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Chapter Three

AVIATION DEMAND FORECASTS

AVIATION DEMAND FORECASTS

Facility planning must begin with a definition of the demand that may reasonably be expected to occur at the facility over a specific period of time. For Hillsboro Airport, this involves forecasts of aviation activity through the year 2025. In this master plan, forecasts of based aircraft, the based aircraft fleet mix, and annual aircraft operations will serve as the basis for facility planning.

Air transportation is a unique industry that has experienced wide fluctuations in growth and recession. For this reason, it is important that from time-to-time an airport re-evaluate its current position and examine future demand trends and potential.

The primary objective of this planning effort is to define the magnitude of change in aviation demand that can be expected over time. Because of the cyclical nature of the economy, it is virtually impossible to predict, with certainty, year-to-year fluctuations in activity when looking more than 20 years into the future. However, a trend can be established which delineates long-term growth potential. While a single line is often used to express the anticipated growth, it is important to remember that actual growth may fluctuate above and below this line. The point to remember about forecasts is that they serve only as guidelines, and planning must remain flexible to respond to unforeseen facility needs. This is because aviation

activity is affected by many external influences, as well as by the types of aircraft used and the nature of available facilities.

Recognizing this, the master plan for Hillsboro Airport will be demand-based rather than time-based. Demand-based planning relates capital improvements to demand factors, such as based aircraft, instead of points in time. This allows the airport to address capital improvement needs according to the actual demand occurring at the airport. For example, should based aircraft growth slow or dramatically decline, it may not be necessary to implement some improvement projects. However, should the airport experience accelerated growth in based aircraft, the plan will need to be flexible enough to respond accordingly. This dynamic aspect of forecasting aeronautical needs will be further described in subsequent chapters of this master plan.

In order to fully assess current and future aviation demand for Hillsboro Airport, an examination of several key factors is needed. These include: national and regional aviation trends, historical and forecast socioeconomic and demographic information of the area, and historical trends at Hillsboro Airport.

These are the first planning forecasts to be prepared for Hillsboro Airport subsequent to the events of September 11, 2001 (9/11). There is no comparative period in recent history to draw conclusions or trends to gauge the full effects of the events of 9/11. In 1991, general aviation was already in an extended period of decline due to product liability concerns and was not specifically affected by the war or economic recession. The industry did not begin to recover until 1994 with the passage of the *General Aviation Revitalization Act*. The total impacts the events of 9/11 will have on general aviation can only be determined over time. General aviation recovery will be dependent upon the economy, corporate profitability, fuel prices, and the type and extent of any new regulatory controls over flight training, aircraft operations, and security. The demand-based manner in which this master plan is being prepared is intended to accommodate variations in demand at the airport.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was prepared was *FAA Aerospace Forecasts-Fiscal Years 2004-2015*, published in March 2004. The forecasts use the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international

markets. It should be recognized that these are national forecasts that are not specific to Hillsboro Airport. However, these forecasts provide important indicators in industry changes that can affect demand at Hillsboro Airport.

GENERAL AVIATION TRENDS

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994, which limited the liability on general aviation aircraft to 18 years from the date of manufacture. This legislation sparked an interest to renew the manufacturing of general aviation aircraft, due to the reduction in product liability, as well as renewed optimism for the industry. The high cost of product liability insurance was a major factor in the decision by many U.S.-based aircraft manufacturers to slow or discontinue the production of general aviation aircraft. The industry responded as expected.

According to the General Aviation Manufacturers Association (GAMA), between 1994 and 2000, general aviation aircraft shipments increased at an average annual rate of more than 20 percent, increasing from 928 shipments in 1994 to 3,140 shipments in 2000. However, the growth in the general aviation industry has slowed considerably since 2000, negatively impacted by the national economic recession and the events surrounding 9/11. In 2001, aircraft shipments were down 4.7 percent to 2,994. The 2002 shipments were down an additional 10.2 percent to 2,687. 2003 aircraft shipments were down less than 1.0 percent from 2002, declining only to 2,686. However, 2003 billings were down 15.5 percent, declining for the third straight year.

Most notable about 2003 shipments was that single-engine piston deliveries were the only category to increase. Single-engine piston deliveries increased to 1,825 from 1,601 or 14.0 percent. This is most likely the result of new product offerings and the age of the single engine piston aircraft fleet. Turboprop and turbojet deliveries declined. Business jets were down 23.4 percent, the second year of declines. This is the result of slowing demand by fractional jet companies and a large used market for turboprop and turbojet aircraft. **Table 3A** summarizes aircraft shipments and billings since 2000.

TABLE 3A
Annual General Aviation Airplane Shipments
Manufactured Worldwide and Factory Net Billings

Year	Total	SEP	MEP	TP	TJ	Net Billings ($millions)
2000	3,140	1,8962	103	415	760	13,497.0
2001	2,994	1,644	147	421	782	13,866.6
2002	2,687	1,601	130	280	676	11,823.1
2003	2,686	1,825	71	272	518	9,994.8

Source: GAMA
SEP – Single Engine Piston; MEP – Multi-Engine Piston; TP – Turboprop; TJ - Turbofan/Turbojet

The decline in aircraft shipments is not expected to last long. According to the National Business Aviation Association (NBAA), there are more than 2,700 aircraft still on order. NBAA cites a study by Honeywell that aircraft shipments will recover to record levels by 2004 and that 8,400 business aircraft will be delivered over the next 10 years.

On February 5, 2002, the FAA published a notice of proposed rulemaking (NPRM), titled *Certification of Aircraft and Airmen for the Operation of Light-Sport Aircraft*. The rulemaking would establish new light-sport aircraft categories and allow aircraft manufacturers to build and sell completed aircraft without obtaining type and production certificates. Instead, aircraft manufacturers would build to industry consensus standards. This reduces development costs and subsequent aircraft acquisition costs. This new category places specific conditions on the design of the aircraft to limit them to low performance aircraft. New pilot training times are reduced and offer more flexibility in the type of aircraft which the pilot would be allowed to operate. Viewed by many within the general aviation industry as a revolutionary change in the regulation of recreational aircraft, this new rulemaking is anticipated to significantly increase access to general aviation by reducing the time required to earn a pilot's license and the cost of owning and operating an aircraft. These regulations are aimed primarily at the recreational aircraft owner/ operator. This new rulemaking is expected to add between 300 and 500 new aircraft each year to the national fleet beginning in 2006. By 2015, there is expected to be 20,915 of these aircraft in the national fleet (including approximately 15,300 existing aircraft which will now be included in the active fleet beginning in 2004).

At the end of 2003, the nation's total pilot population, including student, private, commercial, and airline transport, was estimated by the FAA to decline to 625,011 from the 625,358 pilots in 2002. However, the total pilot population is expected to grow 1.6 percent annually over the next 12 years. A large portion of this growth is from the expected certification of approximately 16,100 currently unrated pilots between 2004 and 2005 as sport-rated pilots. Excluding this influx of pilots due to new regulations (many of these are existing ultralight pilots which now are not certificated), the annual growth rate for pilots is 1.4 percent. Student pilots increased 1.5 percent in 2003. The number of student pilots is projected to increase by 1.9 percent annually through 2015.

While impacting aircraft production and delivery, the events of 9/11 and economic downturn have not had the same negative impact on the business/corporate side of general aviation. The increased security measures placed on commercial flights have increased interest in fractional and corporate aircraft ownership, as well as on-demand charter flights. According to GAMA, the total number of corporate operators increased by 471 operators in 2003. Corporate operators are defined as those companies that have their own flight departments and utilize general aviation airplanes to enhance

productivity. **Table 3B** summarizes the number of U.S. companies operating fixed-wing turbine aircraft since 1991.

TABLE 3B
U.S. Companies Operating Fixed-Wing Turbine Business Aircraft And Number Of Aircraft, 1991-2003

Year	Number of Operators	Number of Aircraft
1991	6,584	9,504
1992	6,492	9,504
1993	6,747	9,594
1994	6,869	10,044
1995	7,126	10,321
1996	7,406	11,285
1997	7,805	11,774
1998	8,236	12,425
1999	8,778	13,148
2000	9,317	14,079
2001	9,709	14,837
2002	10,191	15,569
2003	10,661	15,870

Source: GAMA/NBAA

CORPORATE OWNERSHIP TRENDS

The growth in corporate operators comes at a time when fractional aircraft programs are experiencing significant growth. Fractional ownership programs sell 1/8 or greater shares in an aircraft at a fixed cost. This cost, plus monthly maintenance fees, allows the shareholder a set number of hours of use per year and provides for the management and pilot services associated with the aircraft's operation. These programs guarantee the aircraft is available at any time, with short notice. Fractional ownership programs offer the shareholder a more efficient use of time (when compared with commercial air service) by providing faster point-to-point travel times and the ability to conduct business confidentially while flying. The lower initial startup costs (when compared with acquiring and establishing a flight department) and easier exiting options are also positive benefits.

Since beginning in 1986, fractional jet programs have flourished. **Table 3C** summarizes the growth in fractional shares since 1986. The number of aircraft in fractional jet programs has grown rapidly. In 2001 there were 696 aircraft in fractional jet programs. This grew to 776 aircraft in fractional jet programs at the end of 2002 and 823 in 2003.

TABLE 3C
Fractional Shares
1986-2003

Year	Number of Shares
1986	3
1987	5
1988	26
1989	51
1990	57
1991	71
1992	84
1993	110
1994	158
1995	285
1996	548
1997	957
1998	1,551
1999	2,607
2000	3,834
2001	4,071
2002	4,232
2003	4,515

Source: GAMA/NBAA

Manufacturer and industry programs and initiatives continue to revitalize the general aviation industry with a variety of programs. For example,

Piper Aircraft Company has the Piper Financial Services (PFS) to offer competitive interest rates and/or leasing of Piper aircraft. Manufacturer and industry programs include the "No Plane, No Gain" program promoted jointly by the General Aviation Manufacturers Association (GAMA) and the National Business Aircraft Association (NBAA). This program was designed to promote the use of general aviation aircraft as an essential, cost-effective tool for businesses. Other programs are intended to promote growth in new pilot starts and to introduce people to general aviation. These include "Project Pilot" sponsored by the Aircraft Owners and Pilots Association (AOPA), "Flying Start" sponsored by the Experimental Aircraft Association (EAA), "Be a Pilot" jointly sponsored and supported by more than 100 industry organizations, and "Av Kids" sponsored by the NBAA. Over the years, programs such as these have played an important role in the success of general aviation and will continue to be vital to its growth in the future.

In 2002, there were an estimated 211,244 active general aviation aircraft, representing a decrease of 203 active aircraft from the previous year and the third straight decline following five years of increases. **Exhibit 3A** depicts the FAA's forecast for active general aviation aircraft in the United States. The FAA predicts the number of active general aviation aircraft to increase at an average annual rate of 1.3 percent over the 12-year forecast period. Piston-powered aircraft are expected to grow at an average annual rate of 0.2 percent. This is due, in part, to declining numbers of multi-engine piston aircraft, while single-engine and rotorcraft increase at rates of 0.3 and 1.0 percent, respectively.

Turbine-powered fixed-wing aircraft (turboprop and turbojet) are expected to grow at an average annual rate of 3.6 percent over the forecast period. The jet portion of this fleet is expected to grow at an average annual growth rate of 5.1 percent. This growth rate for jet aircraft can be attributed to growth in the fractional ownership industry, new product offerings (which include new entry level aircraft and long-range global jets), and a shift away from commercial travel by many travelers and corporations.

The Business Aviation Panel has suggested that the market for the new small business jets (i.e. Eclipse Jet) aircraft could reach as high as 5,000 new aircraft in the national fleet by 2010. These small twin-engine business jets are expected to be priced between one and two million dollars, and is believed to have the potential to redefine business jet flying, with the capability to support a true air taxi business service due to their low operating costs. The current FAA general aviation fleet forecast assumes the entry of the Eclipse (or similar jet) in 2006, reaching 4,600 aircraft by 2015.

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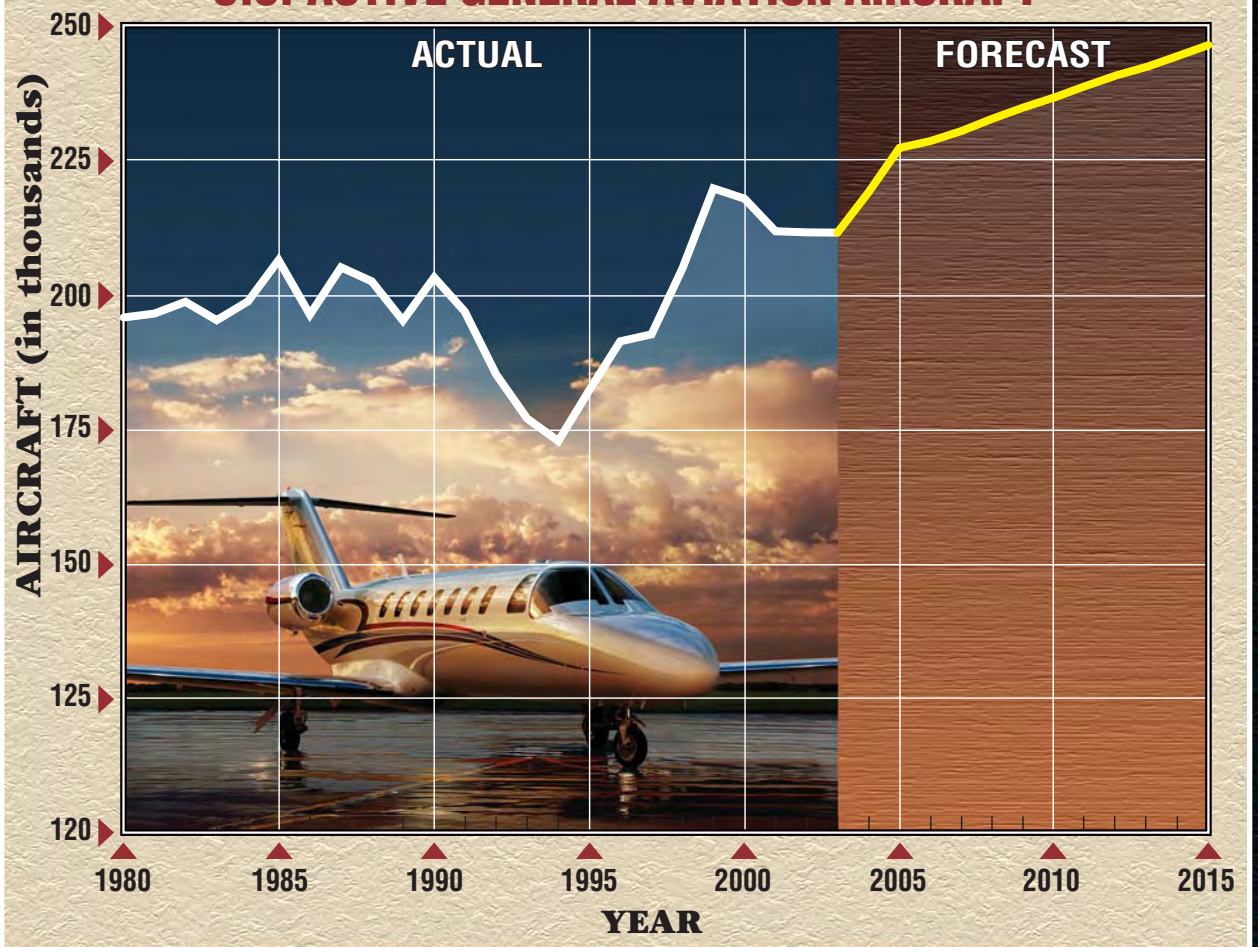
U.S. ACTIVE GENERAL AVIATION AIRCRAFT



U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

Year	FIXED WING						ROTORCRAFT			
	PISTON		TURBINE							
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine	Experimental	Sport Aircraft	Other	Total
2003 (Est.)	143.4	17.5	6.9	8.5	2.4	4.3	22.0	N/A	6.4	211.2
2005	143.5	17.3	7.0	9.0	2.4	4.3	22.1	15.5	6.4	227.6
2010	146.2	16.9	7.6	12.0	2.6	4.4	22.7	18.1	6.5	236.9
2015	148.5	16.5	8.1	15.5	2.7	4.5	23.1	20.9	6.6	246.4

NOTE: Totals may not add due to rounding.

Source: FAA Aerospace Forecasts, Fiscal Years 2004-2015.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

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Exhibit 3A
U.S. ACTIVE GENERAL AVIATION AIRCRAFT FORECASTS

LOCAL SOCIOECONOMIC PROJECTIONS

Similar to other industries, the size of the local population, that population's income, and employment levels are indicators of the underlying viability of the aviation industry. Projected growth in these areas can provide comparative growth rates for estimations of future growth potential of aviation activity.

The local population relates to the size of the pilot population and aircraft ownership. Aircraft ownership is typically associated with a small portion of the total population; given a larger population, there is a greater likelihood of increased aircraft ownership.

Strong employment levels and income are needed to support both business and recreational aircraft ownership and use.

Table 3D summarizes historical and forecast population, households, and total employment for the Portland Metropolitan Area as developed by Metro. The Portland metropolitan area includes Multnomah, Clackamas, Columbia, Washington, and Yamhill counties in the state of Oregon and Clark County in the state of Washington.

TABLE 3D
Portland-Vancouver Socioeconomic Projections

Year	Total Population	Total Households	Total Employment	Per Capita Personal Income[1]
1970	1,078,100	N/A	475,600	$ 4,368
1980	1,333,600	N/A	699,300	11,324
1990	1,515,500	575,500	891,500	20,649
2000	1,918,100	730,200	1,217,000	31,844
2002	1,978,200	751,800	1,211,200	32,563
Forecasts				
2005	2,094,500	799,600	1,320,700	36,612
2010	2,281,800	876,700	1,483,900	44,317
2015	2,444,700	946,900	1,631,800	53,321
2020	2,624,500	1,021,600	1,795,500	65,414
2025	2,824,400	1,104,200	1,979,300	79,894
Average Annual Growth Rate				
2002-2025	1.6%	1.7%	2.2%	4.0%

Source: Economic Report to the Metro Council, 2000-2030 Regional Forecast for the Portland-Vancouver Metropolitan Area, September 2002
[1] 1996$

Table 3D indicates that the total population of the metropolitan area has grown consistently over the past 33 years, growing from approximately 1.1 million in 1970 to nearly 2.0 million in 2002. Metro projects the total population to grow to 2.8 million in 2025, or at an average annual rate of 1.6 percent. There has also been consistent growth in households, employment, and per capita personal income (PCPI) since 1970. Table 3D presents the expected growth rates in each of these categories through 2025. Employment and PCPI are expected to outpace growth in housing and population. The higher growth in employment versus population indicates a trend towards declining unemployment rates.

PILOT SURVEY

A survey was sent to 1,500 registered pilots in the Portland Metropolitan area in July 2003 to gather local users' perspectives on Hillsboro Airport and to gather specific input into the master plan process. A copy of this survey form is included in Appendix E.

As shown in **Table 3E**, 168 pilots responded to this survey. Of this, 80 were pilots who owned an aircraft and kept that aircraft at Hillsboro Airport. The remaining pilots based their aircraft at other metropolitan airports. The survey asked these pilots if they were considering purchasing or upgrading their aircraft. This was done to gauge the continued growth in aircraft ownership and confirm changes to the regional fleet mix.

TABLE 3E
Pilot Survey Results

Total Surveys Sent	1,500
Total Survey Responses	168
Response Rate	11.2%
Respondents Based at Hillsboro Airport	80
Respondents Based at Other Metropolitan Airports	88
Respondents Based at Hillsboro Airport Considering Upgrade or Purchase of Another Aircraft in Next 5 Years.	14 (17.5% of respondents)
Respondents Based at Other Metropolitan Airports Considering Upgrade or Purchase of Another Aircraft in Next 5 Years	17 (19.3% of respondents)

Source: Coffman Associates Analysis

Of the pilots basing at Hillsboro Airport, 17.5 percent indicated that they would be purchasing a replacement aircraft. One respondent indicated an upgrade to a business jet.

The survey also collected information on aircraft use. **Table 3F** indicates that for Hillsboro Airport, the pleasure/recreational use comprised 72 percent of aircraft use of those that

responded to the survey. Flight instruction was four percent, while business use represented 24 percent. The non-based aircraft owners indicated a higher pleasure/ recreational use than Hillsboro Airport pilots and a lower business and flight instruction use. The higher business use of aircraft at Hillsboro Airport is indicative of the stature of Hillsboro Airport within the Portland Metropolitan area. As detailed in Chapter Two, Hillsboro Airport is the most capable general aviation airport in the region. This has led to the growth of business jet aircraft basing and use at the airport. (Please note that these survey results are only indicative of those surveys and does not reflect the actual use of aircraft at Hillsboro Airport.)

The survey respondents were also asked the primary reason for choosing to base at their home airport and rank, on a scale of one to ten, several criterion. **Table 3G** summarizes the responses of Hillsboro Airport based aircraft owners. The table shows the actual number of responses in each category. The number one response of Hillsboro Airport based aircraft owners was convenience. That is, these aircraft owners based at Hillsboro Airport since the airport is located closest to their home or office. The availability of suitable hangar facilities was the second highest rated category, followed by the existing navigational aids available at Hillsboro Airport. The fourth highest included several categories: Fixed Based Operator (FBO) services, hangar costs, and available runway length. Fuel costs, the availability of rental car services and a restaurant all ranked low among the respondents, as a reason why they would choose to base their aircraft at Hillsboro Airport.

TABLE 3F
Pilot Survey Results
Primary Use of Aircraft

Based Aircraft	
Type	**Percentage**
Business	24
Pleasure/Recreation	72
Flight Instruction	4
Total	100
Non-Based Aircraft	
Type	**Percentage**
Business	16
Pleasure/Recreation	82
Flight Instruction	2
Total	100

Source: Coffman Associates Analysis

TABLE 3G
Based Aircraft Pilot Survey Results
Primary Reason for Basing at Hillsboro Airport

Rank	Convenience	Hangar Facilities	FBO Services	Hangar Cost	Runway Length	Navigational Aids	Restaurant	Rental Car Services	Fuel Cost
Number of Responses									
1	57	27	0	2	8	17	1	0	3
2	11	25	3	1	3	7	3	0	1
3	3	8	5	4	4	12	0	0	3
4	2	2	7	4	4	2	2	0	3
5	0	1	5	6	4	4	2	3	5
6	0	0	0	1	4	3	0	0	3
7	0	0	2	3	1	2	2	0	3
8	0	0	1	1	2	0	4	6	2
9	0	1	1	0	1	0	4	4	1
10	1	0	1	1	1	1	2	3	3
Median	1	2	4	4	4	3	8	8	5

Source: Coffman Associates Analysis

Table 3H summarizes the response of non-based aircraft owners to the same question. Similar to Hillsboro Airport based aircraft owners, aircraft owners basing their aircraft at other metropolitan airports chose their airport first for its convenience or location to the home or business and/or the type of hangar facilities available. Hangar cost, FBO services, fuel cost, and runway length were the next highest rated categories. The availability of navigational aids, a restaurant, or rental car services ranked lower.

TABLE 3H
Non-Based Aircraft Pilot Survey Results
Primary Reason for Basing at Hillsboro Airport

Rank	Convenience	Hangar Facilities	FBO Services	Hangar Cost	Runway Length	Navigational Aids	Restaurant	Rental Car Services	Fuel Cost
Number of Responses									
1	39	28	5	17	3	5	3	3	9
2	12	18	4	10	3	2	0	1	6
3	7	6	2	7	3	1	0	0	8
4	1	2	3	3	6	2	1	1	5
5	1	2	5	2	7	4	5	1	3
6	1	0	3	0	0	5	5	0	2
7	1	0	0	1	4	3	1	1	2
8	0	0	0	1	0	3	6	3	0
9	0	0	1	0	1	0	1	9	0
10	1	0	0	0	1	1	0	2	0
Median	1	1	3	2	4	5	6	9	3

Source: Coffman Associates Analysis

These survey responses were not unexpected. It is often found that aircraft owners choose an airport first for its proximity to their home and second for the type of shelter available for their aircraft. These are important confirmations for the forecasting effort, as it can be reasoned that the area from which Hillsboro Airport would draw future/potential based aircraft from is most likely confined to the communities closest to the airport. Secondly, it indicates that growth in based aircraft is most likely linked to the availability of new hangar facilities.

AIRPORT SERVICE AREA

The local airport service area is defined by the proximity of other airports and the facilities they are able to provide owners/operators of general aviation aircraft. General aviation service areas are limited by nearby general aviation airports, which provide similar aircraft tiedown, fuel, and hangar services. Chapter Two provided a summary of the Portland Metropolitan area's public-use airports. These airports provide a wide range of tiedown, fuel, hangar, and general aviation services. Considering that the services at each airport vary according to local conditions (hangar, fuel, tiedown rates, hangar availability, etc.), the service area for Hillsboro Airport is not considered to exactly follow the boundaries of any jurisdictional unit, and is affected by many of the factors detailed above. The availability and cost of aircraft storage facilities is an

important factor in determining based aircraft demand.

Through the pilot survey process discussed above, the zip code of Hillsboro Airport based aircraft owners was collected to gain an understanding of the existing service area for based aircraft demand. **Exhibit 3B** depicts the zip codes of 78 of the 80 Hillsboro Airport-based aircraft owners that responded to the survey. This exhibit clearly shows that the airport's based aircraft service area is primarily limited to Washington County, especially the eastern communities within the County, and areas in western Multnomah County.

This coincides with the survey responses, which indicated convenience, or the proximity of the airport to the aircraft owner's home as a primary reason for basing at an airport.

The Hillsboro Airport-based aircraft service area overlaps the service areas of Skyport Airport and Stark's Twin Oaks Airpark, both of which are located in zip codes of Hillsboro Airport based aircraft owners. These airports draw from the same service area as Hillsboro Airport and take away aircraft that may otherwise base at Hillsboro Airport if these airports were not there.

The service area for transient aircraft users of Hillsboro Airport is expected to comprise a slightly larger area, extending into all the western portions of the metropolitan area and overlapping the general aviation service area of Portland International Airport. Typically, transient users will use the airport located closest to their destination. However, airport capabilities, general aviation services, and aircraft owner preferences are also factored into their decision. Portland International Airport is more conveniently located to eastern metropolitan areas than Hillsboro Airport, and provides adequate runway length, navigational aids, and general aviation services. Therefore, some transient users coming to the metropolitan area will choose Portland International Airport or even Troutdale Airport over Hillsboro Airport, especially if they are accessing the eastern portions of the metropolitan area. However, some users will choose Hillsboro Airport to avoid the commercial airline activity at Portland International Airport.

AIRCRAFT OWNERSHIP

The number of aircraft based at an airport is, to some degree, dependent upon the nature and magnitude of aircraft ownership in the local service area. In addition, Hillsboro Airport is one of several airports serving the general aviation needs of the Portland-Vancouver metropolitan area. Therefore, the process of developing forecasts of based aircraft for Hillsboro Airport begins with a review of historical aircraft registrations in the area.

Historical records of aircraft ownership in the six-county Portland metropolitan area were obtained from the FAA-maintained database of

aircraft ownership. **Table 3J** summarizes total aircraft registrations from 1993 to 2003 for the six-county metropolitan area. As shown in the table, aircraft registrations have grown steadily in the past 10 years, growing from 3,328 aircraft in 1993, to 3,858 aircraft in 2003. In examining the specific type of aircraft growth, it is evident that turbine-powered aircraft have enjoyed the strongest growth rates. The number of turboprop aircraft registered to residents of the Portland metropolitan area has grown at an average annual rate of 3.8 percent while the number of registered turbojet aircraft has grown at an annual rate of 2.6 percent. Single-engine piston powered aircraft have had the largest numerical growth, growing by 414 aircraft, yet have grown at an average annual rate of only 1.6 percent. There was a net addition of 12 helicopters in the region between 1993 and 2003. **Exhibit 3C** illustrates these growth trends for aircraft ownership in the metropolitan area.

TABLE 3J
Registered Aircraft
Portland Metropolitan Area

Year	Total	Single Engine Piston	Multi-Engine Piston	Turboprop	Turbojet	Helicopter	Other[1]
1993	3,328	2,392	305	93	136	290	112
1994	3,330	2,421	302	87	115	289	116
1995	3,396	2,492	305	76	108	287	128
1996	3,418	2,496	312	80	107	295	128
1997	3,546	2,600	320	81	109	295	141
1998	3,577	2,607	298	98	123	311	140
1999	3,610	2,640	307	89	137	297	140
2000	3,779	2,765	323	93	142	310	146
2001	3,804	2,775	290	118	158	307	156
2002	3,820	2,786	287	119	162	304	162
2003	3,858	2,806	282	135	175	302	158
Avg. Ann.	1.5%	1.6%	-0.8%	3.8%	2.6%	0.4%	3.5%
% Growth	15.9%	17.3%	-7.5%	45.2%	28.7%	4.1%	41.1%
Actual	530	414	(23)	42	39	12	46

Source: FAA Records
[1] Other: Examples include balloon, glider, ultralight

Table 3K summarizes this same aircraft registration data only by county. Registered aircraft growth has been strongest in Clackamas County and Washington County. Clackamas County and Washington County have grown at a 2.8 percent and 2.9 percent annual rate, respectively. Clackamas County and Washington County have added 192 and 191 aircraft, respectively over the past 10 years. When combined, this figure represents 72 percent of the 530 new registered aircraft in the region since 1993. Clark County has grown by nearly 23 percent, adding 99 such aircraft. Columbia and Yamhill Counties have added 27 new registered aircraft each. Aircraft registrations are down slightly in Multnomah County.

Table 3L more closely examines the mix of aircraft registrations by type in

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LEGEND

- Portland Metropolitan Area
- (3) Number of Survey Respondents Basing Aircraft at Hillsboro
- County Line
- Airport

NOTE: One aircraft in 97296 and one aircraft in 97729 are not shown.

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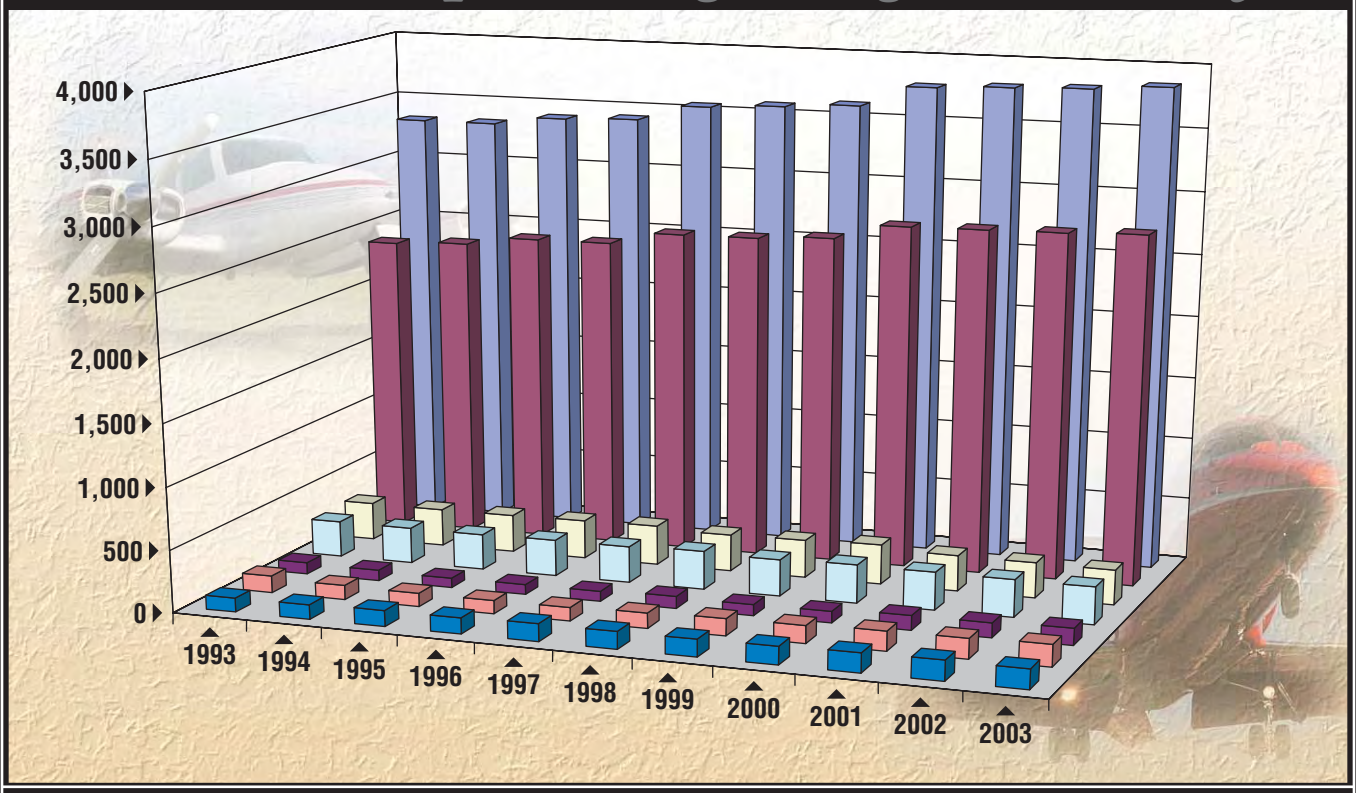
Exhibit 3B

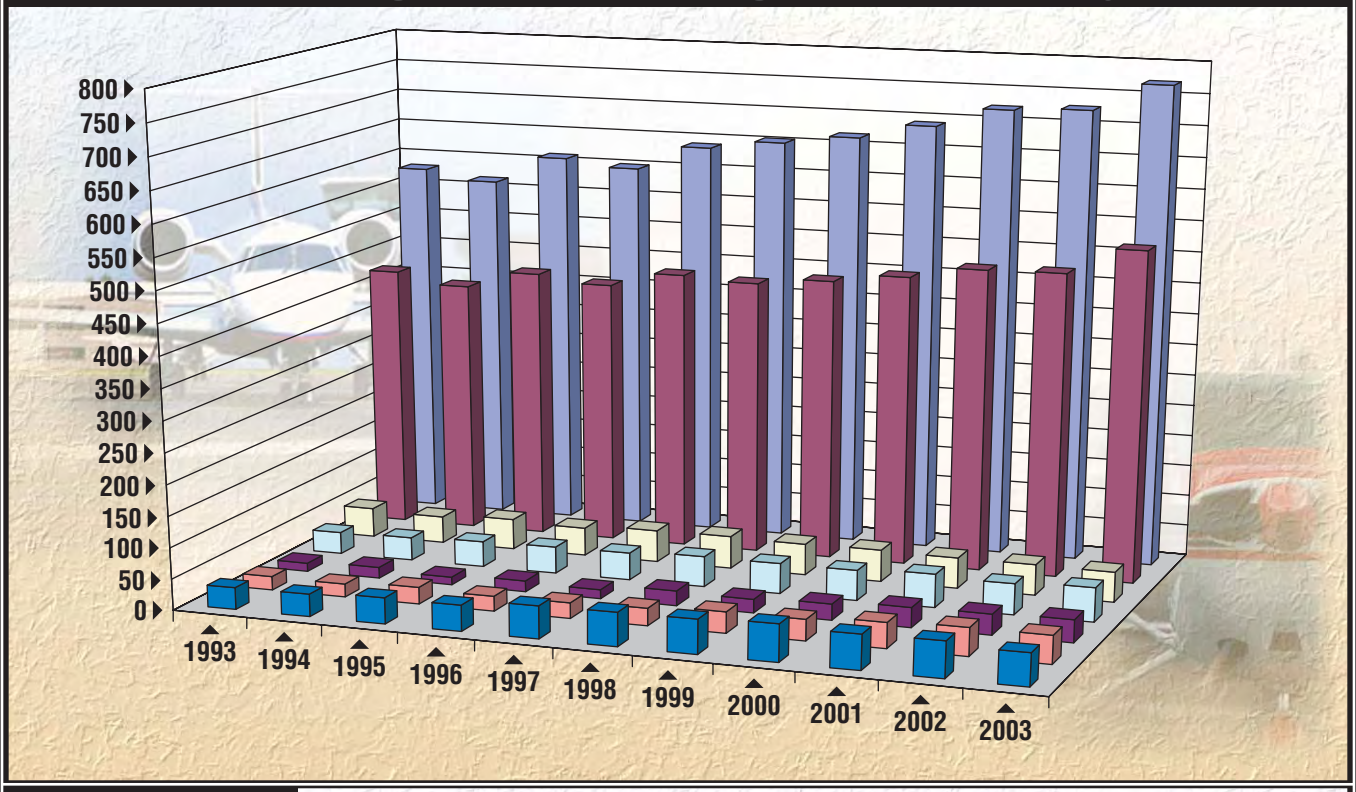
BASED AIRCRAFT SERVICE AREA

03MP01-3C-3/31/04

Portland Metropolitan Region Registered Aircraft



Washington County Registered Aircraft



LEGEND

- Total
- Single Engine Piston
- Multi-Engine Piston
- Helicopter
- Turboprop
- Turbojet
- Other

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Exhibit 3C
REGISTERED AIRCRAFT

Washington, County (the primary area for based aircraft demand at Hillsboro Airport). As shown in this table, turboprop and turbojet registrations have grown at the fastest rate, growing at an average annual rate of 10.4 percent and 7.4 percent annually, respectively. In the past 10 years, there have been 22 new turboprop registrations and 23 new turbojet registrations. When combined, this growth represents 23 percent of the new registered aircraft in Washington County. Single engine piston aircraft have had the largest numerical change, growing by 107. Multi-engine piston aircraft registrations have remained static. There were 20 new helicopter registrations during this time period. The information presented in Table 3L is also presented graphically in the lower portion of Exhibit 3C.

TABLE 3K
Registered Aircraft
Portland Metropolitan Area

Year	Clackamas County, Oregon	Clark County, Washington	Columbia County, Oregon	Multnomah County, Oregon	Washington County, Oregon	Yamhill County, Oregon	Total
1993	602	439	68	1,292	580	347	3,328
1994	611	476	70	1,277	565	331	3,330
1995	624	482	62	1,287	610	331	3,396
1996	638	466	74	1,293	599	348	3,418
1997	669	482	81	1,331	639	344	3,546
1998	677	464	87	1,345	653	351	3,577
1999	690	505	92	1,312	667	344	3,610
2000	729	547	95	1,373	691	344	3,779
2001	749	527	97	1,361	722	348	3,804
2002	759	528	98	1,355	727	353	3,820
2003	794	538	95	1,286	771	374	3,858
Avg. Ann.	2.8%	2.1%	3.4%	0.0%	2.9%	0.8%	1.5%
% Growth	31.9%	22.6%	39.7%	-0.5%	32.9%	7.8%	15.9%
Actual	192	99	27	(6)	191	27	530

Source: FAA Records

TABLE 3L
Registered Aircraft
Washington County, Oregon

Year	Total	Single Engine Piston	Multi-Engine Piston	Turboprop	Turbojet	Helicopter	Other[1]
1993	580	426	46	13	22	36	37
1994	565	409	42	17	21	38	38
1995	610	437	48	12	27	42	44
1996	599	426	44	17	24	44	44
1997	639	450	50	14	25	45	55
1998	653	444	51	23	28	50	57
1999	667	455	49	21	34	50	63
2000	691	469	50	25	34	50	63
2001	722	488	48	31	41	55	59
2002	727	490	48	32	45	51	61
2003	771	533	47	35	45	56	55
Avg. Ann.	2.9%	2.3%	0.2%	10.4%	7.4%	4.5%	4.0%
% Growth	32.9%	25.1%	2.2%	169.2%	104.5%	55.6%	48.6%
Actual	191	107	1	22	23	20	18

Source: FAA Records
[1] Other: Examples include balloon, glider, ultralight

While Washington County is the primary area for based aircraft demand at Hillsboro Airport, it is evident that only a small portion of these new registered aircraft are basing at Hillsboro Airport. While there are 191 new registered aircraft in Washington County since 1993, there were only 16 more based aircraft at Hillsboro Airport in 2003 compared to 1993 based aircraft figures. This clearly indicates that the bulk of the additional aircraft owners over the past 10 years have elected to not base their aircraft at Hillsboro Airport, even though it may be located closer to their home or business. This can be caused by a lack of available hangar storage space for their aircraft at Hillsboro Airport, registered aircraft being based out-of-the-state or at one of the other airports in the region such as Skyport Airport and Stark's Twin Oaks Airport for a whole host of other "preference" reasons.

A review of the aircraft registrations reveals a couple of trends. First, business class aircraft registrations (turboprop and turbojet) are growing faster than all other types of aircraft in both the metropolitan region and in Washington County. This correlates with the increases in new turbine-powered aircraft at Hillsboro Airport in the past few years. In 2003, the 41 based turbojets at Hillsboro Airport represented 91 percent of the registered turbojets in Washington County. Secondly, aircraft registrations in Washington County are growing the fastest of all counties in the metropolitan area. This indicates a potential growing demand for based aircraft at Hillsboro Airport since from the pilot survey we know that local aircraft owners desire to base their aircraft at the closest airport with available hangar storage space.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships are tested to establish logic and a rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast.

The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/time-series projections, correlation/regression analysis, and market share analysis.

Trend line/time-series projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical data, then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as

a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of direct relationship between two or more separate sets of historical data. Should there be a reasonable correlation between the data sets, further evaluation using regression analysis may be employed.

Regression analysis measures statistical relationships between dependent and independent variables yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures association between the change in a dependent variable and the independent variable(s). The higher the "r-squared" value (coefficient determination); the greater the predictive reliability.

Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical aviation market share trend is determined providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections, but can provide a useful check on the validity of other forecasting techniques.

AVIATION ACTIVITY FORECASTS

To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of that activity must be forecasted. Indicators of general aviation demand include:

- Based Aircraft
- Based Aircraft Fleet Mix
- Annual Operations
- Peak Activity
- Operational Mix by Airport Reference Code (ARC)
- Annual Instrument Approaches (AIAs)

The remainder of this chapter will examine historical trends with regard to these areas of general aviation activity, and project future demand for these segments of general aviation activity at the airport through the Year 2025.

BASED AIRCRAFT

The number of based aircraft is the most basic indicator of general aviation demand at an airport. By first developing a forecast of based aircraft, the growth of other factors can be projected. **Table 3M** summarizes based aircraft at Hillsboro Airport between 1980 and 2003. The 2003 based aircraft total was derived by the Port of Portland through contact with aviation tenants and airport management knowledge of actual based aircraft at the airport. As shown in Table 3M, based aircraft totals have fluctuated during this time period, reaching as high as 399 in 1996, and as low as 303 in 1986 and 1987. The based aircraft level of 363 in 2003 is 14 based aircraft higher than the 1980 total of 349.

TABLE 3M
Historical Based Aircraft
Hillsboro Airport

Year	Based Aircraft
1980	349
1981	353
1982	355
1983	355
1984	322
1985	322
1986	303
1987	303
1988	350
1989	341
1990	341
1991	347
1992	347
1993	347
1994	368
1995	368
1996	399
1997	390
1998	390
1999	392
2000	392
2001	392
2002	375
2003	363

Source: FAA Terminal Area Forecast, 1996 Hillsboro Airport Master Plan, Port of Portland

Several analytical techniques were examined for their applicability to projecting based aircraft at Hillsboro Airport. These included time-series extrapolation, regression analyses, and market share analyses. A time-series analysis of based aircraft was prepared based upon the historic based aircraft levels between 1980 and 2003. This resulted in a correlation coefficient (r^2) of 0.47. Extrapolating the results of this analysis results in a projection of 446 based aircraft in 2025. An additional time series extrapolation was tested with a beginning year of 1990. This resulted in a much lower correlation coefficient of 0.095. This analysis was discarded due to its low correlation coefficient.

Next, a series of regression analysis compared historical based aircraft with various socioeconomic variables for the metropolitan area. The first tested based aircraft against the six-county population total between 1980 and 2003. This resulted in a correlation coefficient (r^2) of 0.59. Extrapolating the results of this analysis results in a projection of 466 based aircraft in 2025. A regression analysis comparing total employment in the same period resulted in a correlation coefficient (r^2) of 0.594. An extrapolation of this analysis, yields 461 based aircraft in 2025. Finally, a regression analysis compared per capita personal income (PCPI) against based aircraft starting in 1980. This resulted in a in a correlation coefficient (r^2) of 0.512 and a projection of 514 based aircraft in the Year 2025.

As stated earlier, the higher the r^2 value, the greater the predictive reliability. Generally, a value above 0.90 indicates good predictive reliability. A value below 0.90 may be used with the understanding that the predictive reliability is lower. Since none of these analyses yielded a correlation coefficient above the 0.90 threshold, none of these forecasts can be relied upon on their own to project future based aircraft with any degree of confidence. However, each forecast resulted in a narrow range of based aircraft levels, indicating good comparative value. Therefore, these forecasts have been retained for comparison to other based aircraft

forecasts using market share analyses which compare historical based aircraft totals to U.S. active aircraft and registered aircraft in Washington County.

Table 3N compares based aircraft at Hillsboro Airport to U.S. active general aviation aircraft. As shown in the Table 3N, the percentage of U.S. active general aviation aircraft based at Hillsboro Airport has generally been declining since 1996. This is due in part to declining based aircraft levels at Hillsboro Airport, but also indicates that U.S. active aircraft have been growing at a quicker rate than based aircraft at Hillsboro Airport. From 1993 to 2003, U.S. active general aviation aircraft grew at an annual average rate of 1.8 percent, whereas based aircraft at Hillsboro Airport grew at 0.5 percent annually.

From the earlier analysis, it was established that aircraft registrations were increasing in Washington County and that Hillsboro Airport was not capturing all the potential for based aircraft. Capturing a greater share of the Washington County registered aircraft could reverse the declining share of U.S. active general aviation aircraft. As shown in the table, maintaining the 2003 share of U.S. active aircraft constant through the planning period, results in based aircraft growing at a rate similar to U.S. active aircraft. This translates into 462 based aircraft at Hillsboro Airport by the Year 2025.

TABLE 3N
Hillsboro Airport Share of U.S. Active Aircraft

Year	U.S. Active Aircraft	Hillsboro Airport Based Aircraft	% of U.S. Active Aircraft
Historical			
1993	177,119	347	0.196%
1994	172,936	368	0.213%
1995	188,089	368	0.196%
1996	191,129	399	0.209%
1997	192,414	390	0.203%
1998	204,710	390	0.191%
1999	219,464	392	0.179%
2000	217,533	392	0.180%
2001	211,447	392	0.185%
2002	211,040	375	0.178%
2003	211,370	363	0.172%
Constant Share of U.S. Active Aircraft			
2010	236,915	407	0.172%
2015	246,415	423	0.172%
2020	258,400	444	0.172%
2025	269,300	462	0.172%

Source for Historical Based Aircraft Data: FAA, Port Records
Source for Historical and Forecast U.S. Active Aircraft: 2004 FAA Aerospace Forecasts, Selected Years, 2020 & 2025 Extrapolated by Coffman Associates

A second technique examined historical based aircraft totals as a share of Washington County registered aircraft. Since there are no

recent forecasts of Washington County registered aircraft, Coffman Associates prepared a forecast of aircraft registrations for planning purposes. A time series analysis of aircraft registrations since 1993 resulted in a correlation coefficient of 0.966. This result indicates very good predictive reliability. **Table 3P** shows the results of extrapolating the historic registered aircraft growth rates through 2025. This forecast indicates that Washington County registered aircraft could grow to 1,159 by 2025.

TABLE 3P
Hillsboro Airport Share of Aircraft Registered to Washington County Residents

Year	Washington County Registered Aircraft	Hillsboro Airport Based Aircraft	% of Registered Aircraft
Historical			
1993	580	347	59.8%
1994	565	368	65.1%
1995	610	368	60.3%
1996	599	399	66.6%
1997	639	390	61.0%
1998	653	390	59.7%
1999	667	392	58.8%
2000	691	392	56.7%
2001	722	392	54.3%
2002	727	375	51.6%
2003	771	363	47.1%
Constant Share of Washington County Registered Aircraft			
2010	878	414	47.1%
2015	972	458	47.1%
2020	1,066	502	47.1%
2025	1,159	546	47.1%

Source for Historical Data: FAA, Port Records
Source for Historical and Forecast Washington County Aircraft: Coffman Associates Analysis

Similar to its share of U.S. active general aviation aircraft, the Hillsboro Airport share of Washington County registered aircraft has generally been declining since 1997. As shown in the Table 3P, maintaining the 2003 share of Washington County registered aircraft constant through the planning period results in based aircraft growing at a rate similar to that projected for Washington County registered aircraft. This results in approximately 546 based aircraft at Hillsboro Airport by the Year 2025.

A summary of all forecasts for based aircraft at Hillsboro Airport and the selected planning forecast are shown on **Exhibit 3D.** Together, the combination of forecasts represents a forecast envelope, or an area in which future based aircraft at Hillsboro Airport should be found. The FAA TAF and linear trend line forecasts represent the lower end of the planning envelope, whereas the constant share of Washington County registered aircraft represents the upper end of the forecast envelope.

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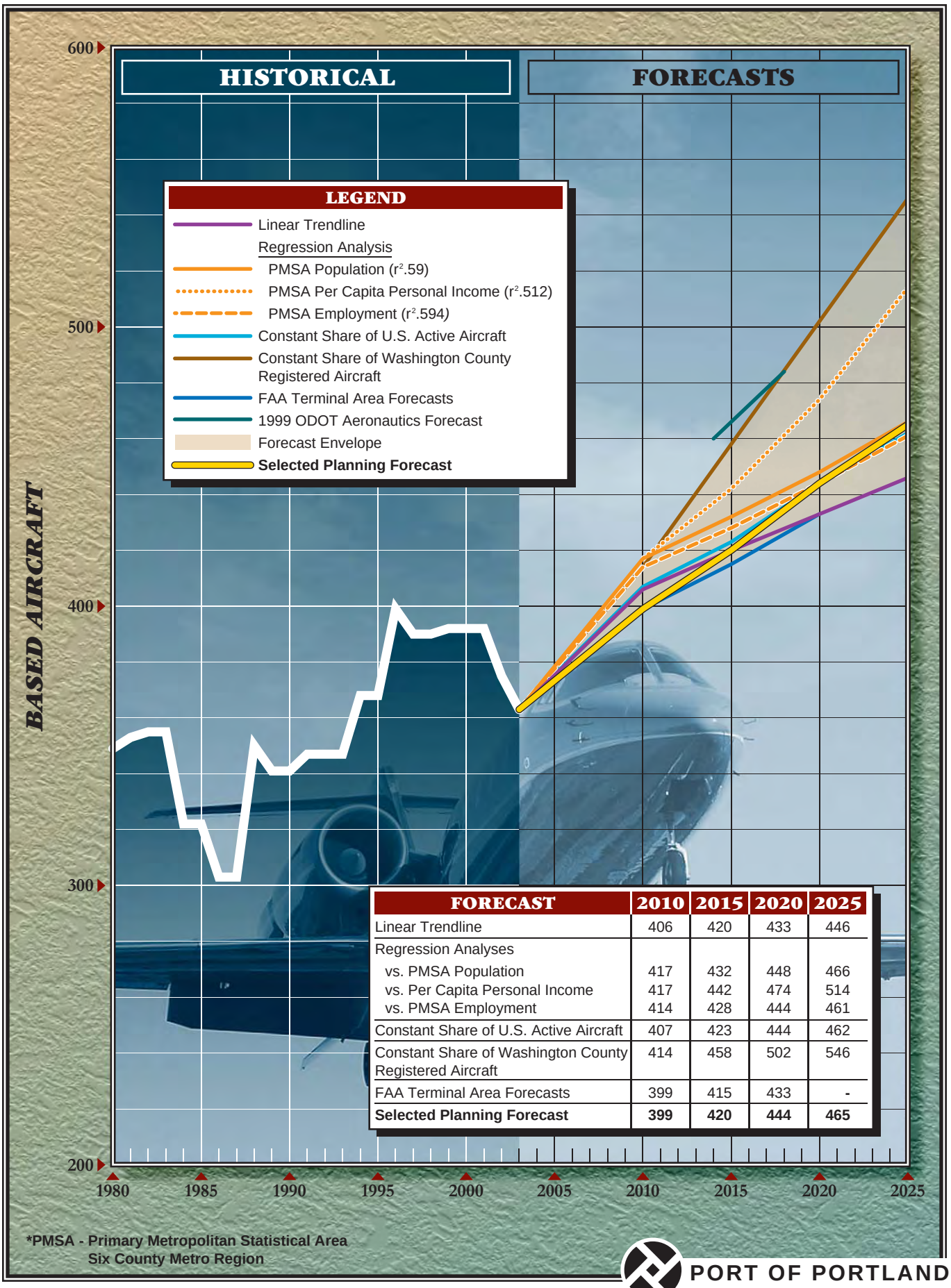

FORECAST	2010	2015	2020	2025
Linear Trendline	406	420	433	446
Regression Analyses				
vs. PMSA Population	417	432	448	466
vs. Per Capita Personal Income	417	442	474	514
vs. PMSA Employment	414	428	444	461
Constant Share of U.S. Active Aircraft	407	423	444	462
Constant Share of Washington County Registered Aircraft	414	458	502	546
FAA Terminal Area Forecasts	399	415	433	-
Selected Planning Forecast	**399**	**420**	**444**	**465**

***PMSA - Primary Metropolitan Statistical Area**
Six County Metro Region

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Exhibit 3D
BASED AIRCRAFT PROJECTIONS

In closely examining the forecasts, it is evident that four independent projections fall within a fairly tight range. The regression analysis using the Portland primary metropolitan statistical area (PMSA) employment, regression analysis using PMSA population, the constant share of U.S. active general aviation aircraft and linear trend line extrapolation all project based aircraft in 2025 within a range of 20 based aircraft. Two forecasts (the regression analysis using PMSA employment and the constant share of U.S. active general aviation aircraft) project based aircraft levels of 462 and 461, respectively. This narrow range suggests that the other forecasts outside this range (the regression analysis using PMSA PCPI and constant share of Washington County registered aircraft) are most likely not representative of future based aircraft demand.

A planning forecast has been prepared which has based aircraft growing to the 465 in 2025. This is within the 2025 projections of three forecasts (the regression analysis using PMSA employment, regression analysis using PMSA population, and the constant share of U.S. active general aviation aircraft). The selected planning forecast begins at the lower end of the envelope, consistent with the FAA Terminal Area Forecast (TAF) for Hillsboro Airport. This allows for a realistic recovery of based aircraft to 1996 levels in the next seven years. Levels above that may be too optimistic considering the time inherent in facility planning and development. This forecast results in based aircraft growing at an average annual rate of 1.4 percent through 2010, and 1.0 percent thereafter.

Many factors appear to support future growth in based aircraft demand for Hillsboro Airport. As shown earlier, there is growing aircraft ownership in the Washington County area that could possibly be captured. Washington County registered aircraft are growing at the strongest rate in the metropolitan area. Finally, the pilot survey indicates that aircraft owners prefer to be located closest to their home or business. This means, that for Washington County, many aircraft owners would possibly choose Hillsboro Airport over other metropolitan airports where they may now be basing. The potential long range future of privately-owned airports such as Skyport Airport and Stark's Twin Oaks Airport is not known. Private airports face many problems that affect their ability to remain in operation. More and more privately owned airports are being closed to the public each year for reasons such as incompatible land use encroachment, insurance costs, and liability considerations, as well as a changeover in property ownership.

BASED AIRCRAFT FLEET MIX

Knowing the aircraft fleet mix expected to utilize the airport is necessary to properly plan facilities that will best serve the level of activity and the type of activities occurring at the airport. **Table 3Q** indicates the 2003 based aircraft fleet mix as being comprised mainly of single engine

TABLE 3P
Based Aircraft Fleet Mix

Year	Total	Single Engine Piston	Multi-Engine Piston	Turboprop	Turbojet	Helicopter	Other[1]
1995	368	267	41	18	24	18	0
2003	363	244	35	13	41	29	1
Avg. Ann.	-0.2%	-1.1%	-2.0%	-4.0%	6.9%	6.1%	-
% Growth	-1.4%	-9.4%	-17.1%	-38.5%	41.5%	37.9%	-
Change	(5)	(23)	(6)	(5)	17	11	1
Percentage Share							
1995	100.0%	72.6%	11.1%	4.9%	6.5%	4.9%	0.0%
2003	100.0%	67.2%	9.6%	3.6%	11.3%	8.0%	0.3%
Forecast 1 (Maintain 2003 Shares)							
2010	399	268	38	14	45	32	1
2015	420	282	40	15	47	34	1
2020	444	298	43	16	50	35	1
2025	465	313	45	17	53	37	1
Percentage Share							
2010	100.0%	67.2%	9.6%	3.6%	11.3%	8.0%	0.3%
2015	100.0%	67.2%	9.6%	3.6%	11.3%	8.0%	0.3%
2020	100.0%	67.2%	9.6%	3.6%	11.3%	8.0%	0.3%
2025	100.0%	67.2%	9.6%	3.6%	11.3%	8.0%	0.3%
Avg. Ann.	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Change	102	69	10	4	12	8	0
Forecast 2 (Increasing TP & TJ & H, Declining MEP & SEP)							
2010	399	263	38	16	48	34	1
2015	420	270	39	18	55	37	1
2020	444	279	41	20	62	40	1
2025	465	285	43	23	70	43	1
Percentage Share							
2010	100.0%	65.8%	9.5%	4.0%	12.0%	8.4%	0.3%
2015	100.0%	64.3%	9.4%	4.3%	13.0%	8.7%	0.3%
2020	100.0%	62.8%	9.3%	4.6%	14.0%	9.0%	0.3%
2025	100.0%	61.2%	9.2%	5.0%	15.0%	9.3%	0.3%
Avg. Ann.	1.1%	0.7%	0.9%	2.7%	2.4%	1.8%	1.5%
Change	102	41	8	10	29	14	0
Forecast 3 (Increasing TP & TJ, Declining MEP & SEP & H)							
2010	399	255	37	20	55	30	1
2015	420	259	38	23	68	31	1
2020	444	262	39	27	83	32	1
2025	465	260	40	30	101	32	1
Percentage Share							
2010	100.0%	63.9%	9.3%	5.0%	13.9%	7.6%	0.3%
2015	100.0%	61.7%	9.0%	5.5%	16.1%	7.4%	0.3%
2020	100.0%	59.1%	8.8%	6.0%	18.7%	7.1%	0.3%
2025	100.0%	56.0%	8.6%	6.5%	21.7%	6.9%	0.3%
Avg. Ann.	1.1%	0.3%	0.6%	3.9%	4.2%	0.5%	1.5%
Change	102	16	5	17	60	3	0.
Selected Planning Forecast							
2010	399	256	37	17	56	32	1
2015	420	265	38	19	63	34	1
2020	444	276	39	21	71	35	1
2025	465	284	41	23	79	37	1
Percentage Share							
2010	100.0%	64.2%	9.3%	4.3%	14.0%	8.0%	0.3%
2015	100.0%	63.1%	9.0%	4.5%	15.0%	8.1%	0.2%
2020	100.0%	62.2%	8.8%	4.8%	16.0%	8.0%	0.2%
2025	100.0%	61.1%	8.8%	4.9%	17.0%	8.0%	0.2%
Avg. Ann.	1.1%	0.7%	0.7%	2.7%	3.0%	1.1%	0.0%
Change	102	40	6	10	38	8	-

Source for Historical Data: Port of Portland
Forecasts: Coffman Associates Analysis
[1] Examples: Glider, Balloon, Blimp

piston aircraft. Comparing the 2003 fleet mix to the 1995 fleet mix indicates that turbojet, helicopter and "other" levels have grown, while single engine piston, multi-engine piston and turboprop have declined.

The based aircraft fleet mix has been examined as a share of total based aircraft. Three separate projections have been made considering local and national trends. The first projection maintains the 2003 share for each aircraft category through the planning period. This projection results in growth for each category consistent with the growth in based aircraft. This projection yields 69 additional single-engine piston aircraft, 10 multi-engine piston aircraft, four turboprops, 12 turbojets, and eight helicopters.

A limitation of this forecast is that it does not fully account for some of the changes taking place nationally and more locally at Hillsboro Airport. As discussed earlier, turboprop and turbojet aircraft are the fastest growing segment of active aircraft nationally. Since 1995, turbojet aircraft have grown the most of all aircraft categories at Hillsboro Airport. Additionally, this forecast only provides for four new turboprop aircraft by the Year 2025. While turboprops have declined at Hillsboro Airport recently, this slow of a growth rate cannot be assumed through the planning period. Therefore, this forecast may not fully account for business aircraft (turboprop and turbojet) growth at Hillsboro Airport.

A second forecast addresses the limitations of the constant share forecast discussed above. This forecast increases the share of turboprop, turbojet, and helicopter categories at Hillsboro Airport, mirroring the 1995 to 2003 growth patterns for helicopters and turbojets at Hillsboro Airport and national forecasts for turboprop growth. This forecast continues the trend of declining percentages of single engine piston and multi-engine piston aircraft.

Nationally, the number of helicopters is declining. The FAA projects very little change in the helicopter fleet over the next 12 years. The FAA projects only 300 new piston engine helicopters and 260 new turbine-powered helicopters by 2015. This indicates that the supply of new helicopters will only barely keep pace with helicopter retirements and that there is not an expected significant expansion of current helicopter activities nationwide.

The national helicopter trend is in contrast with what may be happening with single engine piston aircraft. As mentioned previously, the FAA is finalizing new legislation for sport aircraft. This will create a new category of aircraft and a more simplified approval and manufacturing process. This new rule-making is expected to result in 300 to 500 new aircraft each year beginning in 2006. By 2015, this results in between 2,700 and 4,500 new single engine piston aircraft. The traditional single engine piston fleet is expected to grow by an additional 5,100 aircraft in the next 12 years as well. For comparison, single engine

piston aircraft growth is projected by the FAA to be 1,920 percent higher than helicopter growth. This underscores the fact that the changes in the mix of aircraft at the airport are most likely to be seen within the fixed wing category of aircraft at the airport and that single-engine piston aircraft can be expected to be a growing category of aircraft.

A final forecast more closely follows the national trend of growing business class aircraft (turboprops and turbojets) and declining percentages of single engine piston, multi-engine piston, and helicopters. In doing so, this forecast severely limits other category growth potential (single engine piston growth in particular), while most likely overstating business class aircraft potential.

The selected fleet mix projection shown in Table 3Q includes a growing percentage of turboprop and turbojet aircraft at the airport, similar to national trends and local growth patterns. While the single engine piston category declines as a percentage of total based aircraft, the total number of single engine piston aircraft is expected to grow by 40, the highest numerical change of all aircraft categories. Local economic and population growth will add new private aircraft ownership. The new regulations for sport aircraft should increase single-engine based aircraft levels as well.

Multi-engine piston aircraft decline as a percentage, adding only six (6) new aircraft through the planning period. Nationally, the multi-engine piston mix is expected to decline. The cost of a new multi-engine piston aircraft is comparable to many used turboprops, which has led to their decline in use. The operational costs are also too high for widespread recreational aircraft ownership and use. For perspective, GAMA reports that only 71 new multi-engine piston aircraft were built and delivered worldwide in 2003. This compares with over 1,800 new single engine piston aircraft and 500 business jets. Multi-engine piston aircraft will always have a place in new pilot training and some aircraft charter activities. Both are important components of activity at Hillsboro Airport.

In the preferred forecast, the helicopter percentage is maintained constant through the planning period. This allows for some growth in this category at Hillsboro Airport which has shown a greater percentage of ownership than the national fleet. In 2003, helicopters represented eight percent of the Hillsboro Airport mix, whereas nationally, helicopters represent approximately three percent of active aircraft.

The based aircraft fleet mix projection for Hillsboro Airport is summarized on **Exhibit 3E**.

ANNUAL OPERATIONS

An aircraft operation is either a takeoff or landing. Aircraft operations are classified by the airport traffic control tower (ATCT) as either local or itinerant and separated further into air carrier, air taxi, general aviation,

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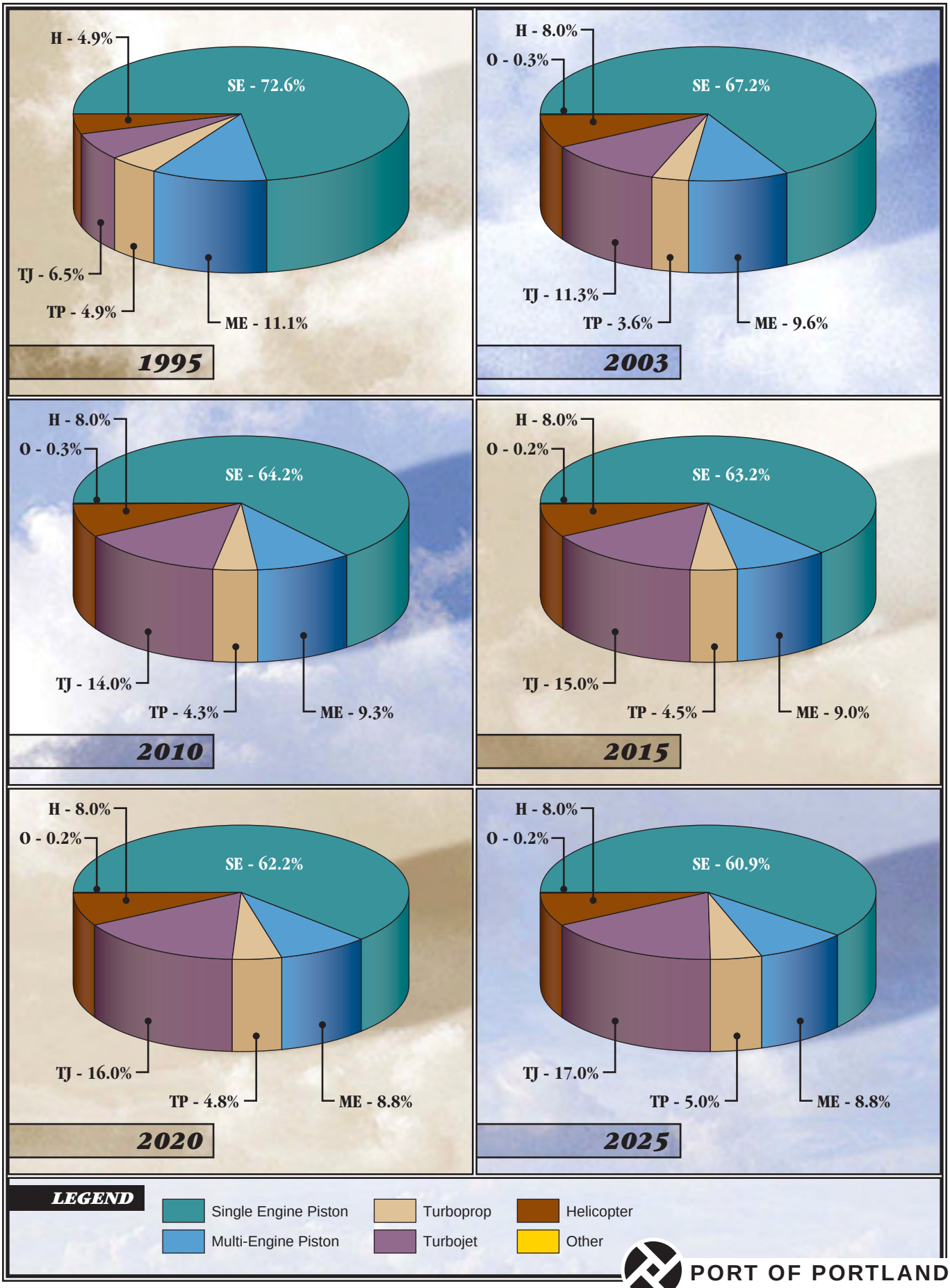

PORT OF PORTLAND

Exhibit 3E

BASED AIRCRAFT FLEET MIX

and military. Local operations are performed by aircraft which:

(a) Operate in the local traffic pattern or within sight of the airport;

(b) Are known to be departing for, or arriving from, flight in local practice areas located within a 20-mile radius of the airport;

(c) Execute simulated instrument approaches or low passes at the airport.

Itinerant operations are all other operations and essentially represent the originating or departing aircraft.

For traffic count purposes, the air carrier category is defined as an aircraft capable of carrying more than 60 passengers or a maximum payload capacity of more than 18,000 pounds. There have never been more than 12 operations in this category since 1980. Approximately 80% or 19 of the past 23 years there have been no air carrier operations at HIO. Due to the limited number of historical air carrier operations, air carrier operations will be combined with air taxi operations for this analysis.

The air taxi category comprises aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less, carrying passengers or cargo for hire or compensation in any combination. This category includes a wide range of civil aircraft conducting charter operations as well.

General aviation comprises the takeoffs and landings of all remaining civil aircraft. All operations within the air taxi category are recorded as transient, while military and general aviation activity is divided into local and itinerant categories.

The Hillsboro Airport ATCT is open from 6:00 a.m. to 10:00 p.m. daily. During this period aircraft operations are recorded and classified as above and in accordance with national ATCT directives. Between 10:00 p.m. and 6:00 a.m., aircraft operations are not recorded or tracked. Therefore, historical operational levels are only applicable to the period the ATCT was open. Annual operations will be examined and projected consistent with the historical counts. A factor for operations after the tower is closed will be added later.

Since October 2003, local helicopter training operations at Hillsboro Airport within the Alpha and Bravo patterns are no longer being included in the overall ATCT count due to changes in air traffic control guidance for recognizing aircraft operations for the ATCT count. Helicopter activity in the helicopter training patterns is now considered by air traffic control guidance to be activity operating independently of ATC, and therefore, no count is authorized. Air traffic control guidance allows for the ATCT to count the entry into the training pattern and the departure from the training pattern. However, the ATCT cannot record operations occurring within the training patterns. The ATCT can also count those times when

the ATCT advises a helicopter to "remain below 50 feet," as required when other aircraft are conducting an instrument approach or planned missed approach (an aborted approach to landing).

Prior to October 2003, the practice of the ATCT was to count all training operations (both a takeoff and a landing) within the helicopter training patterns. Each flight, or circuit, within the helicopter training patterns were counted as two operations (this is similar to how fixed-wing training activities are recorded by ATCT personnel). Therefore, operations for 2003 are not comparable to historical data and will be excluded from this analysis. However, annual operations, in particular general aviation operations, will be projected consistent with the historical recordings in an attempt to account for all helicopter operations.

Table 3R summarizes ATCT recorded operations since 1980. Total operations did not exceed 200,000 annually until 1989. Since then, total annual operations have exceeded 200,000 operations annually, 12 of the past 14 years. The highest level of operations since 1980 was recorded in 1999, with 251,747 operations. Local operations have historically represented approximately 57 percent of operations, with itinerant operations representing the remaining 43 percent.

TABLE 3R
Historical Aircraft Operations

	Itinerant					Local				
Year	**Air Carrier**	**Air Taxi**	**General Aviation**	**Military**	**Total Itinerant**	**General Aviation**	**Military**	**Total Local**	**Total Operations**	**% Increase/ Decrease**
1980	-	1,675	88,222	228	90,125	91,360	1,034	92,394	182,519	N/A
1981	-	1,798	91,001	228	93,027	93,854	1,034	94,888	187,915	3.0%
1982	-	68	65,041	268	65,377	75,268	1,294	76,562	141,939	-24.5%
1983	-	*94*	*62,517*	*398*	*63,009*	*77,365*	*1,064*	*78,429*	*141,438*	*-0.4%*
1984	-	1,077	61,915	700	63,692	77,627	1,265	78,892	142,584	0.8%
1985	-	1,946	60,722	771	63,439	78,475	1,933	80,408	143,847	0.9%
1986	-	1,682	68,498	804	70,984	96,857	1,300	98,157	169,141	17.6%
1987	-	1,034	76,654	637	78,325	106,822	756	107,578	185,903	9.9%
1988	5	1,466	89,790	783	92,044	93,808	701	94,509	186,553	0.3%
1989	2	1,941	92,230	749	94,922	107,470	468	107,938	202,860	8.7%
1990	-	1,946	87,979	903	90,828	120,015	766	120,781	211,609	4.3%
1991	-	3,039	87,479	712	91,230	121,054	499	121,553	212,783	0.6%
1992	-	2,899	85,964	706	89,569	109,124	748	109,872	199,441	-6.3%
1993	-	3,112	86,797	634	90,543	102,632	628	103,260	193,803	-2.8%
1994	-	3,562	87,746	755	92,063	118,523	724	119,247	211,310	9.0%
1995	-	3,371	89,467	1,068	93,906	127,233	715	127,948	221,854	5.0%
1996	-	4,175	88,148	1,491	93,814	119,630	378	120,008	213,822	-3.6%
1997	-	5,631	96,284	735	102,650	129,381	364	129,745	232,395	8.7%
1998	-	5,710	85,619	1,133	92,462	138,105	599	138,704	231,166	-0.5%
1999	**-**	**6,553**	**89,386**	**871**	**96,810**	**154,123**	**824**	**154,947**	**251,757**	**8.9%**
2000	-	7,230	83,201	1,103	91,534	151,645	1,332	152,977	244,511	-2.9%
2001	12	7,931	84,639	873	93,455	141,880	48	141,928	235,383	-3.7%
2002	6	9,078	82,493	426	92,003	131,495	91	131,586	223,589	-5.0%

Source: 1976 – 1989 FAA TAF, 1990 – 2003 FAA Air Traffic Activity Data System
Notes: Year shown in bold is peak year for aircraft operations. Year shown in italics has the lowest level of aircraft operations.

Air Taxi Operations

Historical air taxi operations at Hillsboro Airport are shown in **Table 3S**. Since 1995 air taxi operations have grown each year. Between 1980 and 2002, air taxi operations grew at an average annual rate of 8.0 percent.

TABLE 3S
Air Taxi Operations

Year	HIO Air Taxi Operations
1980	1,675
1981	1,798
1982	68
1983	94
1984	1,077
1985	1,946
1986	1,682
1987	1,034
1988	1,466
1989	1,941
1990	1,946
1991	3,039
1992	2,899
1993	3,112
1994	3,562
1995	3,371
1996	4,175
1997	5,631
1998	5,710
1999	6,553
2000	7,230
2001	7,931
2002	9,078
Forecast	
2010	10,300
2015	12,100
2020	13,900
2025	15,700

Historical: FAA
Forecast: Coffman Associates

Due to a consistent growth pattern in air taxi operations over the past 22 years, a time-series analysis yielded a high correlation coefficient of 0.851. As shown in Table 3S, extrapolating the results of this analysis through 2025 yields an estimated 15,700 annual air taxi operations.

Table 3T compares historical Hillsboro Airport air taxi operations as a percentage of total U.S. air taxi operations since 1992. As shown in this table, the Hillsboro Airport share of U.S. air taxi operations have increased during this period as Hillsboro Airport air taxi operations have grown faster than U.S. air taxi operations.

In addition to air taxi operations at general aviation airports, the U.S. air taxi total also includes scheduled regional airline operations at commercial service airports. This segment of the aviation industry is expected to grow at a faster rate than any other category. Therefore, the long term growth rates may overstate air taxi operations potential at Hillsboro Airport which does not have scheduled regional airline operations. For this reason, a constant share of projected U.S. air taxi operations has been made. This results in an estimate of 17,400 air taxi operations in the Year 2025.

Given that the correlation coefficient of the time series extrapolation does not exceed the 0.90 threshold for better predictive reliability and considering that future U.S. air taxi operations forecasts may overstate air taxi growth rates applicable to Hillsboro Airport, a planning forecast for Hillsboro Airport air taxi operations has been selected that is mid-range of these two forecasts to capture a reasonable growth

projection. **Table 3U** summarizes this forecast. In 2004, the Port of Portland determined that nighttime itinerant activity was approximately 2.73 percent of ATCT recorded itinerant operations. Table 3U increases the forecast air taxi operations by this percent to account for operations after the tower is closed. This forecast results in air taxi operations growing at an average annual rate of 2.9 percent through 2025.

TABLE 3T
Share of U.S. Tower Air Taxi Operations

Year	HIO Air Taxi	U.S. Air Taxi	HIO Share
1992	2,899	9,307,300	0.031%
1993	3,112	9,676,000	0.032%
1994	3,562	10,008,400	0.036%
1995	3,371	9,823,800	0.034%
1996	4,175	9,314,900	0.045%
1997	5,631	10,052,700	0.056%
1998	5,710	10,172,200	0.056%
1999	6,553	10,573,500	0.062%
2000	7,230	10,760,600	0.067%
2001	7,931	10,881,700	0.073%
2002	9,078	11,029,500	0.082%
Avg. Ann.	12.1%	1.7%	
% Growth	68.1%	15.6%	
Forecast			
2010	11,700	14,295,600	0.082%
2015	15,400	18,779,000	0.082%
2020	16,600	20,259,000	0.082%
2025	17,400	21,229,500	0.082%
Avg. Ann.	2.9%	2.9%	
% Growth	47.8%	48.0%	

Historical FAA Tower Operations: FAA Aerospace Forecasts, Selected Years
Source for Forecast FAA Tower Operations: 2004 FAA Aerospace Forecasts, 2020 & 2025
Extrapolated by Coffman Associates
Historical HIO Air Taxi: FAA
Forecast HIO Air Taxi: Coffman Associates

TABLE 3U
Share of U.S. Tower Air Taxi Operations

Year	Day	Nighttime	Total
2010	11,000	300	11,300
2015	13,800	400	14,200
2020	15,300	400	15,700
2025	16,600	500	17,100

Source: Coffman Associates Analysis

General Aviation Operations

General aviation operations are classified as either itinerant or local. To examine the different growth rates and trends applicable to each category, the analysis which follows examines general aviation itinerant and general aviation local operations separately.

ITINERANT OPERATIONS

Table 3V depicts the history of general aviation itinerant operations, as counted by the ATCT at Hillsboro Airport since 1980. Since 1980, general aviation itinerant operations have fluctuated from a high of 96,284 in 1997, to a low of 60,722 in 1985. The 2002 level of 82,493 operations is 5,700 operations below the 1980 level of 88,222 operations. Since 1998, general aviation itinerant operations have remained above 82,000 annually. Eight of the past 15 years (53 percent) have seen general aviation itinerant operations above 87,000 annually.

Table 3V examines the relationship of annual operations to based aircraft. As shown in this table, the number of general aviation itinerant operations per based aircraft has varied from 176 operations in 1983 to 270 operations per based aircraft in 1989. Since 2000, the ratio has been increasing slighting. Since 1988, the number of operations per based aircraft has averaged 239. A forecast for general aviation itinerant operations has been made by carrying forward this average operation per based aircraft ratio through 2025. Table 3V indicates that general aviation itinerant operations could grow to 111,000 by 2025, under this scenario.

TABLE 3V
Itinerant Operations Per Based Aircraft

Year	Total Itinerant	Operations Per Based Aircraft
1980	88,222	253
1981	91,001	258
1982	65,041	183
1983	62,517	176
1984	61,915	192
1985	60,722	189
1986	68,498	226
1987	76,654	253
1988	89,790	257
1989	92,230	270
1990	87,979	258
1991	87,479	252
1992	85,964	248
1993	86,797	250
1994	87,746	238
1995	89,467	243
1996	88,148	221
1997	96,284	247
1998	85,619	220
1999	89,386	228
2000	83,201	212
2001	84,639	216
2002	82,493	220
Avg. Ann.	-0.3%	
% Growth	-6.8%	
Forecast		
2010	95,400	239
2015	100,400	239
2020	106,100	239
2025	111,000	239
Avg. Ann.	1.3%	
% Growth	25.7%	

Source for Historical Data: FAA Records
Forecasts: Coffman Associates Analysis

Table 3W depicts this historical share of Hillsboro Airport general aviation itinerant operations as a percentage of general aviation itinerant operations

at towered airports across the country. The Hillsboro Airport share has remained within a tight range during this period, ranging from a low of 0.36 to a high of 0.50. The average market share over the period has been 0.42 percent. Table 3W presents a projection for Hillsboro Airport based upon maintaining its average share of the itinerant market at 0.42 percent. The 2004 FAA Terminal Area Forecast (TAF) projects annual general aviation itinerant operations growing to 129,411 in 2020, or at an average annual rate of 2.8 percent from 2002 to 2020 (the FAA TAF forecast period).

TABLE 3W
Share of U.S. Tower Itinerant General Aviation Operations

Year	HIO Itinerant	U.S. Itinerant	HIO Share
1992	85,964	21,820,900	0.39%
1993	86,797	20,376,800	0.43%
1994	87,746	20,208,400	0.43%
1995	89,467	18,886,400	0.47%
1996	88,148	17,574,500	0.50%
1997	92,284	21,669,100	0.44%
1998	85,619	22,086,500	0.39%
1999	89,386	23,019,400	0.39%
2000	83,201	22,844,100	0.36%
2001	84,639	21,432,000	0.39%
2002	82,493	21,419,900	0.39%
Avg. Ann.	-0.4%	-0.2%	
% Growth	-4.2%	-1.9%	
Forecast			
2010	96,400	23,078,400	0.42%
2015	102,900	24,644,300	0.42%
2020	109,800	26,286,500	0.42%
2025	116,500	27,895,400	0.42%
Avg. Ann.	1.5%	1.2%	
% Growth	29.2%	23.2%	

Source for Historical FAA Tower Operations: FAA Aerospace Forecasts, Selected Years
Source for Forecast FAA Tower Operations: 2004 FAA Aerospace Forecasts, 2020 & 2025 Extrapolated by Coffman Associates
Historical HIO Itinerant: FAA
HIO Itinerant Forecast: Coffman Associates

The FAA projects an increase in aircraft utilization and the number of general aviation hours flown nationally. National general aviation itinerant operations at towered airports are projected to grow by 1.7 percent annually through 2015. This is following a 2.8 percent increase in 2004. These trends, along with projected growth in based aircraft, support future growth in annual operations at Hillsboro Airport. In particular, the growth in based business class aircraft will drive itinerant operations. Turboprop and turbojet operations are primarily itinerant operations.

Considering these factors, the market share projection of U.S. tower

itinerant operations is the selected planning forecast. This forecast provides for an average annual growth rate of 1.5 percent. This is slightly lower than forecast nationally for itinerant operations. However, Hillsboro Airport itinerant operations have not grown at the same rate as national general aviation itinerant operations.

The FAA TAF forecast appears to be too aggressive. Hillsboro Airport has not sustained this level of growth historically and the 2.8 percent annual growth rate greatly exceeds national forecast levels. Since the FAA TAF provides forecast figures only, the underlying assumptions generating those forecasts are unknown. Therefore, an explanation is not known for this higher level of projected growth. **Exhibit 3F** depicts the Hillsboro Airport general aviation itinerant operations forecasts.

LOCAL OPERATIONS

A similar methodology to that used for itinerant operations was used to analyze local operations. **Table 3X** depicts the history of local operations at Hillsboro Airport, and shows the ratio of local general aviation operations to based aircraft. Local operations are higher in 2002 than 1980, averaging an annual growth rate of 1.7 percent over that period. Local operations peaked in 1999 with 154,123 operations. The year 1982 was the lowest in terms of annual operations (only 75,268 operations). Since 1989, local operations have remained above 102,000 annually. A general decline between 2000 and 2002 was experienced.

TABLE 3X
Local Operations Per Based Aircraft

Year	Total Local	Operations Per Based Aircraft
1980	91,360	262
1981	93,854	266
1982	75,268	212
1983	77,365	218
1984	77,627	241
1985	78,475	244
1986	96,857	320
1987	106,822	353
1988	93,808	268
1989	107,470	315
1990	120,015	352
1991	121,054	349
1992	109,124	341
1993	102,632	296
1994	118,523	322
1995	127,233	346
1996	119,630	300
1997	129,381	332
1998	138,105	354
1999	154,123	393
2000	151,645	387
2001	141,880	362
2002	131,495	351
Avg. Ann.	1.7%	
% Growth	28.3%	
Forecast		
2010	156,800	393
2015	165,100	393
2020	174,500	393
2025	182,700	393
Avg. Ann.	1.4%	
% Growth	28.0%	

Source for Historical Data: FAA
Forecast: Coffman Associates Analysis

The 2003 local operations were trending higher than 2002 local operations. However, as mentioned earlier, 2003 operations have been removed from comparison to historical operations due to a significant change in recording methodology used by FAA ATCT personnel (which, as of October

1, 2003, no longer captures all helicopter training operations at the airport). When considering local operations levels between January 2003 and September 2003, and adjusting these upward 15,000 as detailed in Chapter One, Section Four, the 2003 local operations were slightly higher than, but comparable to, the 1999 annual local operations. As mentioned, 1999 was the peak year for local operations. Therefore, 1999 local operations seem to be a reasonable estimate of the true 2003 annual local operations at Hillsboro Airport if there were no changes in the ATCT count methodology.

With this understanding, a projection of future local operations has been made assuming the 1999 ratio of 393 operations per based aircraft is maintained through the planning period. This results in 182,200 annual operations in 2025.

Table 3Y depicts the Hillsboro Airport share of general aviation local operations at towered airports in the United States. The market share has declined between 2000 and 2002, as local operations declined. The average share since 1992 is 0.86 percent. The increase in local operations in 2003 suggests this decline has leveled off, especially since general aviation local operations at towered airports in the United States declined in 2003. A projection of general aviation local operations at Hillsboro Airport has been made assuming the 1999 share of 0.86 percent remains constant through the planning period. The 2004 FAA TAF projects annual general aviation local operations growing to 201,525 in 2020, or at an average annual rate of 2.7 percent from 2002 to 2020 (the FAA TAF forecast period).

TABLE 3Y
Share of U.S. Tower Local General Aviation Operations

Year	HIO Local	U.S. Local	HIO Share
1992	109,124	15,664,400	0.70%
1993	102,632	14,851,000	0.69%
1994	118,523	14,484,100	0.82%
1995	127,233	13,379,200	0.95%
1996	119,630	11,098,000	1.08%
1997	129,381	15,164,200	0.85%
1998	138,105	15,960,000	0.87%
1999	154,123	16,980,200	0.91%
200	151,645	17,034,400	0.89%
2001	141,880	16,188,000	0.88%
2002	131,495	16,155,500	0.81%
Avg. Ann.	1.9%	0.3%	
% Growth	17.0%	3.0%	
Forecast			
2010	149,000	17,363,500	0.86%
2015	161,200	18,779,000	0.86%
2020	173,900	20,259,000	0.86%
2025	182,200	21,229,500	0.86%
Avg. Ann.	1.4%	1.2%	
% Growth	27.8%	23.9%	

Historical FAA Tower Operations: FAA Aerospace Forecasts, Selected Years
Forecast FAA Tower Operation: 2004 FAA Aerospace Forecasts, 2020 & 2025 Extrapolated by Coffman Associates
Historical HIO Local: FAA
HIO Local Forecast: Coffman Associates

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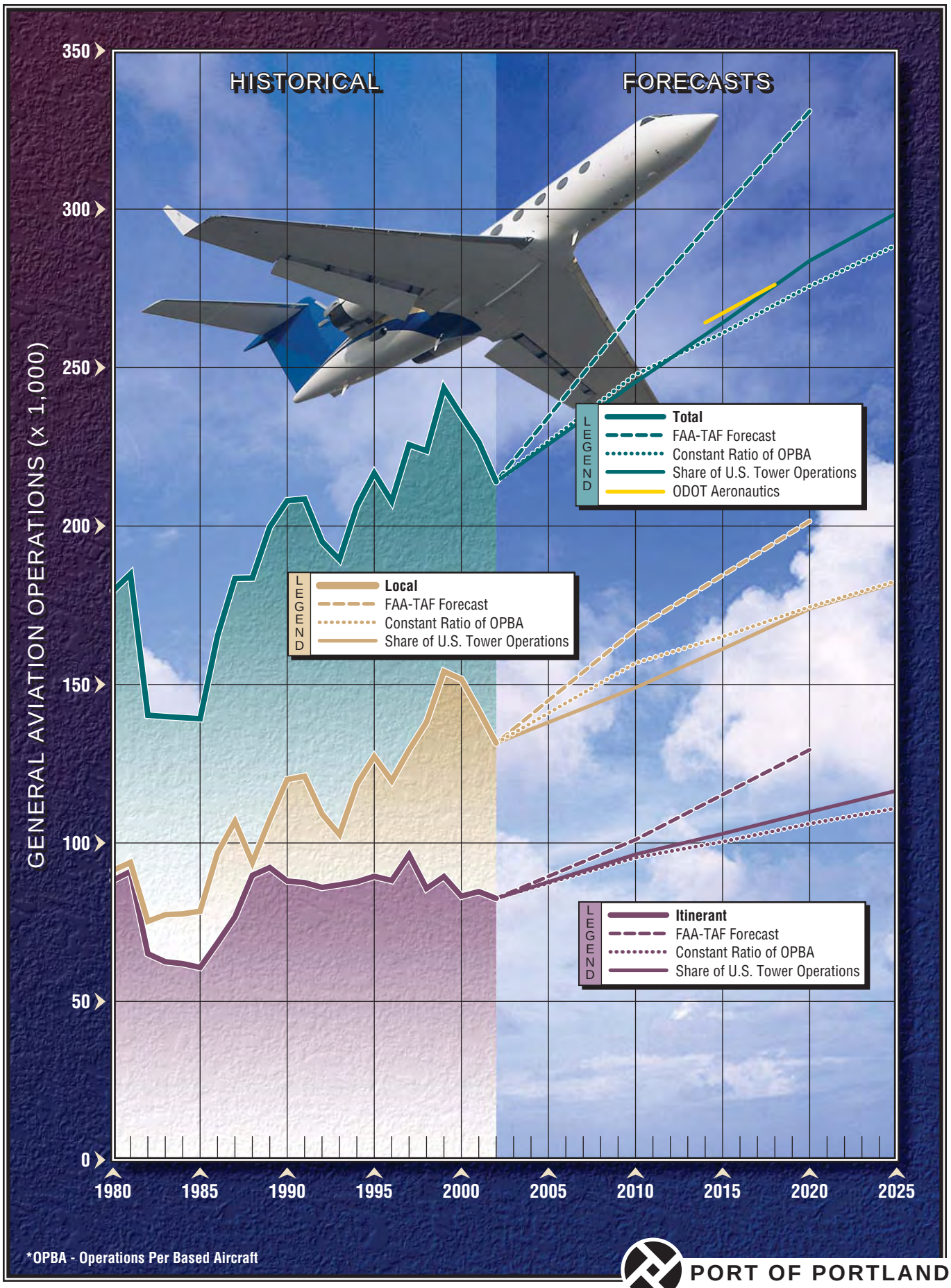


PORT OF PORTLAND

Exhibit 3F
GENERAL AVIATION
OPERATIONS FORECAST

The *FAA Aerospace Forecasts* projects a 1.7 percent per year increase in local operations nationwide. This follows a 3.3 percent increase in 2004. Future growth in local operations will be driven by training operations at Hillsboro Airport. This will be a function of the businesses on the airport which provide pilot training services. The number and type of these businesses through the planning period cannot readily be determined. That will be a function of private business models and business practices. However, considering that historically businesses have been established at Hillsboro Airport that provide pilot training services, it can be expected that these activities will continue in the future. Additionally, new pilot starts are projected to increase over the next 12 years. This will be driven, in part, by the new regulations for sport aviation, which are expected to encourage new recreational pilots who will need primary flight training. This training will be primarily in fixed wing aircraft.

Exhibit 3F graphically depicts the general aviation local operations forecast for Hillsboro Airport. The constant operation per based aircraft forecast is the preferred forecast. This forecast accounts for the higher growth in operations experienced in 2003 and provides for an annual growth rate in local operations of 1.4 percent. This is slightly below the historical 1.7 percent annual growth rate at Hillsboro Airport since 1980, but provides for a 2.7 percent increase in operations over the 2002 level. Similar to general aviation itinerant operations, the *FAA TAF* appears to overstate growth potential in local operations. Exhibit 3F depicts the Hillsboro Airport general aviation local operations forecasts.

TOTAL GENERAL AVIATION OPERATIONS

Table 3Z and Exhibit 3F depict the combined itinerant and local general aviation operations forecasts. An adjustment for nighttime operations is also made in the table. Nighttime general aviation operations were projected as 2.73 percent of projected itinerant operations consistent with the results of the nighttime survey prepared by the Port in 2003. Nighttime local operations were projected as 1.11 percent of projected local operations. Combined, annual general aviation operations are projected to grow to 304,400 annually by the Year 2025.

TABLE 3Z
General Aviation Operations Planning Forecast

	2010	2015	2020	2025
Itinerant Operations	96,400	102,900	109,800	116,500
Nighttime Itinerant Operations	2,600	2,800	3,000	3,200
Total Itinerant Operations	**99,000**	**105,700**	**112,800**	**119,700**
Operations Per Based Aircraft	248	252	254	257
% of Total Operations	38.4%	38.8%	39.0%	39.3%
Local Operations	156,800	165,100	174,500	182,700
Nighttime Local Operations	1,700	1,800	1,900	2,000
Total Local Operations	**158,500**	**166,900**	**176,400**	**184,700**
Operations Per Based Aircraft	397	397	397	397
% of Total Operations	61.6%	61.2%	61.0%	60.7%
Total Operations	**257,500**	**272,600**	**289,200**	**304,400**

Source: Coffman Associates analysis

Military Operations

Military activity accounts for the smallest portion of the operational traffic at Hillsboro Airport. Since 1990, annual military operations have averaged approximately 1,500 annually, with approximately 900 attributable to itinerant operations and approximately 600 attributable to local operations. Unless there is an unforeseen mission change in the area, a significant change from these average figures is not anticipated. Therefore, annual military operations have been projected at these annual levels throughout the planning period. This is consistent with typical industry practices for projecting military operations.

OPERATIONAL MIX

The number and type of aircraft operating at the airport through the planning period will be important throughout the master plan study. This type of information will be used in determining airfield capacity, future noise emissions, and air quality analysis. Section Four of Chapter One detailed the estimate of the existing operational mix. This is summarized at the top of **Table 3AA**. This analysis concluded that the fixed wing aircraft represented approximately 65 percent of the total operations at the airport, while helicopters represented the remaining 35 percent.

A forecast of the operational mix is also shown in Table 3AA. This projection assumes that fixed wing aircraft will grow in number and in percentage of the total mix through the planning period. This is consistent with projected based aircraft fleet mix changes for Hillsboro Airport and national trends showing stronger growth rates for the number of active fixed wing aircraft versus helicopters through 2015. For Hillsboro Airport, business class aircraft use is expected to grow faster than all other categories at the airport.

TABLE 3AA
Operational Split

Aircraft Type	Total Local	% of Total	Total Itinerant	% of Total	Total	% of Total
2003						
SEPF (Fixed Propeller)	73,624	45.9%	50,420	54.0%	124,044	48.9%
SEPV (Variable Pitch Propeller)	8,180	5.1%	8,898	9.5%	17,078	6.7%
MEP (Multi-Engine Piston)	2,413	1.5%	5,105	5.5%	7,518	3.0%
TP (Turboprop)	2,156	1.3%	5,063	5.4%	7,219	2.8%
TJ (Turbojet)	329	0.2%	9,523	10.2%	9,852	3.9%
HP (Helicopter Piston)	72,995	45.5%	10,268	11.0%	83,263	32.8%
HT (Helicopter Turbine)	705	0.4%	4,168	4.5%	4,873	1.9%
Total	**160,402**	**100.0%**	**93,445**	**100.0%**	**253,847**	**100.0%**
Fixed Wing	86,702	54.1%	79,009	84.6%	165,711	65.3%
Rotorcraft	73,700	45.9%	14,436	15.4%	88,136	34.7%
2010						
SEPF (Fixed Propeller)	72,100	45.3%	61,500	55.3%	133,600	49.4%
SEPV (Variable Pitch Propeller)	8,000	5.0%	10,800	9.7%	18,800	7.0%
MEP (Multi-Engine Piston)	2,400	1.5%	6,200	5.6%	8,600	3.2%
TP (Turboprop)	2,500	1.6%	6,300	5.7%	8,800	3.3%
TJ (Turbojet)	400	0.3%	11,900	10.7%	12,300	4.6%
HP (Helicopter Piston)	73,000	45.9%	10,300	9.3%	83,300	30.8%
HT (Helicopter Turbine)	700	0.4%	4,200	3.8%	4,900	1.8%
Total	**159,100**	**100.0%**	**111,200**	**100.0%**	**270,300**	**100.0%**
Fixed Wing	85,400	53.7%	96,700	87.0%	182,100	67.4%
Rotorcraft	73,700	46.3%	14,500	13.0%	88,200	32.6%
2015						
SEPF (Fixed Propeller)	78,800	47.0%	67,300	55.7%	146,100	50.7%
SEPV (Variable Pitch Propeller)	8,800	5.3%	11,900	9.9%	20,700	7.2%
MEP (Multi-Engine Piston)	2,600	1.6%	6,800	5.6%	9,400	3.3%
TP (Turboprop)	3,100	1.9%	7,000	5.8%	10,100	3.5%
TJ (Turbojet)	500	0.3%	13,300	11.0%	13,800	4.8%
HP (Helicopter Piston)	73,000	43.6%	10,300	8.5%	83,300	28.9%
HT (Helicopter Turbine)	700	0.4%	4,200	3.5%	4,900	1.7%
Total	**167,500**	**100.0%**	**120,800**	**100.0%**	**288,300**	**100.0%**
Fixed Wing	93,800	56.0%	106,300	88.0%	200,100	69.4%
Rotorcraft	73,700	44.0%	14,500	12.0%	88,200	30.6%
2020						
SEPF (Fixed Propeller)	86,500	48.9%	72,500	56.0%	159,000	51.9%
SEPV (Variable Pitch Propeller)	9,600	5.4%	12,800	9.9%	22,400	7.3%
MEP (Multi-Engine Piston)	2,800	1.6%	7,300	5.6%	10,100	3.3%
TP (Turboprop)	3,800	2.1%	7,700	6.0%	11,500	3.8%
TJ (Turbojet)	600	0.3%	14,600	11.3%	15,200	5.0%
HP (Helicopter Piston)	73,000	41.2%	10,300	8.0%	83,300	27.2%
HT (Helicopter Turbine)	700	0.4%	4,200	3.2%	4,900	1.6%
Total	**177,000**	**100.0%**	**129,400**	**100.0%**	**306,400**	**100.0%**
Fixed Wing	103,300	58.4%	114,900	88.8%	218,200	71.2%
Rotorcraft	73,700	41.6%	14,500	11.2%	88,200	28.8%
2025						
SEPF (Fixed Propeller)	93,000	50.2%	77,400	56.2%	170,400	52.8%
SEPV (Variable Pitch Propeller)	10,300	5.6%	13,7600	9.9%	23,900	7.4%
MEP (Multi-Engine Piston)	3,000	1.6%	7,800	5.7%	10,800	3.3%
TP (Turboprop)	4,600	2.5%	8,400	6.1%	13,000	4.0%
TJ (Turbojet)	700	0.4%	16,000	11.6%	16,700	5.2%
HP (Helicopter Piston)	73,00	39.4%	10,300	7.5%	83,300	25.8%
HT (Helicopter Turbine)	700	0.4%	4,200	3.1%	4,900	1.5%
Total	**185,300**	**100.0%**	**137,700**	**100.0%**	**323,000**	**100.0%**
Fixed Wing	111,600	60.2%	123,200	89.5%	234,800	72.7%
Rotorcraft	73,700	39.8%	14,500	10.5%	88,200	27.3%

Source: Coffman Associates Analysis

The majority of the increased local operations level recorded in the year 2003 is attributed to a peaking of helicopter training operations at the airport. From discussions with airport tenants, it was determined that late 2002 into 2003 was an unusually busy period for their operations. The level of flight training in 2003 had not been experienced before.

The type and level of helicopter training at Hillsboro Airport are unique to the businesses located at the airport. These businesses cater to students from outside the United States. This is a cyclical business that is based in part on the flight training needs in the United States and in other countries worldwide. It is also a factor of the number and type of competitors to the businesses at the airport. Some flight training businesses have been more successful in managing the new regulatory environment after 9/11.

Considering that this was a peak year and not representative of past years, it is assumed that helicopter operations would not grow much higher than estimated for 2003. Therefore, for planning purposes, helicopter operations have been fixed at the 2003 levels through the planning period. This results in the decline as a percentage of total operations. The growth in new helicopter pilots nationally also suggests that this market may be limited in the future. Nationally, the number of new helicopter only pilots is expected to grow at an annual rate of 1.0 percent through 2015, growing from 7,918 pilots in 2003, to 8,970 pilots in 2015. This is only 1,052 or 87 new pilots each year. Fixed wing pilots are projected to grow at 1.4 percent annually.

AIRPORT REFERENCE CODE

Table 3AB classifies 2003 and forecast fixed-wing operations by FAA airport reference code (ARC). This FAA coding system relates airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. The ARC has two components: the first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

TABLE 3AB
Forecast by Airport Reference Code

Airport Reference Code	2003	2010	2015	2020	2025
A-I, A-II, B-I, B-II	153,004	166,400	182,300	198,300	212,700
C-I, C-II, D-I, D-II	12,317	15,200	17,200	19,300	21,400
C-III, D-III	390	480	550	610	680
Total	165,711	182,080	200,050	218,210	234,780

Source: Coffman Associates Analysis

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADGs are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

All approach category C and D aircraft, as well as some category B aircraft, are turbojets. All turboprop and piston engine aircraft are in categories A and B. These reference codes will be discussed in more detail later in the master plan, in the Facility Requirements chapter.

The most demanding ARC (highest approach category and ADG) with over 500 annual operations is used in determining the applicable FAA airport design criterion. ARC C-III has been applied to Hillsboro Airport planning and design in the past. As shown in the table, ARC C-III is expected to remain the planning ARC through the planning period as this is expected to be the most demanding ARC with over 500 annual operations. This analysis was completed by applying 2003 ARC percentages to the forecast fixed wing operational mix shown previously in Table 3AA.

PEAKING CHARACTERISTICS

Many airport facility needs are related to the levels of activity during peak periods. The periods used in developing facility requirements for this study are as follows:

Recommend we do not use money signs as bullets.

- **Peak Month -** The calendar month when peak activity occurs.

- **Design Day -** The average day in a peak month. The indicator is easily derived by dividing the peak month activity by the number of days in the month.

- **Design Hour -** The peak hour within the design day.

For itinerant operations, a fourth factor, busy day is considered. This is used in calculating apron requirements.

- **Busy Day -** The busy day of a typical week in the peak month.

Table 3AC summarizes peak period forecasts for the airport. This is separated between total annual operations and itinerant general aviation operations. The peak periods were determined by reviewing ATCT counts in the past 13 years. In the past 13 years, the peak month for operations has averaged 11.3 percent of total operations. For itinerant general aviation operations, the peak month has averaged 12 percent of itinerant general aviation operations. The design day is derived simply by dividing the peak month by 30. Design hour operations were estimated at 20 percent of design day operations. The forecast of busy day operations was determined to be 1.23 times design day activity.

TABLE 3AC
Peak Period Forecasts

	2002	2010	2015	2020	2025
Annual Operations					
Annual	227,589	270,300	288,300	306,400	323,000
Peak Month	8,554	30,500	32,600	34,600	36,500
Design Day	285	1,000	1,100	1,200	1,200
Design Hour	57	200	220	240	240
Itinerant General Aviation Operations					
Annual	94,503	111,200	120,800	129,400	137,700
Peak Month	11,340	13,300	14,500	15,500	16,500
Busy Day	465	545	595	636	677
Design Day	378	443	483	517	550
Design Hour	76	89	97	103	110

Source: Coffman Associates Analysis

ANNUAL INSTRUMENT APPROACHES FORECASTS

An instrument approach as defined by the FAA is "an approach to an airport with the intent to land an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude."

Available data on actual instrument approaches (AIAs) was obtained from the FAA for the period from 1994 to 2003. This historical data is summarized in **Table 3AD**. As a percentage of air taxi operations, air taxi instrument approaches have averaged 9.0 percent since 2001. This is a decline from the previous seven years, where air taxi AIAs averaged 20 percent of air taxi operations. An increase in air taxi operations, along with a decline in the actual number of AIAs, has led to this percentage decline. Future air taxi AIAs have been projected at 9.0 percent of future air taxi operations. (Similar to air taxi operations, the air taxi AIAs include air carrier AIAs).

General aviation instrument approaches have represented 1.7 percent of total itinerant general aviation operations since 1994. The forecast of general aviation AIAs was prepared by applying this percentage to forecast general aviation itinerant operations. Military AIAs were projected at the peak level of 50 through the planning period. Table 3AD summarizes the annual instrument approach forecast.

TABLE 3AD
Actual Instrument Approaches

Year	Air Carrier/ Air Taxi	General Aviation	Military	Total
HISTORICAL				
1994	623	780	21	1,424
1995	1,197	2,668	39	3,904
1996	1,140	2,239	20	3,399
1997	634	950	38	1,622
1998	1,232	2,042	53	3,327
1999	1,242	1,693	43	2,978
2000	1,090	1,395	52	2,537
2001	1,002	958	23	1,983
2002	737	815	12	1,564
2003	562	835	16	1,413
FORECAST				
2010	1,000	1,700	50	2,750
2015	1,300	1,800	50	3,150
2020	1,400	1,900	50	3,150
2025	1,500	2,000	50	3,550

Source for Historical Data: FAA
Source for Forecasts: Coffman Associates

SUMMARY

This chapter has outlined the various aviation demand levels anticipated through the year 2025 at Hillsboro Airport. Long term growth at the airport will be influenced by many factors including the local economy, the need for a viable aviation facility in the immediate area, and trends in general aviation at the national level.

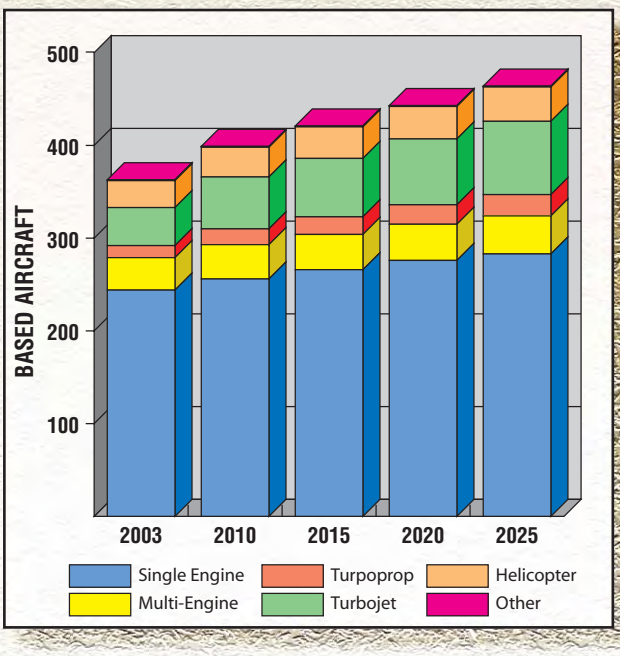
A summary of the forecasts aviation activity levels for Hillsboro Airport is presented on **Exhibit 3G**.

The next step in the master planning process will be to assess the capacity of existing facilities, their ability to meet forecast demand, and to identify changes to the airfield and/or landside facilities which will create a more functional aviation facility.

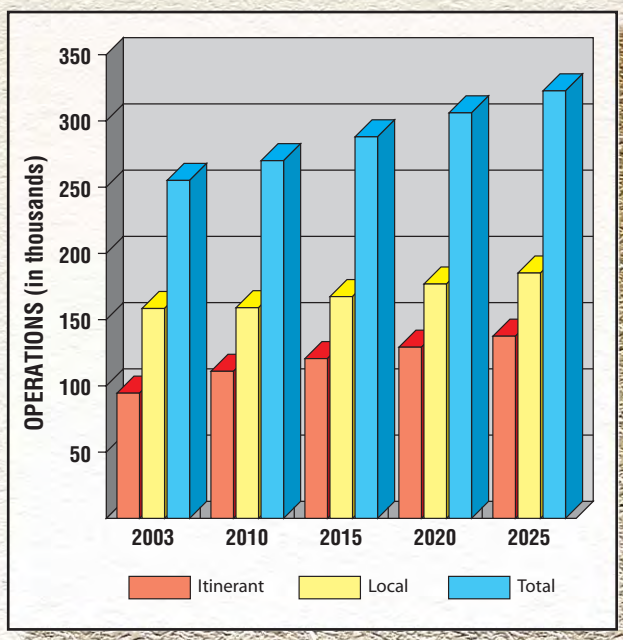
03MP01-3G-5/23/05

	BASE YEAR	FORECASTS			
		2010	2015	2020	2025
BASED AIRCRAFT					
Single Engine Piston	244	256	265	276	284
Multi-Engine Piston	35	37	38	39	41
Turboprop	13	17	19	21	23
Turbojet	41	56	63	71	79
Helicopter	29	32	34	35	37
Other	1	1	1	1	1
Total Based Aircraft	**363**	**399**	**420**	**444**	**465**
OPERATIONS					
ITINERANT OPERATIONS					
General Aviation	83,381	99,000	105,700	112,800	119,700
Air Taxi	9,561	11,300	14,200	15,700	17,100
Military	503	900	900	900	900
Subtotal Itinerant Operations	***93,445***	***111,200***	***120,800***	***129,400***	***137,700***
LOCAL OPERATIONS					
General Aviation	160,261	158,500	166,900	176,400	184,700
Military	141	600	600	600	600
Subtotal Local Operations	***160,402***	***159,100***	***167,500***	***177,000***	***185,300***
Total Operations	**253,847**	**270,300**	**288,300**	**306,400**	**323,000**

BASED AIRCRAFT FLEET MIX



OPERATIONS FORECASTS



PORT OF PORTLAND

Exhibit 3G

FORECAST SUMMARY