



CITY OF PORTLAND, OREGON
BUREAU OF
Planning

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AVIATION DEMAND FORECASTS

Planning Advisory Group Meeting #6

April 15, 2008



AIRPORT FUTURES

CHARTING A COURSE FOR PDX

TOPICS FOR DISCUSSION TODAY

- **Follow Up Items**
 - **Oil Price Forecasts**
 - **Carbon Futures**
 - **Revised Yield Equation**
- **Revised and Proposed Final Probabilistic Forecasts**
 - **Passengers**
 - **Air Cargo**
- **Proposed Final Aircraft Operation Forecasts**
- **Sensitivity Tests**
- **Master Plan Consultant Closing Remarks**

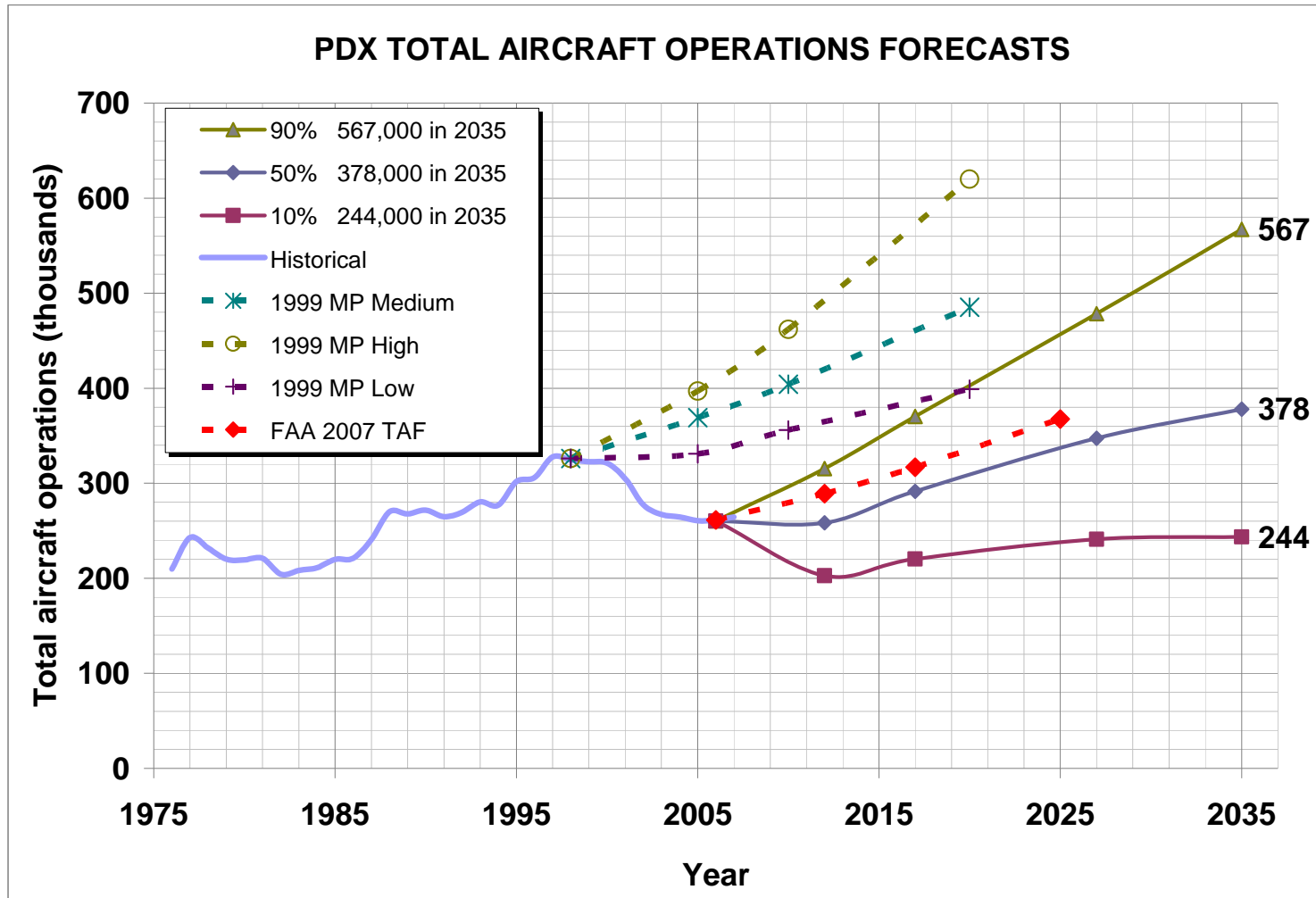
PAG ACTION ITEMS FOR TODAY

- **Consider and comment on the Forecast Results**

- **Make PAG Recommendation**

TOTAL AIRCRAFT OPERATIONS FORECASTS

PDX total aircraft operations are forecast to increase an average of 1.3% between 2006 and 2035 in the median or 50 percentile forecast.



FOLLOW UP ITEMS

The preceding operation forecasts were developed after additional analysis and consideration of Forecast Subcommittee/PAG suggestions.

- 1. Revised Yield Equation for the Passenger Model**
- 2. Carbon Futures for the Passenger and Cargo Models**
- 3. Oil Price Forecasts for the Sensitivity Tests**

REVISED YIELD EQUATION FOR THE PASSENGER MODEL

What was it? What is it now? Why change it? What is the effect?

■ What was it?

- Historical evaluation of fuel and non-fuel costs and load factor
- Carbon costs added to yield

■ What is it now?

- Break-even yield
- Future carbon costs added to the price of oil per barrel

■ Why change it?

- To make yield more sensitive to oil prices and future carbon costs
- To reflect that fuel costs will account for a larger share of total airline costs in the future

■ What is the effect?

- Increases the impact of oil prices and future carbon costs
- Reduces future passenger traffic that is sensitive to cost

CARBON FUTURES FOR THE PASSENGER AND CARGO MODELS

What are the future values? Why change it? What is the effect?

■ What are the future values?

- Estimated to range in cost from \$35 to \$110 per metric ton of carbon in 2035, in 2006 constant dollars

■ Why change it?

- To reflect potential future values of carbon

■ What is the effect?

- Incorporates future carbon costs into the cost of travel
- Reduces future passenger traffic that is sensitive to cost

OIL PRICE FORECASTS FOR THE SENSITIVITY TESTS

Who prepares oil price forecasts? Who else prepares oil price forecasts? Why review them? What is the effect?

■ Who prepares oil price forecasts?

- U.S. Department of Energy (DOE) prepares a high, base, and low range of long-term forecasts

■ Who else prepares oil price forecasts?

- The International Energy Agency (IEA), the World Bank, financial investors, commodity traders

■ Why review them?

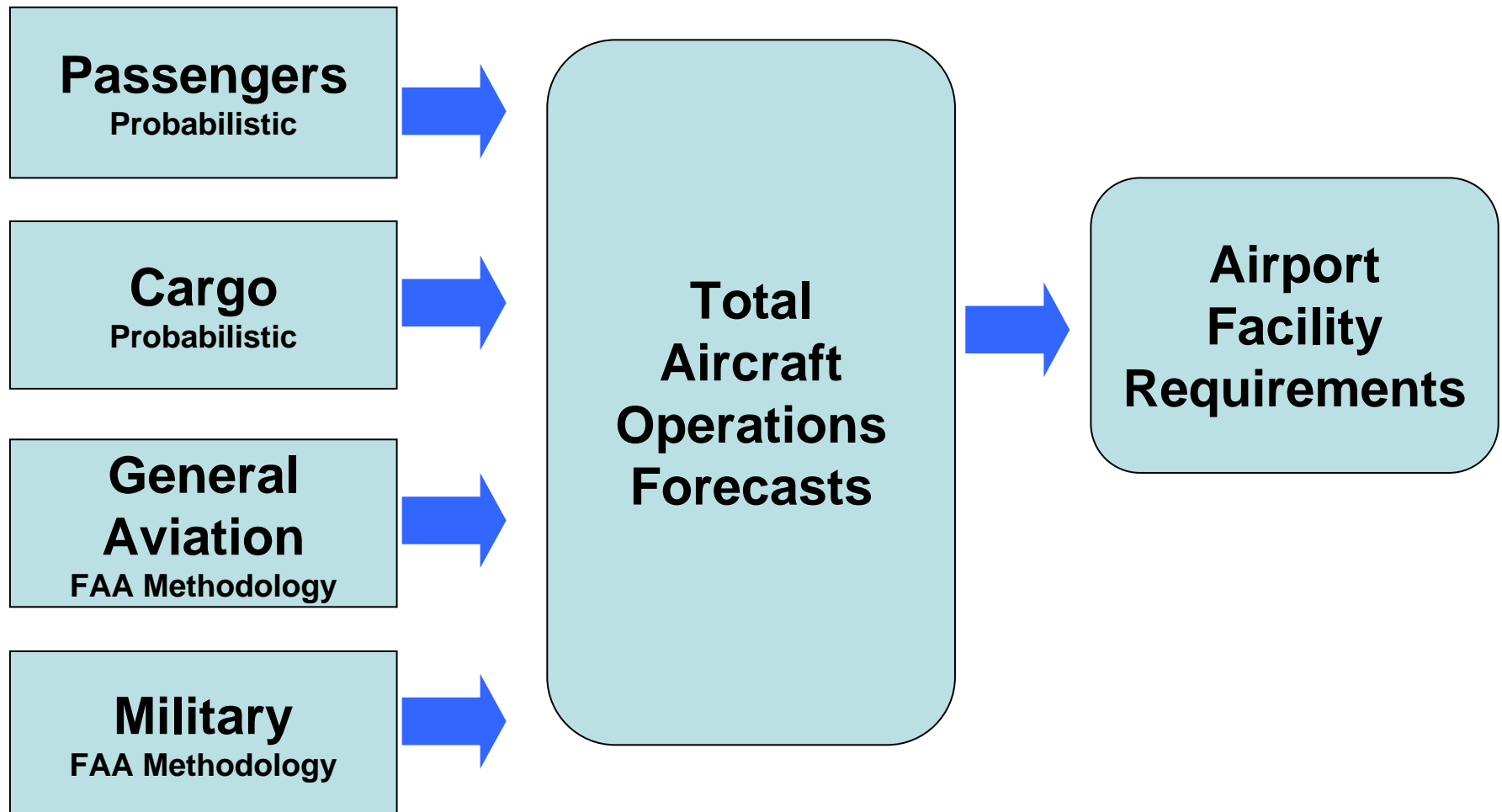
- To obtain other views of the future price of oil
- To evaluate the performance of past forecasts (e.g., the absolute average difference between DOE forecasts and actual oil prices is 20.8% from 1994 through 2005.)

■ What is the effect?

- Provides basis for testing the effect of higher future oil prices
- Reduces future passenger traffic that is sensitive to cost

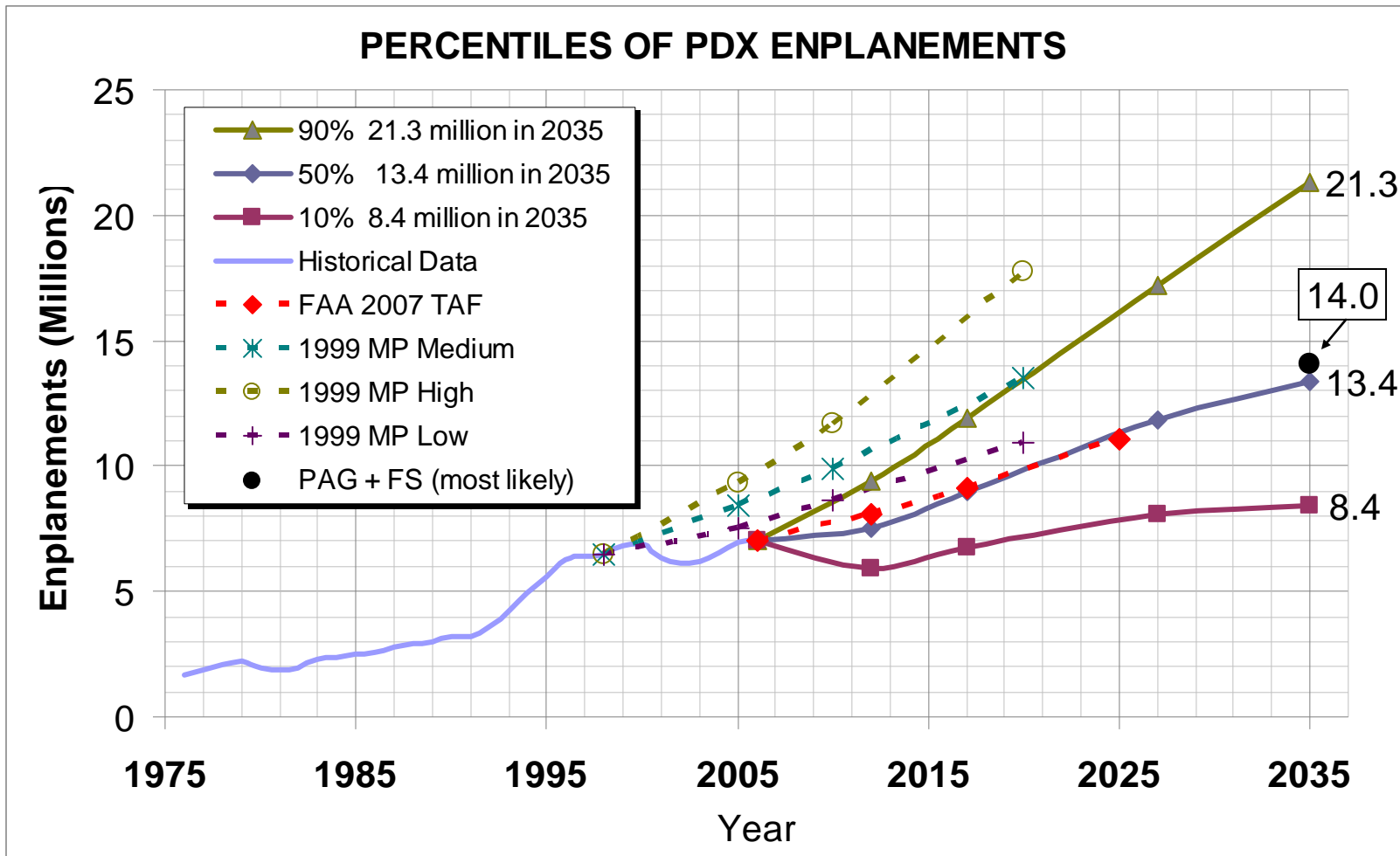
PROBABILISTIC FORECASTS

Probabilistic forecasts were prepared only for passengers and air cargo.



PROBABILISTIC PASSENGER FORECASTS

PDX enplaned passengers are forecast to increase an average of 2.3% per year between 2006 and 2035 in the median or 50 percentile forecast.



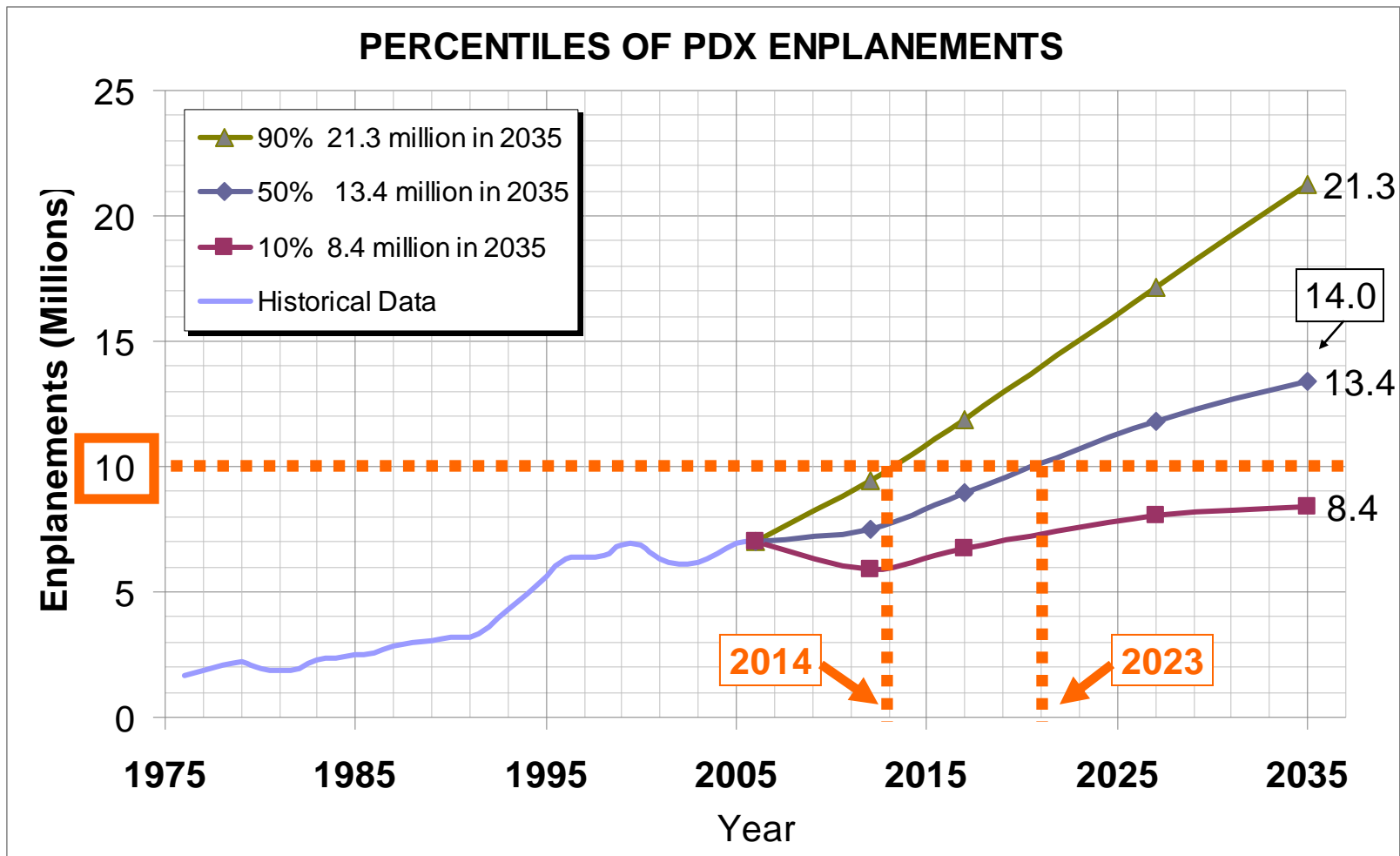
PROBABILISTIC PASSENGER FORECASTS: KEY TAKEAWAYS

What are the key takeaways?

- **Passenger demand is shifted 15 years into the future**
 - The 1999 MP forecast 13.5 million enplaned passengers in 2020 (medium forecast)
 - The 2008 PDX MPU forecasts 13.4 million enplaned passengers in 2035 (median or 50 percentile forecast)
- **Revised and Proposed Final Forecasts of 13.4 million or 27 Million Annual Passengers (MAP) are more sensitive to fuel and carbon costs**
 - Previous forecasts = 15.8 million
 - Forecast Subcommittee/PAG estimate = 14.0 million
- **PDX enplaned passengers are forecast to increase an average of 2.3% per year between 2006 and 2035 in the median or 50 percentile forecast.**
 - FAA 2007 TAF for PDX = 2.5% per year between 2006 and 2025
 - FAA National Domestic = 2.7% per year between 2007 and 2025
 - 1999 MP Medium forecast = 3.4% per year between 1998 and 2020
 - Historical growth = 4.9% average per year between 1976 and 2006
- **Probabilistic forecasts provide a range of possible outcomes and likelihood**

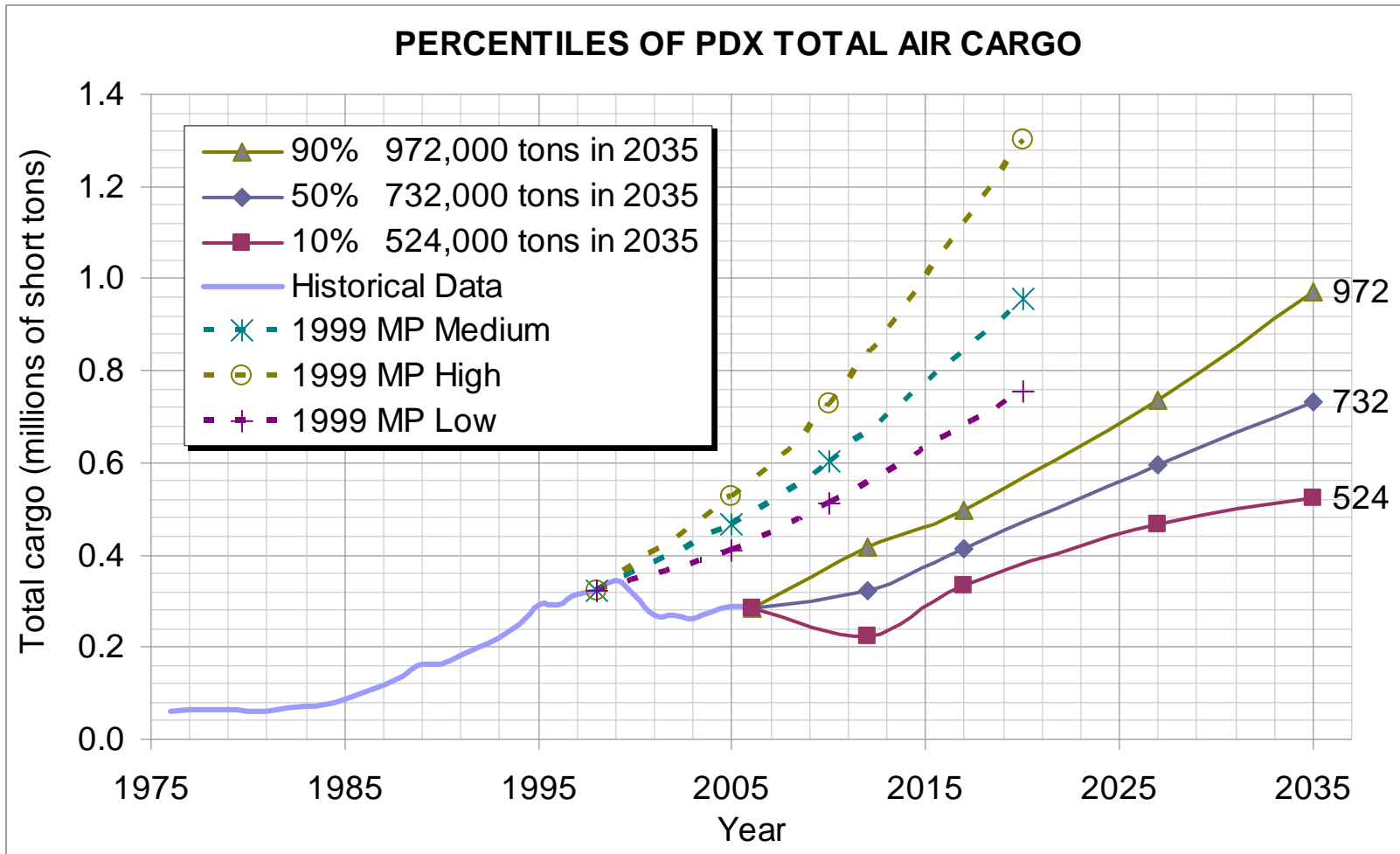
INTERPRETING PROBABILISTIC PASSENGER FORECASTS

A level of 10 million enplaned passengers is more likely to occur in 2023 (50 percentile) than in 2014 (90 percentile).



PROBABILISTIC AIR CARGO FORECASTS

PDX total air cargo is forecast to increase an average of 3.3% between 2006 and 2035 in the median or 50 percentile forecast.



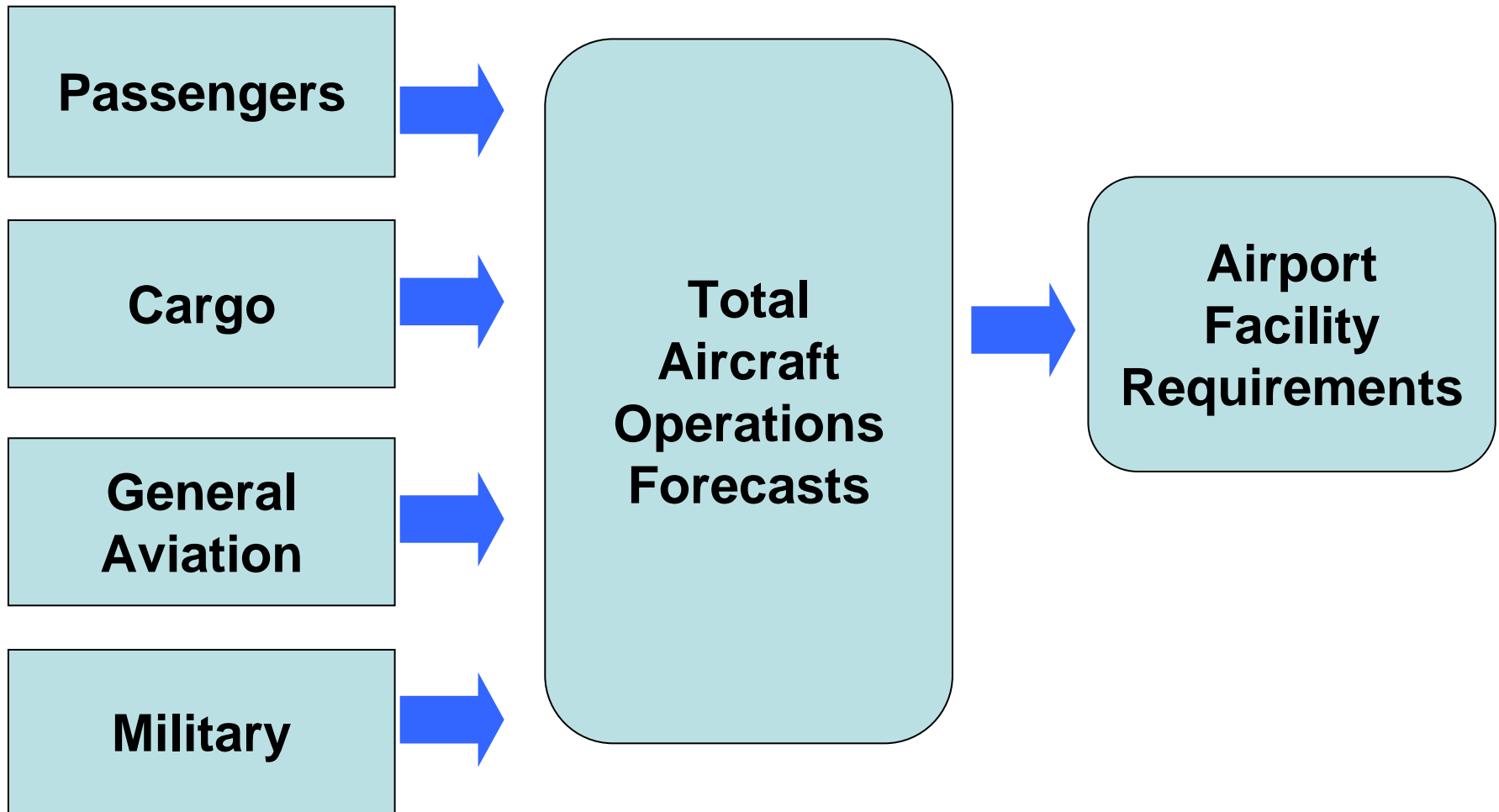
PROBABILISTIC AIR CARGO FORECASTS: KEY TAKEAWAYS

What are the key takeaways?

- **Air Cargo demand shifted more than 20 years into the future**
 - The 1999 MP forecast 957,500 tons in 2020 (medium forecast)
 - The 2008 PDX MPU forecasts 732,000 tons in 2035 (median or 50 percentile forecast)
- **Proposed Final Forecasts of 732,000 tons are sensitive to fuel and future carbon costs**
- **PDX total air cargo forecast to increase an average of 3.3% per year between 2006 and 2035 in the median or 50 percentile forecast.**
 - Boeing Forecast of U.S. Domestic Cargo* = 3.8% per year between 2005 and 2025
 - FAA National Domestic Cargo* = 3.2% per year between 2007 and 2025
 - 1999 MP Medium forecast = 5.1% per year between 1998 and 2020
 - Historical growth = 5.4% average per year between 1976 and 2006
- **Probabilistic forecasts provide a range of possible outcomes and likelihood**

AIRCRAFT OPERATION FORECASTS

What is included in total aircraft operations?

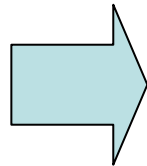


PASSENGER AIRLINE AIRCRAFT OPERATIONS FORECASTS

How do you translate the passenger forecasts into operations?

Probabilistic Passenger Forecasts

- Disaggregate total passenger demand into components (domestic and international, mainline and regional affiliate)
- Evaluate and make future assumptions about average aircraft size by type
- Evaluate and make future assumptions about load factors (percent of occupied seats, on average)

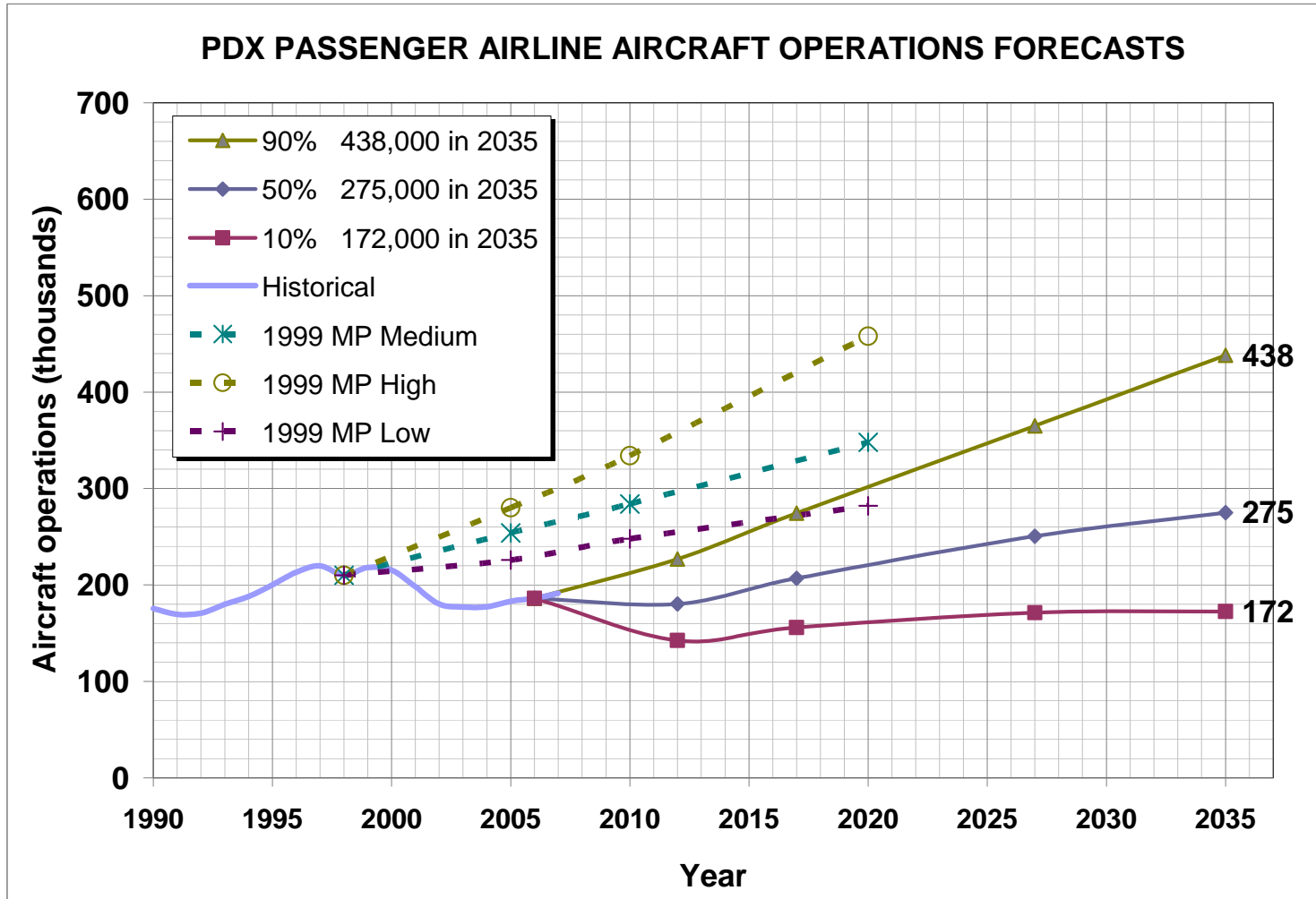


Regional Affiliate Activity in 2035

| | | <u>2035</u> |
|---|---|-------------|
| Enplaned passengers | = | 2,864,000 |
| Aircraft size (seats) | = | 73 |
| Enplaned passenger load factor | = | 79% |
| Enplaned passengers per departure | | |
| = seats x load factor | | |
| = 73 x 79% | = | 58 |
| Annual aircraft departures | | |
| = Enplaned passengers / enplaned passengers per departure | | |
| = 2,864,000 / 58 | = | 50,000 |

PASSENGER AIRLINE AIRCRAFT OPERATIONS FORECASTS

PDX passenger airline aircraft operations are forecast to increase an average of 1.4% between 2006 and 2035 in the median or 50 percentile forecast.



PASSENGER AIRLINE AIRCRAFT OPERATIONS FORECASTS: KEY TAKEAWAYS

What are the key takeaways?

▪ **Passenger airline aircraft operations are shifted more than 20 years into the future**

- The 1999 MP forecast 348,000 operations in 2020 (medium forecast)
- The 2008 PDX MPU forecasts 275,000 operations in 2035 (median or 50 percentile forecast)

▪ **Load factor and seats per departure assumptions account for differences**

- 69% load factor in 2020 in 1999 MP medium forecast vs. 80% in 2035 in the 2008 PDX MPU (domestic mainline)
- 161 seats per departure in 2020 in 1999 MP medium forecast vs. 148 in 2035 in the 2008 PDX MPU (domestic mainline)

▪ **PDX passenger airline aircraft operations are forecast to increase an average of 1.4% per year between 2006 and 2035 in the median or 50 percentile forecast.**

- 1999 MP Medium forecast = 2.3% per year between 1998 and 2020
- Historical growth = 0.4% average per year between 1990 and 2006

▪ **Future mix of aircraft affect operations**

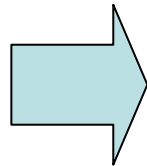
- Horizon up gauges from Q200 (37 seats) to Q400 (74 seats)
- Alaska replaces MD-80s (140 seats) with B737-800 (157 seats)

ALL-CARGO AIRLINE AIRCRAFT OPERATIONS FORECASTS

How do you translate the air cargo forecasts into operations?

Probabilistic Air Cargo Forecasts

- Disaggregate total cargo demand into components (domestic and international, freight and mail, passenger and all-cargo aircraft)
- Evaluate and make future assumptions about average aircraft size by type
- Evaluate and make future assumptions about average cargo per operation by type

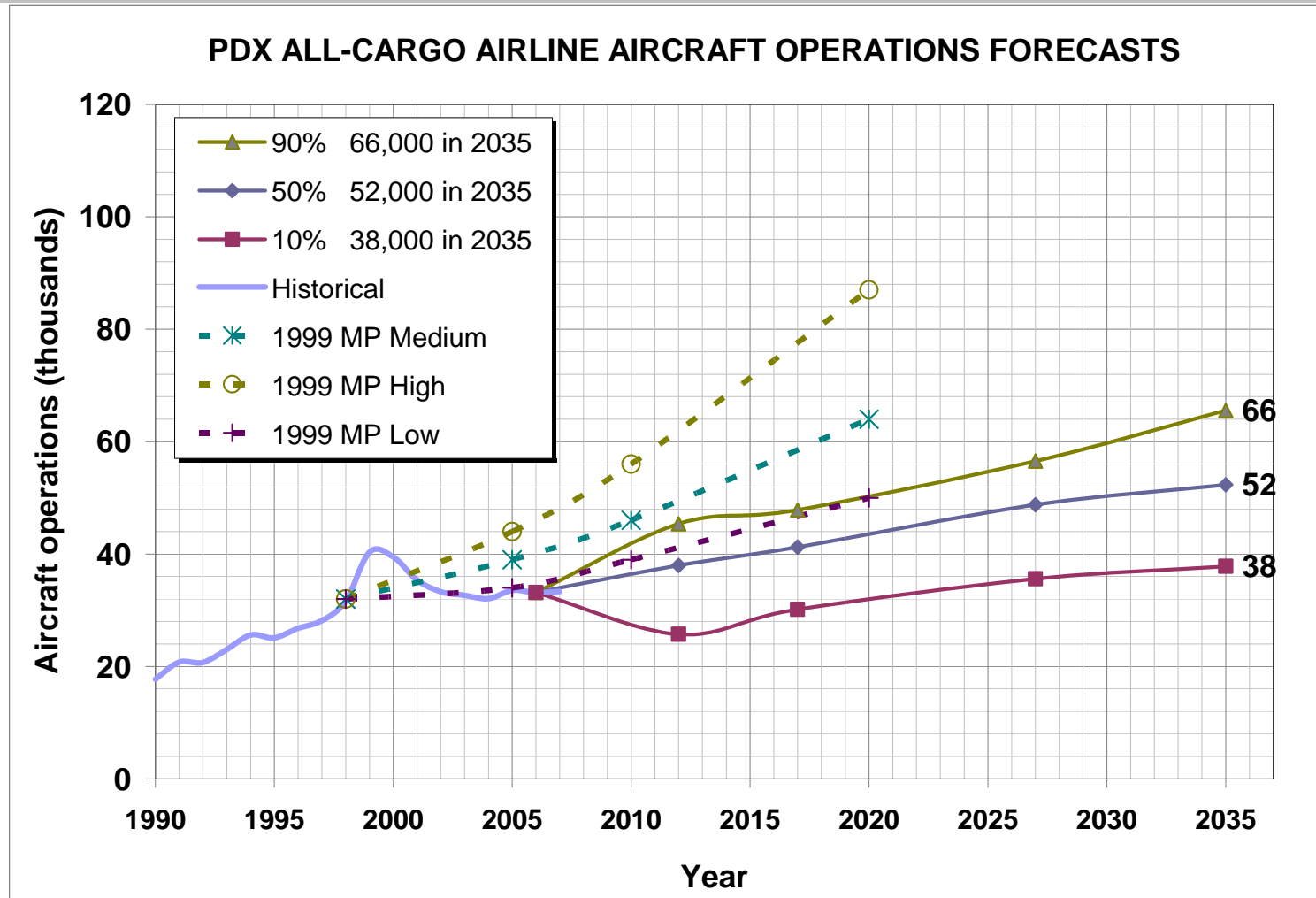


Regional Cargo Feeder Activity in 2035

| | | <u>2035</u> |
|---|---|-------------|
| Enplaned domestic air cargo (tons) | = | 15,000 |
| Enplaned cargo per departure (tons) | | |
| = Air cargo / departures | = | 0.8 |
| Annual aircraft departures | | |
| = Enplaned air cargo / enplaned cargo per departure | | |
| = 15,000 / 0.8 | = | 18,000 |

ALL-CARGO AIRLINE AIRCRAFT OPERATIONS FORECASTS

PDX all-cargo airline aircraft operations are forecast to increase an average of 1.6% between 2006 and 2035 in the median or 50 percentile forecast.



ALL-CARGO AIRLINE AIRCRAFT OPERATIONS FORECASTS: KEY TAKEAWAYS

What are the key takeaways?

■ All-cargo airline aircraft operations are shifted more than 20 years into the future

- The 1999 MP forecast 64,000 operations in 2020 (medium forecast)
- The 2008 PDX MPU forecasts 52,000 operations in 2035 (median or 50 percentile forecast)

■ Average enplaned cargo per departure assumptions

- 28.6 tons per departure in 2020 in 1999 MP medium forecast, compared with 27.7 tons in 2007, and 39.2 tons in 2035 in the 2008 PDX MPU (domestic air carrier)
- 1.0 tons per departure in 2020 in 1999 MP medium forecast vs. 0.8 tons in 2035 in the 2008 PDX MPU (regional feeders)

■ PDX all-cargo airline aircraft operations are forecast to increase an average of 1.6% per year between 2006 and 2035 in the median or 50 percentile forecast.

- 1999 MP Medium forecast = 3.2% per year between 1998 and 2020
- Historical growth = 4.0% average per year between 1990 and 2006

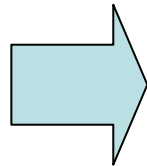
■ Future mix of aircraft affect operations

GENERAL AVIATION AIRCRAFT OPERATIONS FORECASTS

How do you forecast general aviation operations?

General Aviation Aircraft Operations FAA Methodology

- Assessment of general aviation aircraft fleet (present and future)
- Evaluation of local and itinerant activity
- Evaluation of use (general aviation operations per based aircraft)
- Consideration of other general aviation airports in region

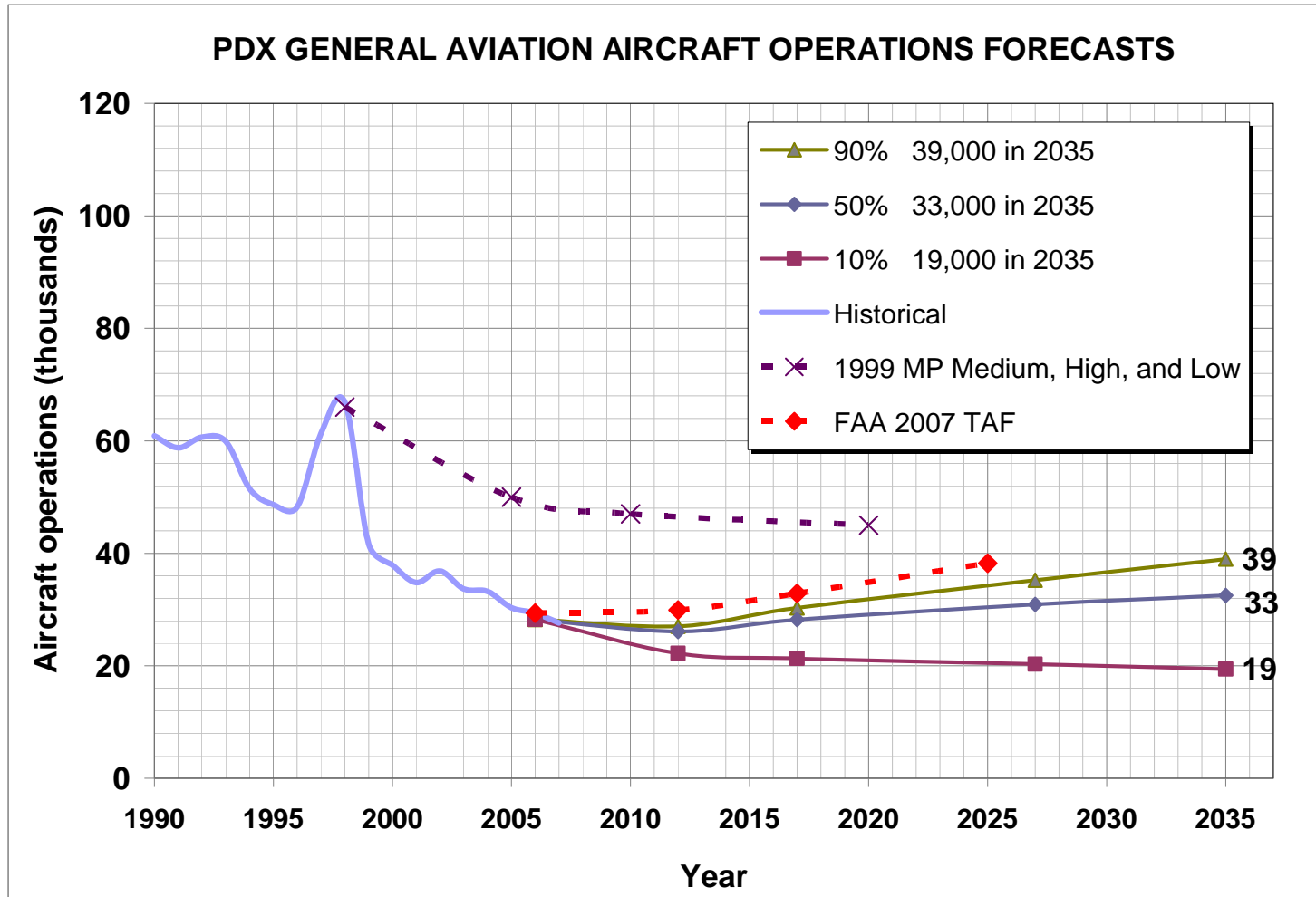


General Aviation Activity in 2035

| | | <u>2035</u> |
|--|---|---------------|
| Based aircraft | = | 94 |
| Operations per based aircraft | | |
| = GA operations / based aircraft | = | 346 |
| Annual General Aviation operations | | |
| = Based aircraft x operations per based aircraft | | |
| = 94 x 346 | = | 33,000 |

GENERAL AVIATION OPERATIONS FORECASTS

PDX general aviation aircraft operations are forecast to increase an average of 0.5% between 2006 and 2035 in the median or 50 percentile forecast.



GENERAL AVIATION AIRCRAFT OPERATIONS FORECASTS: KEY TAKEAWAYS

What are the key takeaways?

- **General aviation aircraft operation forecasts are for continued decline through 2012, then slow growth from 2012 through 2035**

- The 1999 MP forecast 45,000 operations in 2020 (medium forecast)
- The 2008 PDX MPU forecasts 33,000 operations in 2035 (median or 50 percentile forecast)

- **General aviation operations account for 8.6% of total aircraft operations in 2035**

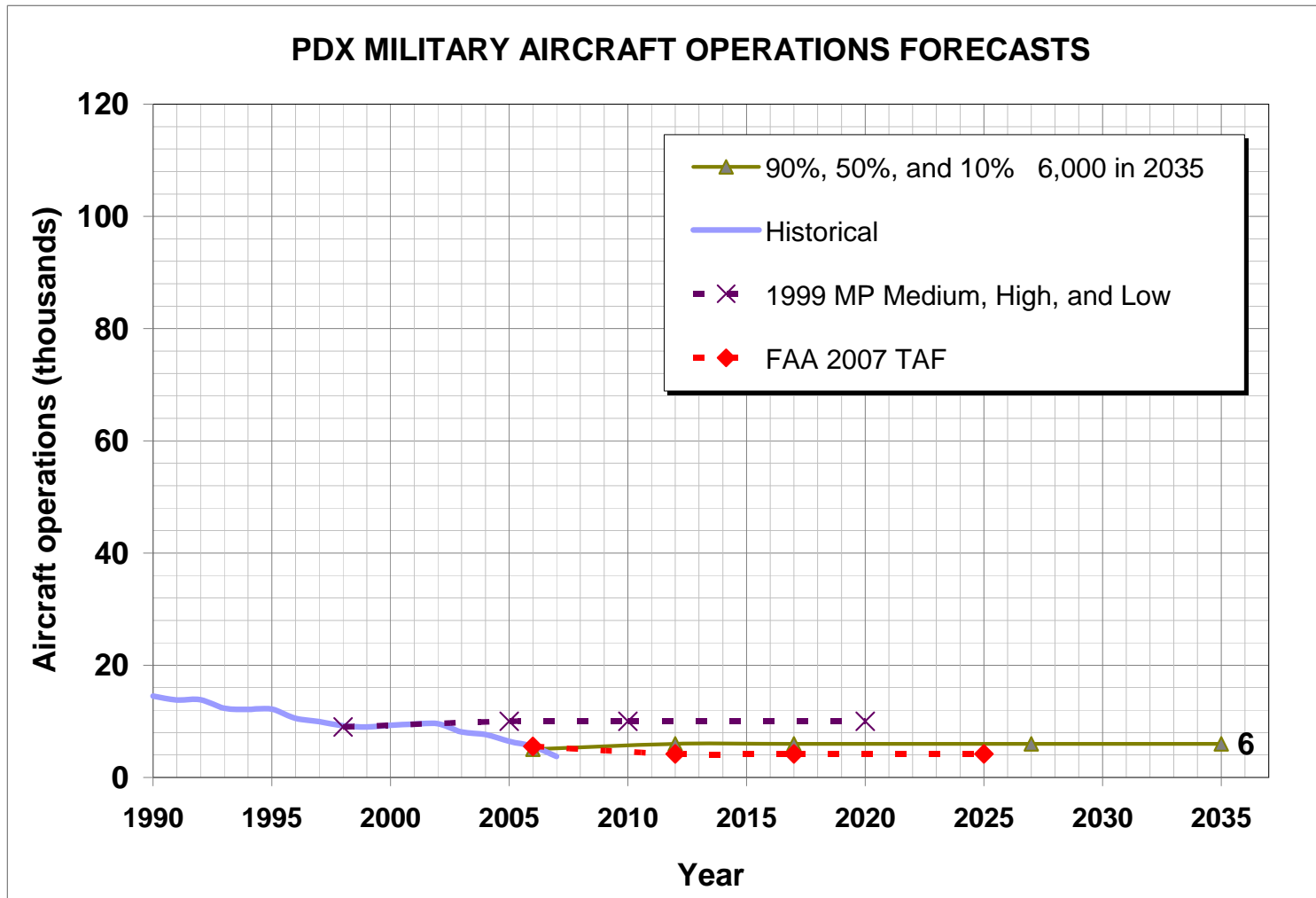
- 10.8% actual share at PDX in 2006
- 10.4% share in 2025 in FAA 2007 TAF
- 49.8% forecast share in 2025 for total U.S. general aviation operations in the FAA National forecast

- **PDX general aviation aircraft operations are forecast to increase an average of 0.5% per year between 2006 and 2035 in the median or 50 percentile forecast.**

- FAA National = 1.3% per year between 2007 and 2025
- FAA 2007 TAF for PDX = 1.4% per year between 2006 and 2025
- 1999 MP Medium forecast = an average decrease of 1.7% per year between 1998 and 2020
- Historical growth = an average decrease of 4.5% per year between 1990 and 2006

MILITARY OPERATIONS FORECASTS

PDX military operations are forecast at a level of 6,000 operations per year through the forecast period.



MILITARY AIRCRAFT OPERATIONS FORECASTS: KEY TAKEAWAYS

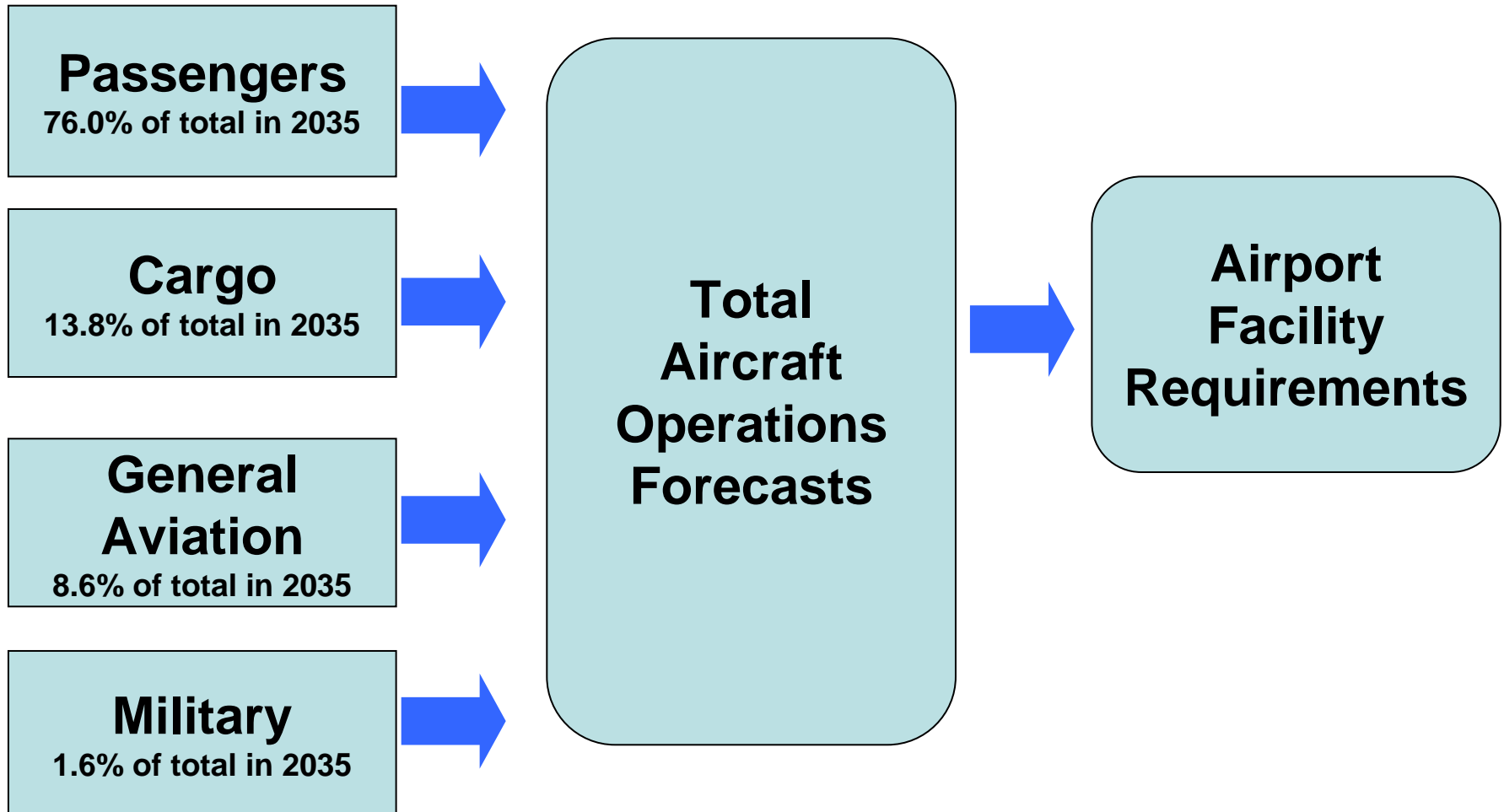
What are the key takeaways?

- **Military aircraft operations are forecast to remain at a level of 6,000 through 2035**
 - The 1999 MP forecast 10,000 operations in 2020
 - The 2008 PDX MPU forecasts 6,000 operations in 2035
- **Military operations are forecast to account for 1.6% of total PDX aircraft operations in 2035**
 - 1.9% actual share at PDX in 2006
 - 1.1% forecast share in 2025 at PDX for FAA 2007 TAF
 - 3.2% forecast share of total U.S. military operations in 2025 in the FAA National forecast

- **No growth in PDX military aircraft operations is forecast between 2006 and 2035 in the median or 50 percentile forecast.**
 - FAA National = No growth forecast between 2007 and 2025
 - FAA 2007 TAF for PDX = No growth forecast between 2006 and 2025
 - 1999 MP Medium forecast = No growth forecast between 1998 and 2020
 - Historical growth = an average decrease of 5.8% per year between 1990 and 2006

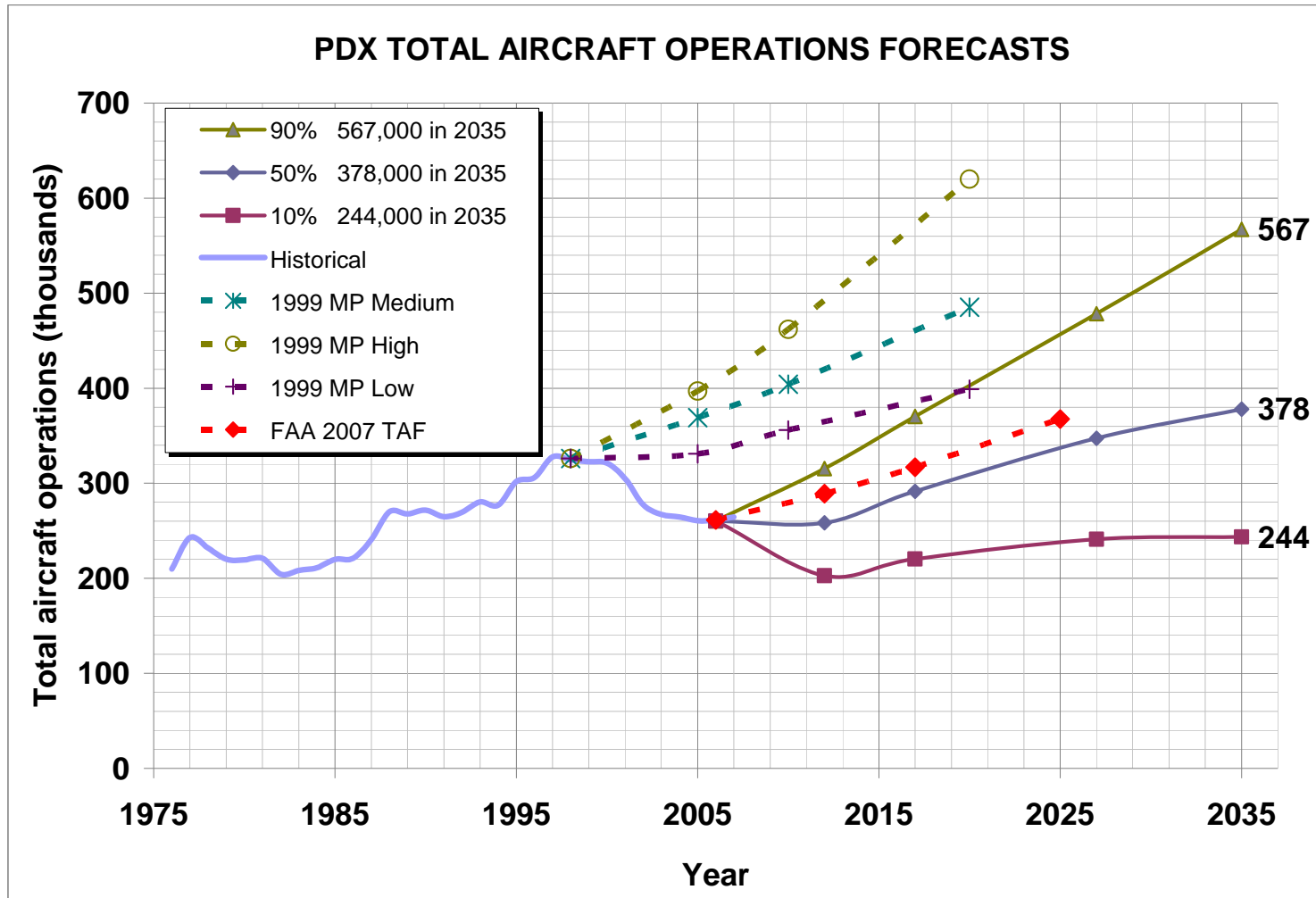
TOTAL AIRCRAFT OPERATIONS FORECASTS

Total aircraft operation forecasts are the sum of the four types of activity forecast at PDX.



TOTAL AIRCRAFT OPERATIONS FORECASTS

PDX total aircraft operations are forecast to increase an average of 1.3% between 2006 and 2035 in the median or 50 percentile forecast.



TOTAL AIRCRAFT OPERATIONS FORECASTS: KEY TAKEAWAYS

What are the key takeaways?

▪ **Total aircraft operations are shifted more than 20 years into the future**

- The 1999 MP forecast 485,000 total aircraft operations in 2020 (medium forecast)
- The 2008 PDX MPU forecasts 378,000 in 2035 (median or 50 percentile forecast)

▪ **PDX total aircraft operations are forecast to increase an average of 1.3% per year between 2006 and 2035 in the median or 50 percentile forecast.**

- FAA 2007 TAF for PDX = 1.8% per year between 2006 and 2025
- FAA National Domestic = 1.8% per year between 2007 and 2025
- 1999 MP Medium forecast = 1.8% per year between 1998 and 2020
- Historical growth = 0.6% average per year between 1976 and 2006

SENSITIVITY TESTS

The following are 5 of the 25 key issues and trends that the Forecast Subcommittee and PAG identified.

- 1. Oil Prices**
- 2. Leakage to Other Airports**
- 3. Leakage to Other Transportation Modes**
- 4. Video Conferencing**
- 5. Airline Mergers**

PASSENGER SENSITIVITY TEST RESULTS

How would PDX passenger traffic be different in 2035 if.....?

Effect of Sensitivity Tests on Enplaned Passenger Forecast in 2035

| Sensitivity test | Difference from forecast assumptions | 2035 Enplaned passengers (thousands) | Difference from 50 percentile forecast | |
|---|---|--------------------------------------|--|---------|
| | | | Enplaned passengers (thousands) | Percent |
| Scenario 1 (Median, 50 percentile) forecast | -- | 13,393 | -- | -- |
| Higher oil prices | Oil prices increased by 20.8% | 12,864 | -529 | -4% |
| Leakage to other airports | Loss of non-PDX catchment region passengers (8% decrease based on PDX Terminal User Survey) | 12,322 | -1,071 | -8% |
| Leakage to other transportation modes | Originating passengers to Seattle, Eugene, and Spokane decreased by 50% | 13,213 | -180 | -1% |
| Video Conferencing | 5% Substitution of video conferencing for business travel | 13,192 | -201 | -2% |
| Airline Mergers | Consolidation occurred among legacy carriers (excluding Southwest and Alaska) | 13,393 | 0 | 0% |

SENSITIVITY TESTS: KEY TAKEAWAYS

What is the value of sensitivity tests?

- **Sensitivity tests provide a means to measure the effect of:**
 - Changes in model variables
 - The impact of variables not included in the model such as external events
- **The results of the sensitivity tests are not additive**

SUMMARY

Where are we compared to the 1999 MP?

- **Forecast activity is shifted 15 years or more into the future for all categories—**
passengers, air cargo, and total operations
- **PDX total passengers are forecast to reach 27 Million Annual Passengers (MAP) in 2035**
 - An average increase of 2.3% per year between 2006 and 2035 in the median or 50 percentile forecast.
 - 1999 MP = 27 MAP in 2020
- **PDX total air cargo is forecast to reach 732,000 tons in 2035**
 - An average increase of 3.3% per year between 2006 and 2035 in the median or 50 percentile forecast.
 - 1999 MP = 957,500 tons in 2020
- **PDX total aircraft operations are forecast to reach 378,000 in 2035**
 - An average increase of 1.3% per year between 2006 and 2035 in the median or 50 percentile forecast.
 - 1999 MP = 485,000 in 2020