger activity. It is interesting to note that a review of the forecasts developed for the previous airport master plan revealed that the trend analysis projection most closely represented the actual passenger enplanements at the Airport since 1980. The trend analysis projected a total of 91,188 enplaned passengers at the Airport in the year 2000 versus the actual passenger enplanement level of 85,239 passengers. This represents a difference of less than 7 percent between the actual and the projected enplanement levels. Exhibit 5 compares the historical passenger enplanements at the Yakima Air Terminal versus the trendline projection of passenger enplanements.

Exhibit 28, at the end of this chapter, presents historical data relative to Yakima County for Population, Farm Income, Labor Force, Non-Agricultural Employment, Per Capita Income, Total Income, and Earned Income for the period 1980 through the year 2000. A comparison of these data to historical enplaned passengers revealed varying levels of disparity between each of the socioeconomic measures and historical enplaned passengers at the Airport.

It has therefore been concluded that a projection of future passenger enplanements derived using a trendline projection methodology would reasonably represent future enplaned passenger levels at the Airport, in view of the dramatic fluctuations in enplanements experienced since the previous master plan was completed. This approach would also be less likely to be influenced by the stagnant growth currently being experienced in the Yakima Valley economy. Forecasting is not an exact science, as previously discussed. The goal of forecasting is to reasonably project future activity levels while discounting broad swings or variations in any given year.

Exhibit 6 graphically depicts the trendline projection of passenger enplanements at the Yakima Air Terminal throughout the planning period. Passenger enplanements are projected to increase from 85,239 in the year 2000 to approximately 96,500 in the year 2005, 106,000 in the year 2010, and approximately 123,000 by the year 2020. This represents an average annual growth rate of approximately 1.85 percent per year.

This trendline projection of passenger enplanements was compared to the FAA's Terminal Area Forecast (TAF) of passenger enplanements for the Airport. The TAF Forecast for the Yakima Air Terminal projects passenger enplanements totaling 121,871 by the year 2015. Extrapolating the FAA forecast through the year 2020 would result in a passenger enplanement level of approximately 132,000. This passenger enplanement level represents total passenger activity of a little more than 7 percent more (9,000 annual passengers) than the trendline projection.

**EXHIBIT 4
HISTORICAL ENPLANEMENT GROWTH/DECLINE**

**YAKIMA AIR TERMINAL
Historical Enplanement Growth/Decline**

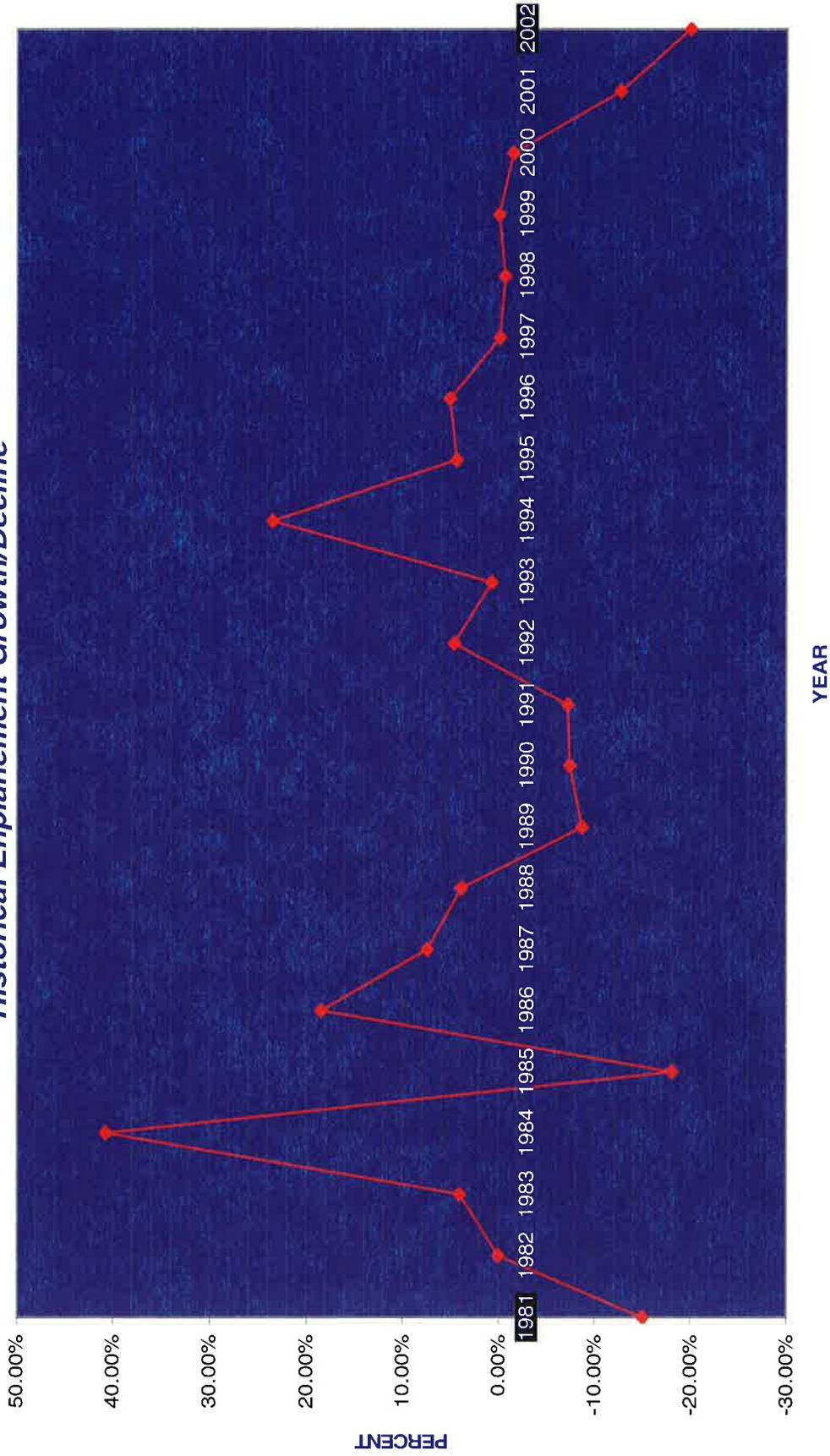


EXHIBIT 5
HISTORICAL ENPLANEMENTS VERSUS TRENDLINE PROJECTION

YAKIMA AIR TERMINAL
Historical Enplanements Versus Trendline Projection

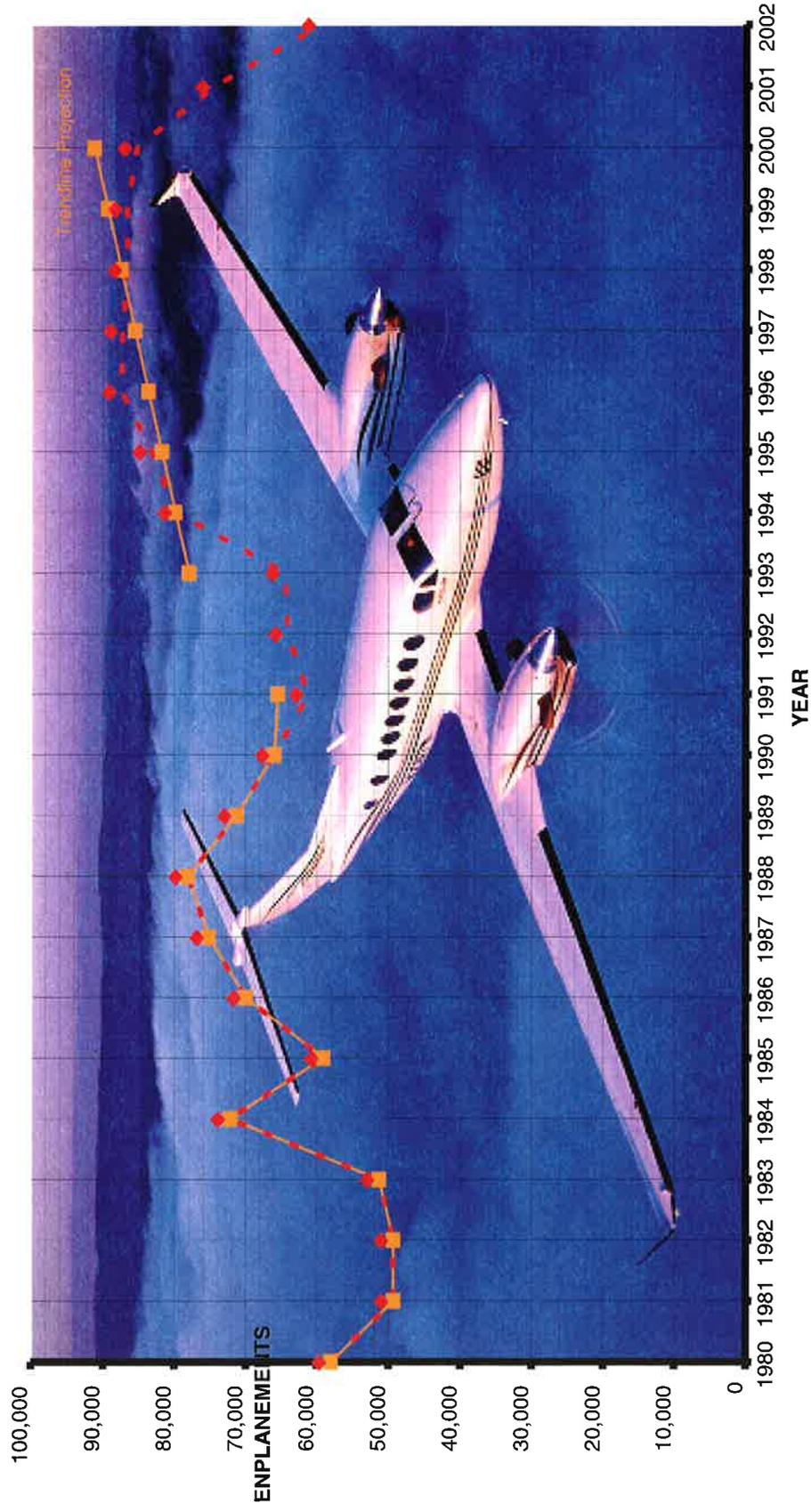
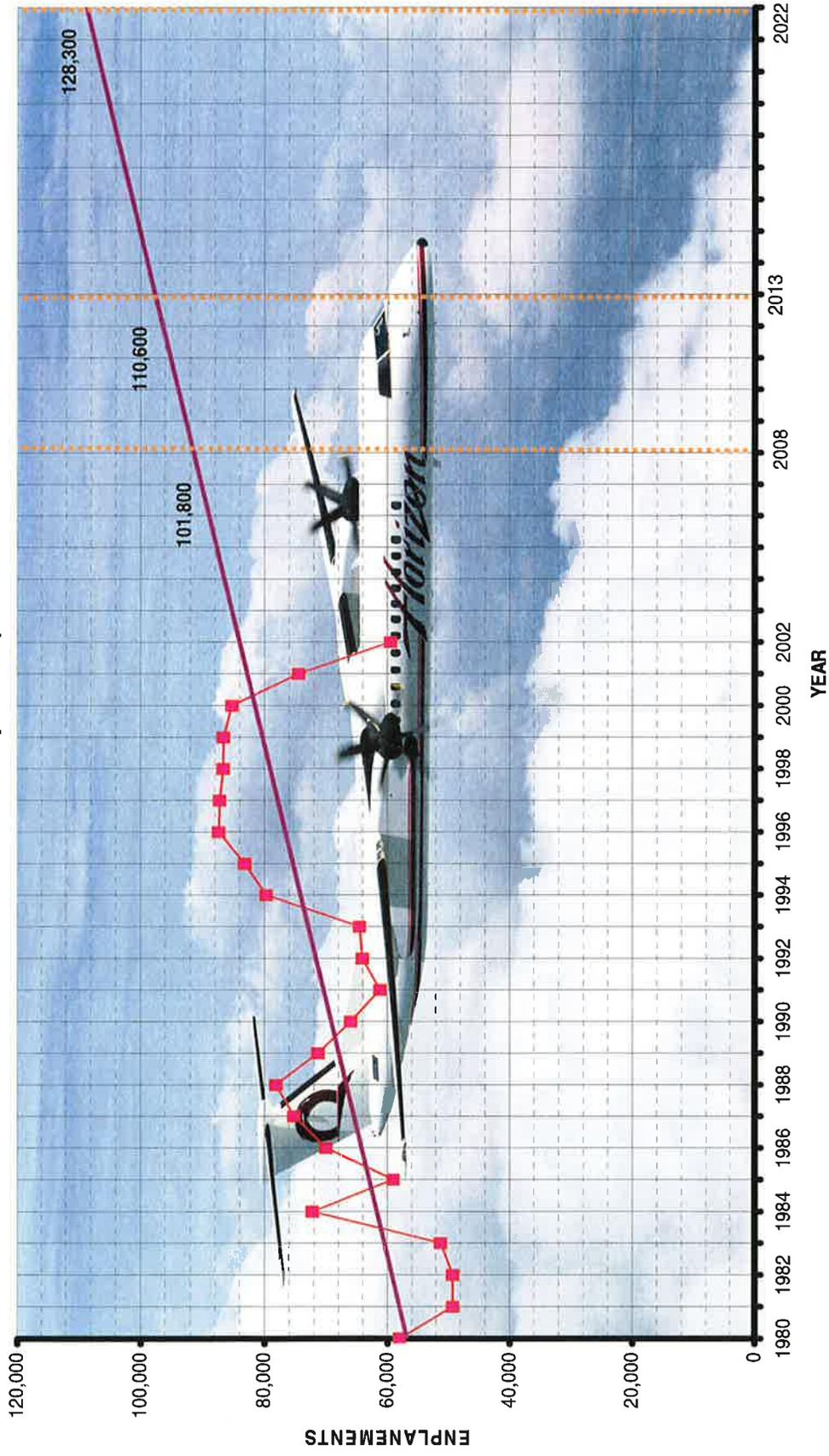


EXHIBIT 6
HISTORICAL AND PROJECTED ENPLANEMENTS

YAKIMA AIR TERMINAL
Historical and Projected Enplanements



Preferred Forecast

The trendline projection and the FAA's Terminal Area Forecast result in comparable enplaned passenger activity levels over the 20-year planning period with the FAA forecasts exceeding the trendline projection by a little more than 7 percent at the end of the planning period. Exhibit 7 graphically depicts the two enplaned passenger projections derived from these two approaches. The FAA Terminal Area Forecasts are based on regression formulas developed for the entire nation. These formulas are not specific to the Yakima area, but rather represent a broad range of airports throughout the country; with varying economic climates. Some are located in areas with high levels of economic growth while others are located in areas experiencing low growth. Therefore, it is believed that the FAA Terminal Area Forecast should be used as a reference by which to gauge the validity of the trendline projections for the Yakima Air Terminal. The trendline methodology has therefore been selected as the appropriate approach to establish future activity projections for the Yakima Air Terminal.

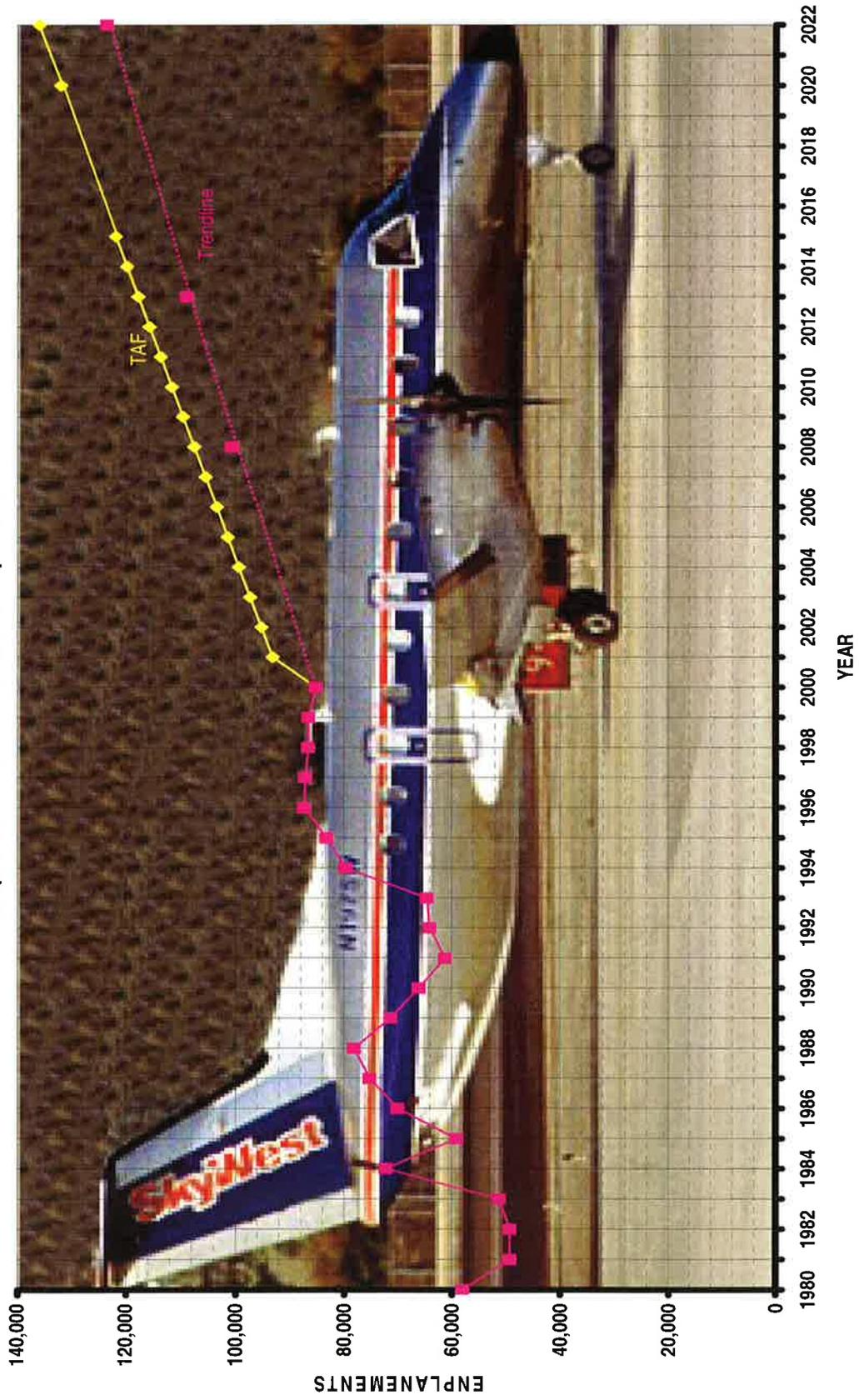
Airline Operational Fleet Mix

When the previous airport master plan was prepared, the regional airline fleet was composed predominantly of 15 to 19 seat aircraft. The trend toward the larger regional airline fleet was just beginning at that time. Today, the fastest growing segment of the regional airline fleet is comprised of small regional jets, which range in size from approximately 50 passengers on up to 70 and 90 passenger aircraft currently being developed for introduction to the regional airline fleet in the next 4-5 years. Yakima has not seen the introduction of regional jets into the airline fleet serving the airport. In all probability, regional jets will not serve the airport in the foreseeable future.

Horizon Airlines is the regional carrier operating at the Yakima Air Terminal. Horizon Airlines is operating the 37 seat Bombardier Dash 8 aircraft, with seven daily departures to Seattle. Horizon Airlines connects with the Alaska Airlines hub in Seattle. The introduction of jet aircraft operations into the Yakima market is not projected during the course of the planning period. There are a number of factors that minimize the likelihood of jet aircraft operations at the airport. The operating economics of the new regional jets are not suited to the short flying distance between Yakima and Seattle. The size of the Yakima market relative to the Seattle market would tend to preclude direct service to any other market in the foreseeable future. A review of the enplaned passenger data and regional air carrier operations indicate that the aircraft serving the Yakima market are operating at just under 50 percent load factor. Therefore, there is substantial capability for growth in passenger enplanements with the aircraft presently serving the Yakima market.

EXHIBIT 7
COMPARISON OF TAF AND TRENDLINE ENPLANEMENTS

YAKIMA AIR TERMINAL
Comparison of TAF and Trendline Enplanements



Annual Airline Operations

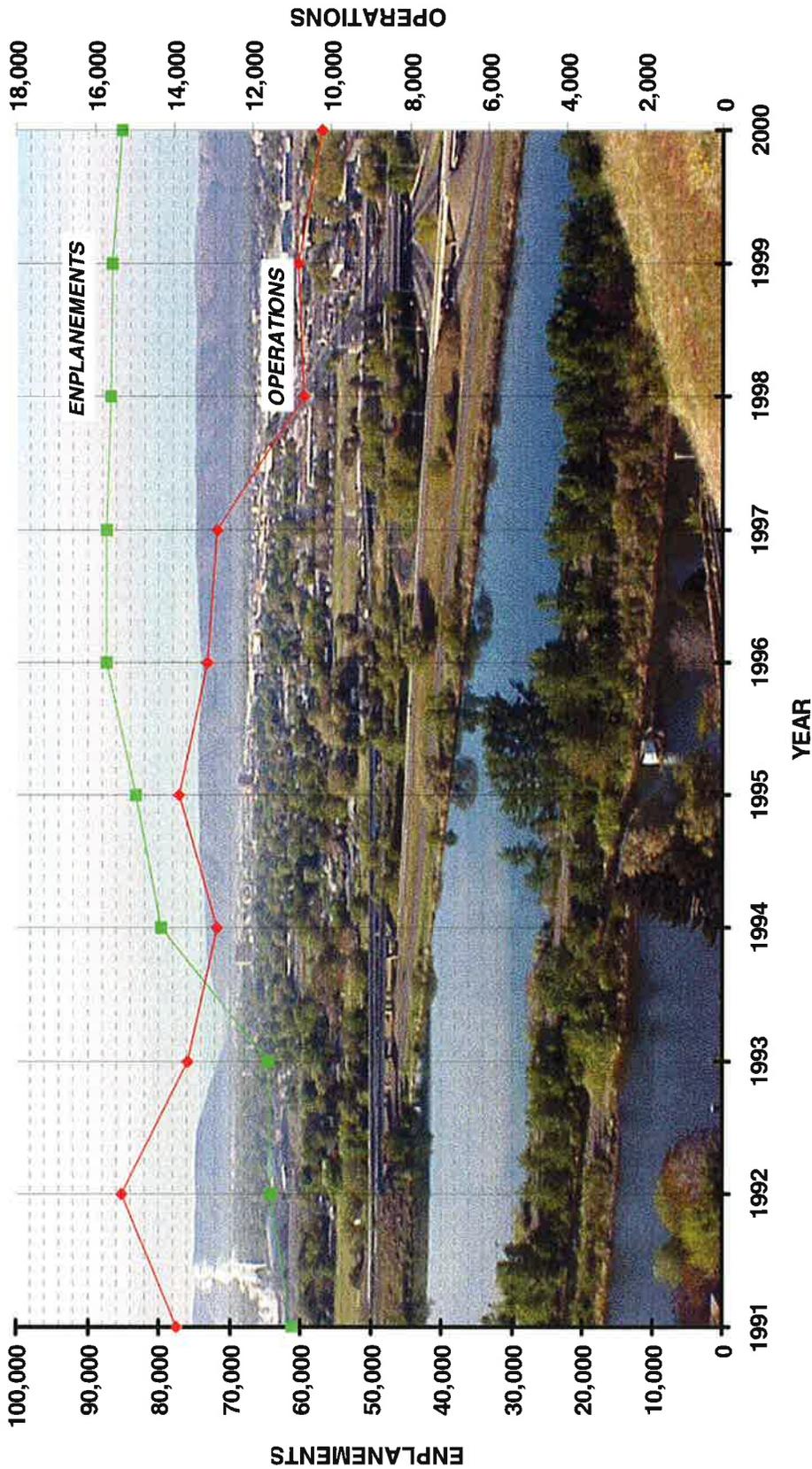
Exhibit 8 presents a summary of historical airline operations versus passenger enplanements at the Airport for the period 1991 through the year 2002. This table also tabulates the calculated number of passengers per departure in each year. This exhibit shows a substantial growth in passengers per departure over the past 10 years including the post September 2001 results. During this same period the number of annual airline operations have shown a fairly sizable decrease, which would account for the growth in passengers per departure. This is shown graphically in Exhibit 9.

**EXHIBIT 8
 HISTORICAL ENPLANEMENTS PER OPERATIONS**

Year	Enplanements	Operations	Enplanements per Departure
1991	61,237	13928	8.8
1992	64,085	15332	8.4
1993	64,534	13668	9.2
1994	79,697	12908	12.3
1995	83,181	13854	12.0
1996	87,379	13142	13.3
1997	87,235	12908	13.5
1998	86,636	10702	16.2
1999	86,581	10836	16.0
2000	85,239	10238	16.7
2001	74,416	8,182	18.2
2002	59,522	5,466	21.8

EXHIBIT 9
HISTORICAL ENPLANEMENTS VERSUS REGIONAL AIRLINE OPERATIONS

YAKIMA AIR TERMINAL
Historical Enplanements Versus Regional Airline Operations



The development of airline operations forecasts for the Airport is expected to be a function of the passenger activity level and the need for increased flight frequencies to meet the growing passenger levels. Airlines typically add frequencies to accommodate increased demand, which would usually result in the addition of additional flights to fill in time slots around the peak periods of the day, usually in the morning or late afternoon/early evening. Therefore, rather than a continually increasing growth in aircraft operations, it is expected that flights will be added to the market in stages, as demand warrants.

Horizon Airlines operates early morning departures to Seattle, with the earliest flight departing at 5:15 AM. Horizon Airlines could initiate a departure in the 5:15 AM to 7:00 AM time period. The timing of these flights would enable passengers to connect with early morning departures out of Seattle to their ultimate destinations provide the ability to work a full day in Seattle before returning home.

Airline operations have been calculated based on the following assumptions:

- The airlines will strive to maintain or grow their current enplanement levels per departure,
- Additional flights would be initiated at a minimum of one flight per day, five days per week.

Exhibit 10 presents the regional airline operations forecast derived using this approach. Regional airline operations are projected to increase to approximately 5,361 departures in the year 2008 (one additional departure per day, five days per week), 5,856 annual departures in the year 2013 (two additional departures per day, five days per week), and 6,612 annual departures in the year 2022 (three additional departures per day, five days per week).

**EXHIBIT 10
 REGIONAL AIRLINE OPERATIONS FORECAST**

Year	Passenger Enplanements	Enplanements per Departure	Annual Departures	Annual Operations
2000	85,239	16.7	5,119	10,238
2008	101,800	19.0	5,361	10,722
2013	110,600	18.9	5,856	11,712
2022	128,300	19.4	6,612	13,224

Source: Keiser Phillips Associates.

Airline Peaking Characteristics

Passenger Peaking

Many airport requirements are particularly sensitive to peak period demand. Three peak planning periods are recognized in airport master planning. They are:

- Peak Month: The month in the calendar year when the highest overall activity levels occur.
- Average (design) Day: A typical day in the peak month, which is determined by dividing peak month activity by the number of days in that month.
- Peak (design) Hour: The peak, or busiest hour during the average day.

The design day and design hour are not necessarily the absolute peaks that will occur within a given year. They represent an industry standard that enables the planner to quantify reasonable facility needs while avoiding the over- or under building of airport facilities.

The previous master plan determined that there is very little peaking with respect to Yakima monthly

enplanements. January was determined to be the peak activity month at the airport, with an average of 9.35 percent of total annual passengers enplaned.

Analysis of Horizon’s flight schedules indicates that the peak hour occurs between 5:15 AM and 8:33 AM. Further analysis determined that a little more than 15 percent of the available seats for the day are offered during this period. Peak hour percentage is expected to gradually increase over the planning period as more flights are added during the morning peak period to coincide with the peaking periods at Seattle. The percentage has been increased from 15 percent to 18 percent over the planning period. Exhibit 11 presents the enplaned passenger peaking forecast for the Airport.

**EXHIBIT 11
 ENPLANED PASSENGER PEAKING FORECAST**

Year	Annual Enplaned Passengers	Peak Month Enplaned Passengers	Average Day Enplaned Passengers	Peak Hour Enplaned Passengers
2000	85,239	7,969	257	39
2008	101,800	9,518	307	50
2013	110,600	10,341	334	56
2022	128,300	11,996	387	70

Source: Keiser Phillips Associates.

General Aviation Forecast

General aviation activity includes all civil aviation activity except that of certificated air carriers and the military. The types of aircraft used in general aviation activities range from corporate multi-engine jet aircraft to single engine piston aircraft, acrobatic planes, helicopters, and other aircraft.

General aviation is an important component of the aviation industry, providing aviation services that commercial carriers cannot or will not provide. The general aviation industry contributes to the health of the national and regional economies through the sale of general aviation aircraft, avionics, and other equipment, and the provision of support services such as flight schools, air taxi operators, fixed base operators (FBOs), aircraft financing, and insurance.

Three measures of general aviation demand are particularly important to the airport planning process. These measures include:

- The number of based aircraft;
- The volume of aviation activity categorized as local, itinerant, and total operations; and
- The peaking characteristics of general aviation operations.

General Aviation Trends

General aviation activity is influenced by various socioeconomic factors as well as local, regional, and national trends. The general aviation industry has experienced substantial changes over the past 20 years. In addition, recent proposals will in all likelihood cause further changes within the aviation industry. A Notice of Proposed Rulemaking (NPRM) is currently making its way through the regulatory process, which will result in the establishment of a new category of aviation referred to as the Sport Pilot/Light Aircraft category. This change, which has been brought about largely through the efforts of the Experimental Aircraft Association (EAA), will result in the inclusion of home built aircraft and ultralight aircraft in the FAA's definition of a general aviation aircraft. Previously, these craft were not considered aircraft nor were they counted by the FAA when determining aircraft basing demand.

The proposed legislation will also change the requirements for piloting this category of aircraft. Private pilots must currently obtain a medical certificate from an FAA certified doctor in order to receive their pilots license. Under the new proposal, pilots operating this new category of "light aircraft" will need only their drivers license and a much less rigorous pilot training program to receive a license to pilots this new category of aircraft. Since this change to the general aviation regulatory process has not yet been enacted and final guidelines will need to be developed before it will be possible to determine the actual impact of this regulation on the industry, the assumption is that there will be a jump in the numbers of licensed pilots and aircraft.

Beyond the implementation of this new regulation, one of the principal areas of general aviation that has continued to develop is business flying. The consolidations in the airline industry following deregulation in 1979 and the development of the major airline hubs have made commercial airline travel more time-consuming and imposed more circuitous routing to final destinations. The impacts of airline consolidation have been especially detrimental to smaller communities. These changes have led to increased use of business aircraft. Beyond the increased use of business aircraft, the aircraft used in business flying have seen a substantial increase in sophistication. The trend in types of aircraft used by business is toward the twin-engine piston and turbo-prop fixed wing aircraft, rotorcraft, and newer and higher performance business jets.

The FAA publication, *FAA Aviation Forecasts: Fiscal Years 2001-2012*, identified additional trends in the general aviation sector. Among these is the increased shipment of general aviation aircraft in 1999, which marked the sixth consecutive year of increases following years of minimal growth or actual declines in the shipment of new general aviation aircraft. GA aircraft shipments have increased by 172 percent since 1994; from 928 GA aircraft shipped in 1994 to 2,525 GA aircraft shipped in 1999. During the first three quarters of the year 2000, shipments were up again – 16.3%. Shipments of piston powered aircraft have more than tripled since 1994 to 1,747 in 1999 and further growth seen during the first three quarters of the year 2000 as well. At the other end of the GA aircraft spectrum, jet aircraft shipments again increased over the previous year in 1999, with 514 jet aircraft shipped in 1999 and the first three quarters of the year 2000 having shown additional growth beyond that in 1999. These trends suggest that all elements of the general aviation sector are showing continued growth, from single engine piston aircraft up through the more sophisticated business jet fleet.

Based Aircraft Forecast

The number of general aviation aircraft based at an airport (permanently located at an airport) is an important factor when planning future airfield and landside facilities. Exhibit 12 lists the annual based aircraft totals at the Airport since 1984, while Exhibit 13 graphically depicts the historical based aircraft at the Airport. Numerous discrepancies in total based aircraft were encountered during the review of the information sources concerning based aircraft. It is apparent from a review of the available based aircraft data, that the Airport has seen a significant decline in based aircraft since 1984. This is consistent with what has happened at the majority of airports around the country. The cost of obtaining a pilots license –

both time and expense, the lack of affordable “entry level” aircraft, the costs of aircraft maintenance, insurance, and storage and the escalating price of fuel have all contributed to the decline in the general aviation fleet.

The number of based aircraft has decreased from a high of 160 in 1984 to approximately 141 in the year 2002. While this is a typical scenario for many airports over the past 20 years, since 1990, the number of based aircraft has shown more stability with smaller swings up or down. A review of Exhibit 12 shows the inherent difficulty in forecasting based aircraft. While population, employment, income, and most other socioeconomic measures have shown increases since 1984, the number of based aircraft has shown no reasonable correlation to any of these possible indicators.

**EXHIBIT 12
 BASED AIRCRAFT**

Year	Total Based Aircraft*	Year	Total Based Aircraft
1984	160	1994	123
1985	160	1995	106
1986	160	1996	122
1987	161	1999	117
1988	160	2000	114
1989	160	2001	138
1990	117	2002	141
1991	118		

The FAA prepares forecasts of aviation activity each year and presents the results of this forecasting effort in the document titled, “*FAA Aviation Forecasts: Fiscal Years 2001-2012*”. The FAA has developed growth rates for active general aviation aircraft, which are presented in Table I-5 of this document. The average annual growth rate of active general aviation aircraft presented in the Aviation Forecasts document was projected as 0.9 percent per year through the year 2012. This average annual growth rate was applied to the year 2002 based aircraft total of 141 aircraft and extended throughout the 20-year planning period. Exhibit 13 shows the forecast of based aircraft projected at the Yakima Air Terminal using this methodology.

**EXHIBIT 13
 FAA GROWTH RATE BASED AIRCRAFT FORECAST**

Year	Annual Growth ¹	Based Aircraft	Year	Annual Growth ¹	Based Aircraft
2002	0.90%	141	2013	0.90%	156
2003	0.90%	142	2014	0.90%	157
2004	0.90%	144	2015	0.90%	158
2005	0.90%	145	2016	0.90%	160
2006	0.90%	146	2017	0.90%	161
2007	0.90%	147	2018	0.90%	163
2008	0.90%	149	2019	0.90%	164
2009	0.90%	150	2020	0.90%	166
2010	0.90%	151	2021	0.90%	167
2011	0.90%	153	2022	0.90%	169
2012	0.90%	154			

¹U.S. Dept. of Transportation, Federal Aviation Administration, *FAA Aviation Forecasts: Fiscal Years 2001-2012*, Table I-5, (Washington, D.C., March 2001).

The numbers of based aircraft derived using this methodology assumes a stable economy in the Airport service area (a parallel assumption of the FAA forecast document). In all likelihood, there will be periods of fluctuation in based aircraft throughout the planning period. However, the based aircraft totals calculated using this methodology are considered reasonable. Exhibit 14 depicts typical aircraft based at the Airport while Exhibit 15 is a graphical representation of the numbers of forecast based aircraft over the 20-year planning period.

EXHIBIT 14
HISTORIC BASED AIRCRAFT

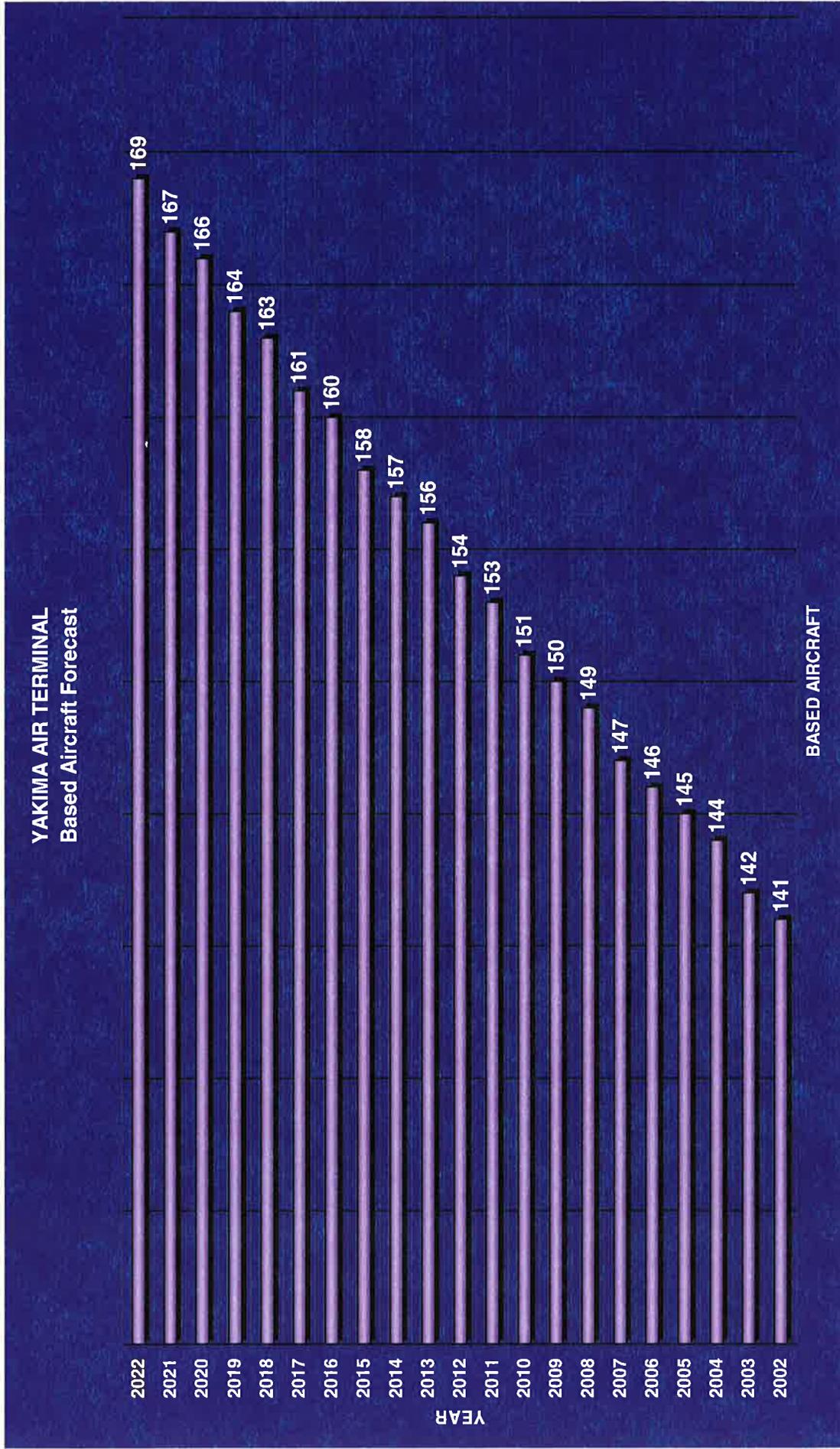


EXHIBIT 15
REPRESENTATIVE YAKIMA BASED AIRCRAFT



Beech Baron



Cessna Citation Ultra



Bell 206 JetRanger

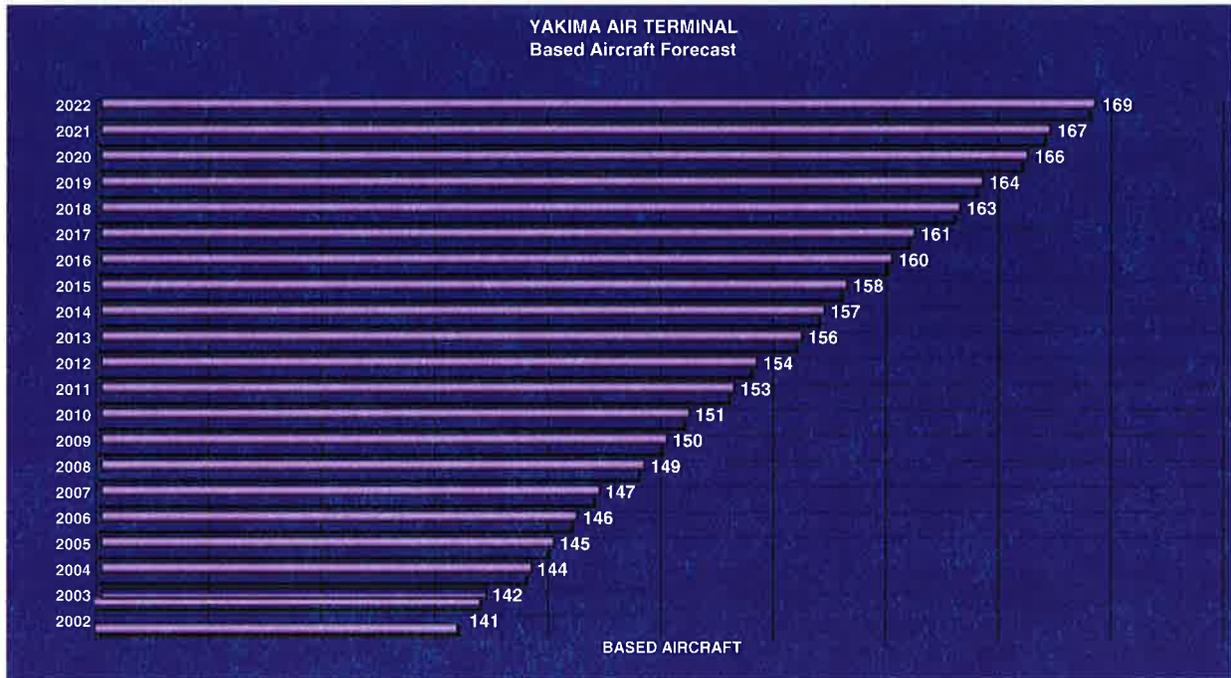


Mooney



Beech Kin Air 200

**EXHIBIT 16
 BASED AIRCRAFT FORECAST**



Comparison With FAA Terminal Area Forecast of Based Aircraft

The FAA prepares forecasts of aviation activity for airports in the National Plan of Integrated Airport Systems (NPIAS) of which the Yakima Air Terminal is an integral part. A review of the 2001 FAA TAF for the Yakima Air Terminal revealed no growth in based aircraft over the FAA’s 12 year planning period (through 2012).

In view of the past growth in the local economy and the forecast for continued future growth, the FAA Terminal Area Forecast of based aircraft at the Yakima Air Terminal appears to be flawed. Recent discussions with the FBO indicated that the number of based aircraft at the Airport has been increasing in the past few years. In addition, it was noted by the FBO that the number of student pilots enrolled in flight training is at its highest level ever at the Airport. In fact, an additional based helicopter is locating to the Airport within the current week. This information supports the assessment that the TAF forecasts for the Airport are erroneous. Beyond that, the pending change in regulations associated with the new designation of sport aviation/light aircraft would further suggest that FAA TAF forecast for Yakima is inaccurate.

Therefore the based aircraft forecasts derived using the FAA average annual growth rates of active aircraft are considered reasonable for the Yakima Air Terminal. These forecasts represent relatively conservative growth in based aircraft over the planning period that is considered to be sustainable, given the increased activity in student pilot flying and the proposed changes to pilot and aircraft certification that has been approved by the FAA and awaits final adoption.

Based Aircraft Fleet Mix

A based aircraft fleet mix projection was also developed as part of the planning effort for the Yakima Air Terminal. Information was gathered from the Airport and FBO in order to determine the percentages of aircraft in the based fleet by class. In the year 2002, 85.1 percent of the Airport’s based aircraft fleet was comprised of single-engine aircraft. Multiengine aircraft comprise approximately 12.8 percent (piston and turbine) of the aircraft fleet. Just over two percent of the based aircraft fleet is comprised of jet aircraft and helicopters. The Airport does not have any existing based aircraft in the category “other” - ultralights and gliders.

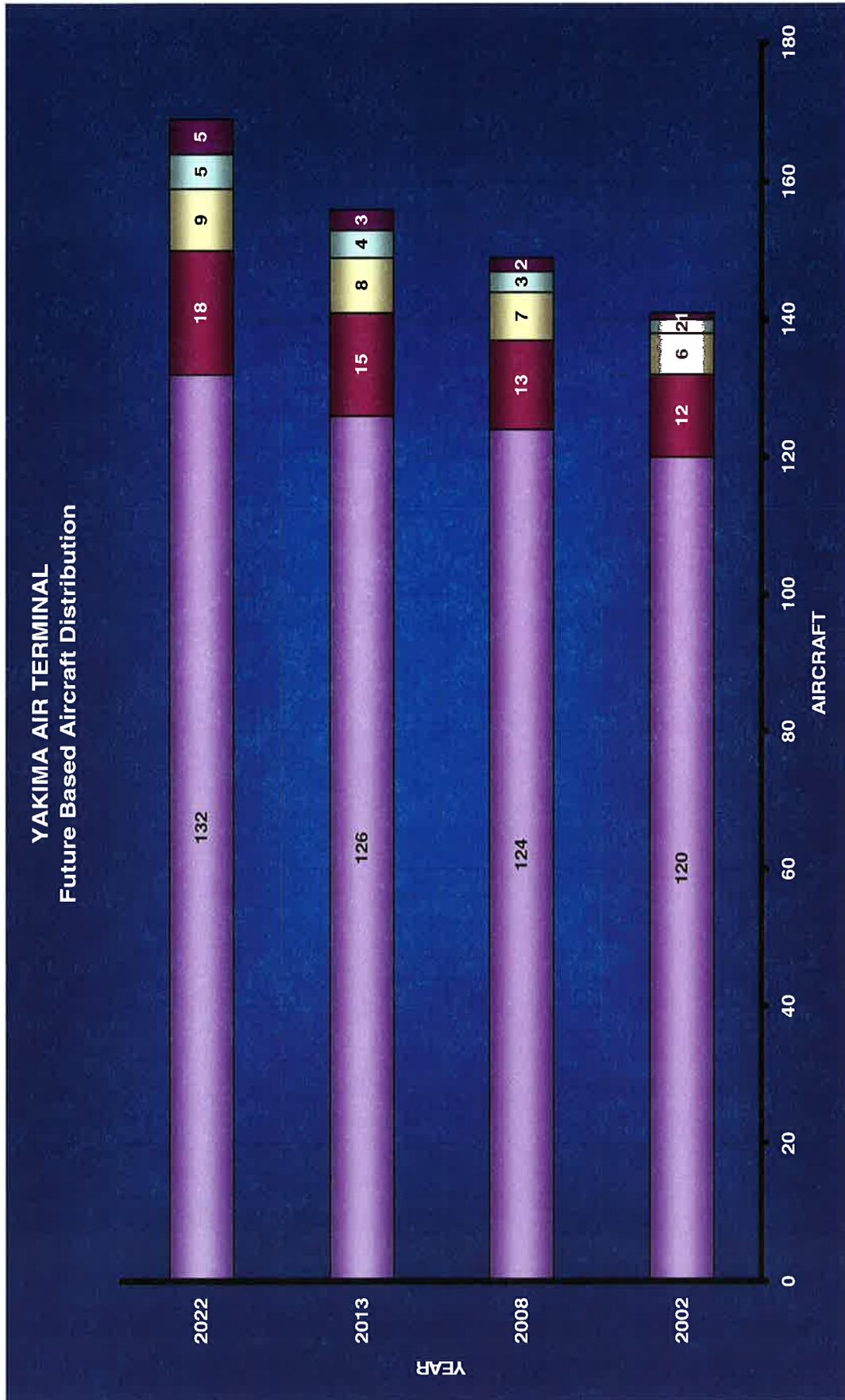
The existing and projected based aircraft fleet is tabulated in Exhibit 17. The percentage distribution of Yakima’s future based aircraft fleet was calculated in consideration of the percentage breakdown of active aircraft in the national fleet. Based single engine aircraft are projected to slowly decrease as a percentage of the Airport’s based aircraft fleet over the course of the planning period. During this same period, the multi-engine piston and turbine aircraft, business jets, and helicopters are gradually projected to increase as a percentage of the Airport’s based aircraft fleet. Ultimately, the based aircraft fleet at the Yakima Air Terminal is expected to more closely reflect the distribution of the national fleet. The increasing importance of business aircraft in the national, state, and ultimately, the local economy was considered to be the most important element in projecting the future based aircraft distribution at the Airport. Exhibit 18 graphically represents the based aircraft distribution at the Airport over the course of the planning period.

**EXHIBIT 17
 BASED AIRCRAFT FLEET MIX**

Year	Single Engine		Multiengine P		Multiengine T		Jet		Helicopters		Total	
	Based	%	Based	%	Based	%	Based	%	Based	%	Based	%
Historical												
2002	120	85.1	12	8.5	6	4.3	2	1.4	1	0.7	141	100
Projected												
2008	124	83.2	13	8.7	7	4.7	3	2.0	2	1.3	149	100
2013	126	80.8	15	9.6	8	5.1	4	2.6	3	1.9	156	100
2022	132	78.1	18	10.7	9	5.3	5	3.0	5	3.0	169	100

Source: Keiser Phillips Associates

EXHIBIT 18
FUTURE BASED AIRCRAFT DISTRIBUTION



Annual General Aviation Operations

Historical aircraft operations data for the Airport were obtained from the FAA Air Traffic Control Tower. Exhibit 19 presents the historical breakdown of general aviation operations (local, itinerant and total) for the years 1996 through the year 2002. A review of this table shows the fluctuation in general aviation activity during this period. Total operations declined during the period 1996 through 1998, then showed a growth trend through the year 2000 followed by a decrease in 2001 and 2002. The increase and decrease in operations affected both local and itinerant activity. This trend differs somewhat from the national picture, where general aviation operations grew throughout the country during the years 1996 through 1999 and then showed a decline in the years 2000 through 2002.

EXHIBIT 19
HISTORICAL GENERAL AVIATION OPERATIONS

Year	Local	Itinerant	Total
1996	25,593	24,064	49,657
1997	21,124	19,833	40,967
1998	16,529	17,986	34,515
1999	15,886	19,285	35,171
2000	18,729	20,741	39,470
2001	17,467	19,421	36,888
2002	16,120	19,592	35,712

Aircraft operations are an important consideration in airport facility development, since they establish the parameters by which future facility expansion can be gauged. There are two types of operations: local and itinerant. A local operation is a takeoff or landing performed by an aircraft that will operate in the local traffic pattern, within sight of the airport or that will execute simulated approaches or *touch-and-go* operations at the airport. Itinerant operations are all arrivals other than local. Generally, local operations are characterized as training operations and itinerant operations are those aircraft with a specific destination away from the airport. Typically, itinerant operations increase with business and industry use since business aircraft are used to carry people from one location to another.

A comparison of the total number of based aircraft to the total number of general aviation operations provides a means of quantifying future aviation activity. This methodology is known as an operations per based aircraft (OPBA) methodology. The OPBA is a methodology recognized by the FAA that relates total general aviation airport activity to a known variable, in this case, based aircraft. Historically, the number of OPBAs at general aviation airports has remained fairly consistent. Exhibit 20 presents the OPBA at the Airport during the period 1996 through the year 2000. Operations per based aircraft have shown the same pattern as total operations, decreasing from 1996 through the 1998 and then growing from 1999 to the year 2000. Due to the fluctuation in OPBA's during this period, an average of the five years was calculated to use in projecting future general aviation operations. The average OPBA during this period was approximately 335 per based aircraft.

As with the commercial operations and enplanement forecast, the downturn in operations following the events of September of 2001 are excluded from analysis of future operations. Inclusion of these figures would lead to projections which are not believed to be representative of projected growth through the 20 year planning horizon.

**EXHIBIT 20
HISTORICAL GENERAL AVIATION OPERATIONS PER BASED AIRCRAFT**

Year	Total	Based Aircraft	Operation per Based Aircraft (OPBA)
1996	49,657	122	407
1997	40,967	124	330
1998	34,515	124	278
1999	35,171	117	301
2000	39,470	114	346
2001	36,888	138	267
2002	35,712	141	253

Historically, the ratio of itinerant to local operations has ranged from a high of 55 percent in 2000 to a low of 48 percent itinerant to local in 1996 and 1997. Itinerant operations have become a higher percentage of total GA operations since 1997. While local operations represented roughly 52 percent of total operations during 1996 and 1997, they have since been displaced by itinerant operations, which now represent the majority of general aviation activity at the Airport. It is expected that in the future, the percentage of itinerant to local operations will trend more toward the historic percentage (52 percent local and 48 percent itinerant) over the course of the planning period. The reasoning behind this assumption is based on the discussions with the FBO, who indicated that pilot training is currently at an all time high at the Airport and in view of the proposed new regulations pertaining to sport pilot/light aircraft. Exhibit 21 presents the breakdown of projected general aviation activity, including local, itinerant, and total operations.

**EXHIBIT 21
FORECAST GENERAL AVIATION OPERATIONS PER BASED AIRCRAFT**

Year	Based Aircraft	OPBA	Total Operations	Local Operations	Itinerant Operations
2002	141	253	35,712	16,120	19,592
2008	149	335	49,915	23,959	25,956
2013	156	335	52,260	25,607	26,653
2022	169	335	56,615	28,874	27,741

Peaking Characteristics

Because many facility needs are related to activity levels during peak demand periods, projections were developed for peak month, average day, and peak hour operations as shown in Exhibit 22. The peak operating month for general aviation activity typically occurs in the summer months of July or August. A review of the air traffic control tower activity statistics indicated that peak month operations represent approximately 10.5 percent of total annual operations. It was assumed that this monthly peaking factor would remain constant throughout the planning period. Average daily operations were estimated by dividing the peak month by 31 days. To develop peak hour operations projections, an hourly peaking

factor was applied to the number of average daily operations. Past studies have shown this factor to be approximately 20 percent for airports with activity levels comparable to those experienced at the Yakima Air Terminal. A 20 percent hourly peaking factor accounts for brief periods of relatively heavy use, including periods when several aircraft are in the pattern performing touch-and-go operations.

**EXHIBIT 22
 PEAKING CHARACTERISTICS**

Year	Total Operations	Peak Month Operations	Average Day Peak Month Operations	Peak Hour Operations
2002	35,712	3,749	121	24
2008	49,915	5,241	169	34
2013	52,260	5,487	177	35
2022	56,615	5,945	192	38

Source: Keiser Phillips Associates.

Peak month operations are projected to increase from 3,749 in 2002 to 5,945 in 2022. Average day - peak month operations should increase from 134 to 154 over this same period. It should be noted that peak day operations can surpass this figure during very busy periods. Peak hour activity is expected to increase from 24 to 38 operations by the end of the planning period. Again, these projections represent averages, rather than absolute peak numbers. Therefore, the hourly and daily peaks may be exceeded during exceptionally active periods.

Military Operations

A variety of military aircraft routinely use the airport. Exhibit 23 shows historical and forecast military operations for Yakima Air Terminal. Typically, the level of military activity at an airport is determined solely by the requirements of the Department of Defense. Military operations are not a function of local population, economic or other civilian air traffic indicators. The basis for the military operations forecast at the Yakima Air Terminal is an assumption that the present level of activity will continue in the future.

**EXHIBIT 23
 HISTORICAL AND FORECAST MILITARY OPERATIONS**

Year	Local	Itinerant	Annual Operations	Peak Month Operations
1996	3,040	2,255	5,295	1,400
1997	2,544	1,904	4,448	679
1998	n.a.	n.a.	3,268	504
1999	n.a.	n.a.	4,030	710
2000	n.a.	n.a.	3,878	540
2001	881	1,632	2,513	511
2002	948	1,611	2,559	379

Forecast				
2008	2,200	1,800	4,000	500
2013	2,200	1,800	4,000	500
2022	2,200	1,800	4,000	500

Source: Keiser Phillips Associates.

Total Aviation Activity

The preceding sections of this chapter developed forecasts for each segment of aviation activity at Yakima Air Terminal. Since each of these segments represents a portion of the total activity levels expected at the airport, it is important that a summary of the total airport's activity be prepared.

Annual Operations Summary

Exhibit 24 summarizes historical and projected activity at the Yakima Air Terminal during the planning period. These projections will be used in subsequent portions of the ALP Update to examine the ability of the Airport's existing airside and landside facilities to effectively accommodate both existing and future demand levels.

EXHIBIT 24 SUMMARY OF AVIATION ACTIVITY

Year	Air Carrier	General Aviation	Military	Total
2002	5,466	35,712	2,559	43,737
2008	10,722	49,915	4,000	64,637
2013	11,712	52,260	4,000	67,972
2022	13,224	56,615	4,000	73,839

Source: Keiser Phillips Associates

Total Airfield Peaking Characteristics

A review of the Air Traffic Control Tower records indicates that the peak month of the year for total airfield operations has fluctuated over the summer and early autumn months. Peak month percentages of annual aircraft operations averaged 10.9 percent. This percentage is applied to the forecast of total annual aircraft operations to derive the peak month forecast of operations for all activity at the airport. Peak month operations were divided by 31 to determine average day activity. A 20 percent hourly peaking factor was used to account for brief periods of relatively heavy use, including periods when several aircraft are in the pattern performing touch-and-go operations. The resulting peak hour forecast for total operations is shown in Exhibit 25.

**EXHIBIT 25
AIRFIELD PEAKING CHARACTERISTICS**

Year	Total Annual Operations	Peak Month Operations	Average Day Operations	Peak Hour Operations
2002	43,737	4,767	154	31
2008	64,637	7,045	227	45
2013	67,972	7,409	239	48
2022	73,839	8,048	260	52

Source: Keiser Phillips Associates.

Local and Itinerant Operations

Aircraft operations are comprised of two categories: itinerant and local as described in the General Aviation activity section. All airline, cargo, and air taxi operations are classified as itinerant. Exhibit 26 presents the annual itinerant/local operations forecast throughout the planning period.

**EXHIBIT 26
ANNUAL ITINERANT AND LOCAL OPERATIONS FORECAST**

Year	Itinerant					Local		
	Air Carrier	Air Cargo	General Aviation	Military	Subtotal	General Aviation	Military	Subtotal
2002	5,466	n.a.	19,592	1,611	26,669	16,120	948	17,068
2008	10,722	1,290	25,956	1,800	39,768	23,959	2,200	26,159
2013	11,712	1,300	26,653	1,800	41,465	25,607	2,200	27,807
2022	13,224	1,320	27,741	1,800	44,085	28,874	2,200	31,074

Source: Keiser Phillips Associates.

Instrument Operations

An instrument operation is defined as an arrival or departure from an airport by aircraft operating in accordance with an instrument flight rule (IFR) flight plan, for the purposes of this study. Instrument operations can be performed regardless of meteorological conditions. Actual instrument approaches, however, are defined as instrument operations conducted during instrument meteorological conditions. Instrument meteorological conditions exist when the cloud ceiling is less than 1,000 feet above ground level (AGL) and/or visibility is less than three miles.

FAA Air Traffic Control records maintained at the Yakima Tower were reviewed for the years 1990 through 1999. Annual data indicates that IFR operations account for between 31 and 41 percent of the total operations. The average percentage of IFR operations over the ten-year period (1990-1999) was applied to the total operations forecast to develop the future VFR/IFR operations split. The calculated percentage over this ten-year period was 35.4 percent. Exhibit 27 presents the forecast of VFR/IFR operations for the airport.

**EXHIBIT 27
 FORECAST OF INSTRUMENT OPERATIONS**

Year	Instrument Operations	Visual Operations	Total Annual Operations
1990	29,479	55,235	84,714
1991	27,180	54,070	81,250
1992	28,539	50,995	79,534
1993	28,021	40,007	68,028
1994	26,927	49,703	76,630
1995	24,092	50,415	74,507
1996	22,995	50,973	73,968
1997	23,145	38,540	61,685
1998	20,892	34,804	55,696
1999	19,643	36,665	56,308
Forecast			
2008	22,881	36,097	64,637
2013	24,062	38,044	67,972
2022	26,139	41,412	73,839

Source: Keiser Phillips Associates.

**EXHIBIT 28
HISTORICAL ENPLANEMENTS AND SOCIO-ECONOMIC DATA - 1980-2001**

		Farm	Labor	Non AG	Per Capita	Total	Earned	
	Enplanements	Population	Income	Force	Employment	Income	Income	
1980	58,000	172,508	\$111,498	82,700	52,670	\$8,993	\$1,556,884	\$1,036,638
1981	49,300	174,300	\$113,247	83,700	52,150	\$9,734	\$1,705,533	\$1,092,115
1982	49,300	176,100	\$123,979	85,500	50,300	\$10,085	\$1,783,338	\$1,119,722
1983	51,300	178,300	\$132,860	91,100	51,450	\$10,478	\$1,878,090	\$1,189,932
1984	72,200	180,100	\$168,861	87,200	52,710	\$11,259	\$2,028,996	\$1,290,170
1985	59,100	181,500	\$120,338	84,800	54,000	\$11,393	\$2,065,778	\$1,273,845
1986	70,000	182,100	\$187,056	90,000	54,900	\$12,151	\$2,198,913	\$1,372,197
1987	75,200	183,400	\$240,993	91,400	57,700	\$13,051	\$2,371,495	\$1,517,740
1988	78,100	184,700	\$189,081	93,500	59,700	\$13,102	\$2,429,873	\$1,552,018
1989	71,300	186,200	\$256,412	98,900	62,100	\$14,418	\$2,704,429	\$1,726,499
1990	66,000	188,823	\$229,454	102,300	64,800	\$15,657	\$2,965,915	\$1,852,162
1991	61,237	195,026	\$326,939	101,600	65,800	\$16,400	\$3,177,008	\$2,070,497
1992	64,085	200,555	\$397,138	109,300	68,100	\$17,576	\$3,491,965	\$2,303,081
1993	64,534	207,390	\$389,900	112,700	69,700	\$17,893	\$3,647,152	\$2,393,163
1994	79,697	214,440	\$346,325	110,900	71,900	\$18,156	\$3,783,461	\$2,470,794
1995	83,181	219,480	\$323,264	113,400	73,000	\$18,362	\$3,890,329	\$2,489,364
1996	87,379	223,203	\$422,109	115,200	73,500	\$19,511	\$4,176,687	\$2,677,854
1997	87,235	223,917	\$354,502	114,700	75,100	\$20,047	\$4,333,704	\$2,751,220
1998	86,636	222,838	\$399,342	115,000	75,200	\$20,674	\$4,523,596	\$2,901,809
1999	86,581	223,596	\$301,611	111,500	74,700	\$20,811	\$4,594,687	\$2,895,574
2000	85,239	222,581		108,700	75,900			
2001	74,416							
2002	59,522							

Source: Washington State Data Book.