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EXECUTIVE SUMMARY – AVIATION DEMAND FORECASTS


MASTER PLAN UPDATE PORTLAND INTERNATIONAL AIRPORT

Prepared for
Port of Portland
Portland, Oregon

May 12, 2008



CITY OF PORTLAND, OREGON
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AIRPORT FUTURES

CHARTING A COURSE FOR PDX

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PREFACE

This document summarizes the aviation demand forecasts prepared for the 2010 Portland International Airport Master Plan Update. This executive summary will become part of the aviation demand forecasts chapter in the final Master Plan Update report scheduled to be produced in 2010. The final chapter will also provide a detailed description of the aviation demand forecasts as well as historical data on the regional population and economy, aviation activity at PDX, and national aviation and economic trends—all of which were the basis for the aviation demand forecasts presented in this document. The PDX Master Plan forecast process was initiated in November 2007 and this executive summary was prepared in April 2008.



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1. INTRODUCTION AND SUMMARY

This executive summary presents forecasts of aviation activity in support of the Master Plan for Portland International Airport (the Airport, or PDX). The forecasts presented in this document are “unconstrained” and, therefore, do not include specific assumptions about the future capacity of the Airport. The forecasts are prepared for four future demand years: 2012, 2017, 2027, and 2035. The base year for the forecasts is 2006.

1.1 Forecast Process

The PDX Master Plan forecasts were prepared using a collaborative process which included (1) a review of the 1999 Master Plan and Federal Aviation Administration (FAA) Terminal Area Forecasts (TAF), (2) the collection and analysis of data related to the key issues and trends affecting future aviation demand at PDX, (3) the development of statistical models to define historical causal factors and to provide the logical structure for incorporating input from key stakeholders, (4) supplemental analyses to address technical issues and to reflect stakeholder and peer review input, (5) the preparation of probabilistic forecasts (described later), and (6) coordination with representatives of the Port of Portland (the Port), City of Portland (the City), Forecast Subcommittee and Planning Advisory Group (both described in the following paragraphs), FAA and the public. Figure 1 presents a diagram of the forecast process.

1.1.1 Forecast Subcommittee

The Forecast Subcommittee was formed to review and comment on the forecast process and included representatives from the Planning Advisory Group (PAG), Port of Portland Aviation Planning Department, City of Portland, Metro (the Portland-Vancouver region’s Metropolitan Planning Organization or MPO), and members of the public. The Forecast Subcommittee was charged with assisting the Aviation Consultant and City Peer Review Consultant in reviewing the methodology, assumptions, and scenarios which formed the basis of the aviation forecasts and assisted in assembling the list of key issues and trends. The Forecast Subcommittee met five times to discuss and review the forecasts and made a final recommendation to PAG regarding the forecast results.

1.1.2 Planning Advisory Group

The Planning Advisory Group (PAG) serves as the advisory body to the City of Portland and Port of Portland and helps to guide and inform the joint planning process. Presentations to the PAG were made at five meetings to report on the forecast process and meetings with the Forecast Subcommittee. The PAG reviewed the forecast process, methodology, and forecast results and assisted in refining forecast assumptions and scenarios. The PAG unanimously recommended the forecast results be accepted on April 15, 2008.

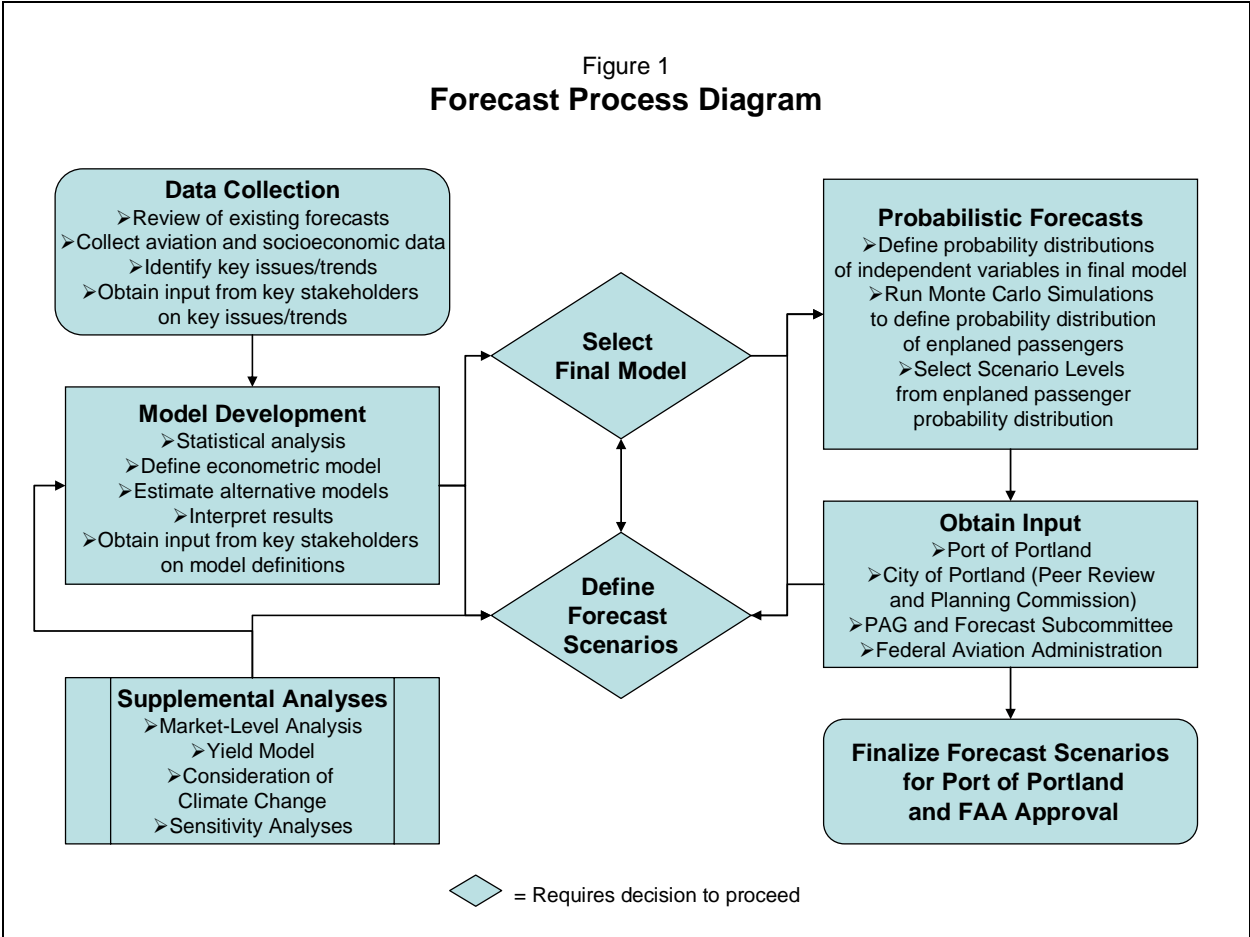
1.1.3 Peer Review

An independent peer review of the forecast process and technical results was conducted by Aviation System Consulting, LLC. The peer reviewer was retained by the City of Portland and

was involved throughout the forecast process. The scope of work of the peer reviewer included (1) participation with the Port of Portland staff, the City of Portland staff, the PAG, and the Master Plan consultant in the creation, analysis, and adoption of the forecasts, and (2) preparation of an analysis of each forecast scenario, including the underlying assumptions and methodology.

1.2 Forecast Approach

The PDX Master Plan forecasts were developed using a variety of analytical tools, including trend analysis, econometric models, and probability (or risk) analysis, an innovative approach to evaluate the likelihood of future aviation activity. The key components of the forecast approach included (1) the definition and evaluation of key issues and trends affecting future aviation activity, (2) the creation of econometric models to provide a logical structure for testing the forecast scenarios and assumptions, (3) the preparation of probabilistic forecasts, (4) consideration of the price of oil forecasts, (5) the inclusion of future carbon costs related to the cost of travel, and (6) the translation of passenger and cargo demand generated by these analyses into future aircraft operations.



1.2.1 *Key Issues and Trends*

A list of key issues and trends affecting future aviation activity was created at the beginning of the forecast process and was the product of extensive public involvement including input obtained from the Forecast Subcommittee, PAG, the peer reviewer, and the public. The key issues and trends included five main categories: (1) aviation industry, (2) regional and economic, (3) technology, (4) global, and (5) external events, as shown in Table 1. As noted in Table 1, the forecast approaches for addressing each of the key issues and trends included (1) the incorporation of data for key variables in the econometric models, if available, and (2) the preparation of sensitivity tests of the forecast results.

1.2.2 *Sources of Forecast Uncertainty*

At the beginning of the PDX MP forecast process, it was recognized that “there are no facts about the future” and that there are many sources of uncertainty related to the preparation of aviation forecasts. Uncertainty is evident in the continuous restructuring of the airline industry and the related changes in service, the fluctuations in the price of oil and the resulting impact on airfares, and future policies related to greenhouse gas emissions and the potential effects on the aviation industry. There is also uncertainty related to how historical aviation demand relationships will be carried forward in the future. The question of whether demand remains unchanged over time or is changed by future events for which there is no available information today has been considered continuously throughout the forecast process.

1.2.3 *Econometric Models*

Econometric models of passenger and cargo activity were created based on data for 1976 through 2006. The independent variables in the passenger model included population, per capita income in 2006 dollars, a dummy variable for the effects of September 11, and PDX airline yield. In addition, a series of equations defining airline yield were created which (1) related PDX airline yield to U.S. domestic yield, (2) included the price of oil and future carbon costs as independent variables in the equations, and (3) allowed for the testing of alternative assumptions regarding oil and carbon costs in the forecast scenarios. The cargo model is a logistic model which relates PDX cargo tonnage to total personal income for the Portland-Vancouver region and is a measure of the cargo intensity of the Portland economy.

1.2.4 *Probabilistic Forecasts*

Probabilistic forecasts express the likelihood of obtaining a future value in a given year and provide an indication of the uncertainty or risk associated with future values. For example, a probabilistic forecast would indicate that there is a 90% probability that the number of PDX passengers enplaned in 2035 would be equal to or less than 21 million. In contrast, traditional forecasting methods would provide a single value for 2035 but no indication of the likelihood of reaching that level. The probabilistic forecasts of passengers and cargo at PDX were prepared (1) using the econometric models described in 1.2.2, (2) probability distributions of the independent variables used in the models, and (3) Monte Carlo simulations used to randomly generate future values of PDX enplaned passengers.

Table 1
KEY ISSUES AND TRENDS
 Master Plan Update
 Portland International Airport

Key issue / trend	Category
INCLUDED IN ECONOMETRIC MODELS OR OTHER ANALYSES	
Price of oil / Jet fuel costs	Aviation Industry
Fuel as a share of airline costs	Aviation Industry
Enplaned passenger load factors	Aviation Industry
Aircraft capacity (seats)	Aviation Industry
Airfares / yield (cost of travel)	Aviation Industry
Maturity of PDX markets (airline service)	Aviation Industry
Visitor vs. resident travel to PDX, domestic	Aviation Industry
Visitor vs. resident travel to PDX, international	Aviation Industry
Population	Regional / Economic
Nonagricultural employment	Regional / Economic
Personal income	Regional / Economic
Climate change	Global
SENSITIVITY TESTS OF THE ENPLANED PASSENGER FORECASTS	
Security concerns	Aviation Industry
Leakage to other airports (Oregon and Washington airports)	Aviation Industry
Leakage to other transport modes (high-speed rail and van shuttles)	Aviation Industry
New market / airline service development by Port	Aviation Industry
Airport fees	Aviation Industry
Congestion at other airports	Aviation Industry
Airline consolidation/merger	Aviation Industry
Income distribution	Regional / Economic
Wealth (accumulated income)	Regional / Economic
Population in-migration	Regional / Economic
Population age distribution	Regional / Economic
Propensity to travel by age group	Regional / Economic
Aircraft related	Technology
Fuel (biofuels, solar)	Technology
Video conferencing	Technology
Other new technologies	Technology
Currency exchange rates	Global
Foreign-country air travel patterns	Global
Terrorist event	External Event
Biological event	External Event
Global economic crisis	External Event
National economic recession	External Event
Oil shocks	External Event
Airline industry labor strikes / shortages	External Event
War	External Event

Note: A sensitivity analysis is conducted to test the sensitivity of the final passenger forecasts to changes in and specific assumptions about specific key issues and trends. For example, assumptions regarding the increased use of videoconferencing would be measured in terms of the potential reductions in the passenger forecasts in a given year.

1.2.5 Price of Oil Forecasts

From 2002 to 2006, the price of oil per barrel in 2006 dollars increased an average of 22% per year. According to the Air Transport Association (ATA), every penny paid for a gallon of jet fuel costs the U.S. passenger and cargo airline industry an additional \$195 million annually. Throughout the PDX Master Plan forecast process, the potential future impact of rising oil prices on airline costs and the cost of passenger travel was considered and evaluated as a source of forecast uncertainty. As a result, additional research and analysis was conducted to (1) include the price of oil as an independent variable in the yield equations, (2) examine alternative forecasts of the price of oil, and (3) test the sensitivity of the passenger forecasts to changes in the future price of oil.

1.2.6 Carbon Emission Costs

According to the Environmental Protection Agency (EPA), the U.S. aviation industry currently accounts for about 3% to 4% of national greenhouse gas emissions. Although a U.S. policy regarding greenhouse gas emissions is not yet defined, a number of legislative proposals are under consideration and it is expected that a policy will be in place during the forecast period (through 2035). As a result, additional research and analysis was conducted to (1) include future carbon costs as an independent variable in the yield equations and (2) examine available research to define a range of future carbon costs.

1.2.7 Aircraft Operations

The probabilistic forecasts of passenger and cargo activity for the airport were translated into aircraft operations by (1) disaggregating the total demand into the components (i.e., domestic and international, mainline (air carrier) and regional affiliate) and (2) making future assumptions about average aircraft size in terms of seats per departure and average enplaned passenger load factors (percentage of seats occupied, on average). In addition, the future fleet plans of the airlines serving PDX were also considered based on available information.

1.2.8 Study Limitations

During the forecast process, a number of limitations were identified related to the reporting and composition of aviation data and the potential effects on the forecasts. To the extent that time and budget were available, every effort was made to address the issues raised by the Forecast Subcommittee, PAG, peer reviewer, and members of the public. A summary of the study limitations related to yield data, aircraft fuel efficiency, and air cargo activity are presented in the aviation demand forecasts chapter in the final Master Plan Update Report. .

1.3 Review of Existing Forecasts

A review and comparison of the 1999 Master Plan forecasts and the FAA 2007 TAF was conducted at the beginning of and throughout the forecast process. The purpose of this review was to compare actual activity to the previous forecasts and to understand the reasons for any differences. A review of existing forecasts was conducted of enplaned passengers, cargo, and



aircraft operations. For the purposes of comparison, the 2010 Master Plan forecasts are presented graphically in this section and summarized in Table 2.

1.3.1 Enplaned Passengers

Figure 2 presents a graphical comparison of actual activity from 1976 through 2006 and PDX enplaned passengers forecasts for the 2010 Master Plan, the FAA 2007 TAF, and the 1999 Master Plan. The 1999 Master Plan forecasts tracked actual activity in 1999 and 2000 but were 9%, 20%, and 28% higher than actual in 2006 for the low, medium, and high growth scenarios, respectively. The differences between actual and the 1999 Master Plan forecasts are related to the events of September 11 and the resulting decrease in passenger traffic at PDX and in the nation as a whole. The 2010 Master Plan forecasts are based on 2006 data and are within 5.6% of the FAA 2007 TAF in 2011 and 2.6% in 2016. The enplaned passenger growth rate for the median scenario 2010 MP forecast (an average increase of 2.3% per year from 2006 to 2035) is lower than the annual growth rate forecast by the FAA in its 2007 Terminal Area Forecast (TAF) for the Airport—2.5% from Federal Fiscal Year (FFY) 2006 to FFY 2025.

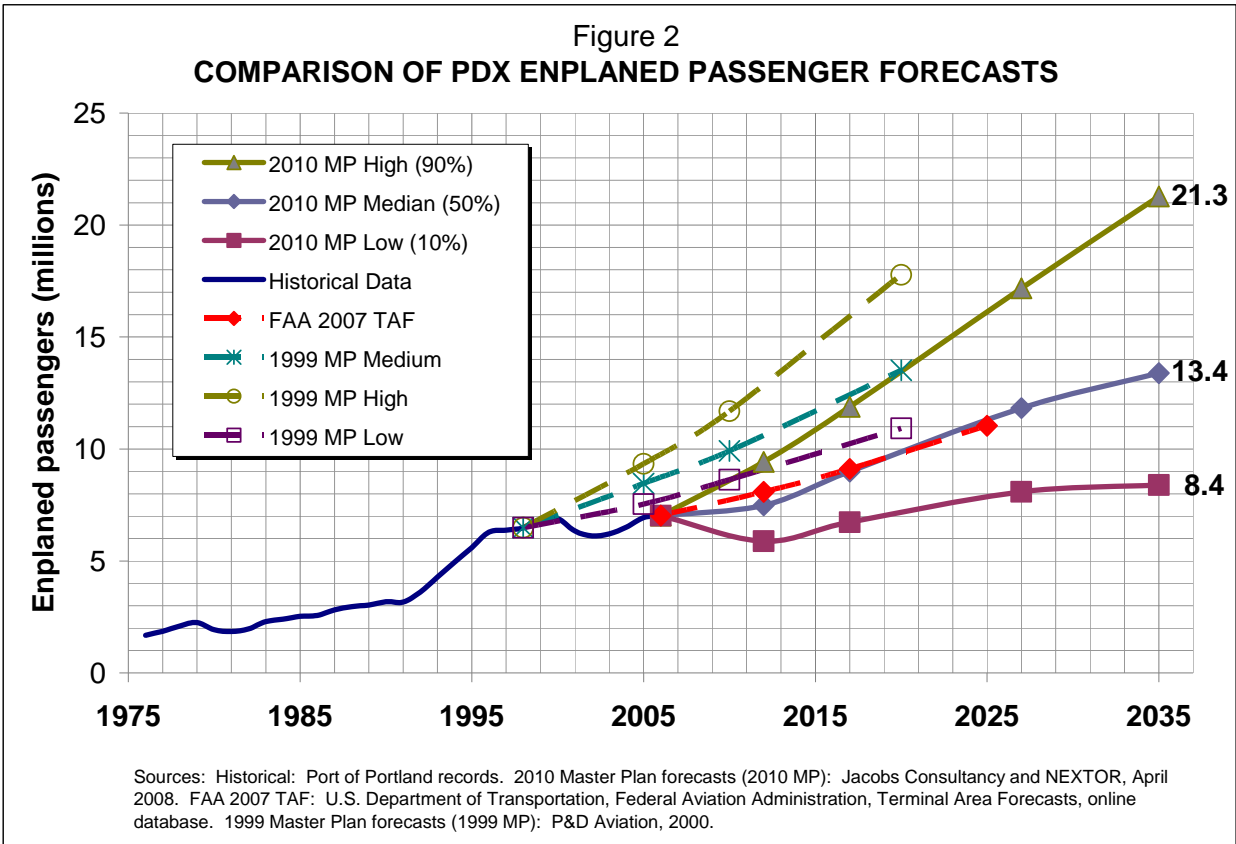


Table 2

SUMMARY OF AVIATION DEMAND FORECASTS

Master Plan Update
 Portland International Airport
 2006 - 2035

The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

	Historical		Scenario 1 (Median, 50 percentile)				Scenario 2 (High, 90 percentile)				Scenario 3 (Low, 10 percentile)			
	2006 (a)	2007	2012	2017	2027	2035	2012	2017	2027	2035	2012	2017	2027	2035
ENPLANED PASSENGERS														
(thousands)	7,022	7,332	7,489	8,992	11,825	13,393	9,421	11,886	17,177	21,277	5,887	6,730	8,086	8,395
Average annual percent change	--	4.4%	0.4%	3.7%	2.8%	1.6%	5.1%	4.8%	3.8%	2.7%	-4.3%	2.7%	1.9%	0.5%
TOTAL AIR CARGO (thousands of short tons) (b)	285	280	322	414	594	732	417	496	736	972	225	332	466	526
Average annual percent change	--	-1.8%	2.8%	5.2%	3.7%	2.6%	8.2%	3.6%	4.0%	3.5%	-4.3%	8.1%	3.4%	1.5%
AIRCRAFT OPERATIONS														
PASSENGER AIRLINE AIRCRAFT OPERATIONS	186,124	191,554	180,400	207,000	250,600	275,000	227,000	274,400	365,000	438,200	142,600	156,000	171,400	172,400
ALL-CARGO AIRLINE AIRCRAFT OPERATIONS	33,184	33,324	37,980	41,240	48,760	52,320	45,400	47,840	56,540	65,540	25,720	30,160	35,580	37,800
GENERAL AVIATION	28,230	27,623	26,100	28,200	30,900	32,500	27,000	30,300	35,200	39,000	22,200	21,300	20,300	19,400
MILITARY	5,017	3,707	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
OTHER ACTIVITY (c)	7,831	8,310	8,000	9,100	11,100	12,000	10,100	11,800	15,600	18,400	6,200	6,900	7,800	8,000
TOTAL AIRPORT--AIRCRAFT OPERATIONS	260,386	264,518	258,480	291,540	347,360	377,820	315,500	370,340	478,340	567,140	202,720	220,360	241,080	243,600
Average annual percent change	--	1.6%	-0.5%	2.4%	1.8%	1.1%	3.6%	3.3%	2.6%	2.2%	-5.2%	1.7%	0.9%	0.1%

(a) The base year for the forecasts is 2006.

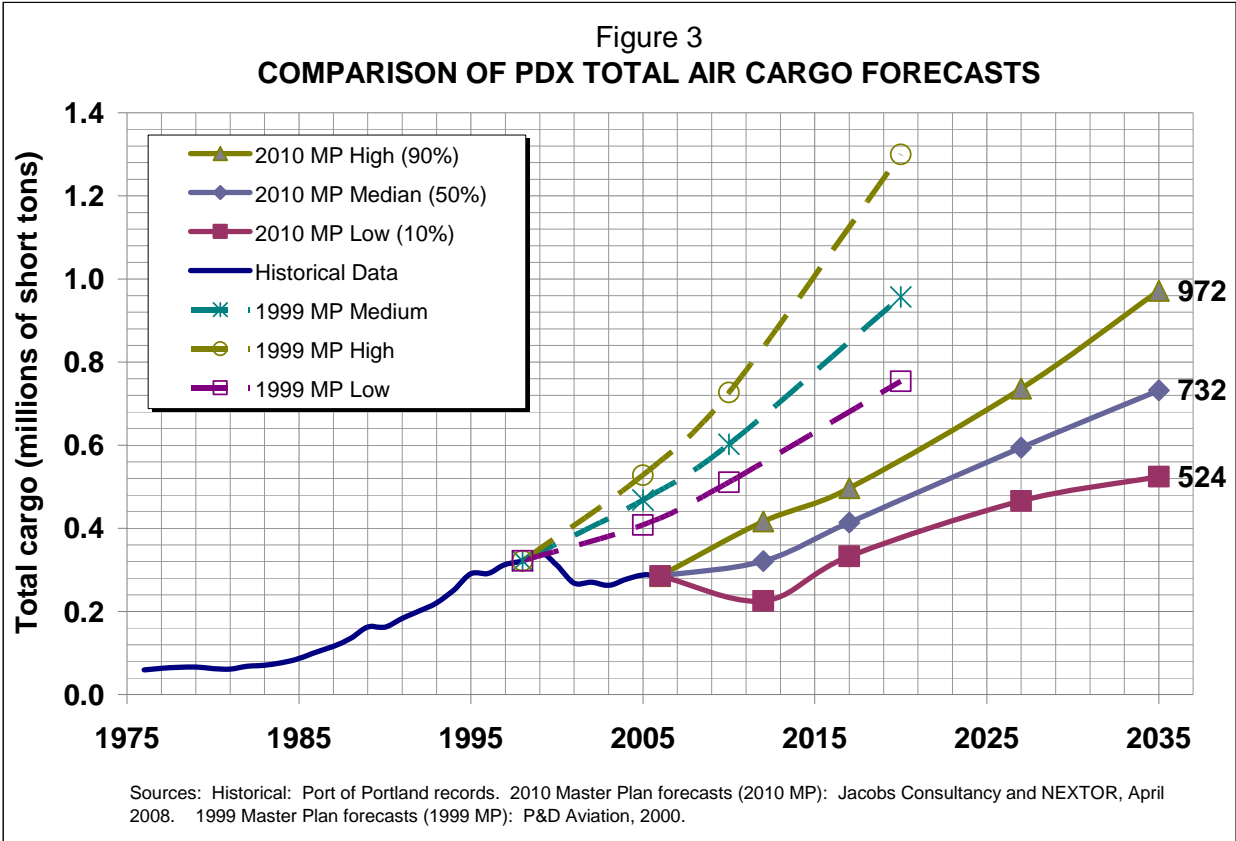
(b) A short ton equals 2,000 pounds.

(c) Includes nonscheduled and empty flights.

Sources: Historical: Port of Portland records. Forecast: Jacobs Consultancy, Inc. and U.C. Berkeley NEXTOR, April 2008.

1.3.2 Cargo

Figure 3 presents a graphical comparison of actual activity from 1976 through 2006 and PDX total air cargo forecasts for the 2010 Master Plan and the 1999 Master Plan. (The FAA does not prepare cargo forecasts for individual airports as part of the TAF.) The 1999 Master Plan forecast tracked actual activity in 1999 but were 33%, 42%, and 49% higher than actual in 2006 for the low, medium, and high growth scenarios, respectively. The differences between actual and the 1999 Master Plan forecasts are related to the events of September 11, consolidation in the air cargo industry, and an increasing trend in the volume of cargo transported by truck. In the median scenario 2010 MP forecast, all-cargo airlines are forecast to account for an increasing share of total air cargo, from 85% in 2006 to 92% in 2035. The cargo transported on all-cargo airlines is forecast to increase an average of 3.8% per year from 2006 through 2035, compared with a forecast growth rate of 1.6% per for passenger airlines during the same period.

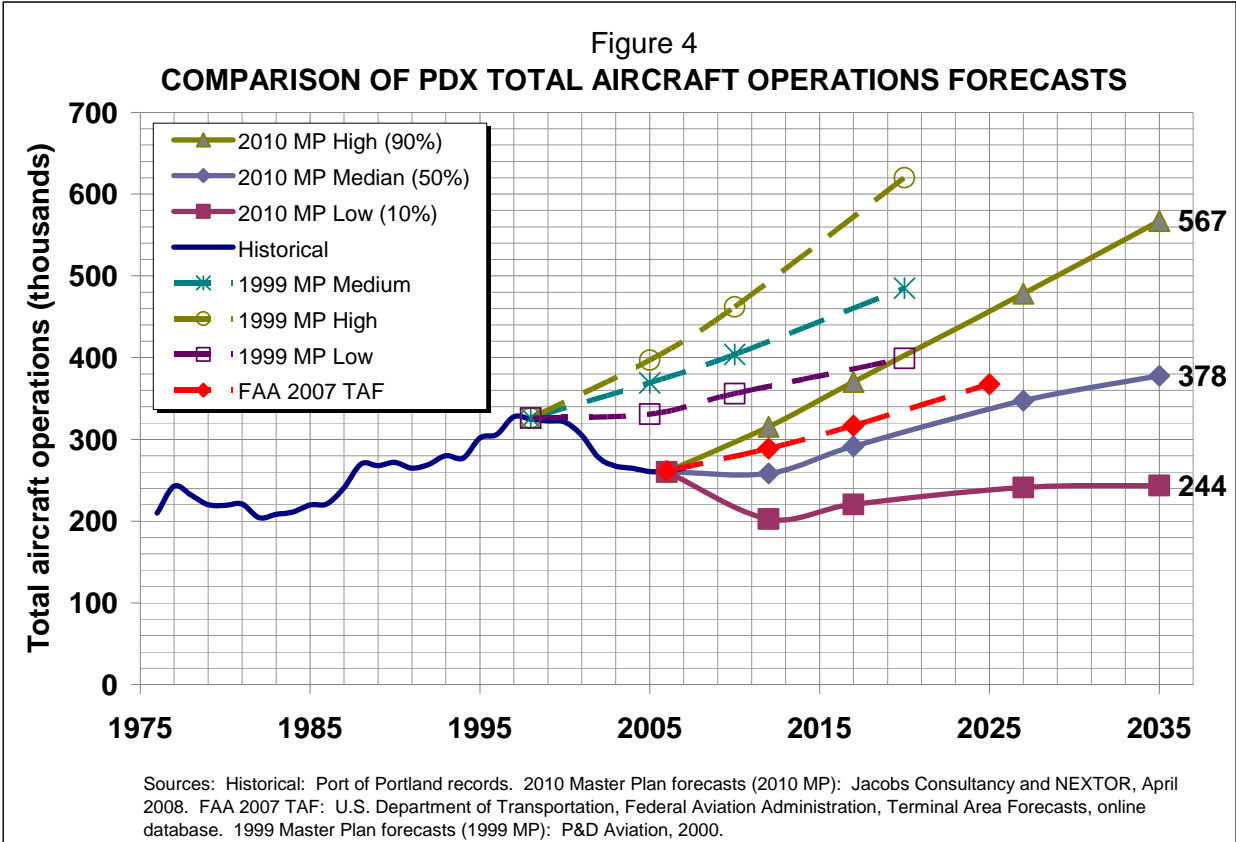


1.3.3 Aircraft Operations

Figure 4 presents a graphical comparison of actual activity from 1976 through 2006 and PDX total aircraft operations forecasts for the 2010 Master Plan, the FAA 2007 TAF, and the 1999 Master Plan. The 1999 Master Plan forecasts tracked actual activity in 1999 but were 22%, 31%, and 36% higher than actual in 2006 for the low, medium, and high growth scenarios,



respectively. The differences between actual and the 1999 Master Plan forecasts are related to the events of September 11, considerable increases in enplaned passenger load factors which contributed to slower growth in passenger airline operations, slower growth than forecast in the average aircraft size, slower growth than forecast in air cargo, and declines in general aviation and military activity. The 2010 Master Plan forecasts are based on 2006 data and are within 8.5% of the FAA 2007 TAF in 2011 and in 2016. In the median scenario 2010 MP forecast, total aircraft operations at PDX are forecast to increase from 260,386 in 2006 to 377,820 operations in 2035, an average increase of 1.3% per year. The total aircraft operations forecast growth rate for the median scenario forecast is lower than the annual growth rate forecast in the FAA 2007 TAF for the Airport—1.8% from 2006 to 2025.



1.4 Airport Service Region

For purposes of the PDX Master Plan forecasts, the Portland-Vancouver region is defined as the five-county planning region used by Metro in preparing its regional population and economic forecasts, including Clackamas, Multnomah, Washington, and Yamhill counties in Oregon and Clark county in Washington. The population densities for the five counties underline the importance of this region, as shown on Figure 5. The secondary region served by the Airport, which includes many of the counties surrounding the Portland-Vancouver region, is defined by the location of (and the airline service provided at) other commercial service air carrier airports. The nearest such airports are in Seattle (174 miles to the north) and Eugene (109 miles to the south).

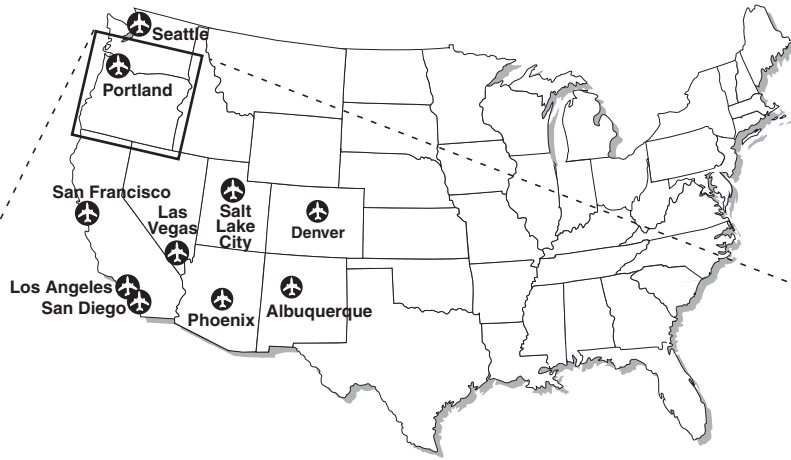
1.5 Airport Role

Portland International Airport plays an important role in the national, state, and local air transportation systems. PDX is the primary commercial service airport for the State of Oregon, supports a large origin-destination passenger base, and serves as a secondary hub for Alaska and Horizon airlines.

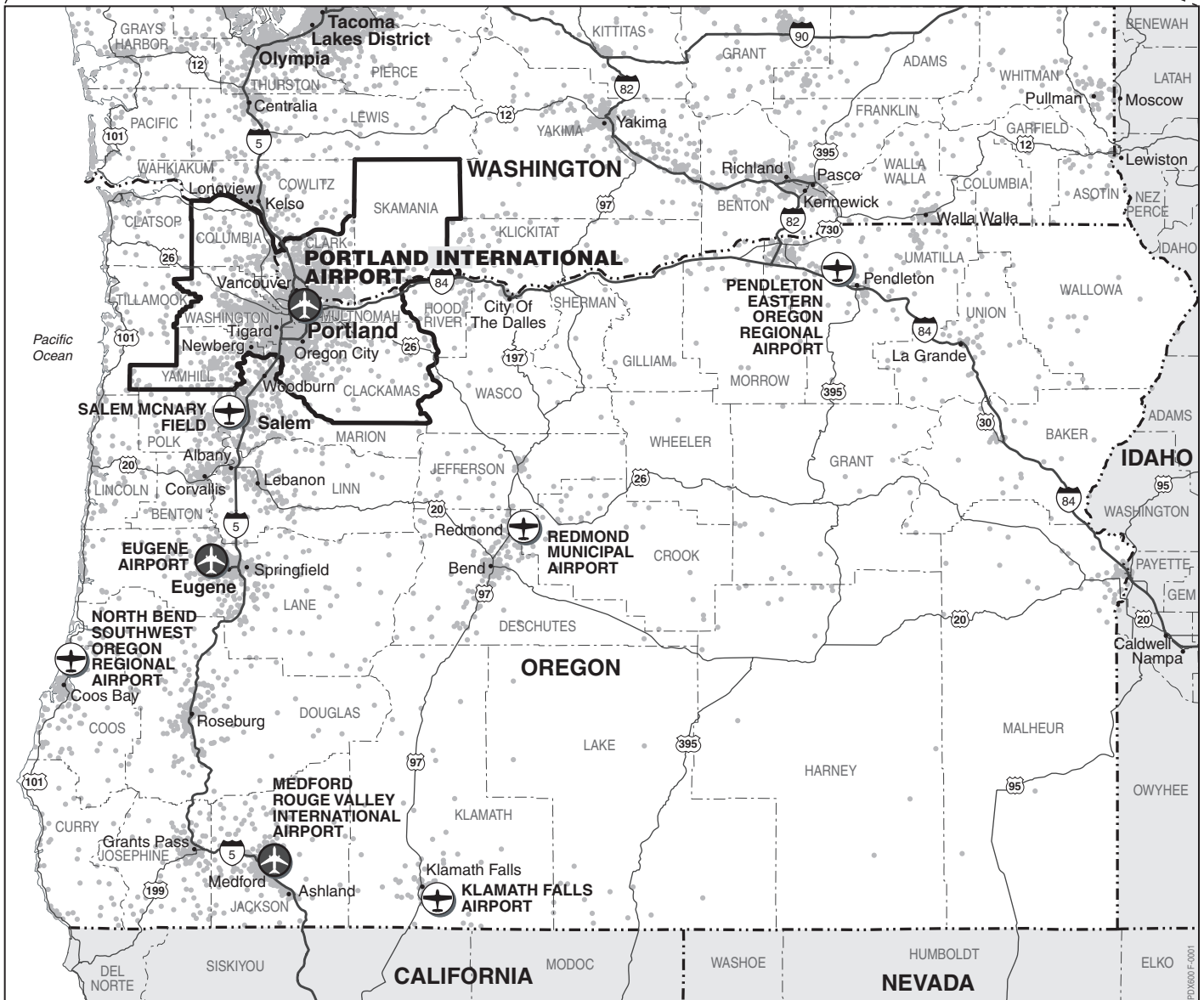
1.5.1 Primary Commercial Service Airport in Oregon

Of the eight commercial service airports in Oregon, the Airport accounted for 87% of the passengers enplaned in the State and is the primary commercial service airport in Oregon, as shown earlier on Figure 5 and in Table 3. Eugene Airport, a non-hub airport 109 miles south of the Airport, is the second largest commercial service airport in Oregon. Approximately 387,628 enplaned passengers were accommodated at Eugene Airport and 27 scheduled average daily aircraft departures were provided at Eugene Airport in 2007, compared to 7.3 million enplaned passengers and 265 scheduled average daily aircraft departures at Portland International Airport in the same year.





Road miles from Portland to:	
Eugene	109
Klamath Falls	280
Medford	272
North Bend	219
Pasco	217
Pendleton	207
Redmond	145
Salem	47
Seattle	174
Spokane	352
Yakima	185



LEGEND

- Portland-Vancouver-Beaverton MSA (a)
- Population density: 1 dot equals 500 people
- Passenger air carrier service
- Commuter service airport
- State boundary
- County boundary

(a) Metro forecast region does not include Columbia County in Oregon and Skamania County in Washington.

Source: U.S. 2000 Census data.

Figure 5
AIRPORT SERVICE REGION
 Portland International Airport
 May 2008

Table 3
OREGON COMMERCIAL SERVICE AIRPORTS IN 2007

Oregon airport	Aircraft type providing service to Portland	Enplaned passengers
Portland International	--	7,332,478
Eugene	Turboprop	387,628
Medford	Regional jet/turboprop	317,326
Redmond	Turboprop	249,610
North Bend	Turboprop	37,984
Klamath Falls	Turboprop	28,902
Pendleton	Turboprop	16,841
Salem	--	12,960
Total Oregon airports		8,383,729

Sources: Port of Portland records, U.S. Department of Transportation, Form T-100 Domestic; Official Airline Guides, Inc., online database.

1.5.2 Large Origin-Destination Passenger Base

The Airport's large origin-destination passenger base reflects the strength of the Portland-Vancouver regional economy. A total of 5.9 million passengers originated from the Portland-Vancouver area in 2006, i.e., enplaned passengers whose flight originated at the Airport and who have not connected from another flight. According to the Port's Terminal User Survey, about 85% of total Airport passengers in 2006 were originating, with the remaining 15% of Airport passengers connecting between flights.

1.5.3 Secondary Hub for Alaska and Horizon

Portland International Airport accounted for 11% of the combined seating capacity of Alaska and Horizon Airlines in 2007, second only to its primary hub operations at Seattle International Airport with 30% of system wide seating capacity. Alaska provided service from PDX to 18 airports in 2007 and Horizon provided service to 26 airports, with overlapping service by Alaska and Horizon to 10 destination airports. In 2007, Alaska and Horizon together accounted for 35% of enplaned passengers at PDX.

