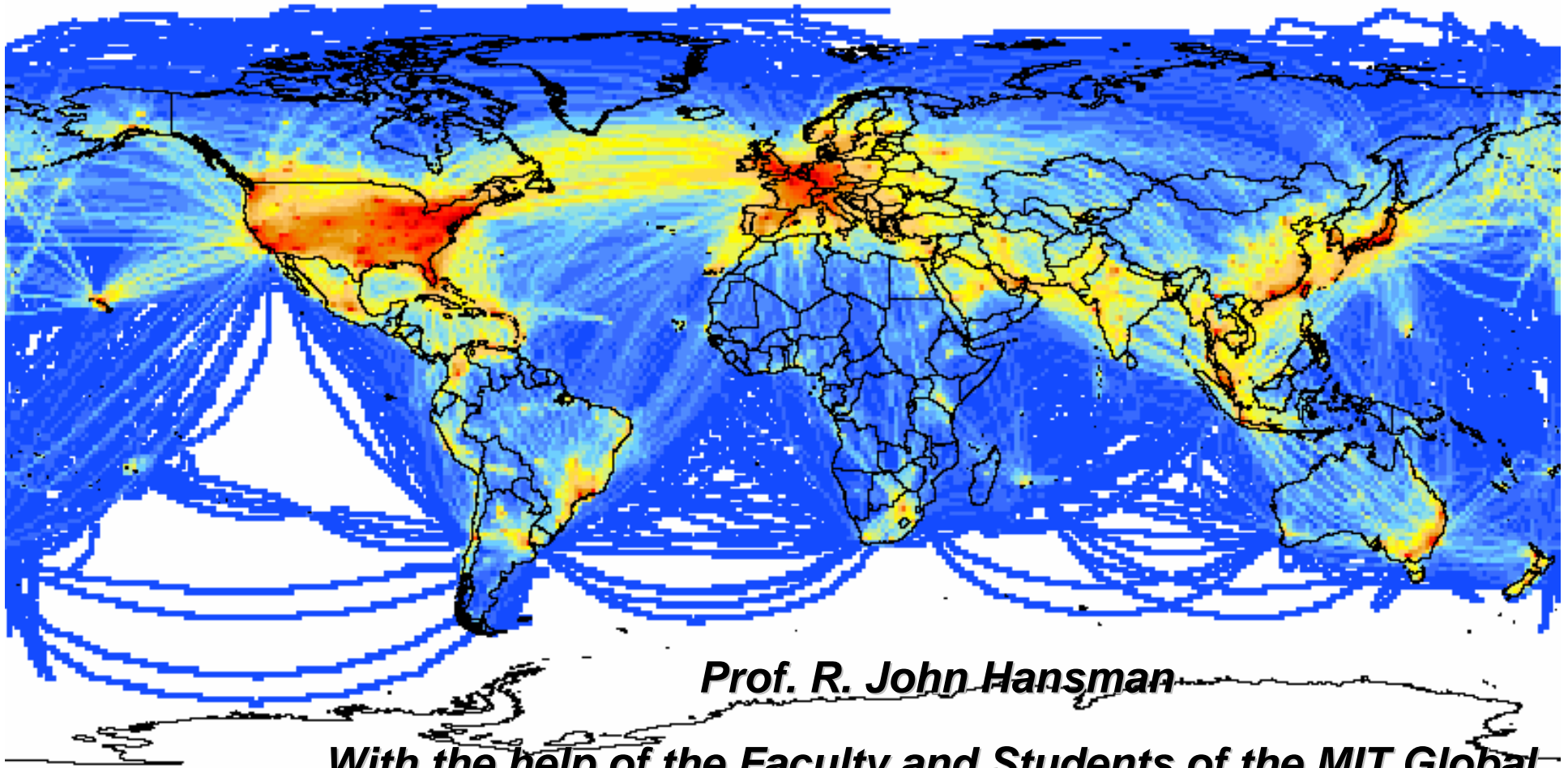




# ***Overview of Recent Trends in the Airline Industry***

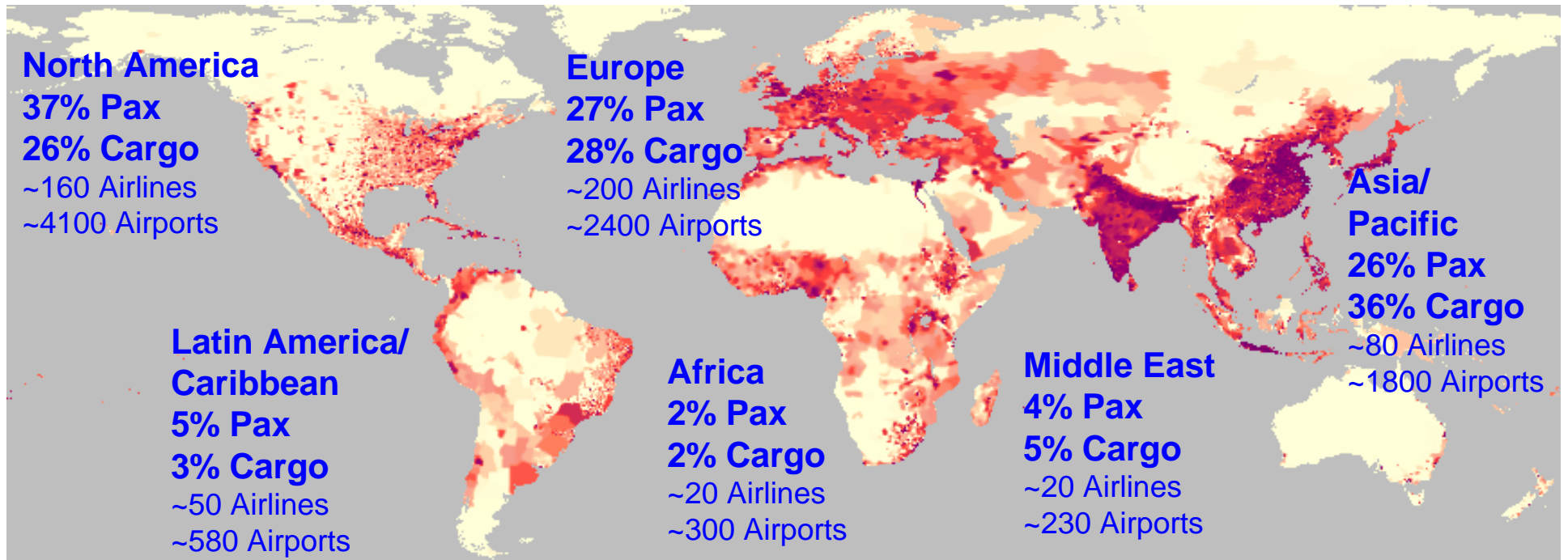


***Prof. R. John Hansman***

***With the help of the Faculty and Students of the MIT Global  
Industry Study***



# World Population Distribution & 2002 Air Transportation Activity



Population Source: <http://www.ciesin.org/datasets/gpw/globldem.doc.html>

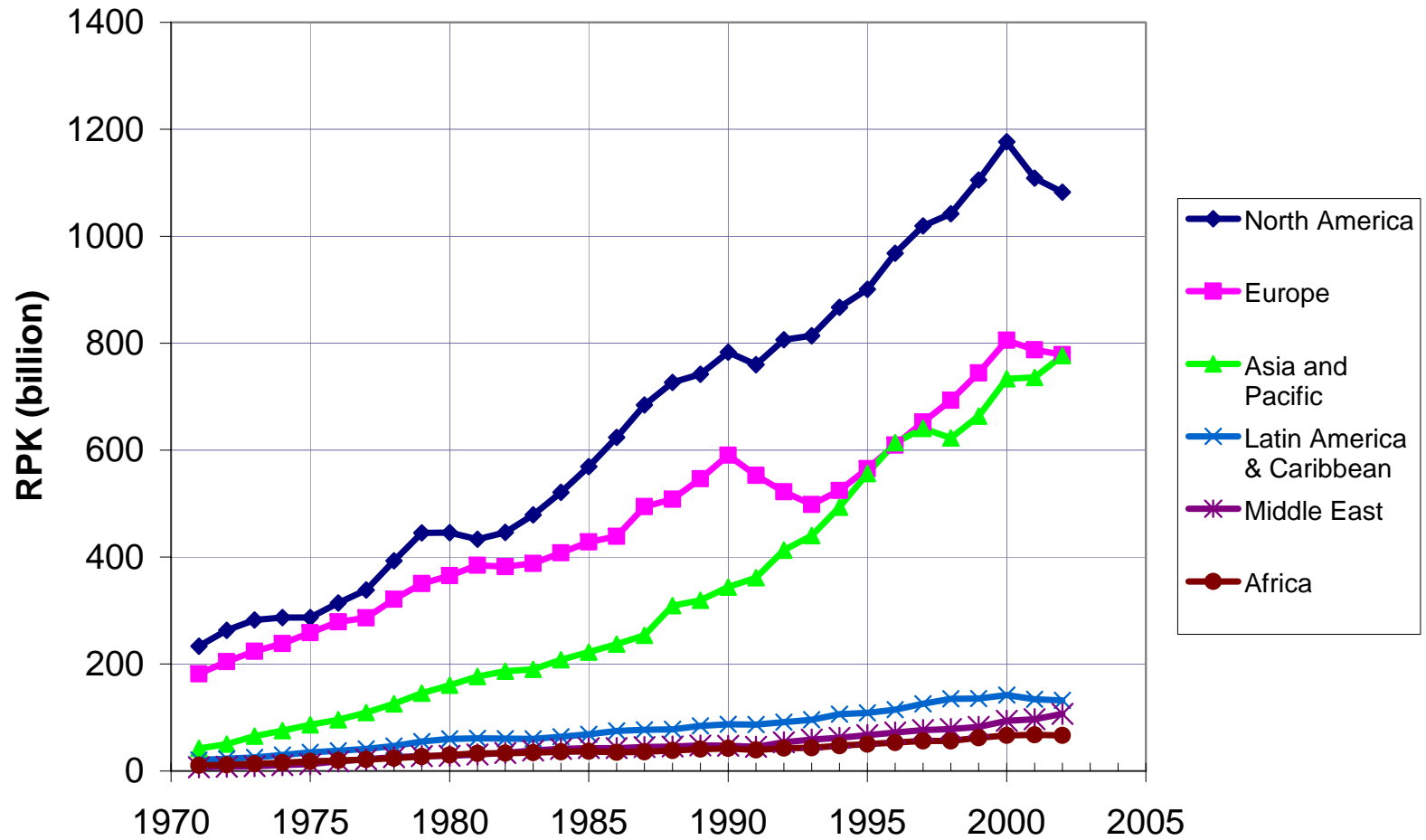
Air Transport Source: ICAO, R. Schild/Airbus

Passenger and freight traffic represent RPK and FTK share in 2002



# RPK by Region

## Scheduled Revenue Passenger-Kilometers by Region

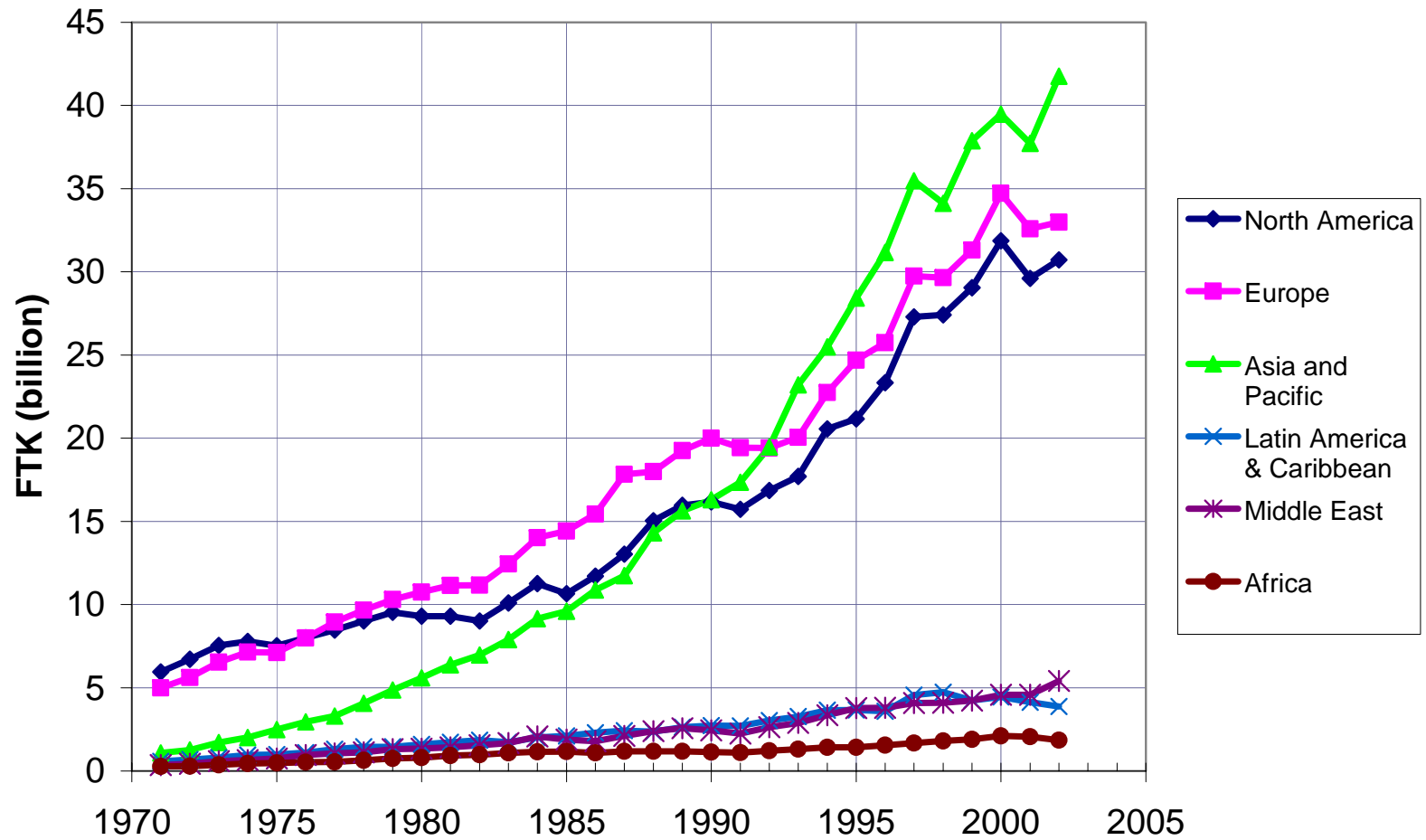


Source: ICAO, scheduled services of commercial air carriers



# Freight Trends by Region

## Freight Tonne-Kilometers by Region

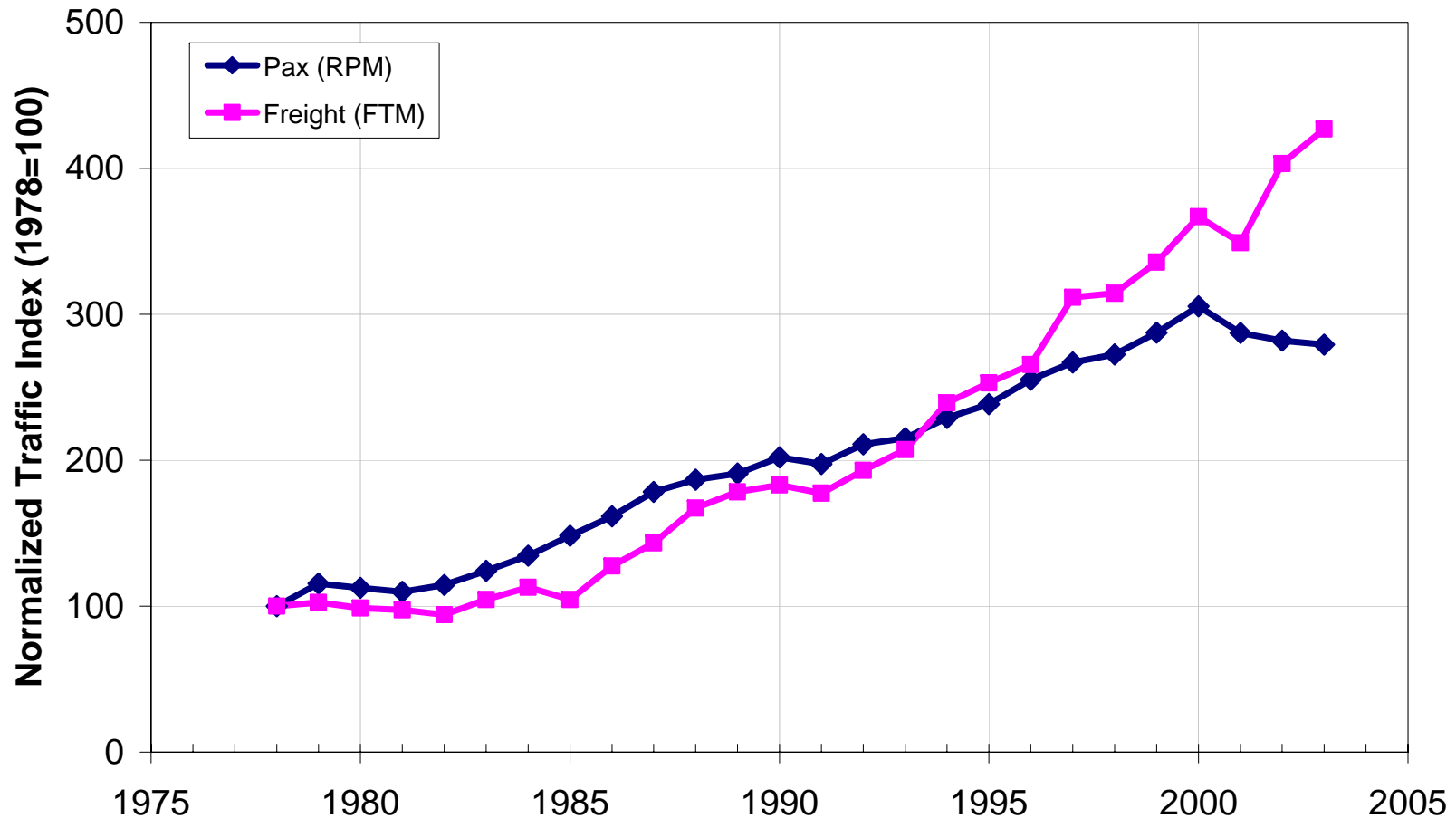


Source: ICAO, scheduled services of commercial air carriers



# Rapid Cargo Growth since Mid 90s

US Scheduled Pax Traffic vs. Cargo Traffic

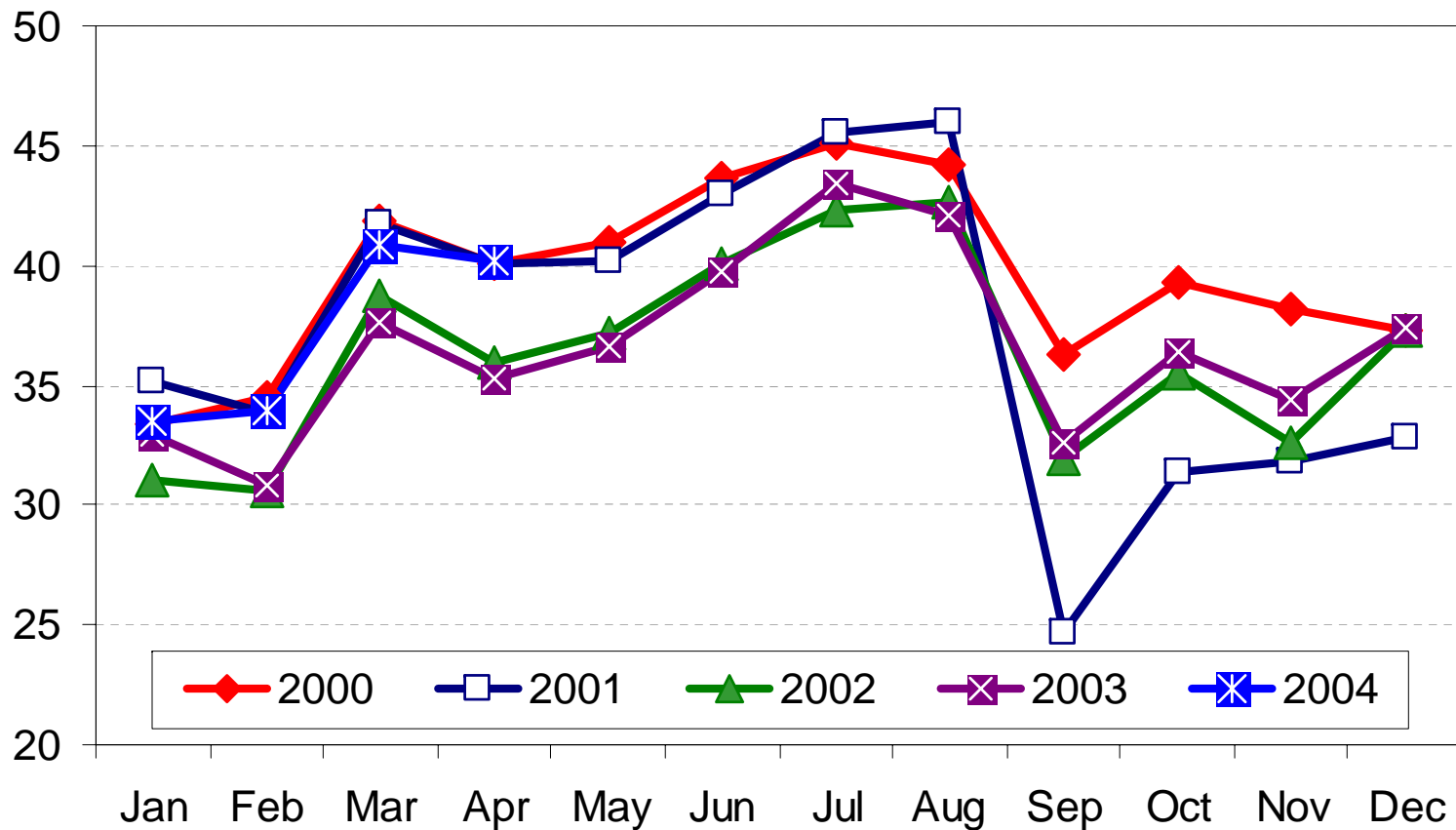


Source: Form41 data, all US carriers



# Impact of September 11 US Domestic RPMs

## Domestic Traffic -- RPMs (Billions)



Source: ATA, US member airlines, scheduled mainline service

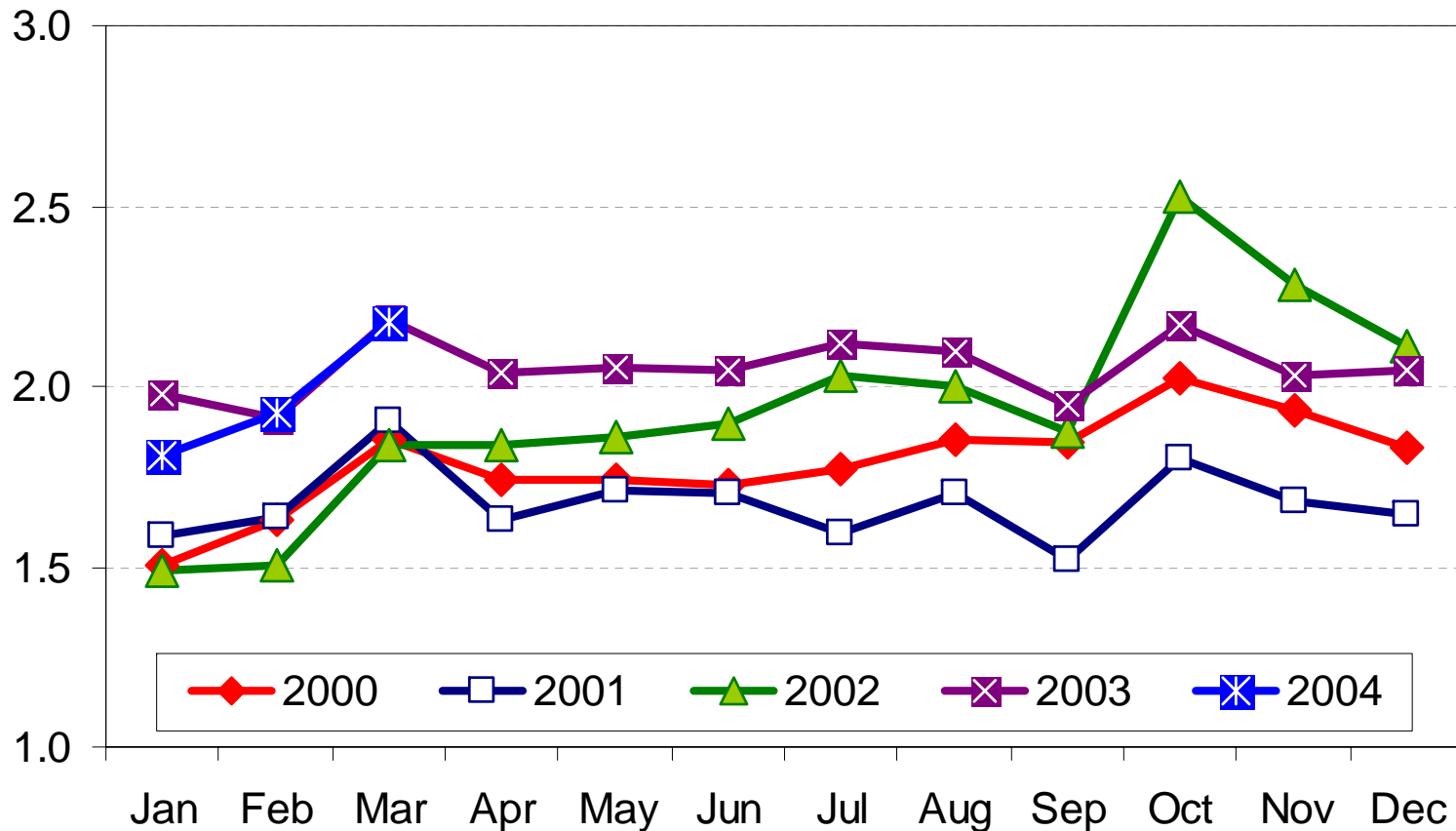


# Cargo Traffic Is Immunized

(US Monthly Scheduled FTMs)

## Scheduled Cargo Traffic -- FTMs

(Billions)

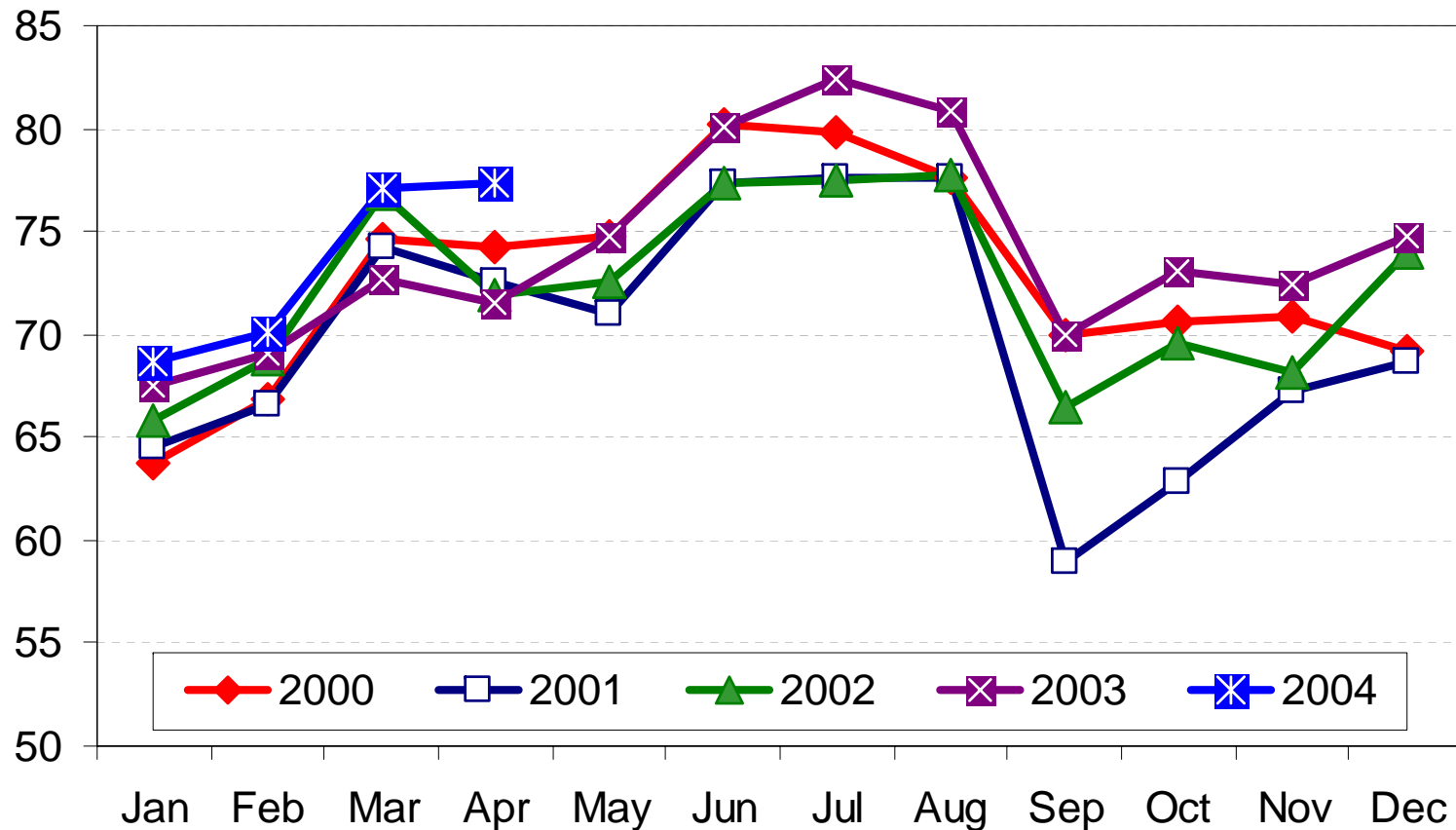


Source: Form41, all US carriers, scheduled cargo traffic



# US Airline Load Factors 2000-2003

## Monthly Load Factor -- System (Percent)



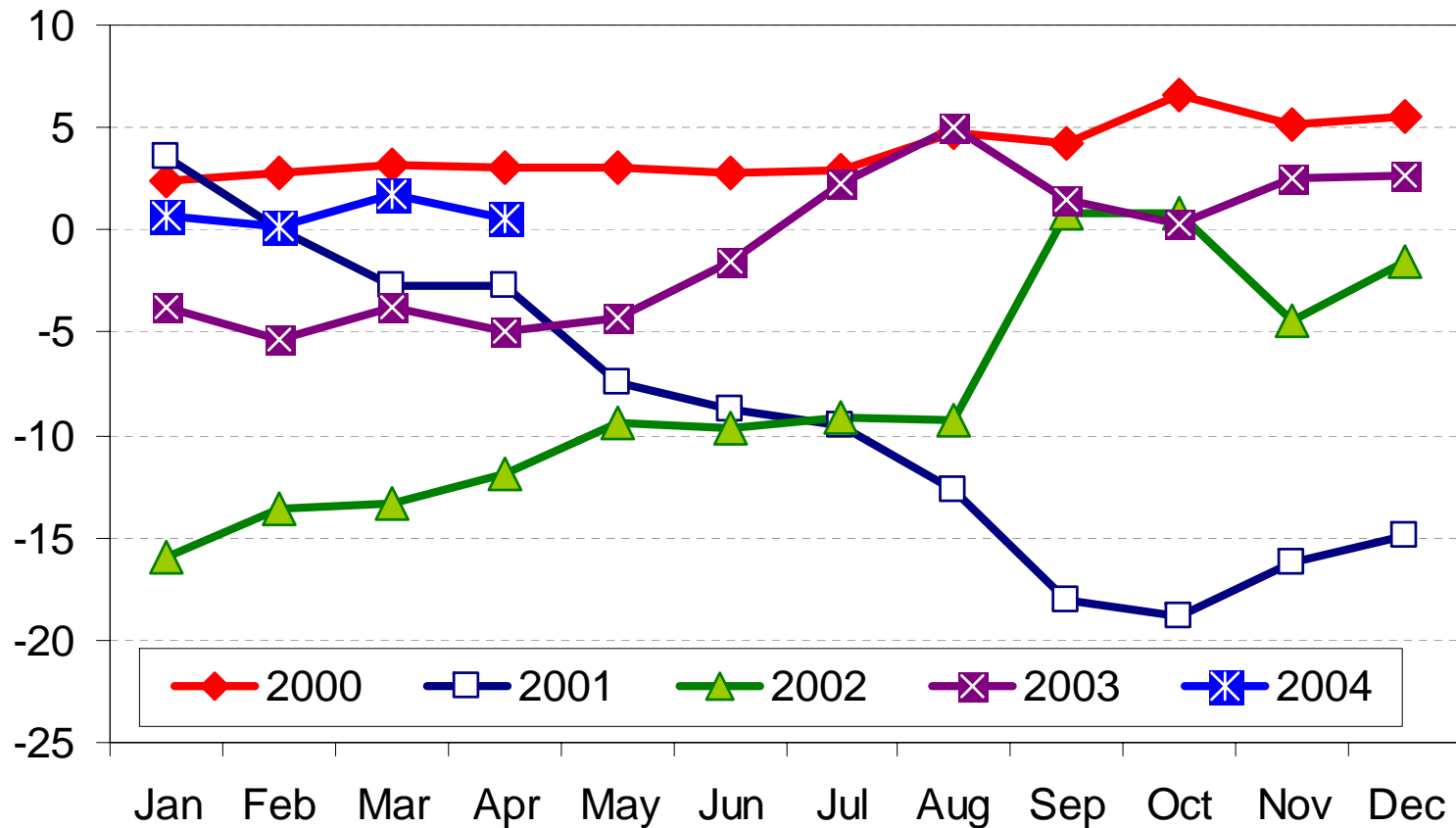
Source: ATA, US member airlines, scheduled mainline service





# Annual Change in Average Domestic Fare (2000-2004)

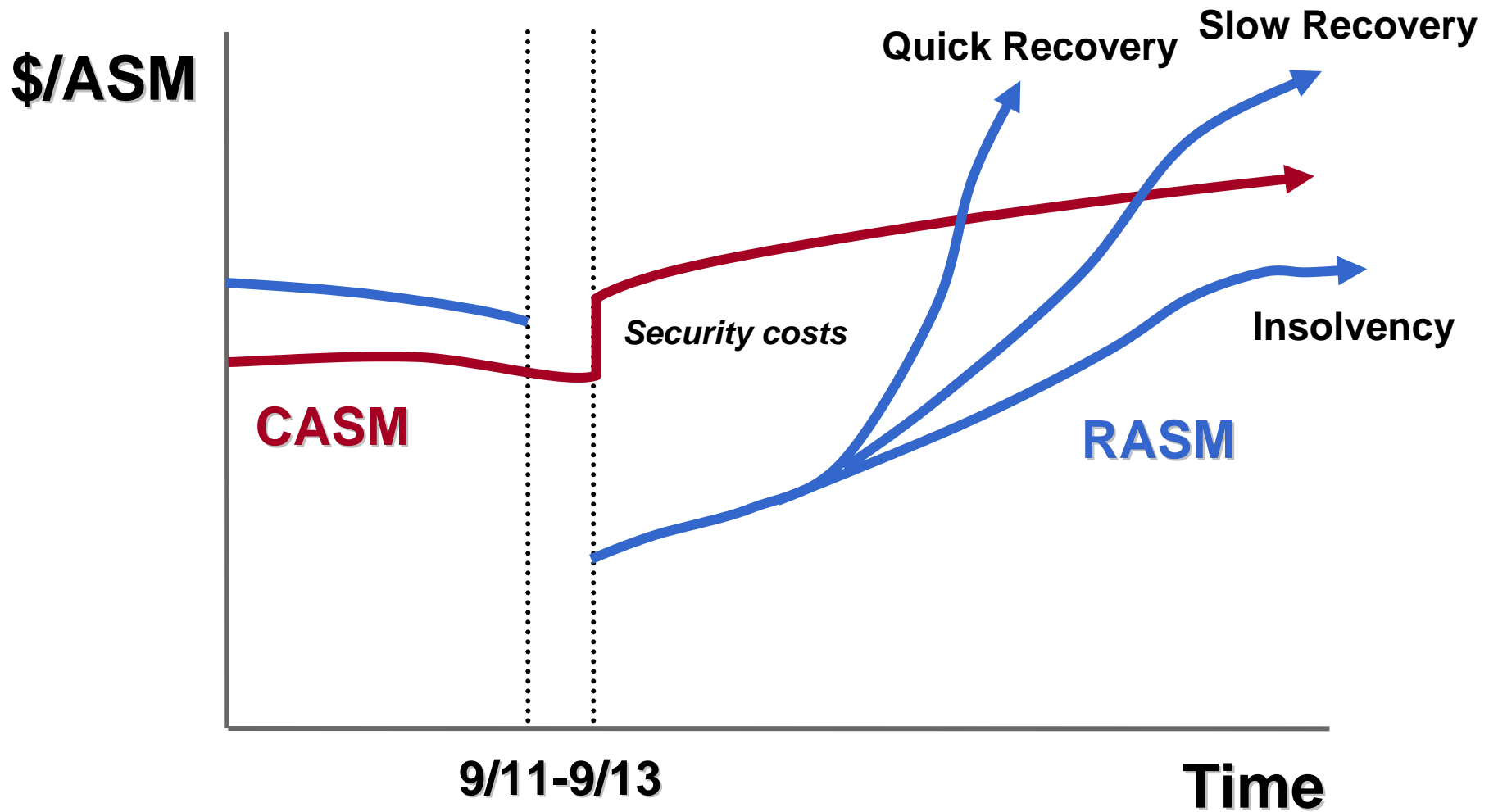
## Average Domestic Air Fare (Percent Change from Previous Year)



Source: ATA Monthly Airfare Report; eight US major airlines excluding Southwest (WN)

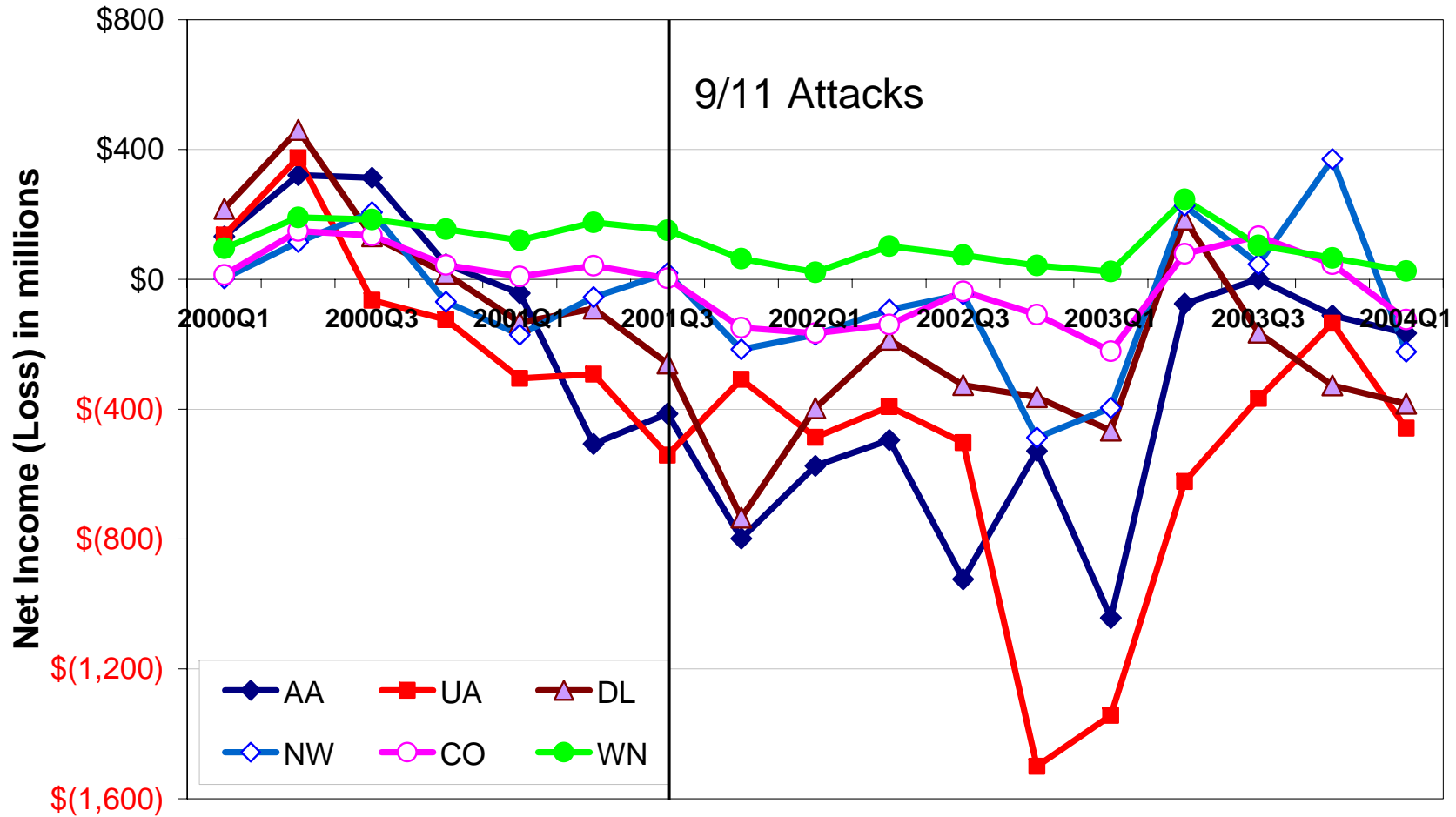


# Airline Profitability Impact of Sept 11





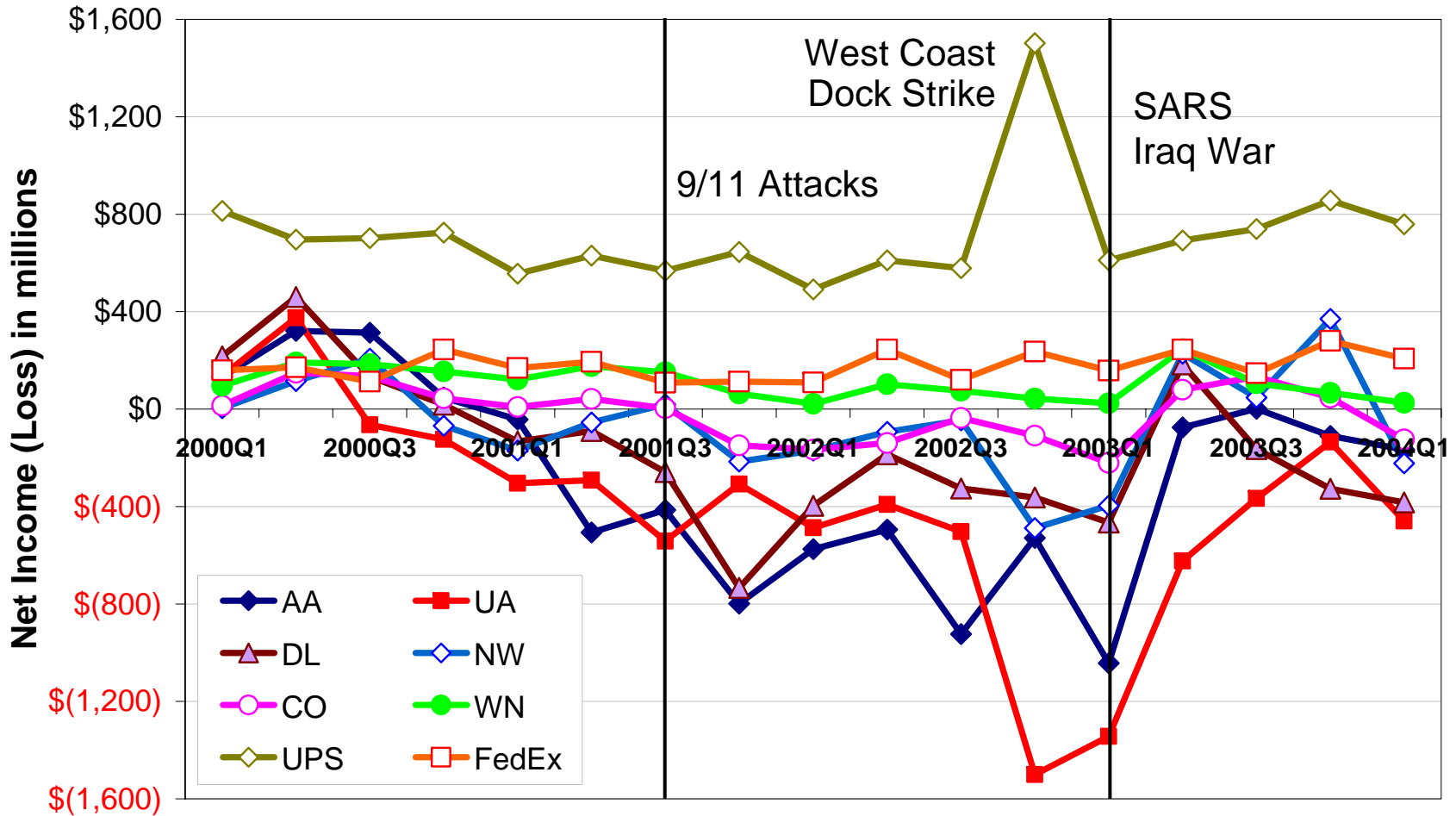
# All Major Carriers On “Slow Recovery” Trajectory Except Southwest



Source: Airline reports



# Operating Performance of Major Pax and Cargo Carriers

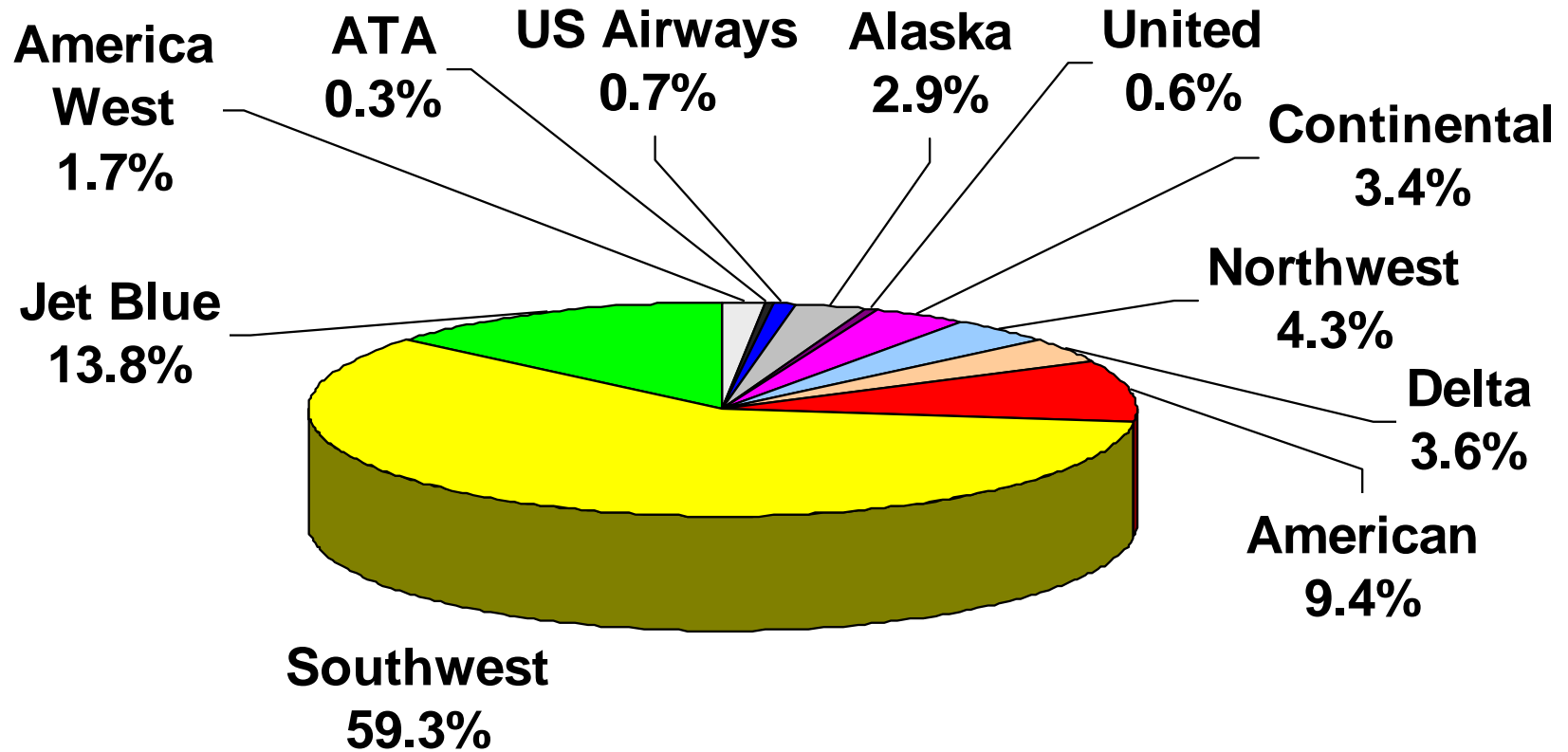


Source: companies' annual reports



# Market Cap: US Majors, 6/10/04

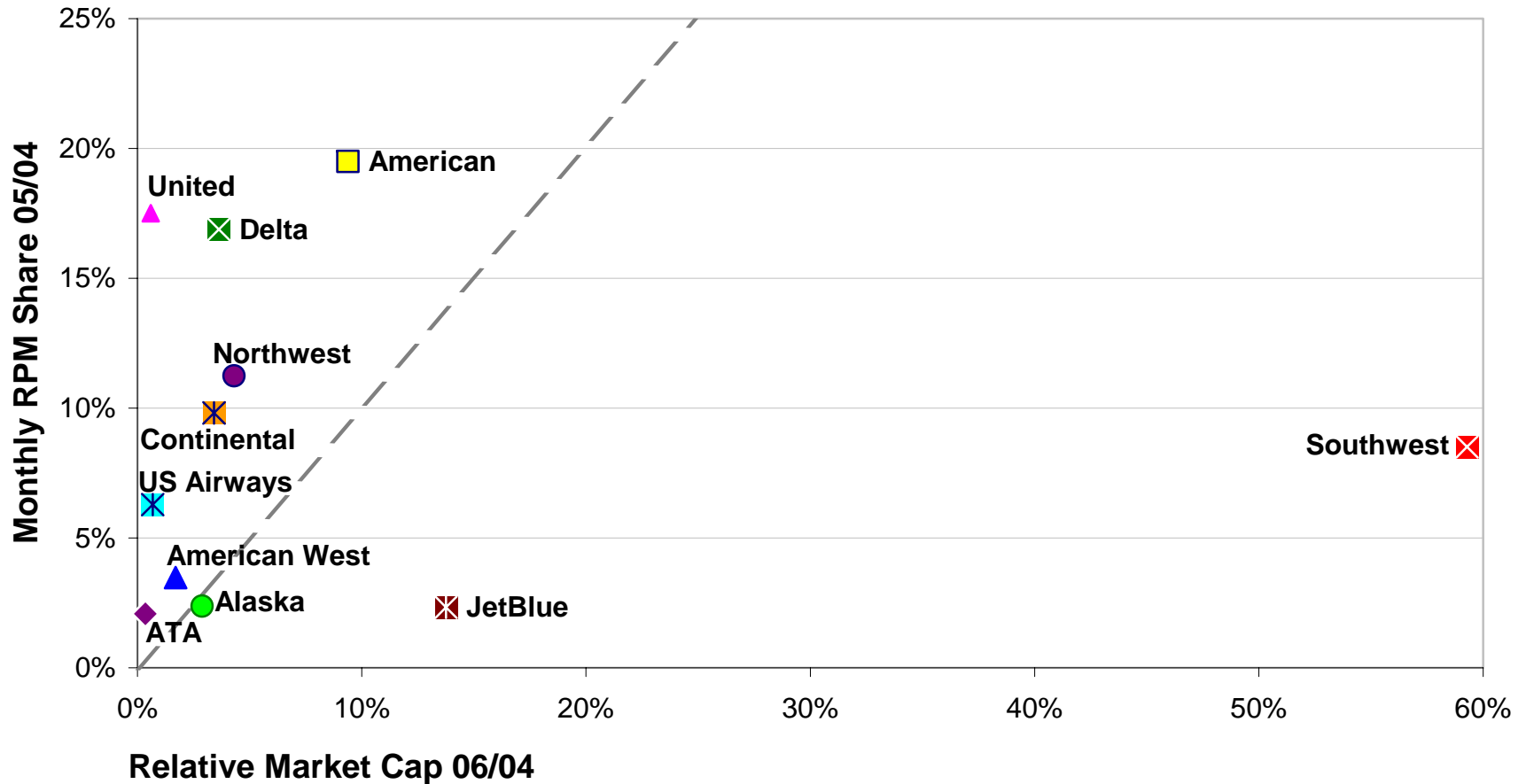
With Jet Blue



**Total Market Cap: \$20.9 billion**



# Current Market Cap vs. RPM Share US Majors and ATA



## *Network vs. Cost Efficiency Questions*

Source: Yahoo! Finance and airline traffic reports



# Weak Carriers Vulnerable to LCC Attack



## Southwest PHL Entry

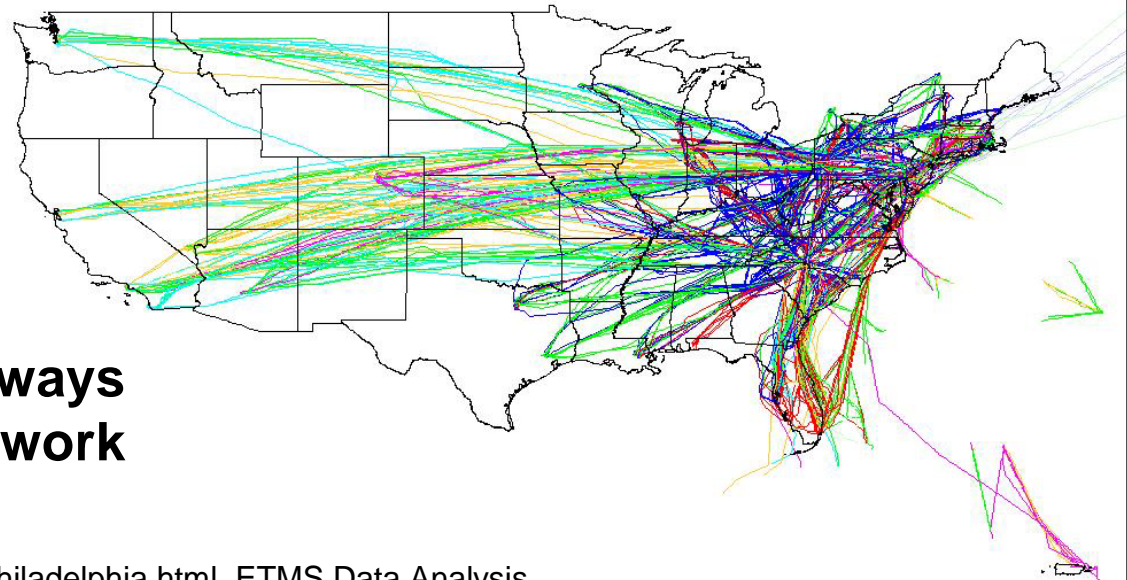
Service since May 9:

Chicago (Midway)	\$ 79	one-way
Las Vegas	\$ 99	one-way
Orlando	\$ 79	one-way
Providence	\$ 29	one-way

AoFl  
 B733  
 A319  
 B734  
 B752  
 A320  
 A321  
 B762  
 A333  
 PA31

US Airways match many of Southwest's fares with its own new, less restricted "GoFares."

Both airlines offer the lowest available fares on many competing routes.



## US Airways Network



# Emergence of Low-Cost Carriers

## Canada (7, 1 in 2004)

CanJet  
 HMY Airways  
 JetsGo Airlines  
 Tango Airlines  
 Westjet  
 Zip  
**Canada West**

## Europe (60, 3 in 2004)

Aer Arann	Baboo	Fare4U	Sun Express
Air 2000	Basiq Air	German Wings	Swedline
Air Baltic	Bexx Air	Germania Express	ThomsonFly
Air Berlin	BMI Baby	Globespan	V Bird
Air Finland	British European	Hapag Lloyd Express	Virgin Express
Air Luxor Lite	BudgetAir	Hellas Jet	VLM Airlines
Air Polonia	Corendon	Helvetic Airways	VolareWeb
Air Scotland	Deutsche BA	Iceland Express	Windjet Vola
Air Southwest	EasyJet	Ryanair	<b>Smart Wings</b>
Air Wales	Evolavia	Snalskjutsen	<b>Wizz Air</b>
Alpi Eagles	Excel Airways	SnowFlake Airlines	<b>Hop</b>
Azzurra Air	Fairline Austria	Sterling	

## USA (19, 4 in 2003/2004)

AirTran  
 Allegiant Air  
 American West  
 ATA  
 Frontier Airlines  
 Interstate Jet  
 JetBlue Airways  
 Midwest Express  
 Pan American  
 Southeast Airlines  
 Southwest Airlines  
 Spirit Airlines  
**Song Air**  
 Sun Country  
 USA 3000 Airlines  
 Vacation Express  
**Ted**  
**Independence**  
**Virgin USA**

## South America (3)

Bra  
 Gol  
 U Air

## Africa (2)

1Time  
 Kulula

## Asia/Pacific (20, 8 in 2004)

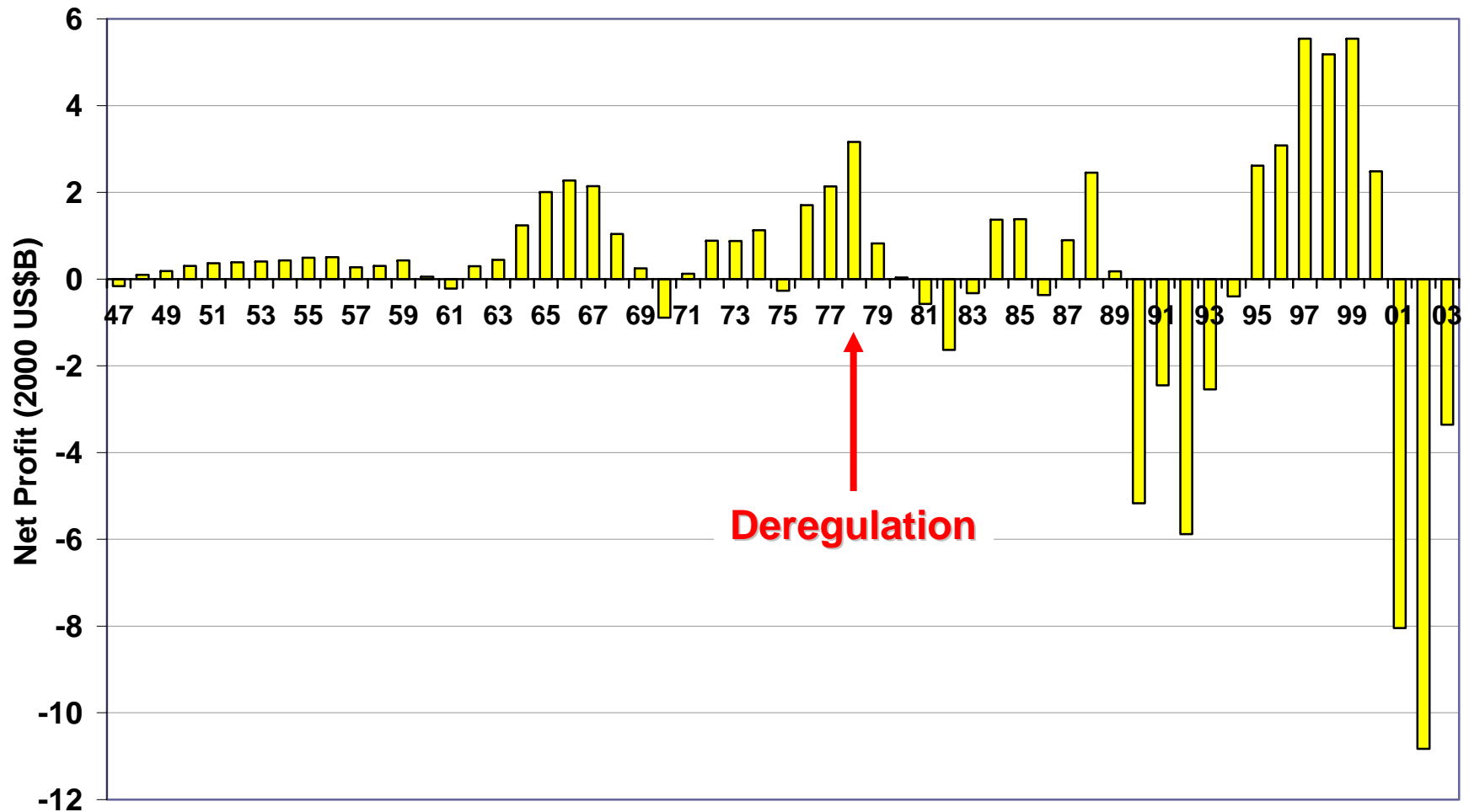
Air Arabia	ValuAir
Air Asia	Virgin Blue
Air Deccan	<b>Air Blue</b>
Athena Air Services	<b>Air One</b>
Citilink	<b>BackpackersXpress</b>
Freedom Air	<b>Jetstar</b>
Lion Airways	<b>Nok Air</b>
One-Two-Go	<b>Pacific Blue</b>
Skymark Airlines	<b>SkyAsia</b>
Skynet Asia Airways	<b>Tiger Airways</b>





# Macro Scale Drivers US Airline Net Profit

**Cyclic Industry with Exponential Growth In Volatility Since Deregulation**



Source: ATA, Form41, US Airlines all services

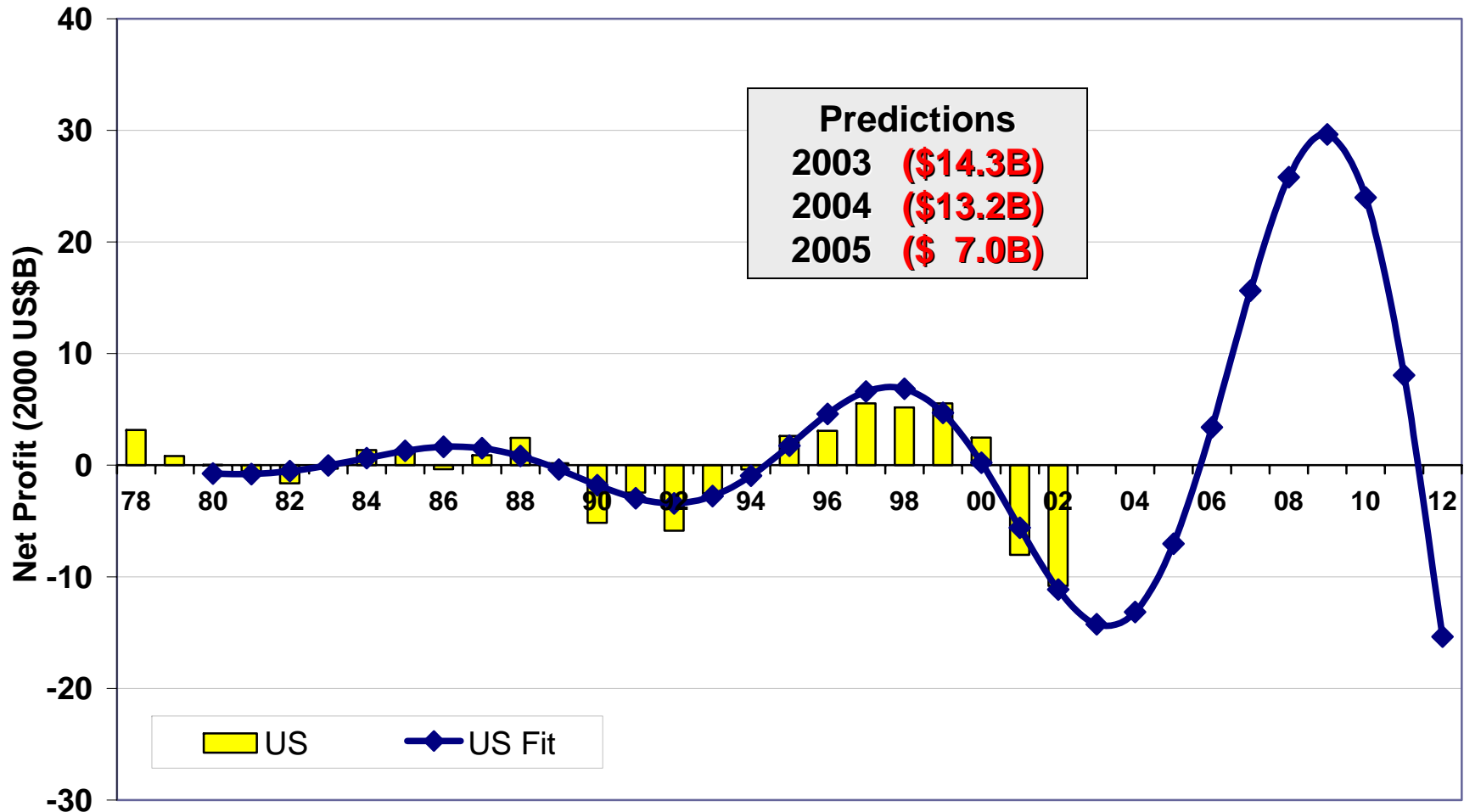
NB: 2001 data includes Air Trans Stabilization Act receipts



# US Airlines Net Profit Model - 2002

Best Fit of Undamped Oscillation

Cycle Period = 11.3 yr    eFolding Time = 7.9 yr



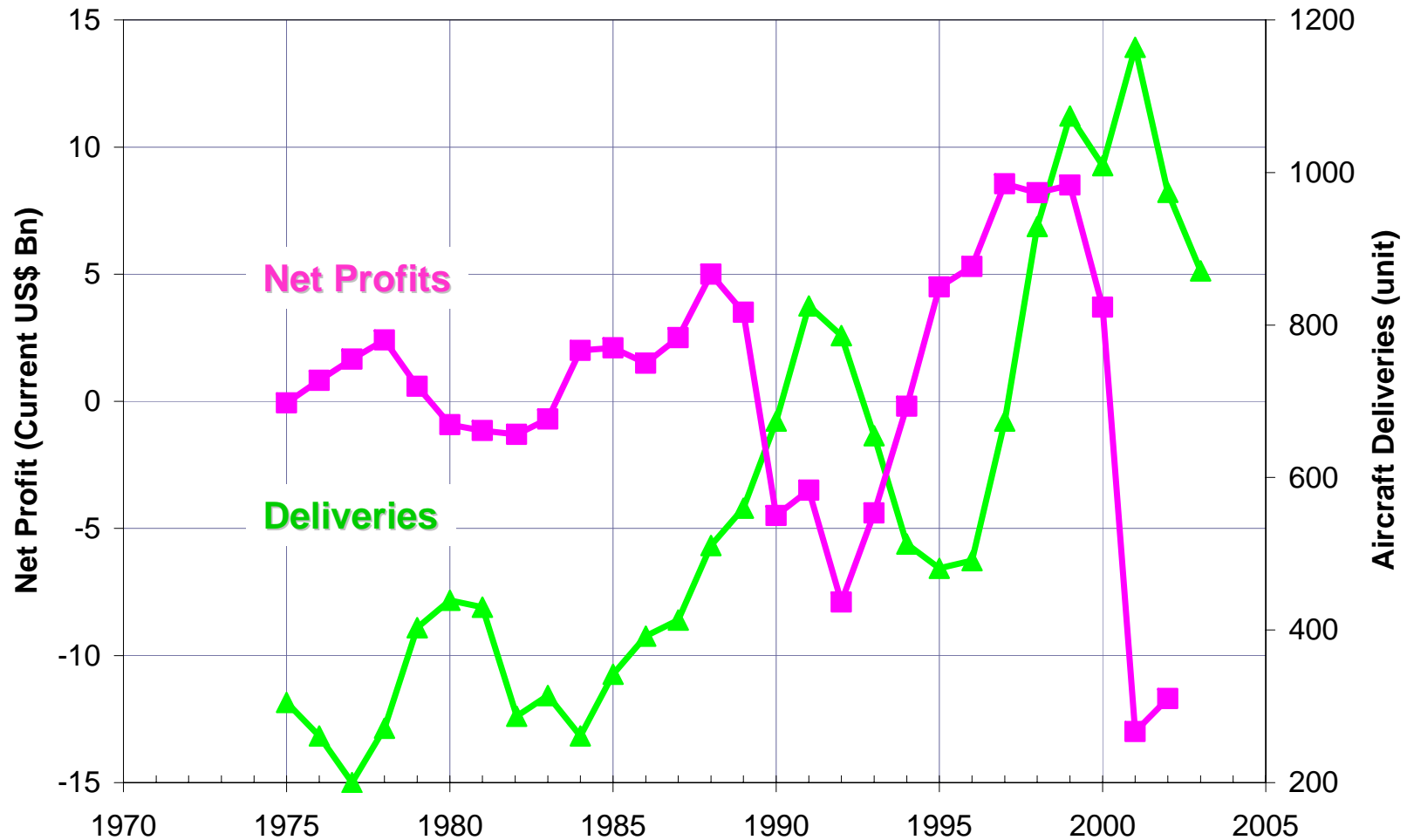
NB: Predictions are in constant 2000 dollars.



# Net Profit and Aircraft Deliveries

Hypothesize that instability driven by capacity response phase lag

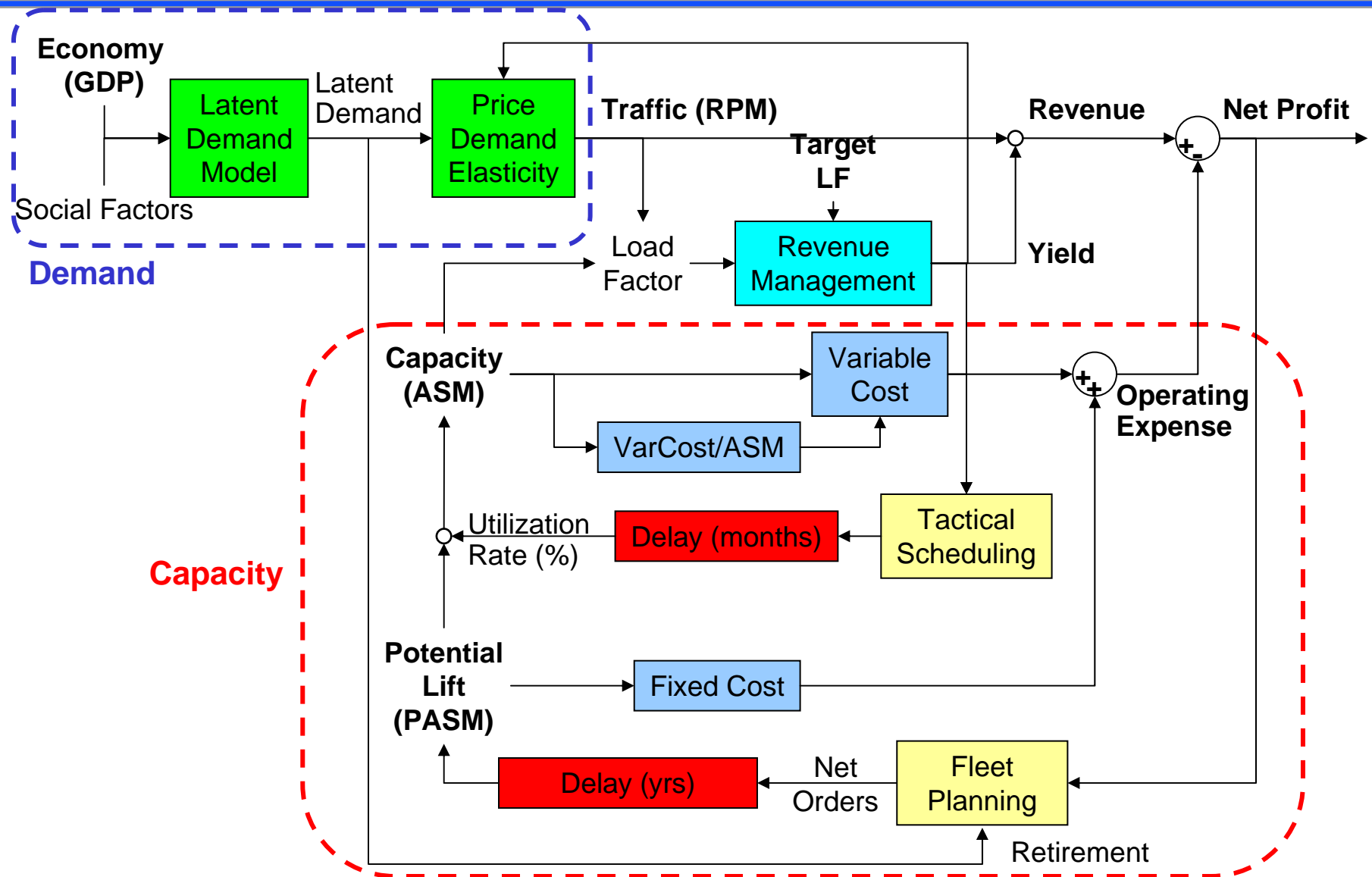
## World Airlines Net Profits vs. Aircraft Deliveries



Source: ICAO data



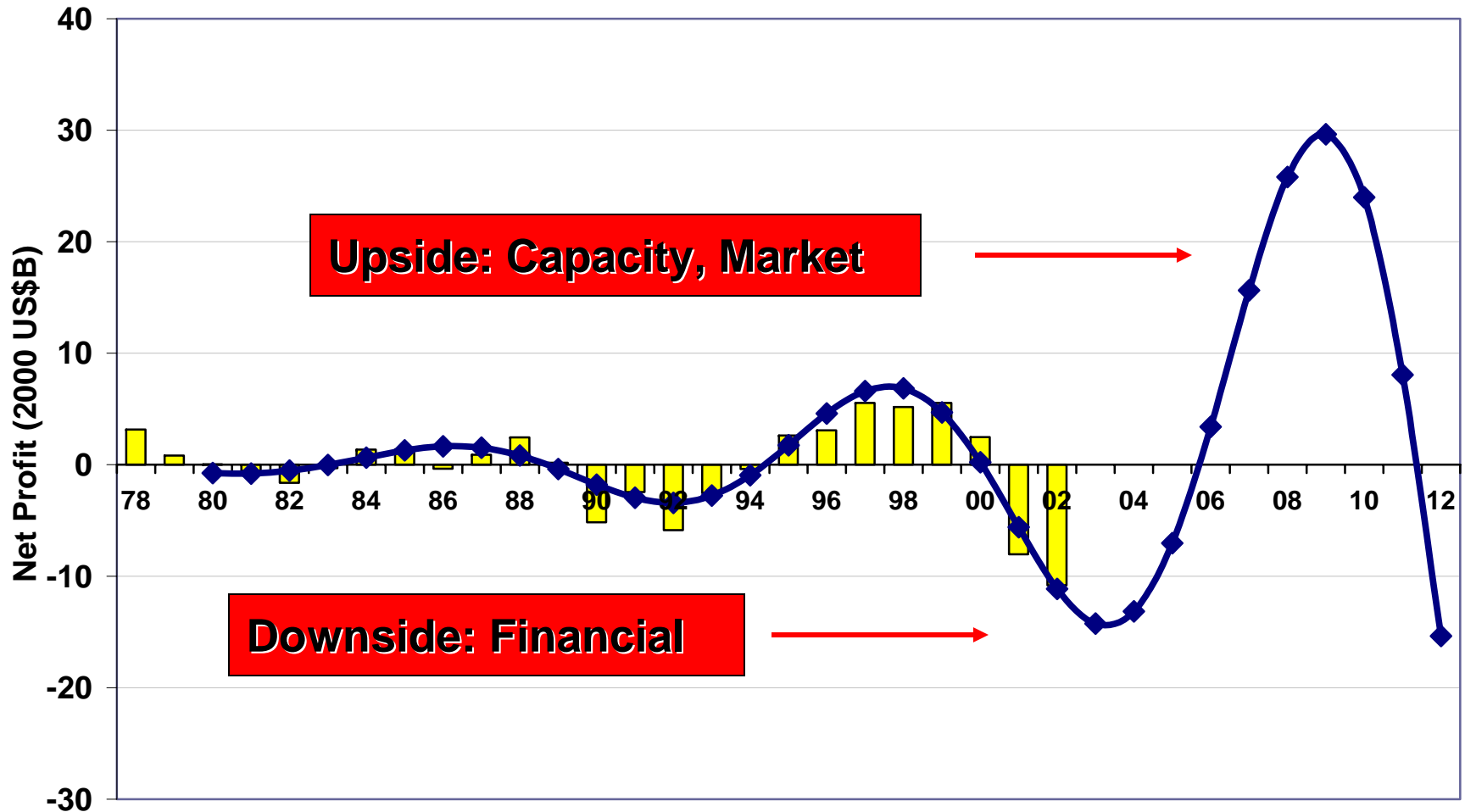
# Simple Conceptual Model for Capacity Effects





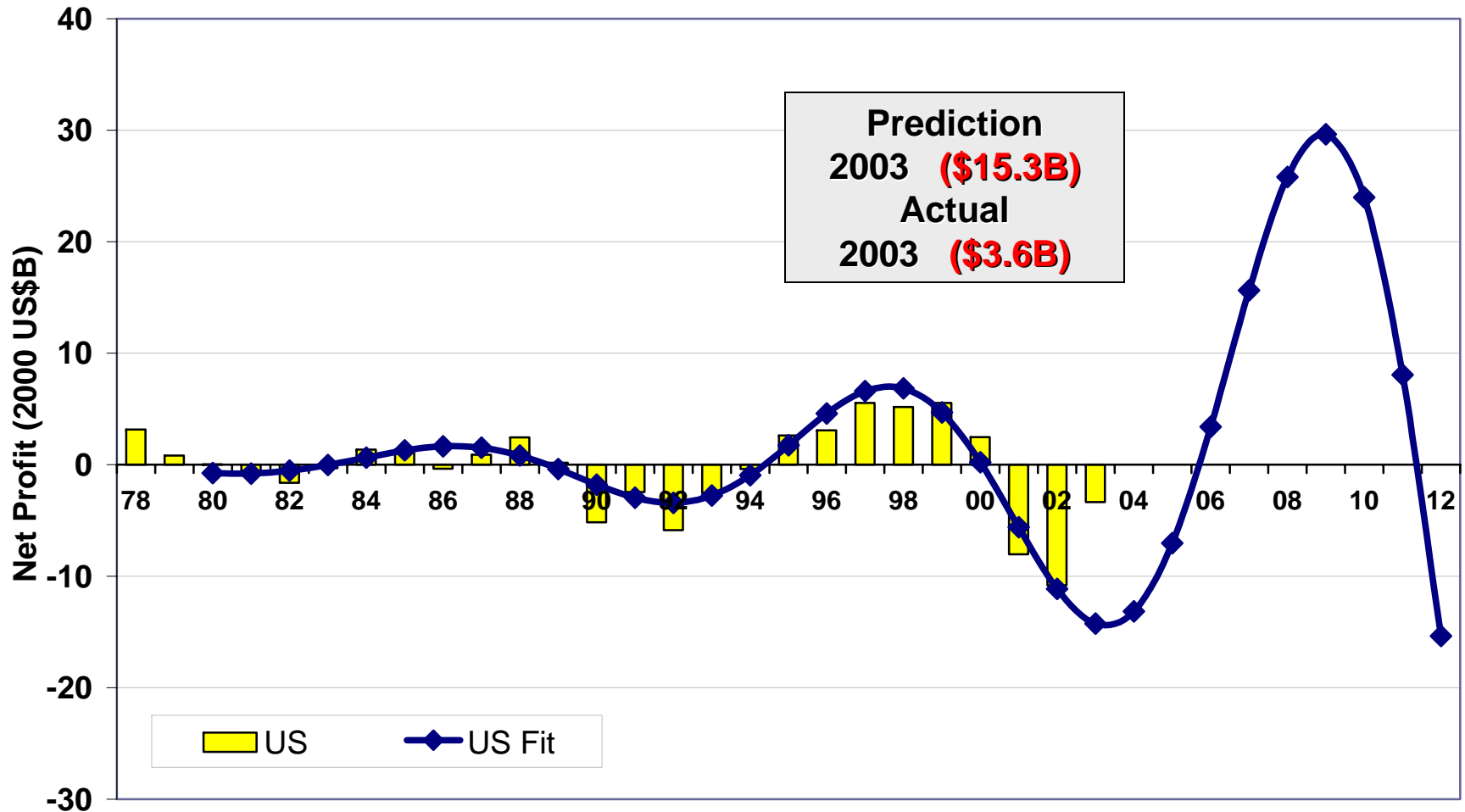
# Growth Limits

## Constraints vs Damping





# US Airline Performance Cycling Up Faster Than Predicted



NB: predictions are in current dollars.



# Profitability Improvement Factors

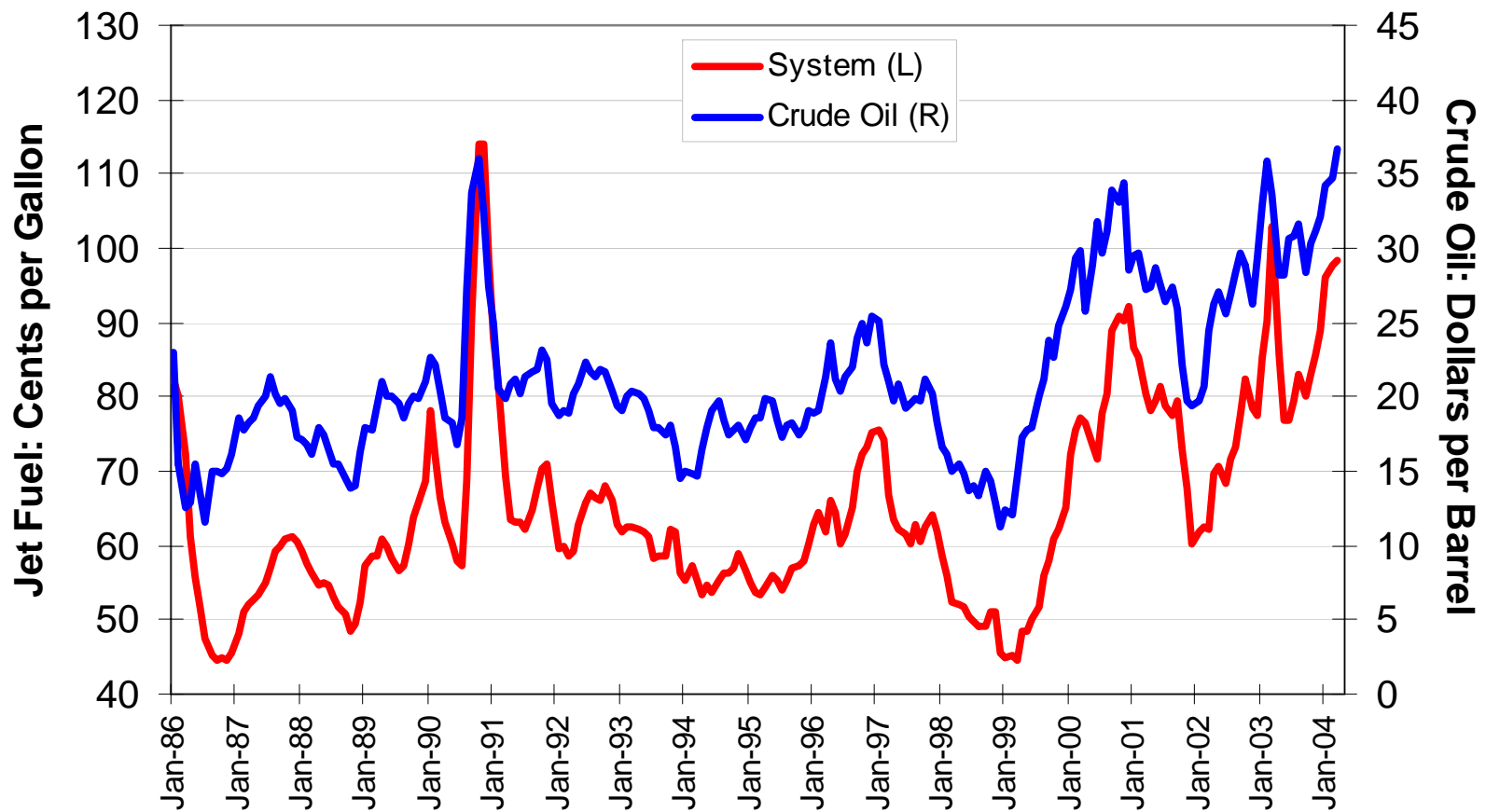
---

- **Cargo Airlines Profitable**
  - **Yields Turned the Corner**
  - **Wage Concessions**
    - US: \$1 billion
    - UA: \$2.56 billion
    - AA: \$2 billion
  - **Distribution Costs**
    - \$1 billion
  - **Debt Restructuring & Chapter 11**
  - **Pensions**
    - (Pension Benefit Guaranty Corporation (PBGC))
  - **Security Costs and Insurance?**
  - **Operating Efficiencies**
    - \$4 billion
  - **Fuel**
-



# Trends in Fuel Price

## Historical: Average Jet Fuel and Crude Oil Prices



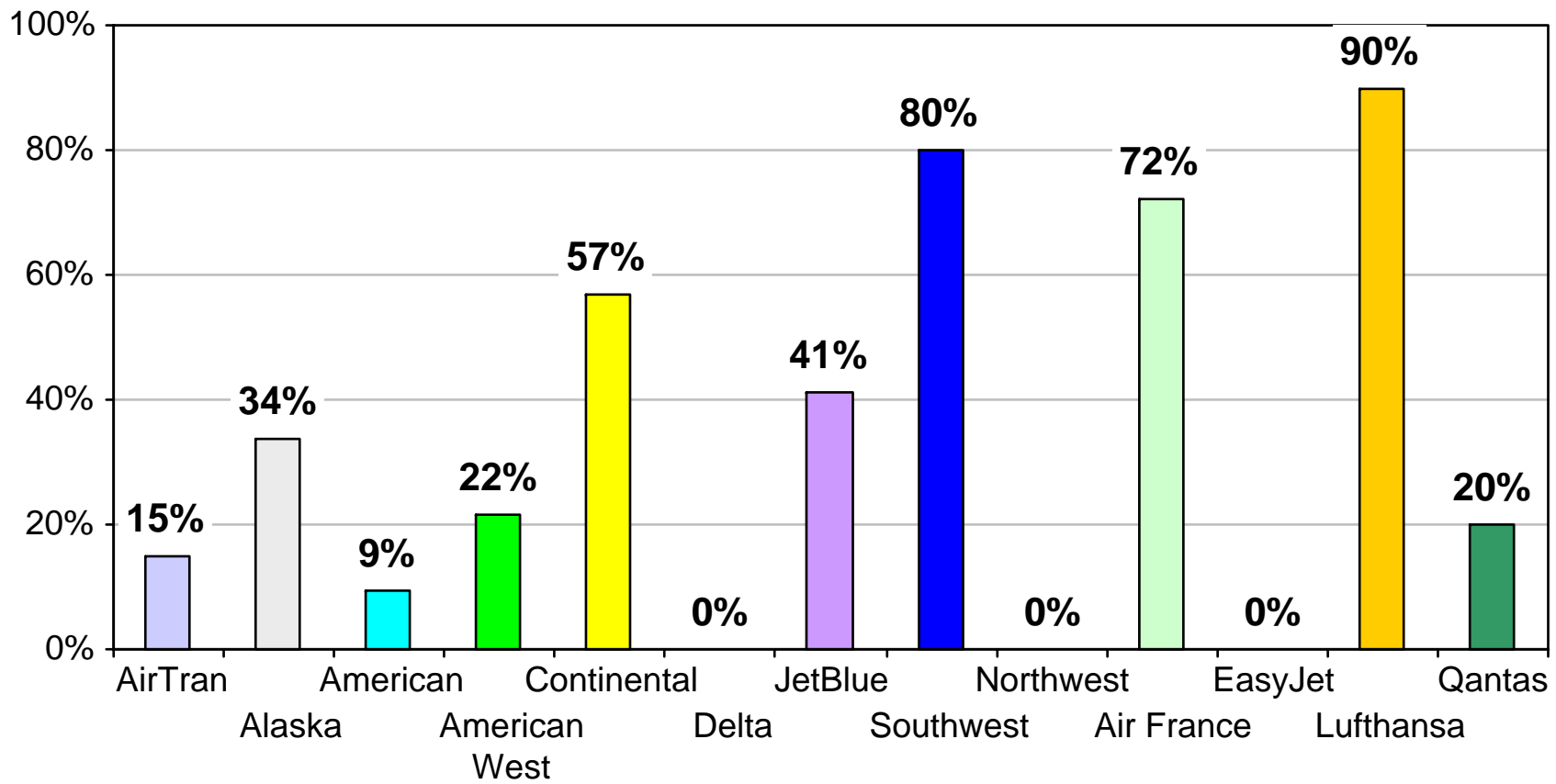
Source: ATA data; U.S. major, national, large regional passenger and cargo airlines; all services





# 2004 Fuel Hedge Levels

- Reduce the risk of high fuel prices by hedging future fuel contracts
- Many U.S. major carriers lack credit lines or cash to buy hedges

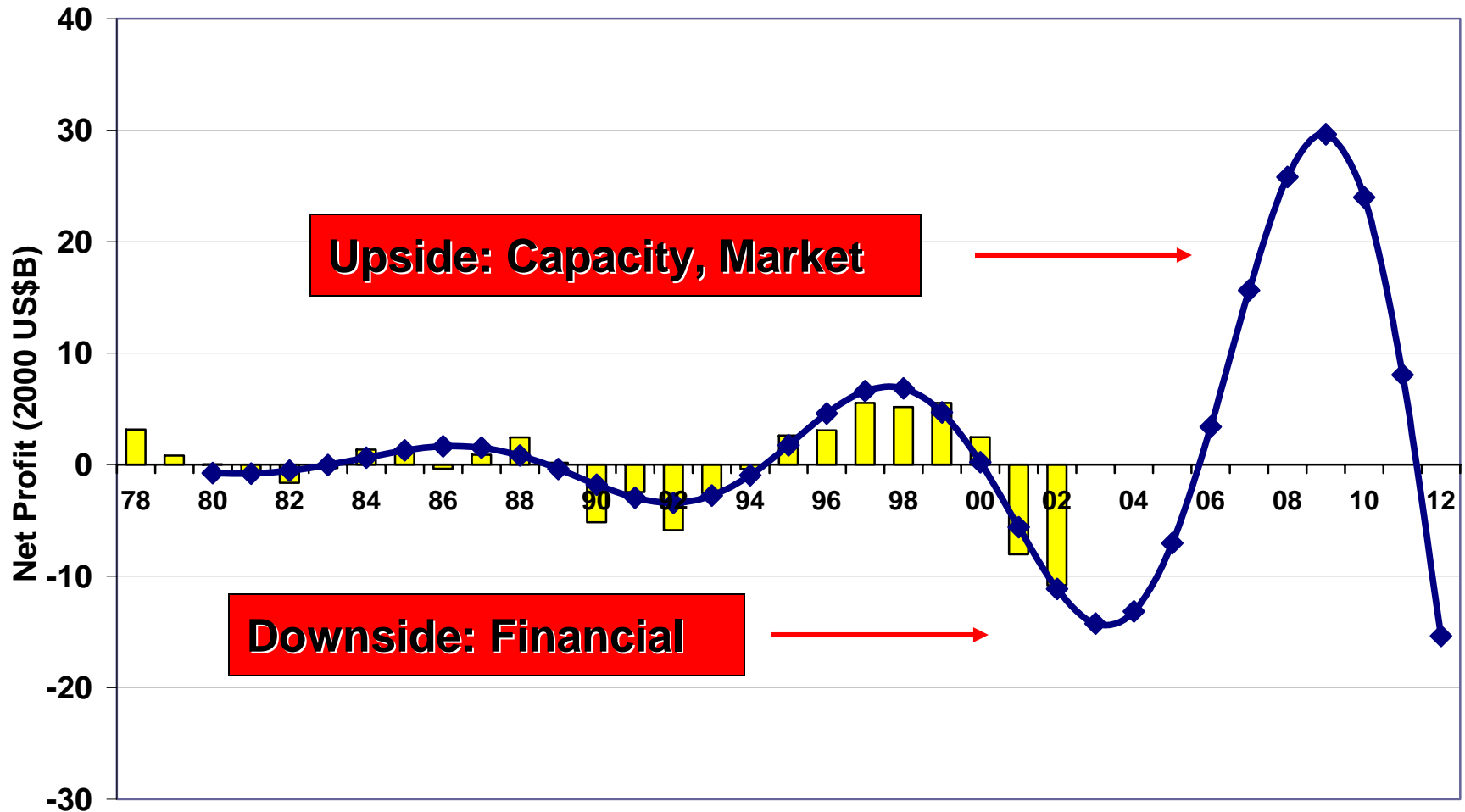


Source: Lehman Brothers, MSNBC news, Goldman Sachs, airline news



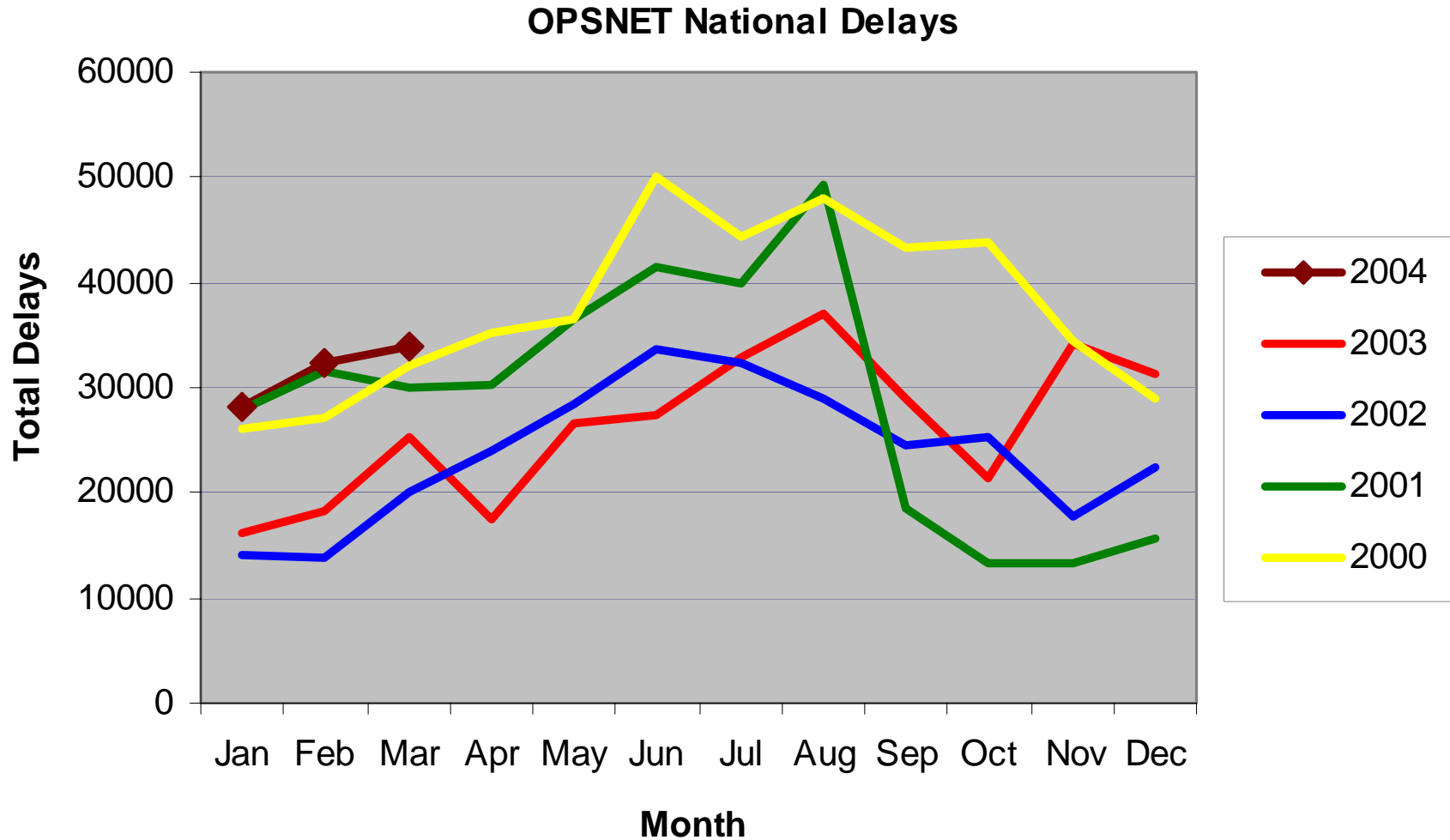
# Growth Limits

## Constraints vs Damping





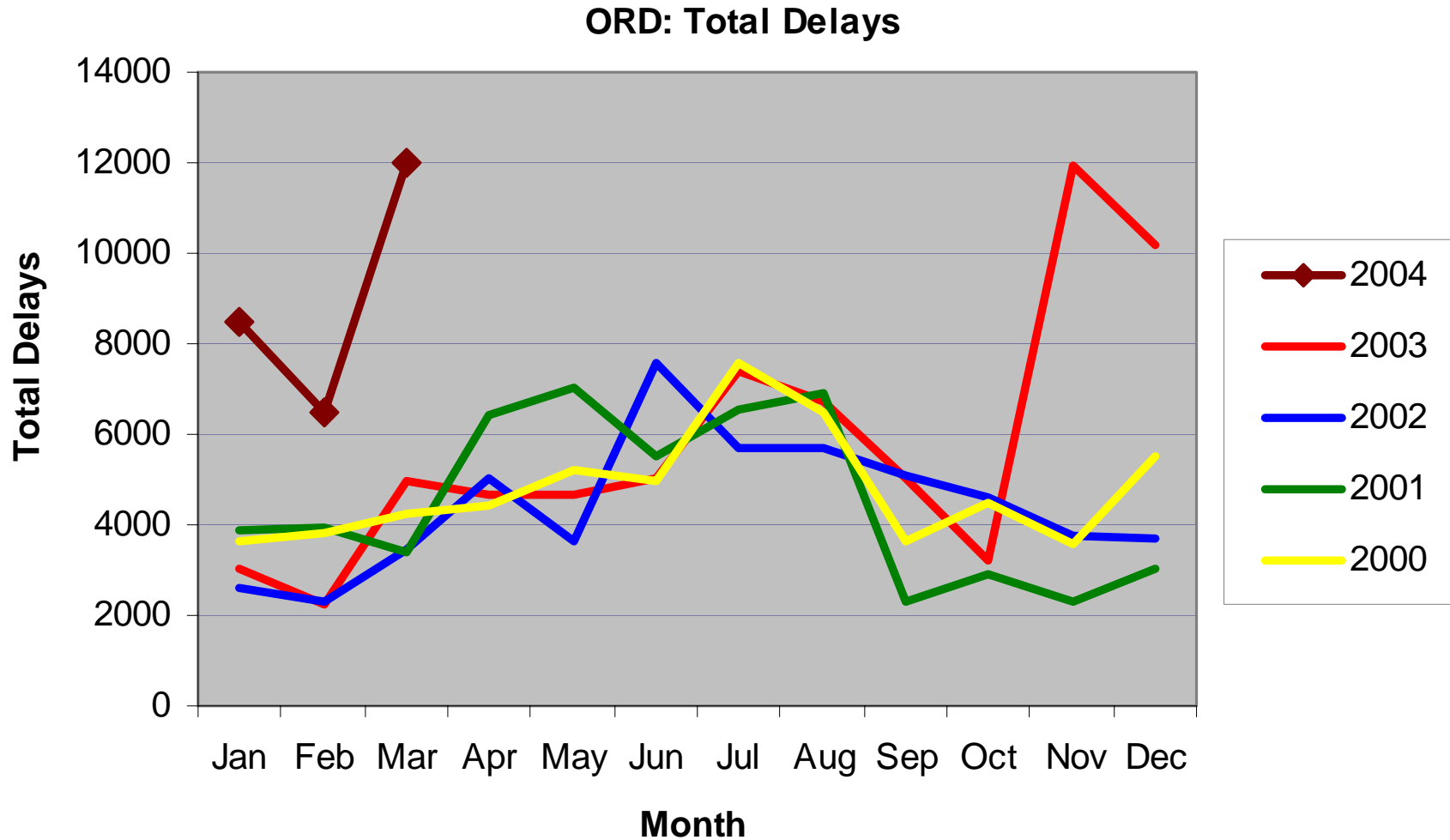
# Flight Delays Reemerging



Source: FAA OPSNET data



# Total Delays at Chicago O'Hare Intl

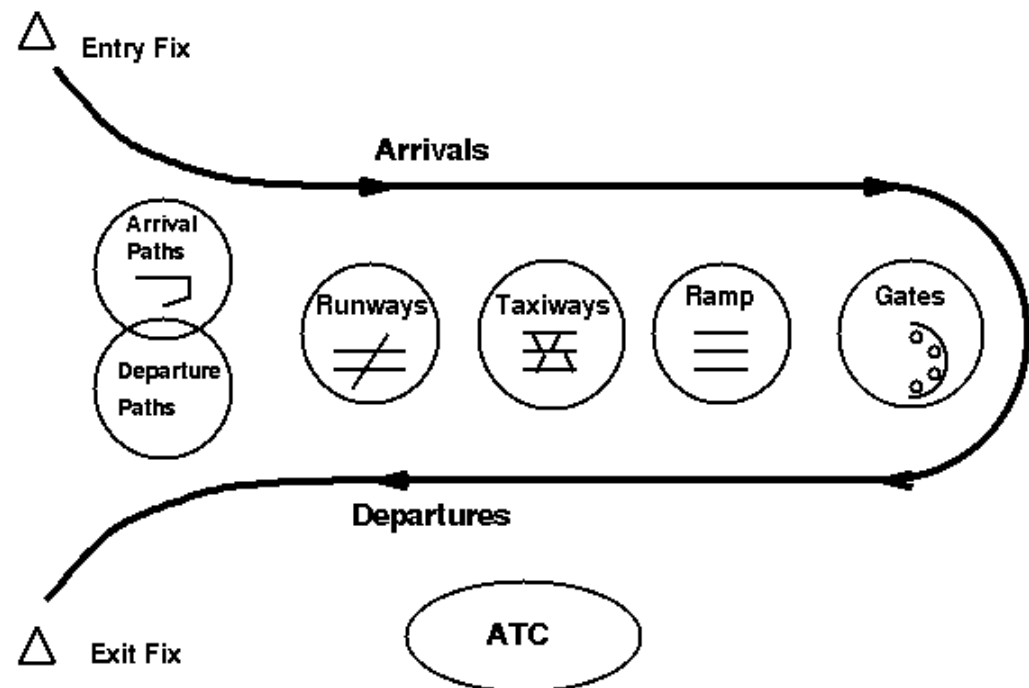


Source: FAA OPSNET data



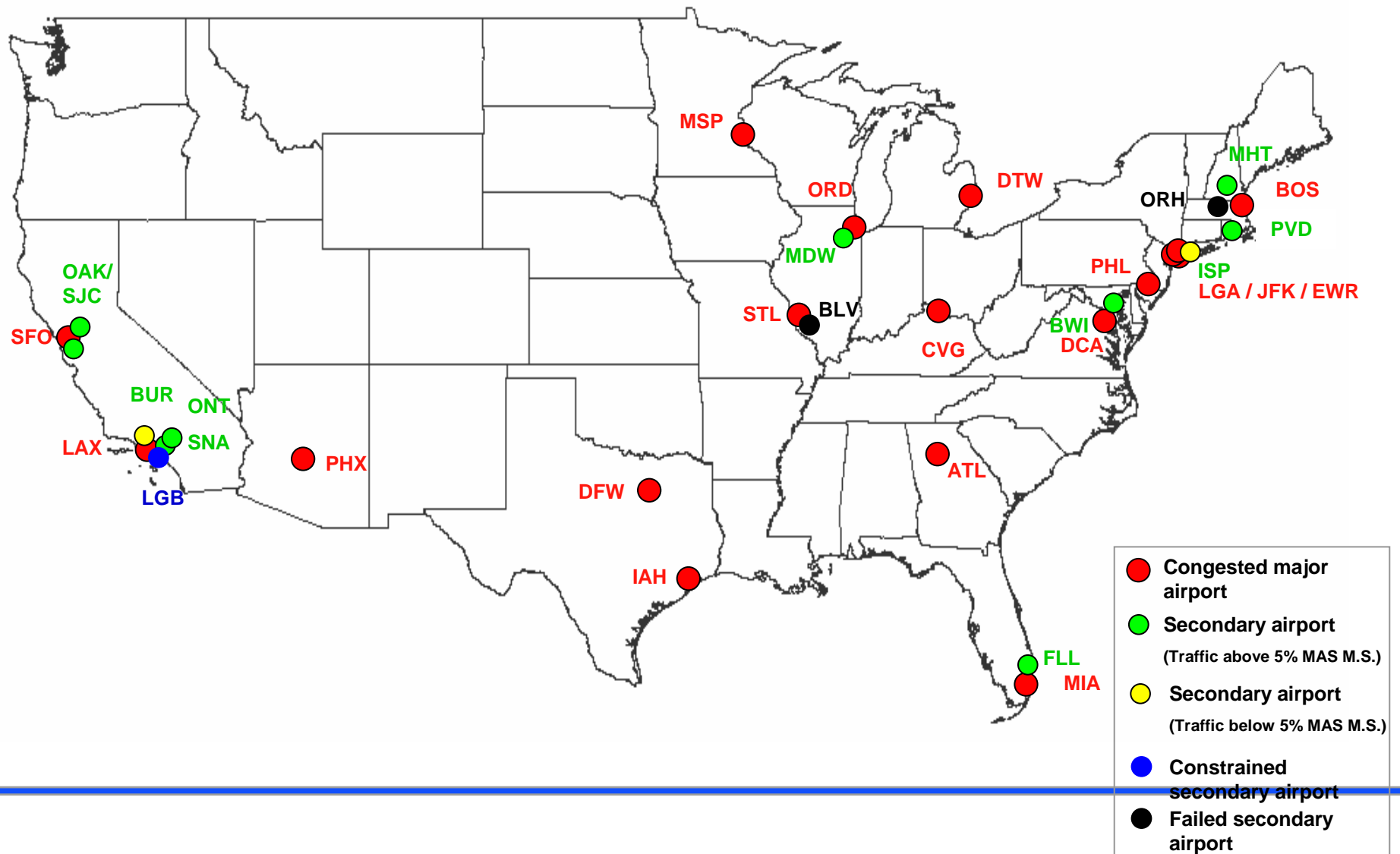
# Airport System Capacity Limit Factors

- **Runways**
- **Weather**
  - Capacity Variability
  - Convective Weather
- **Landside Limits**
  - Gates
  - Terminals & Security
  - Road Access
- **Downstream Constraints**
- **Controller Workload**
- **Environmental**
  - Community Noise
  - Emissions
- **Safety**



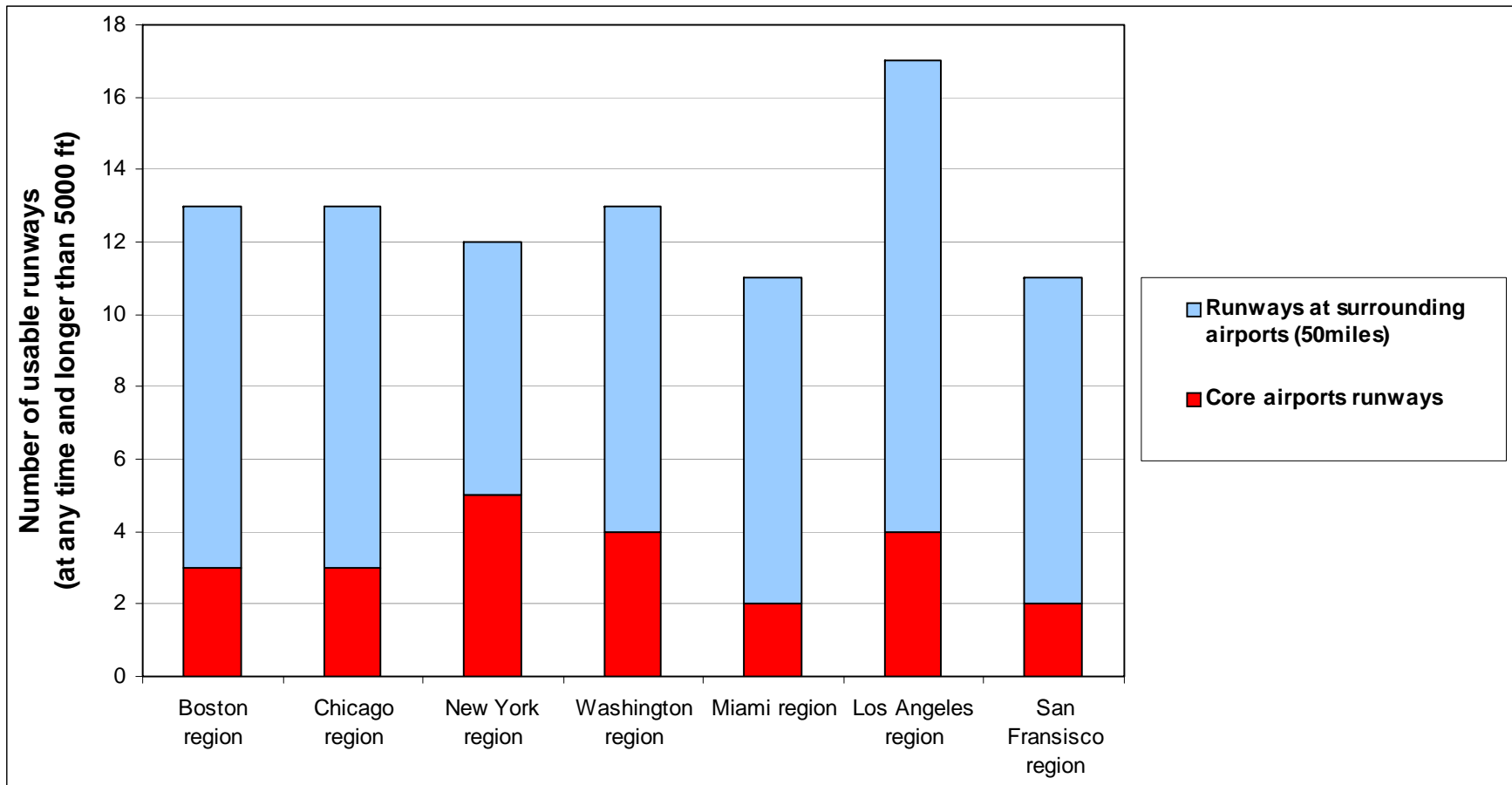


# Emergence of Secondary Airports





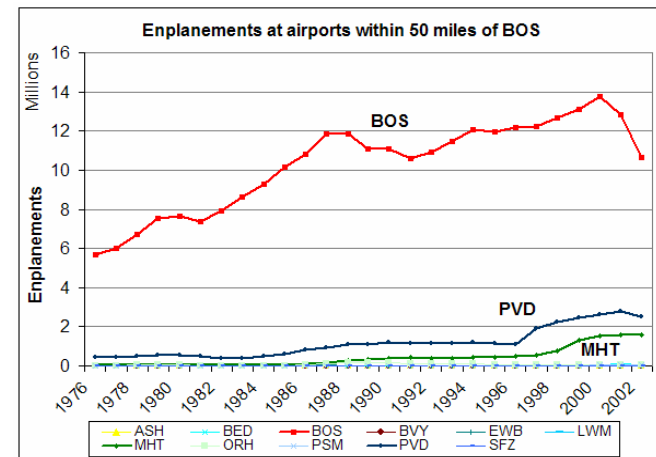
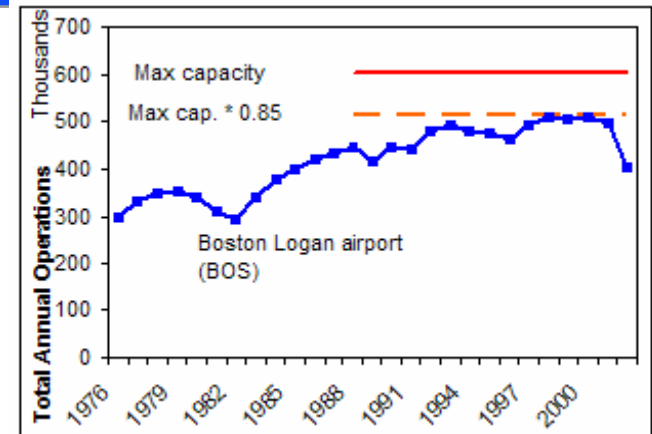
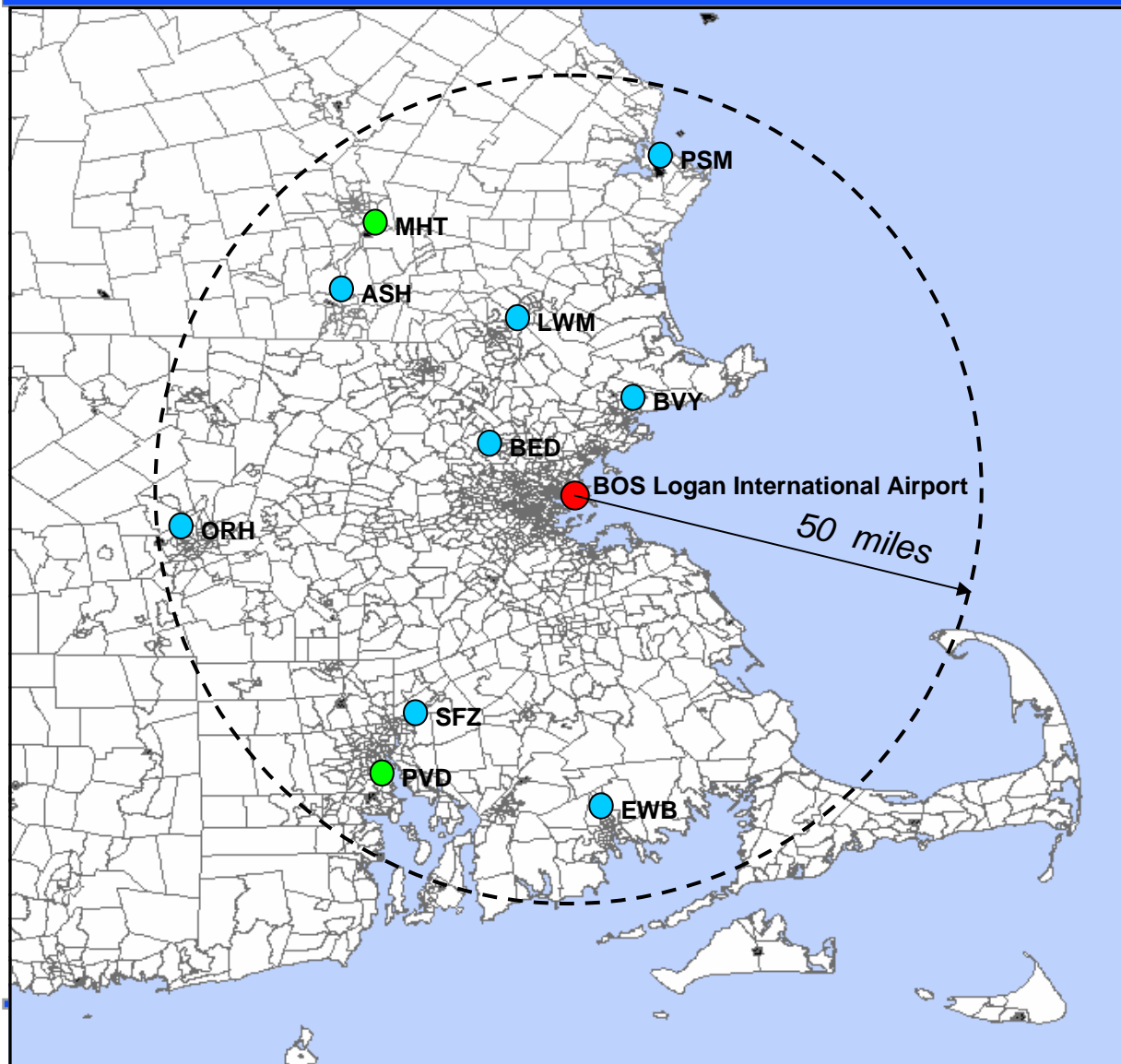
# Additional Capacity at Region Level





# Identification of Secondary Airports

## Case study of the Boston Metropolitan Area

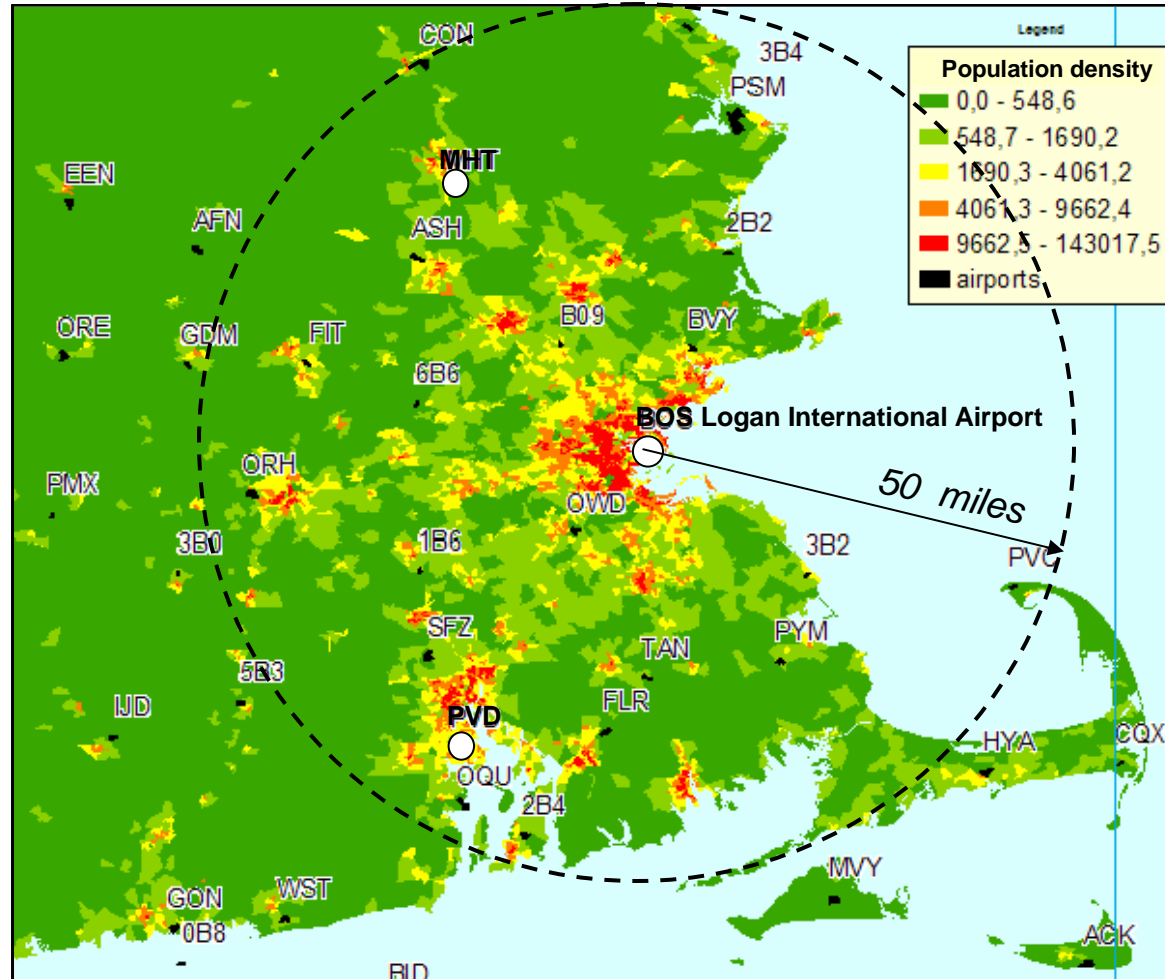


- Core airport
- Secondary airport
- Surrounding airports (with runway length greater than 5000 ft)





# Density of Population





# Factors Influencing the Emergence of Sec. Airports

## Population:

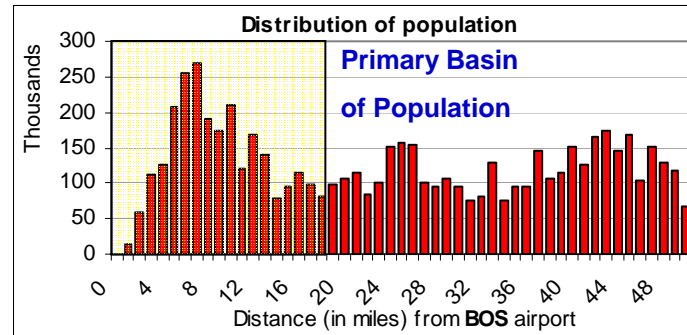
## Distribution of Population around Core and Secondary Airports

### Core airport

Boston Logan (BOS)

Population within 20 miles:

*2.6 millions*

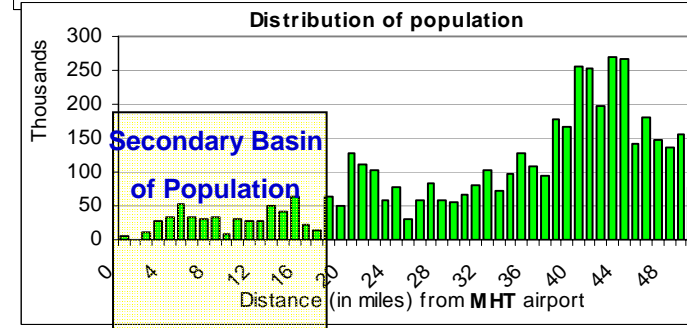


### Secondary airports

Manchester (MHT)

Population within 20 miles:

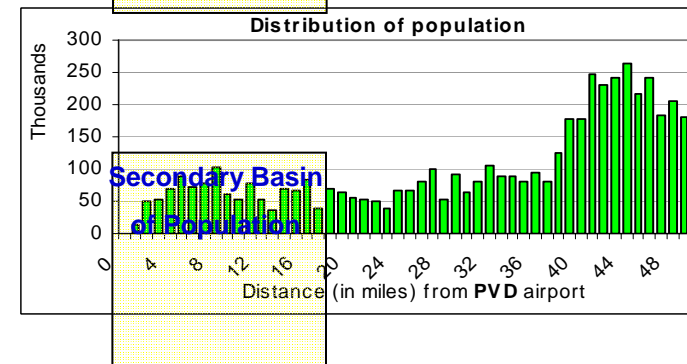
*0.6 million*



Providence (PVD)

Population within 20 miles:

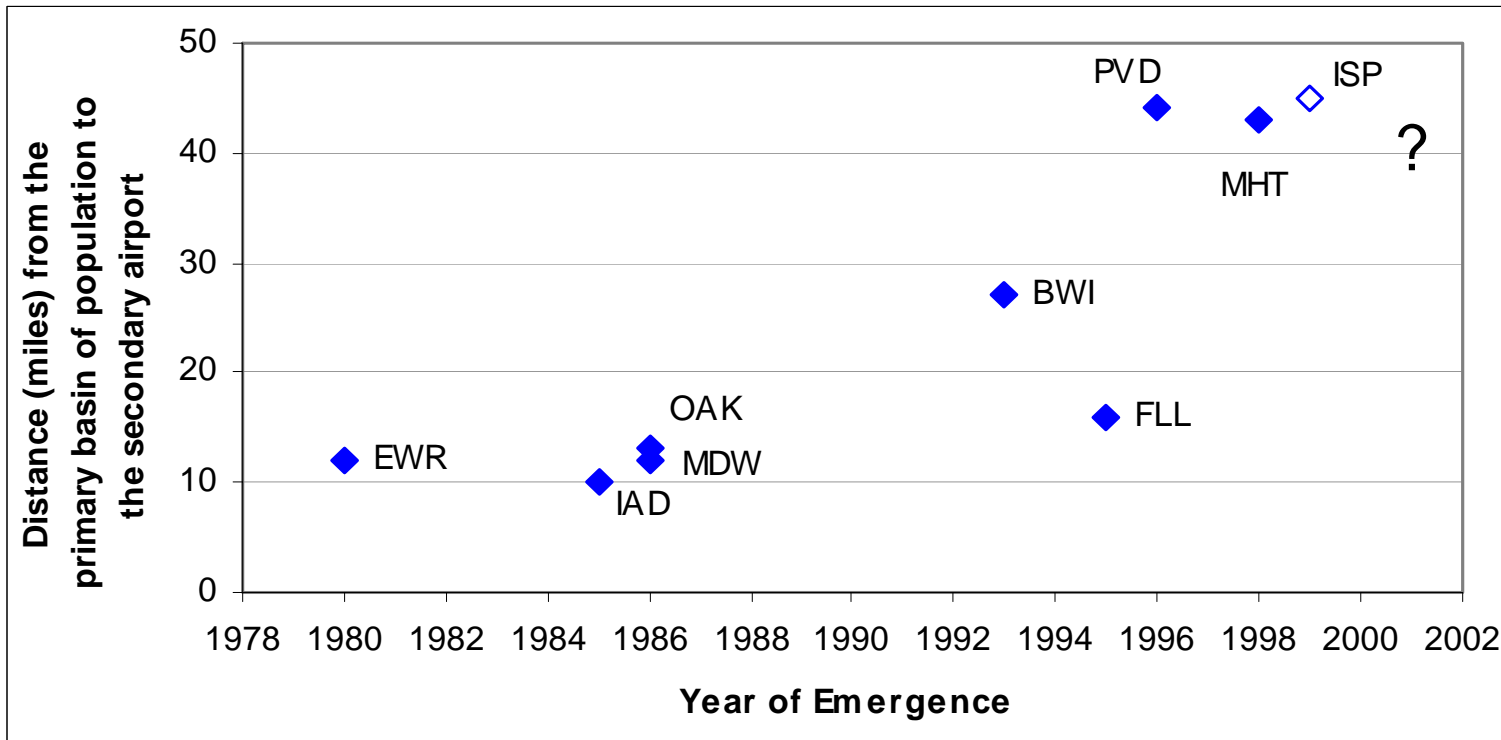
*1.2 million*





# Factors Influencing the Emergence of Sec. Airports

**Population:** Evolution in the Secondary Airport Location Relative to Primary Basin of Population



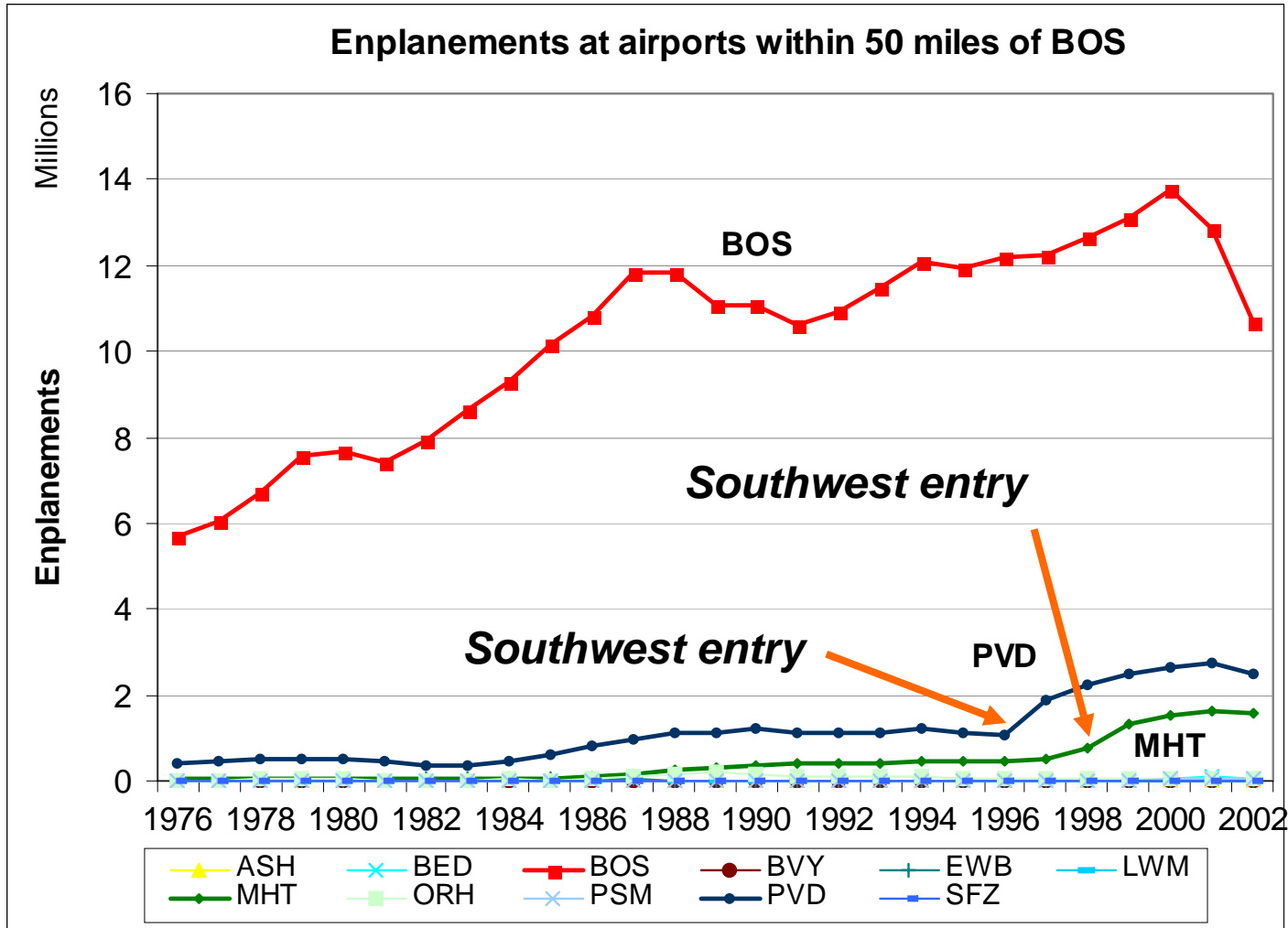


# Factors Influencing the Emergence of Sec. Airports

**Low Cost Carriers:**  
correlated

**Secondary Airport Emergence is**  
with Low Cost Carrier entry.

Case : Boston Region



Data source: Historical data from FAA Terminal Area Forecasts



# FAA Air Traffic Responses

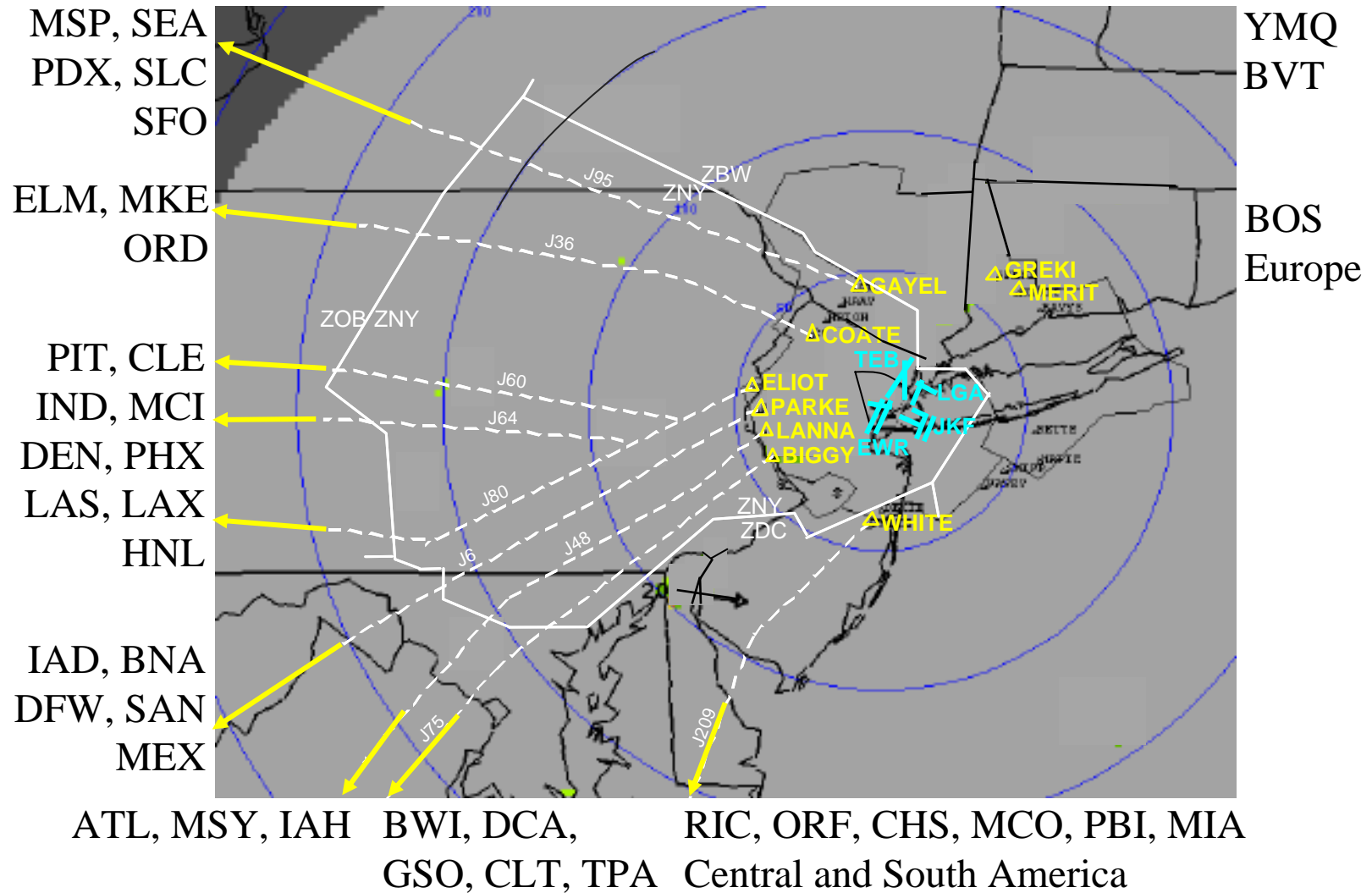
---

- **Air Traffic Organization Stood Up**
  - Russ Chew COO
  - Performance Based Organization
  - In Transition
  
- **Schedule Reductions at ORD**
  - “Voluntary” reduction\*
    - ◆ United and American to reduce flights by 5 percent between March and October 2004
    - ◆ United cancelled 50 daily flights, American cancelled 27
  - Collaborative Decision Making
    - ◆ Pilot Case
  
- **“Express Lanes” from Congested Core Systems**
  - Delay “peripheral” airports



# New York Center Airspace

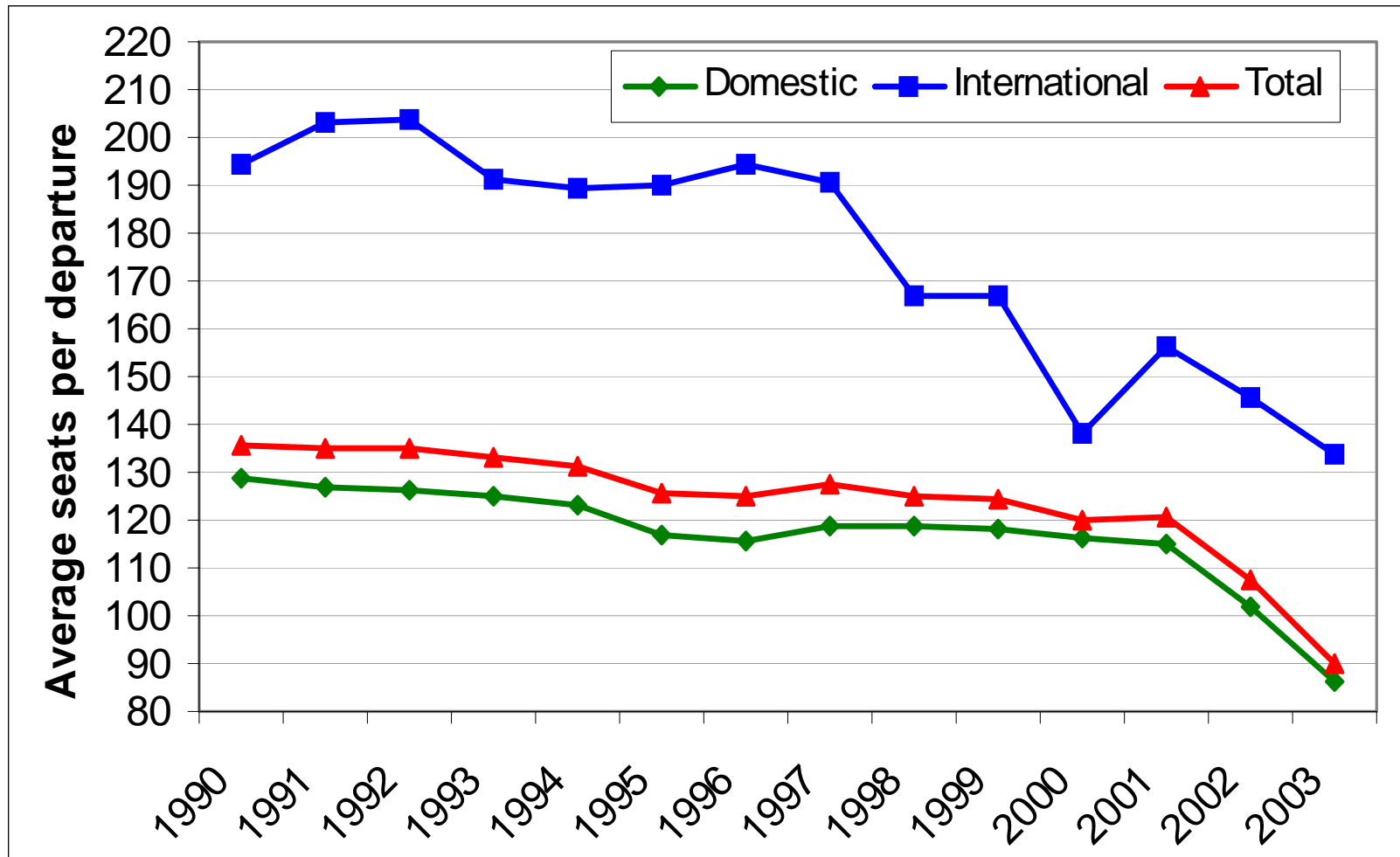
## With Primary EWR Departure Fixes/Jet-routes



Based on Lincoln Laboratory ITWS Map



# Trends in Aircraft Size



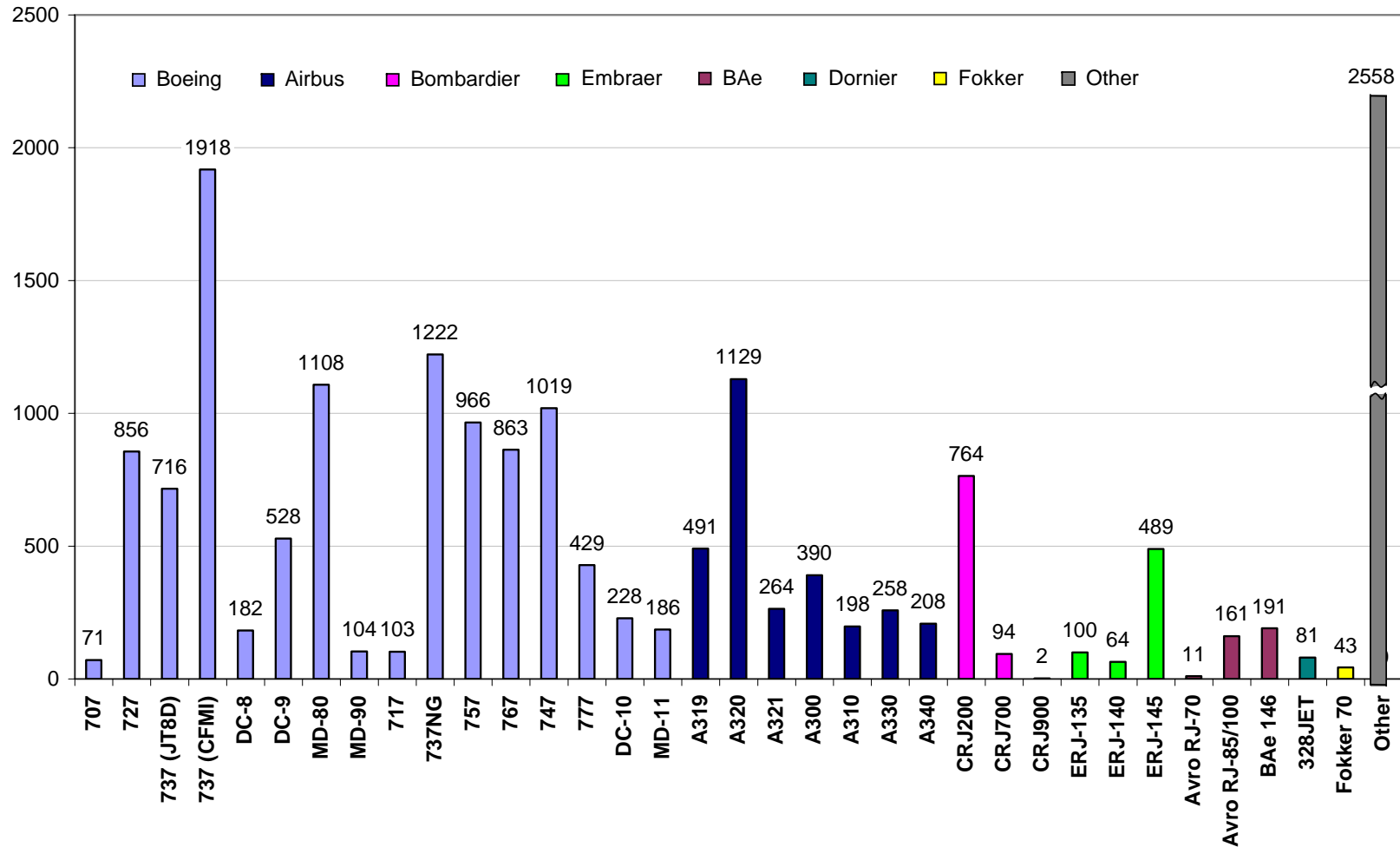
Data source: Form 41 Traffic data from Bureau of Transportation Statistics (includes Regional Jets and Turboprops)



# World Jet Fleet Summary

(as of May 14, 2003)

Total 17,995 Jet Aircraft



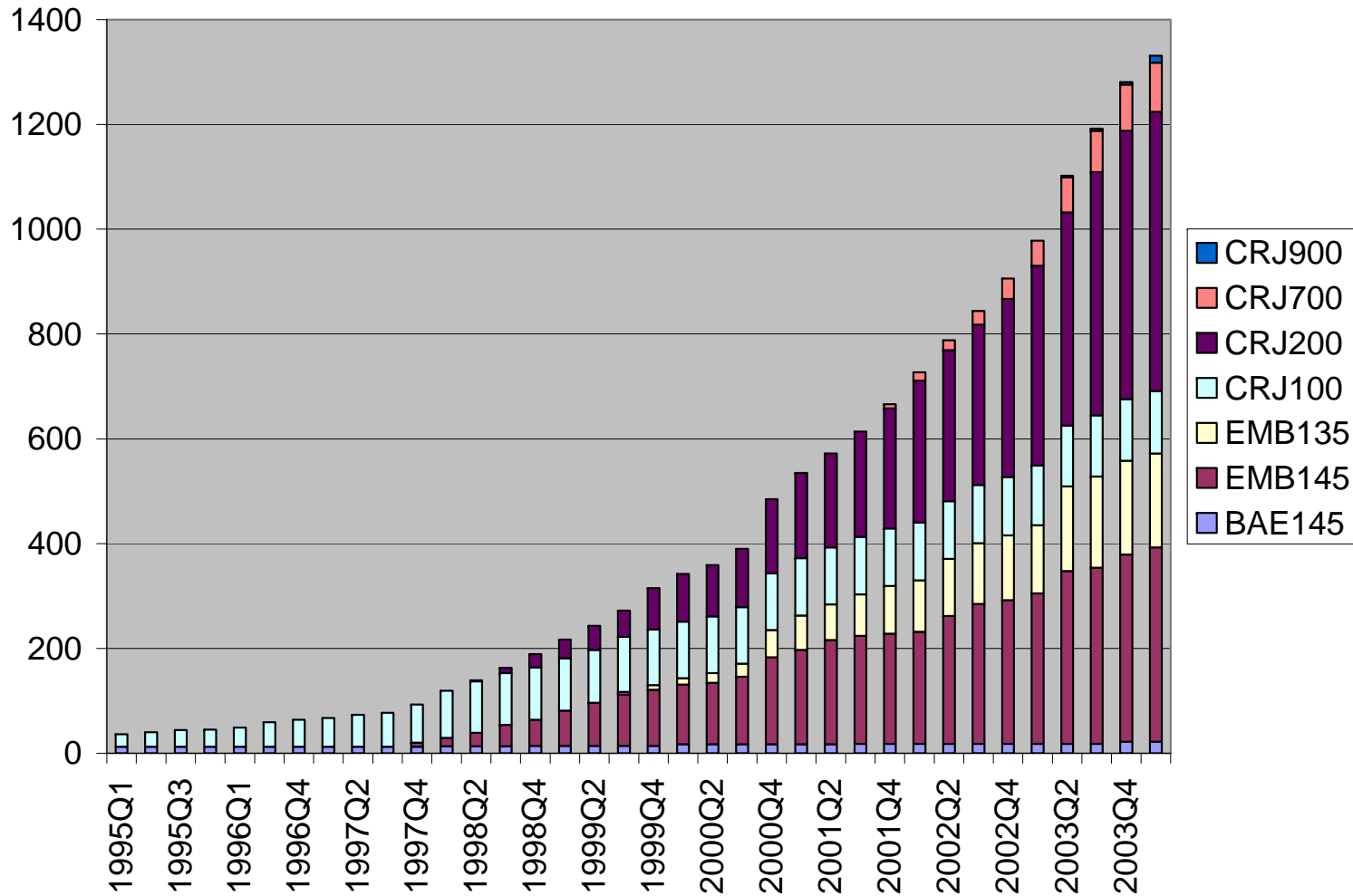
Source: Airclaims, published by ATW, July 2003

Others include L-1011, Fokker 100, Russia/Ukraine a/c





# U.S. Regional Jet Growth



Source: FAA registration data from 1995 until the present



## Most Common Regional Jets

---

### ERJ 145 (50 seats)



About 400 aircraft in national fleet  
About 2000 daily flights in January 2003

### CRJ 200 (50 seats)

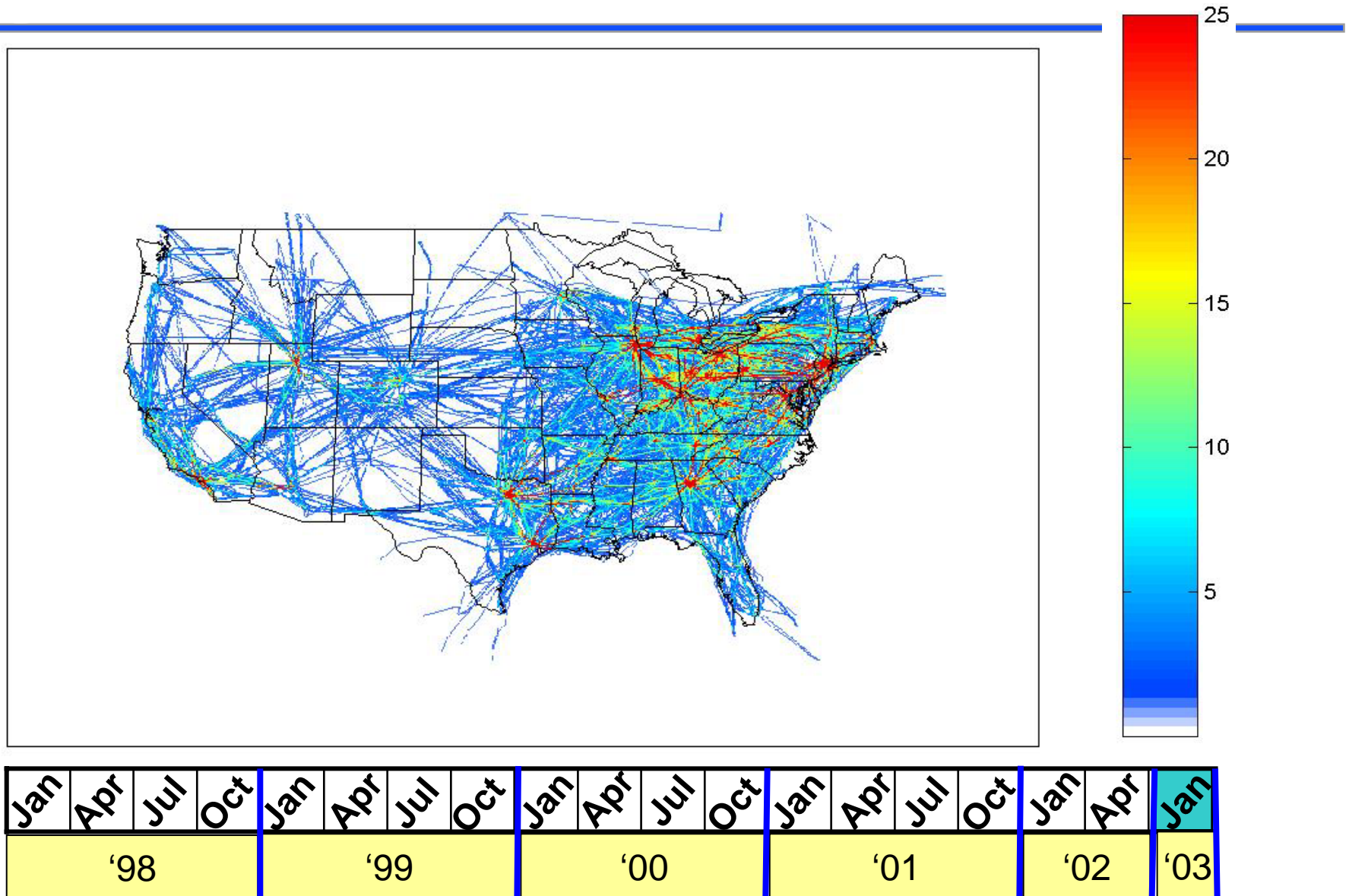


About 400 aircraft in national fleet  
About 1500 daily flights in January 2003

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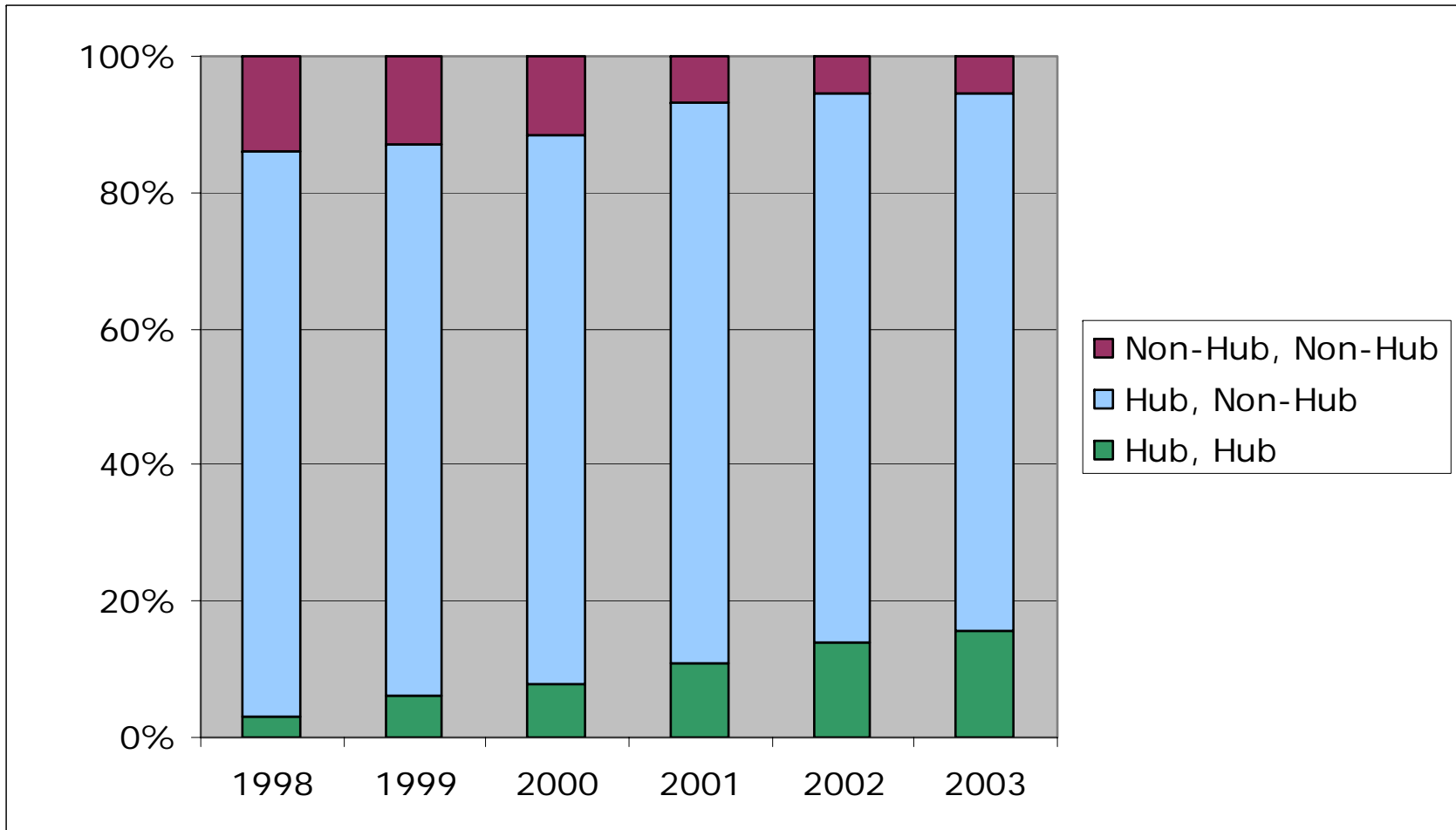


# Regional Jet Density Growth





# Significant Regional Jet Growth at Hub Airports



- **About 90% of regional jet flights depart from or arrive at a hub airport**

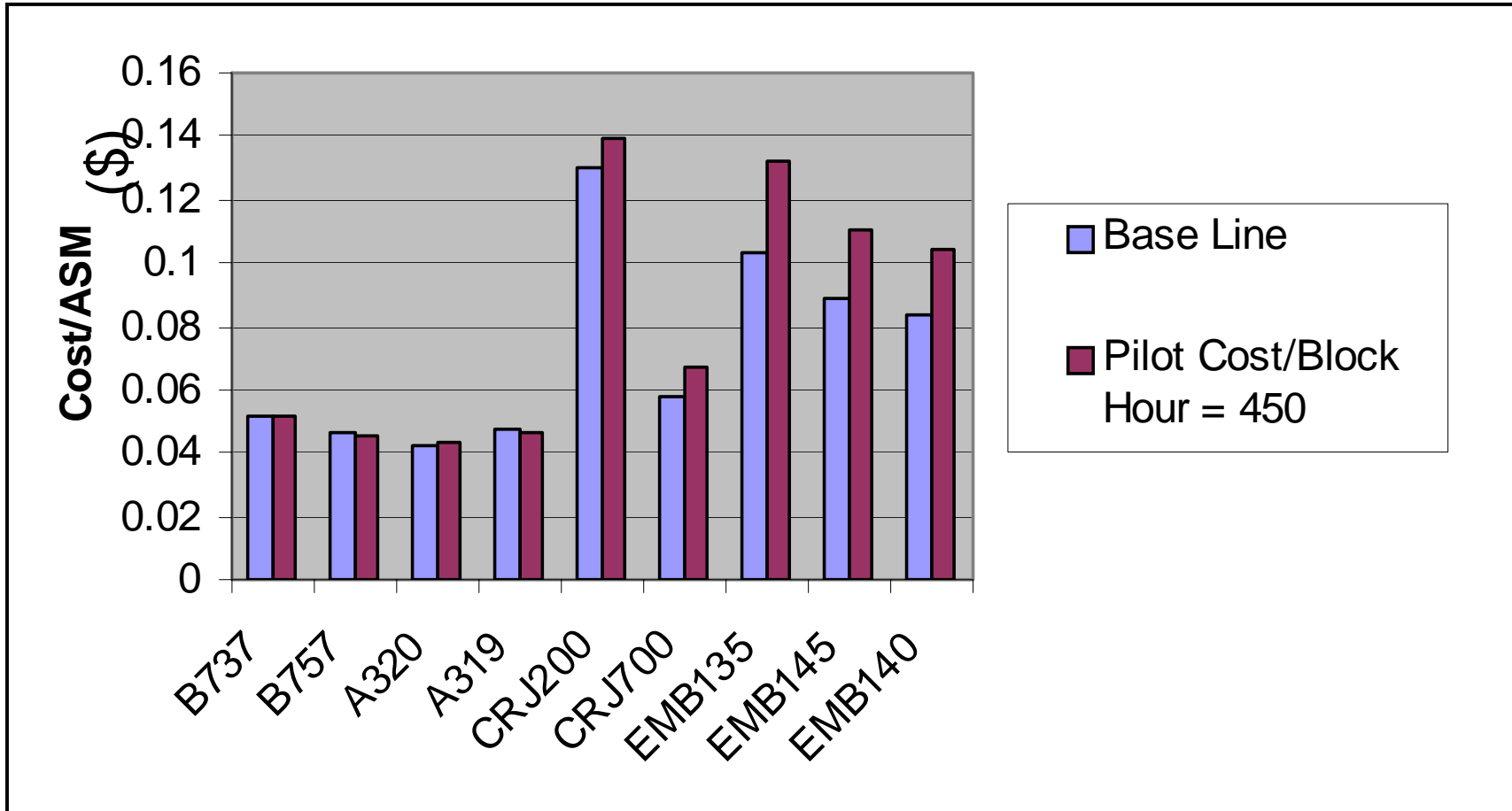


## Form 41 Averages by Aircraft Type

<b>Aircraft Type</b>	<b>Average Trip Length</b>	<b>Pilot Cost/Block Hour</b>	<b>Total Aircraft Operating Cost/ASM</b>	<b>Total Aircraft Operating Cost/Trip</b>
<b>B737</b>	<b>663</b>	<b>430</b>	<b>0.05</b>	<b>4505</b>
<b>B757</b>	<b>1236</b>	<b>547</b>	<b>0.05</b>	<b>10326</b>
<b>A320</b>	<b>1094</b>	<b>411</b>	<b>0.04</b>	<b>6836</b>
<b>A319</b>	<b>931</b>	<b>460</b>	<b>0.05</b>	<b>5359</b>
<b>CRJ200</b>	<b>459</b>	<b>287</b>	<b>0.13</b>	<b>2838</b>
<b>CRJ700</b>	<b>542</b>	<b>215</b>	<b>0.06</b>	<b>2214</b>
<b>EMB135</b>	<b>351</b>	<b>181</b>	<b>0.10</b>	<b>1341</b>
<b>EMB145</b>	<b>354</b>	<b>169</b>	<b>0.09</b>	<b>1572</b>
<b>EMB140</b>	<b>386</b>	<b>187</b>	<b>0.08</b>	<b>1412</b>

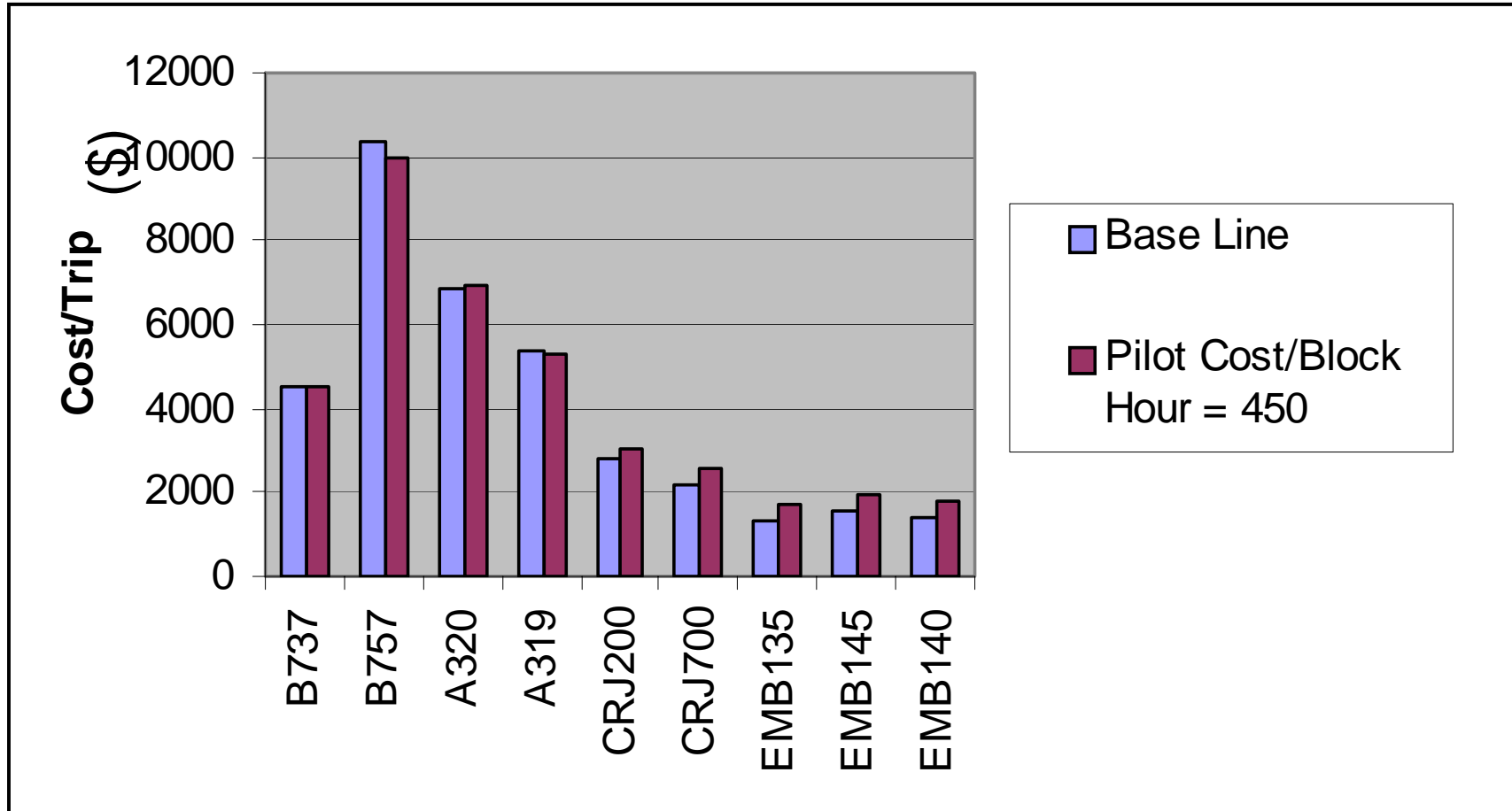


## Total Operating Cost per ASM when Pilot Cost/Block Hour is Normalized to \$450



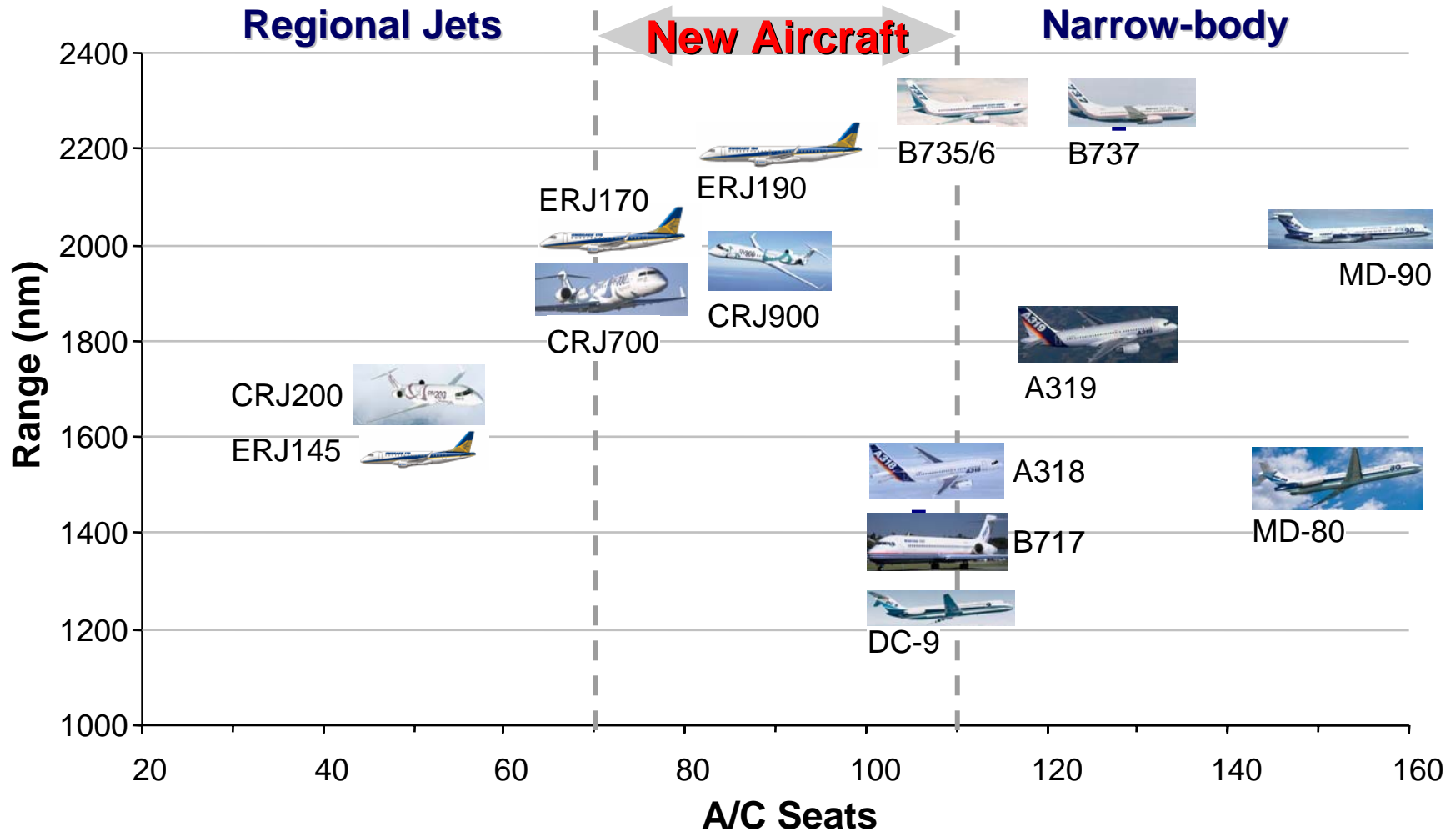


## Total Operating Cost per Trip when Pilot Cost/Block Hour is Normalized to \$450





# RJ-NB Boundary Blurred



Source: based on manufactures' a/c specifications. Full pax range of standard version





# EMB 170

- **March Deliveries**

- Lot
- Alitalia
- US Airways

- **Orders**

- US Airways
  - ◆ 85





# EMB 190

- **First Flight**
  - 3/12/04
- **Orders**
  - Jet Blue
    - ◆ 100
  - Air Canada
    - ◆ 45





# A-380

---

- **A380 Baseline**
  - Shrink
  - Stretch
  - ER Variants
- **555 passengers (3 class)**
- **14,800km/8,000nm range**
- **Payload: 330,000lbs over 10,400km/5,600nm**
- **Rolls-Royce Trent 900 engines or GP7200 engines**



# Boeing 7E7

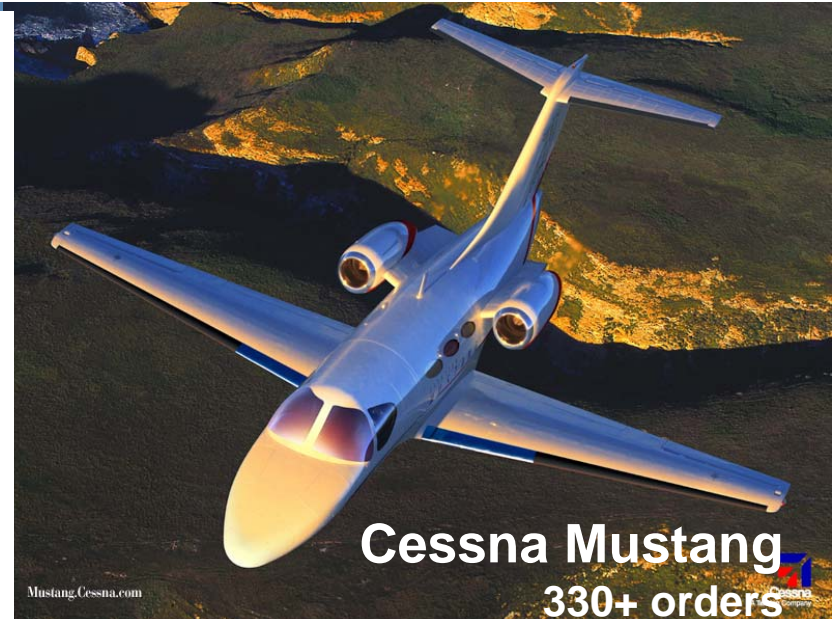


- 200 pax, 7800 nm range
- 50 firm orders by All Nippon Airways (ANA)

•<http://www.boeing.com/commercial/7e7/k62790.html>

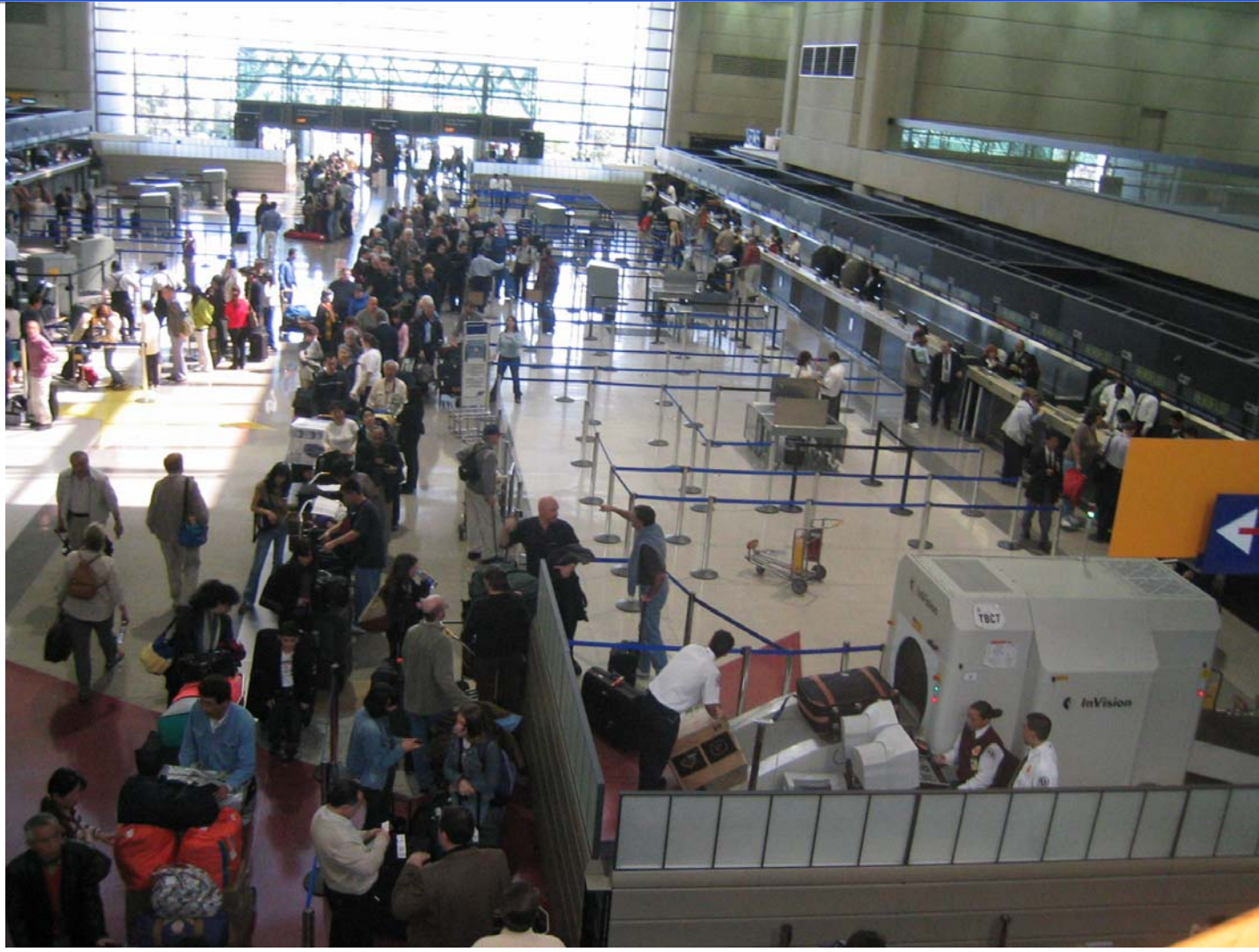


# Small Turbofan Passenger Aircraft





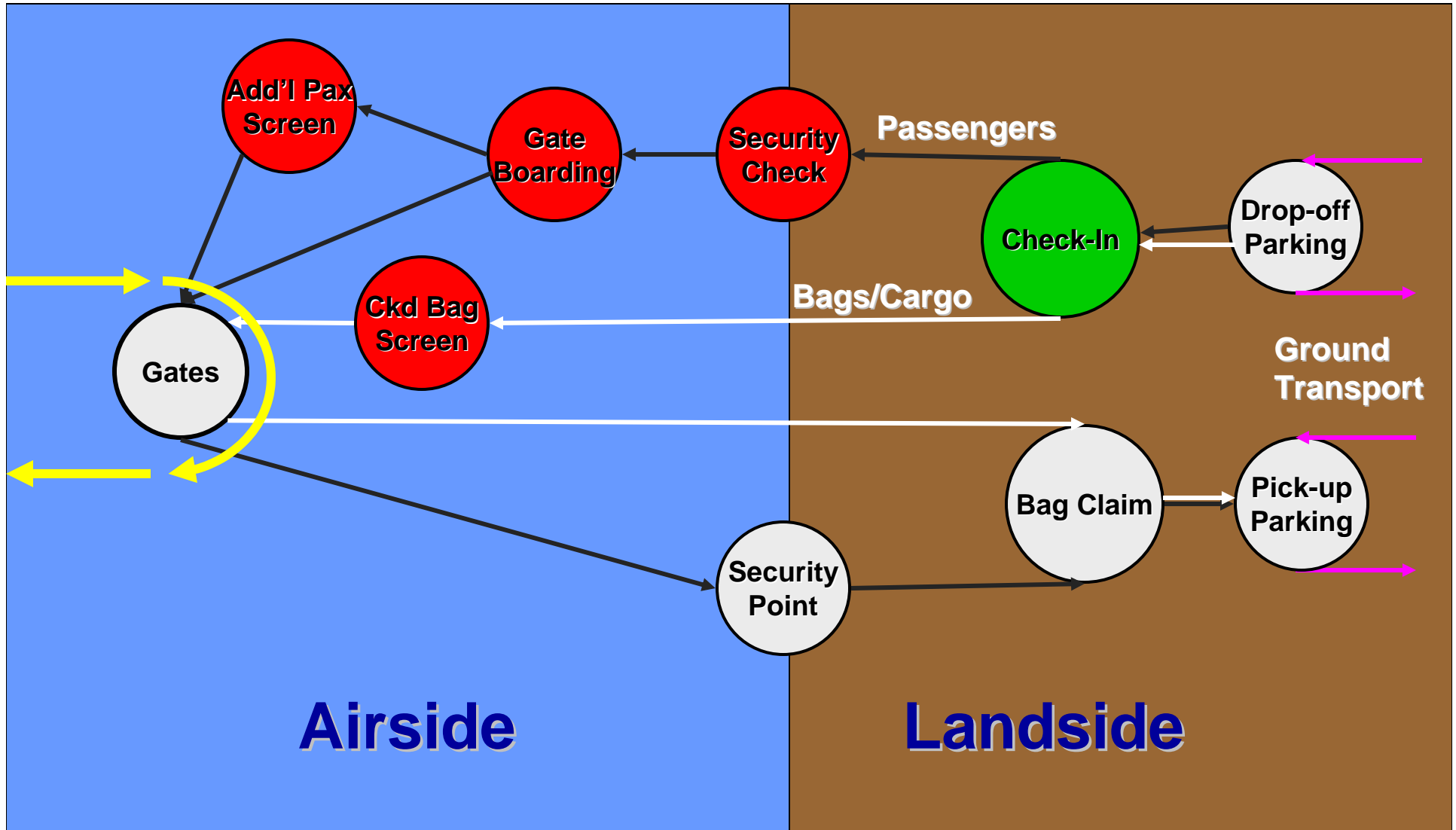
# Security?





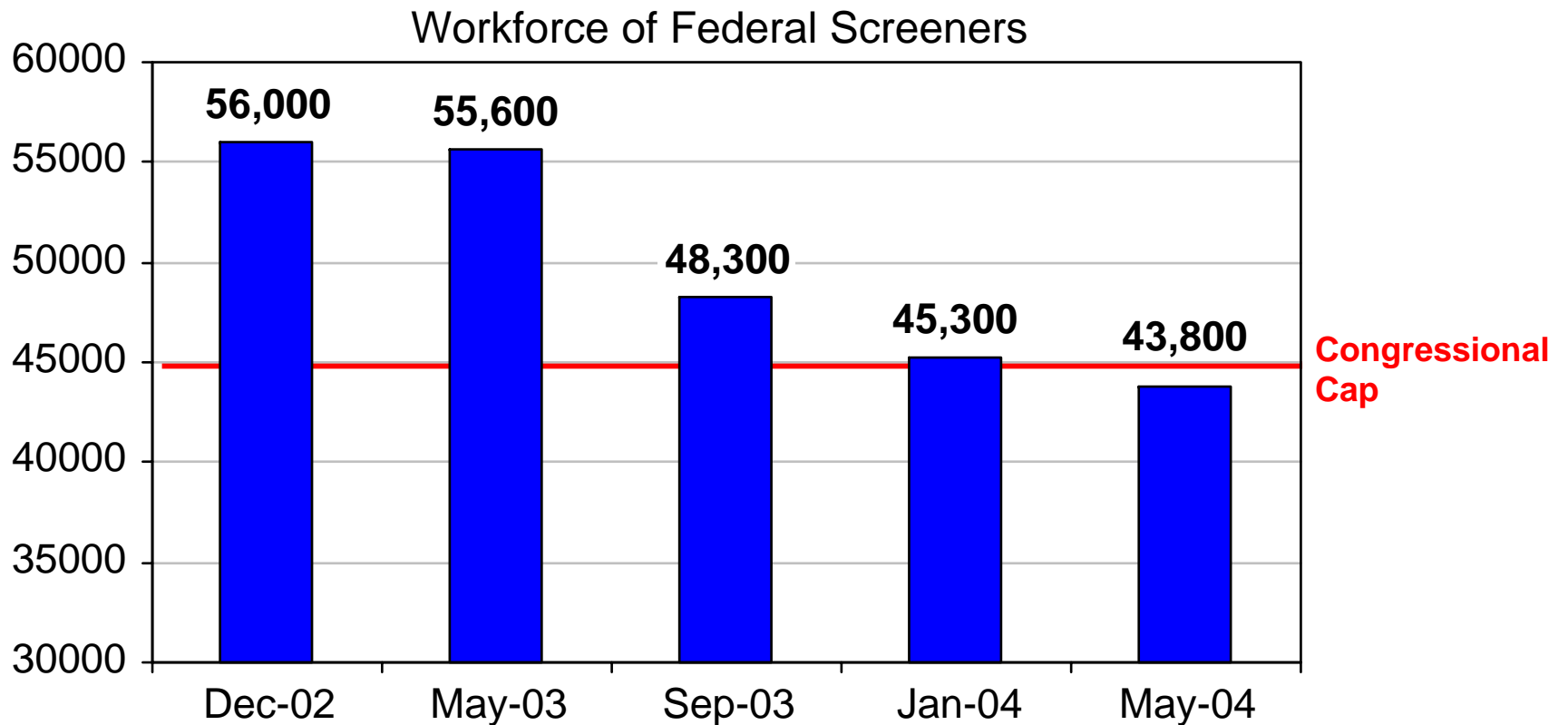
# Passenger Delays Variable

## Airport as an Adaptive System





# Declining Airport Screener Workforce



- **Deployed at 451 commercial airports**
- **Allocation revised to cover busier airports this summer**





# Immigration

---

- **US-VISIT System**

- Photo, Fingerprinting, Biometrics

- Countries in the Visa Waiver Program:** Andorra, Australia, Austria, Belgium, Brunei, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Liechtenstein, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Portugal, San Marino, Singapore, Slovenia, Spain, Sweden, Switzerland and the United Kingdom

- **Parity Programs**

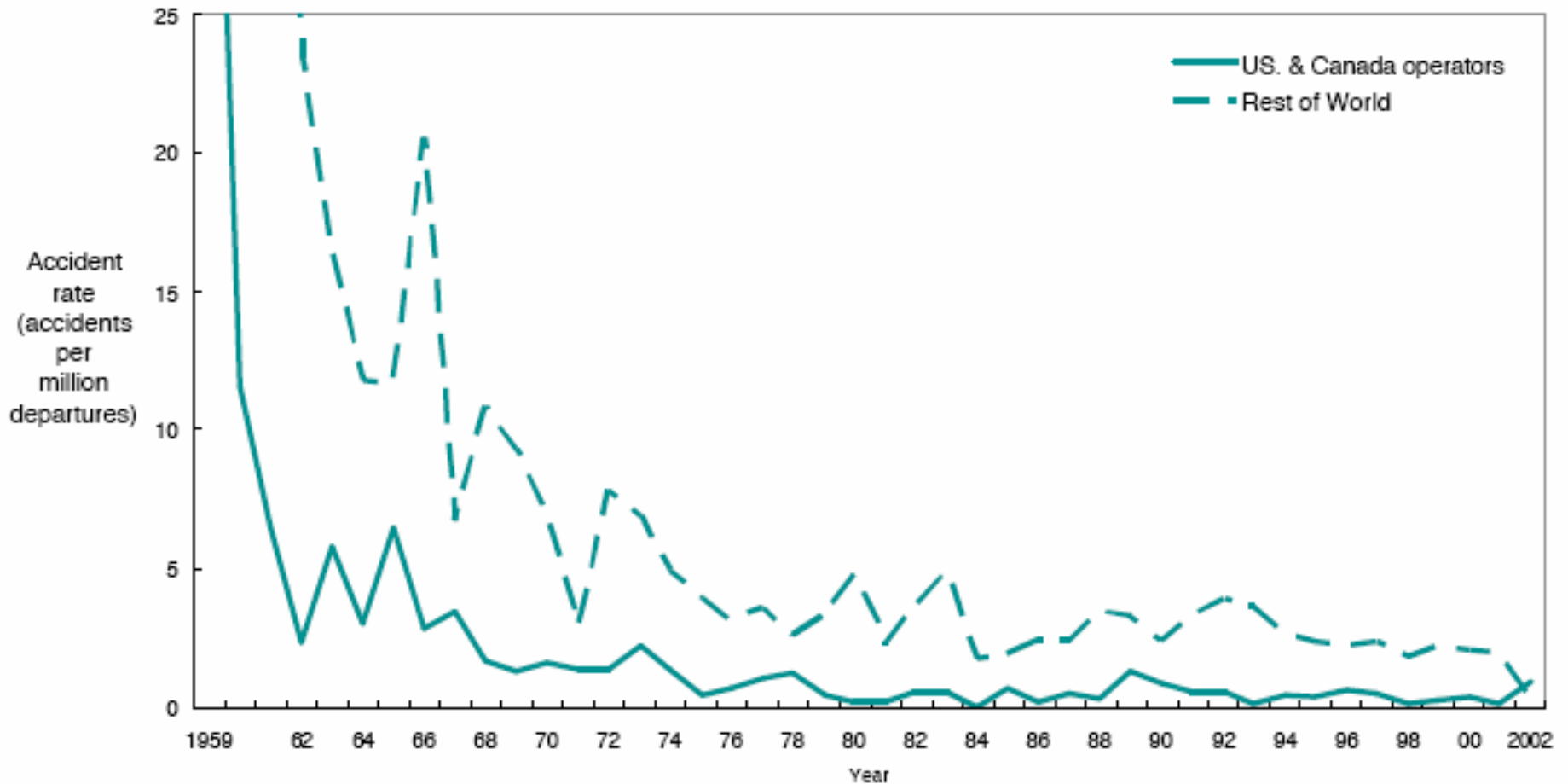
- Brazil, China

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# Safety Trend

Hull Loss and/or Fatal accidents - Worldwide Commercial Jet Fleet - 1959 through 2002



Source: Boeing Statistical Abstract