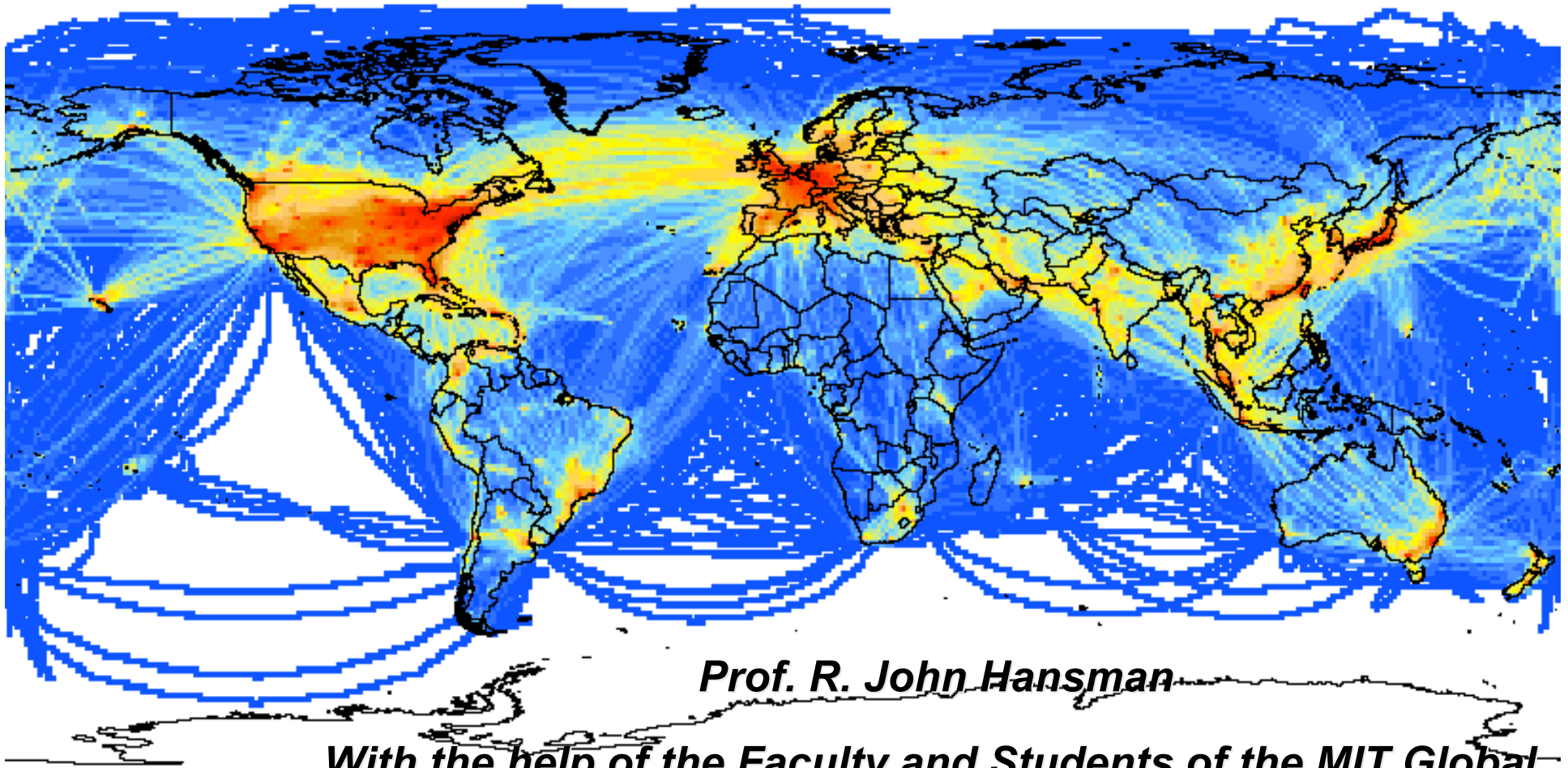




Airline Industry Recent Trend Update (March 2008)

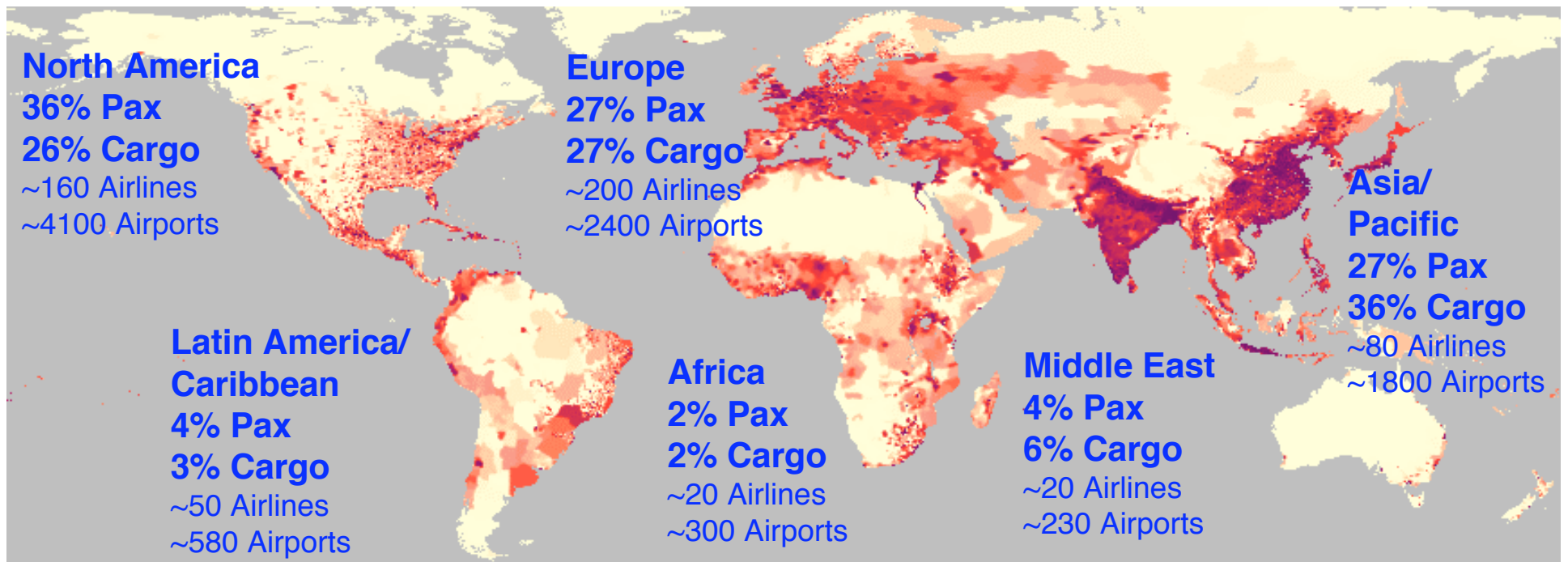


Prof. R. John Hansman

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



World Population Distribution & 2004 Air Transportation Activity



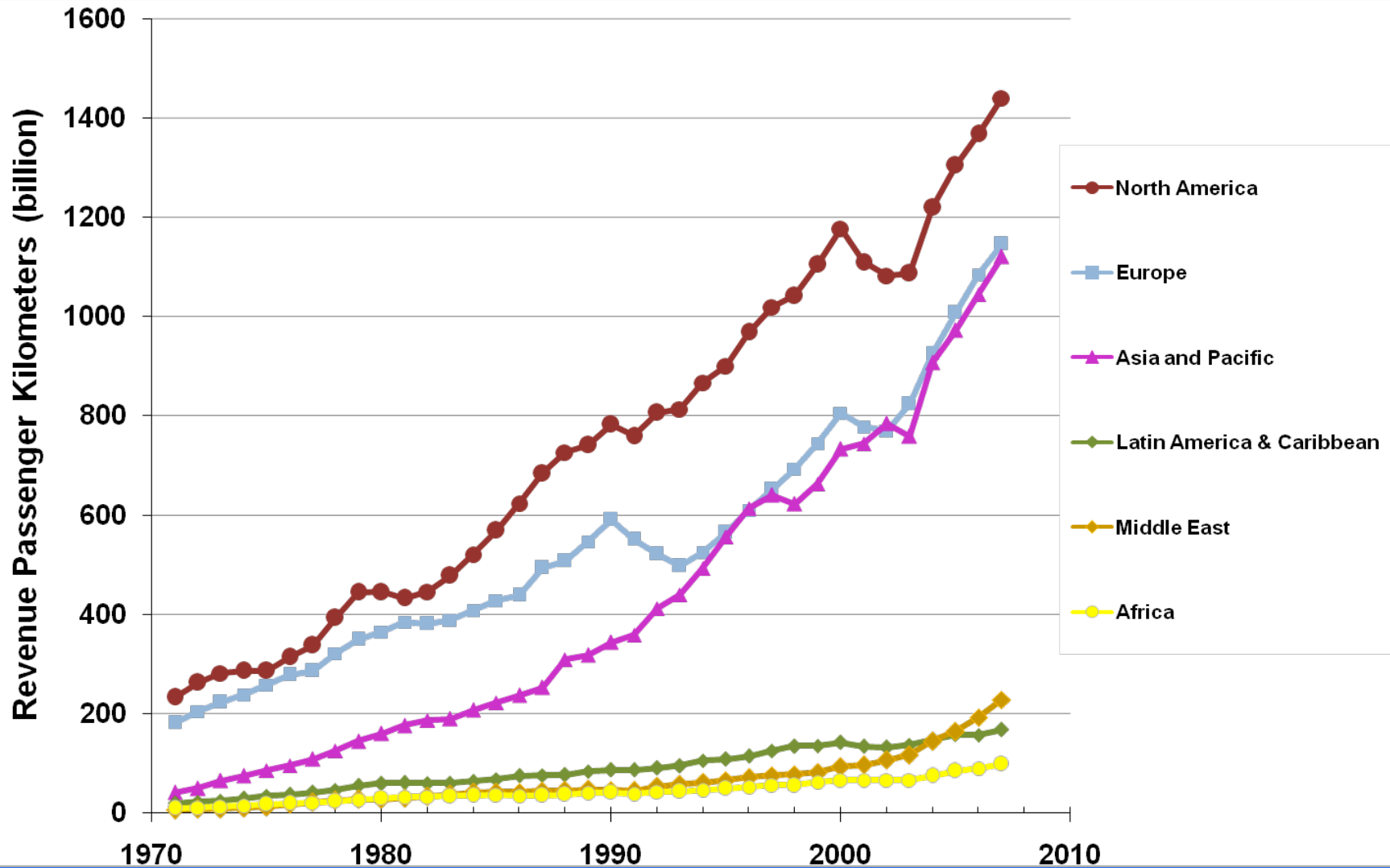
Data source: Population: [URL:<http://www.ciesin.org/datasets/gpw/globldem.doc.html>]

Air Transport: ICAO, R. Schild/Airbus

Passenger and freight traffic represent RPK and FTK share in 2004



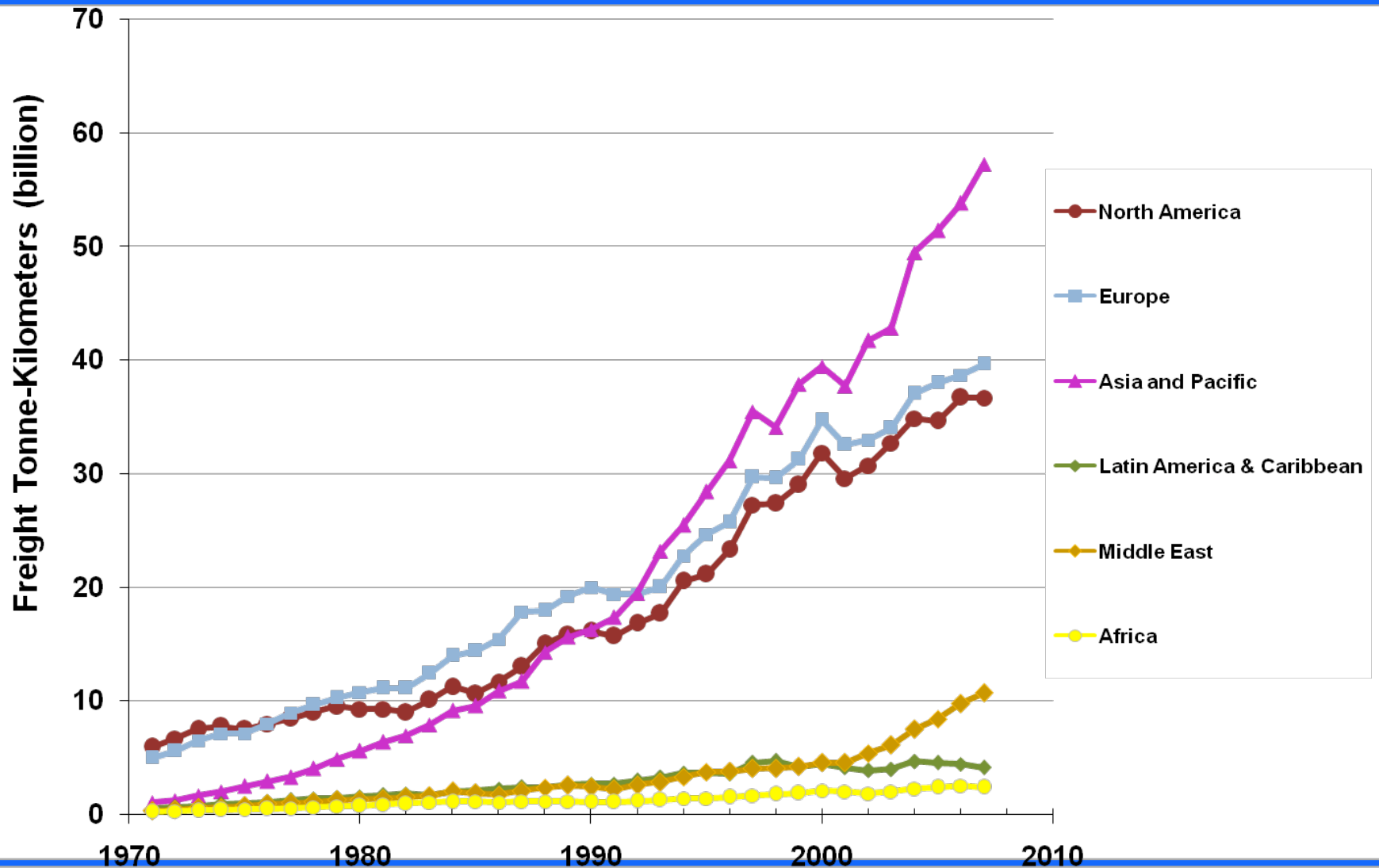
Passenger Traffic Trends (RPK) by World Region



Data source: ICAO, scheduled services of commercial air carriers (through 2006), IATA annual traffic growth data for year 2007 (Jan-Oct)



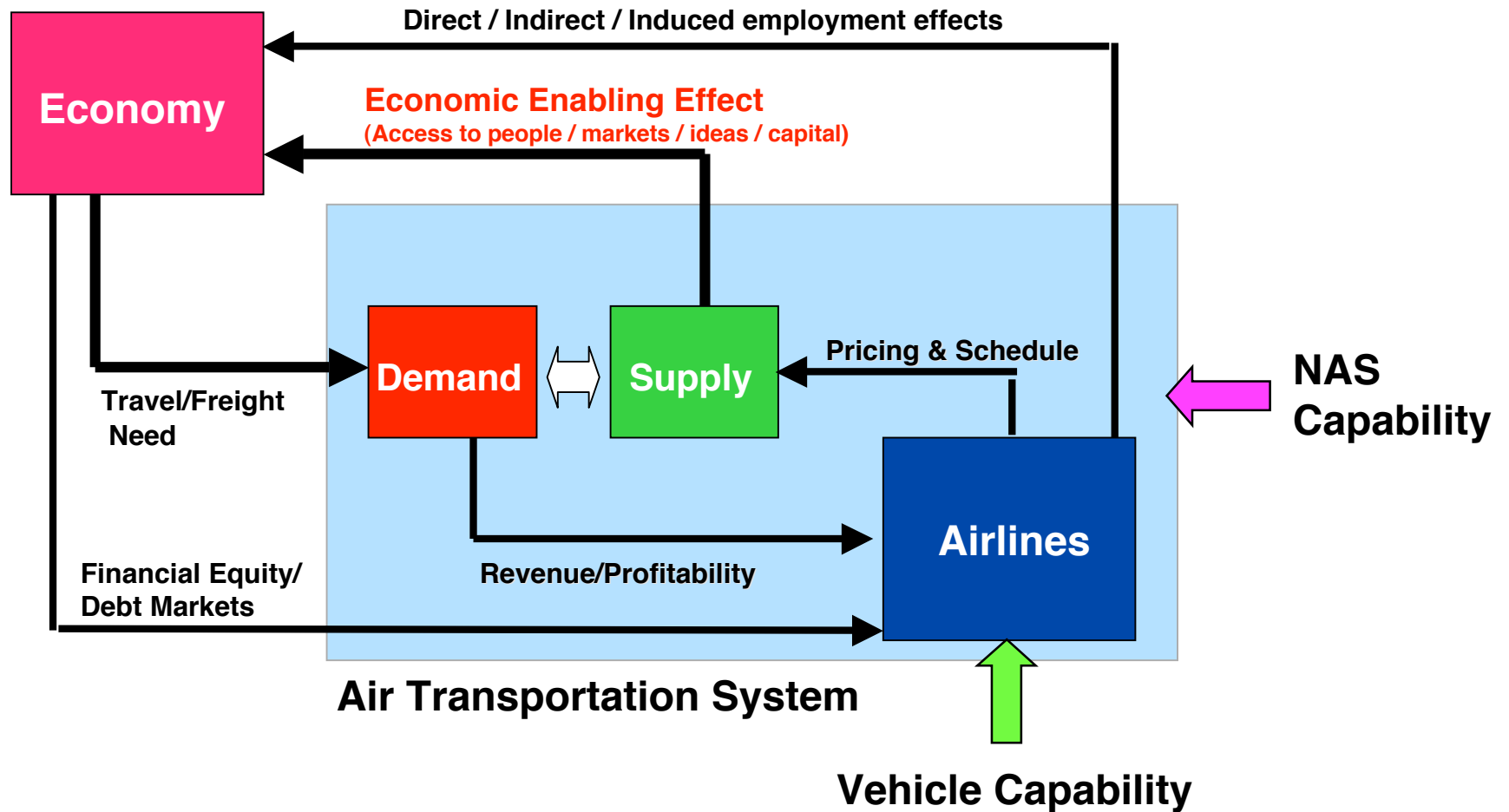
Freight Trends (FTK) by World Region



Data source: ICAO, scheduled services of commercial air carriers (through 2006), IATA annual traffic growth data for year 2007 (Jan-Oct)

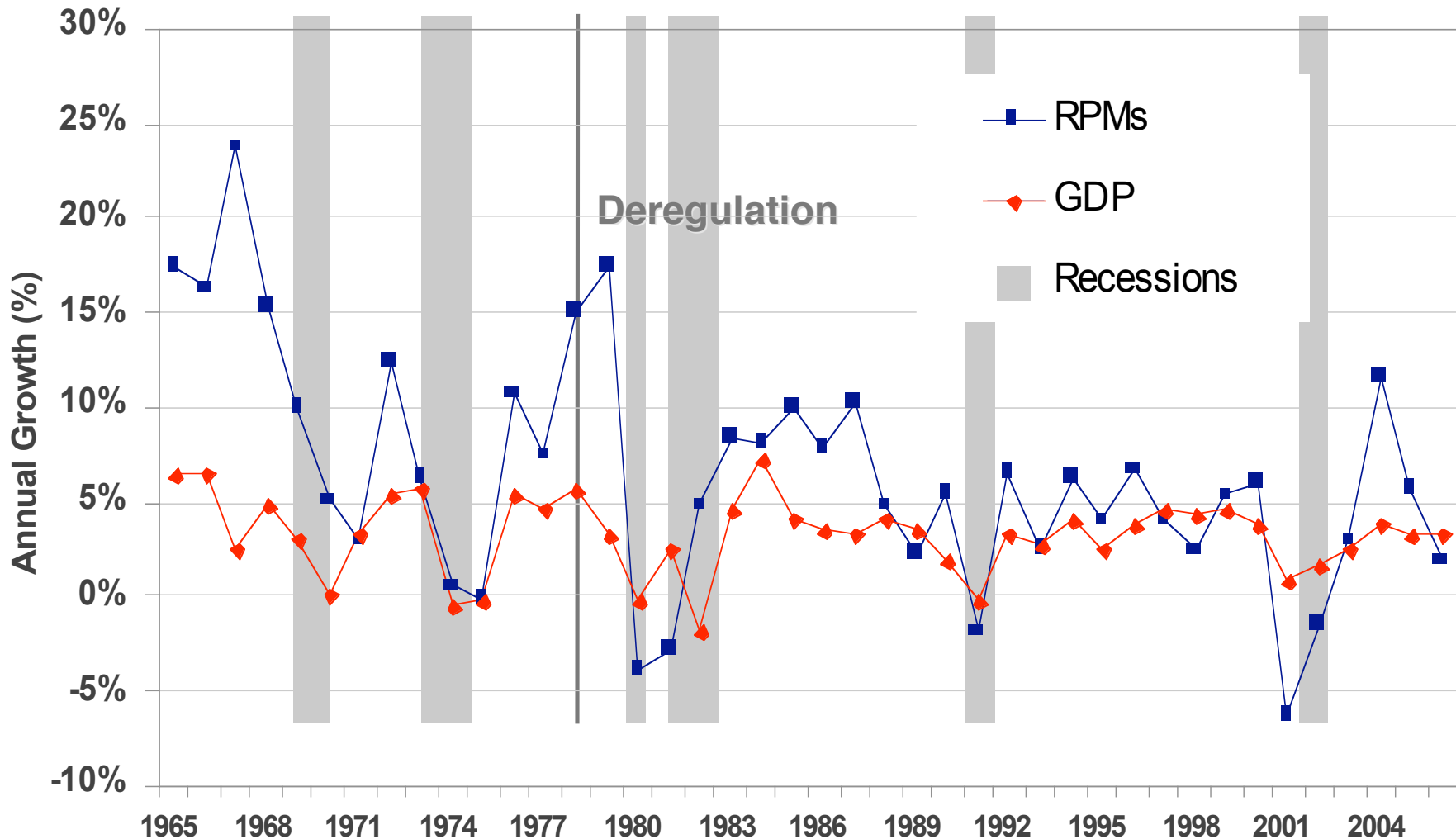


Relationship Between Economy and Air Transportation





Correlation Between US GDP and Passenger Traffic



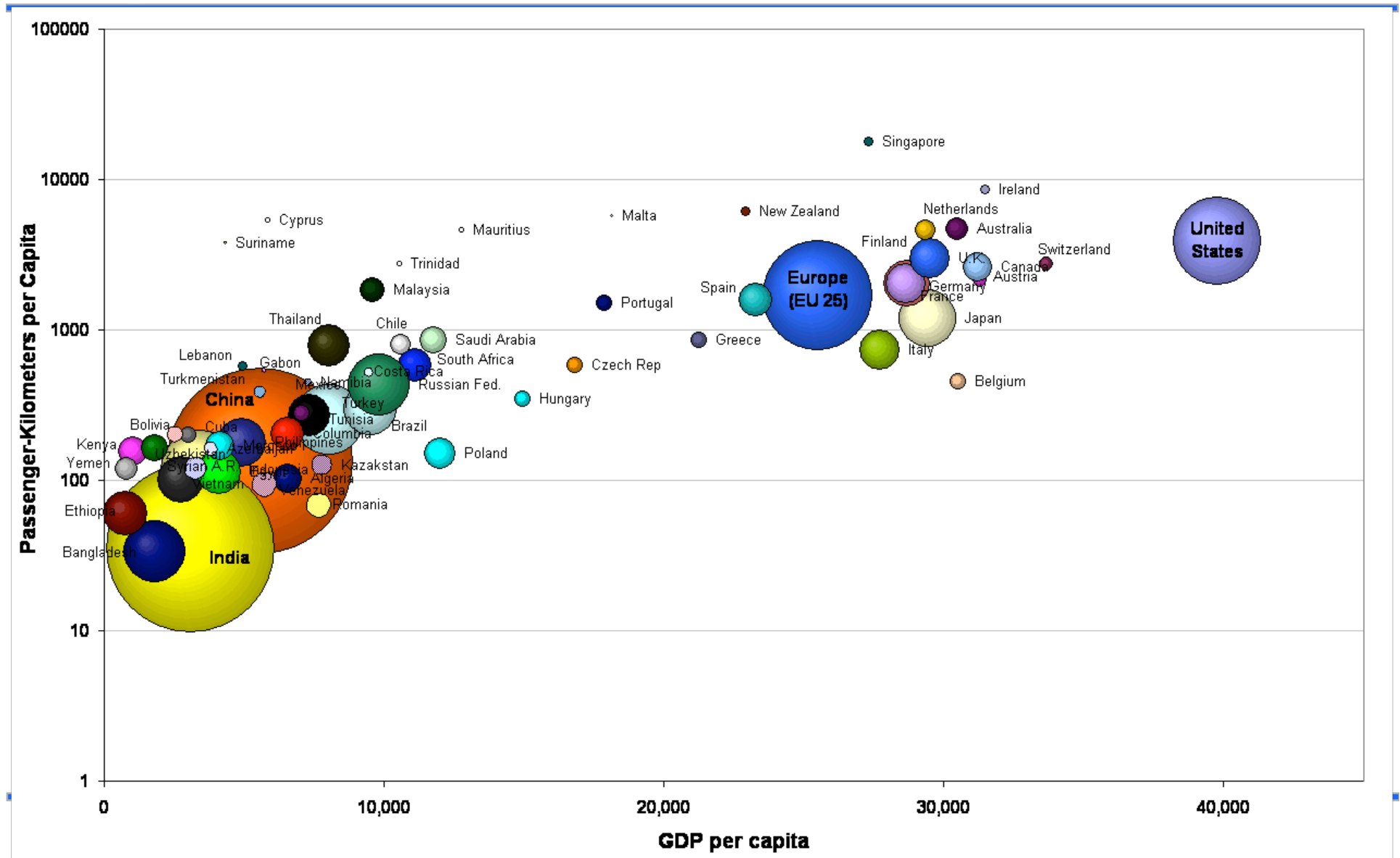
Data source: RPMs: Bureau of Transportation Statistics, (BTS)

GDP: US Bureau of Economic Analysis

Recession data: National Bureau of Economic Research



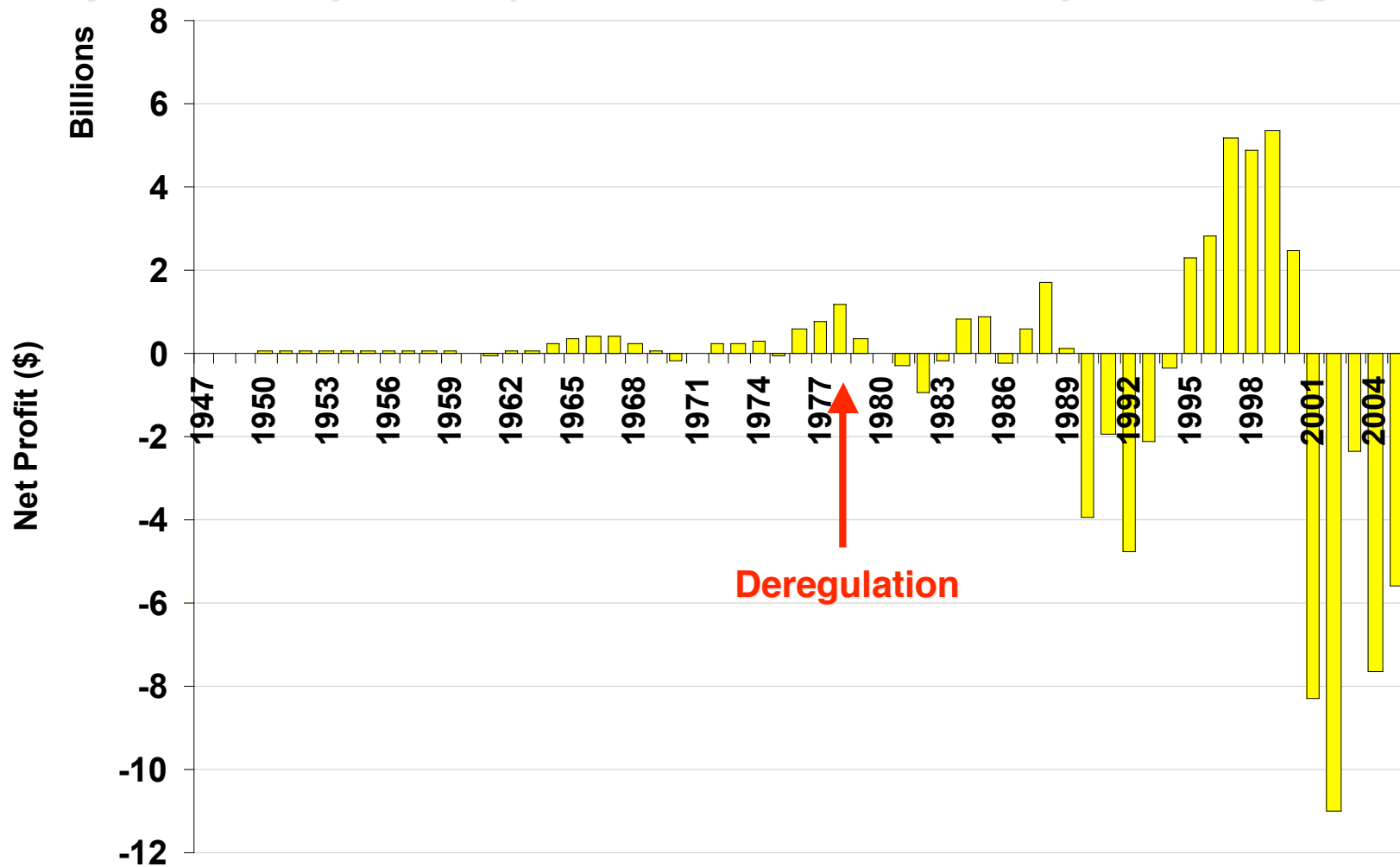
Air Transportation Markets 2004 Data





Macro Scale Drivers US Airline Net Profit

Cyclic Industry with Exponential Growth In Volatility Since Deregulation

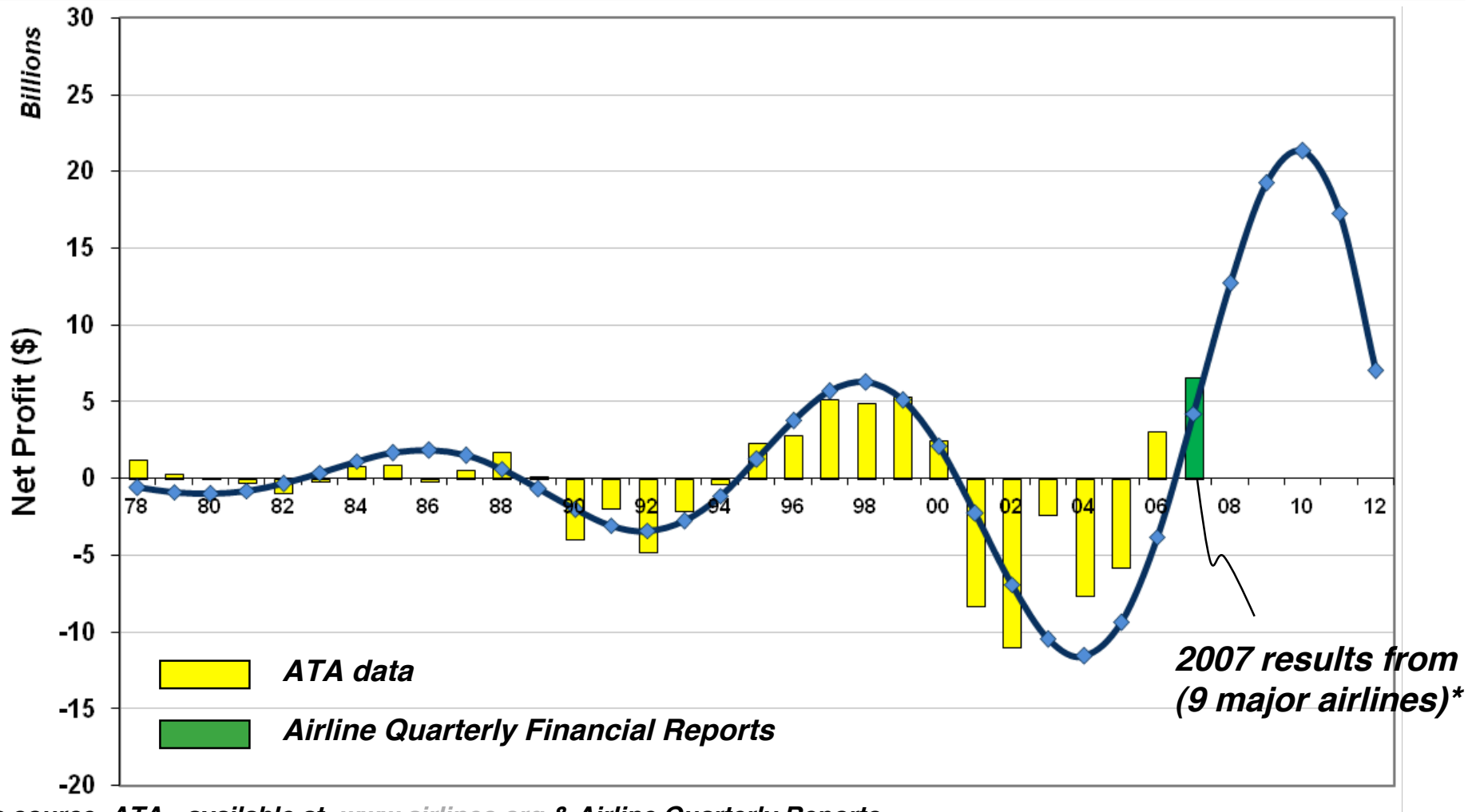


Data source: ATA Annual Revenue and Earnings - Net Profit and Loss



US Airlines Net Profit

Best Fit of Undamped Oscillation
 Cycle Period = 11.3 yr eFolding Time = 7.9 yr



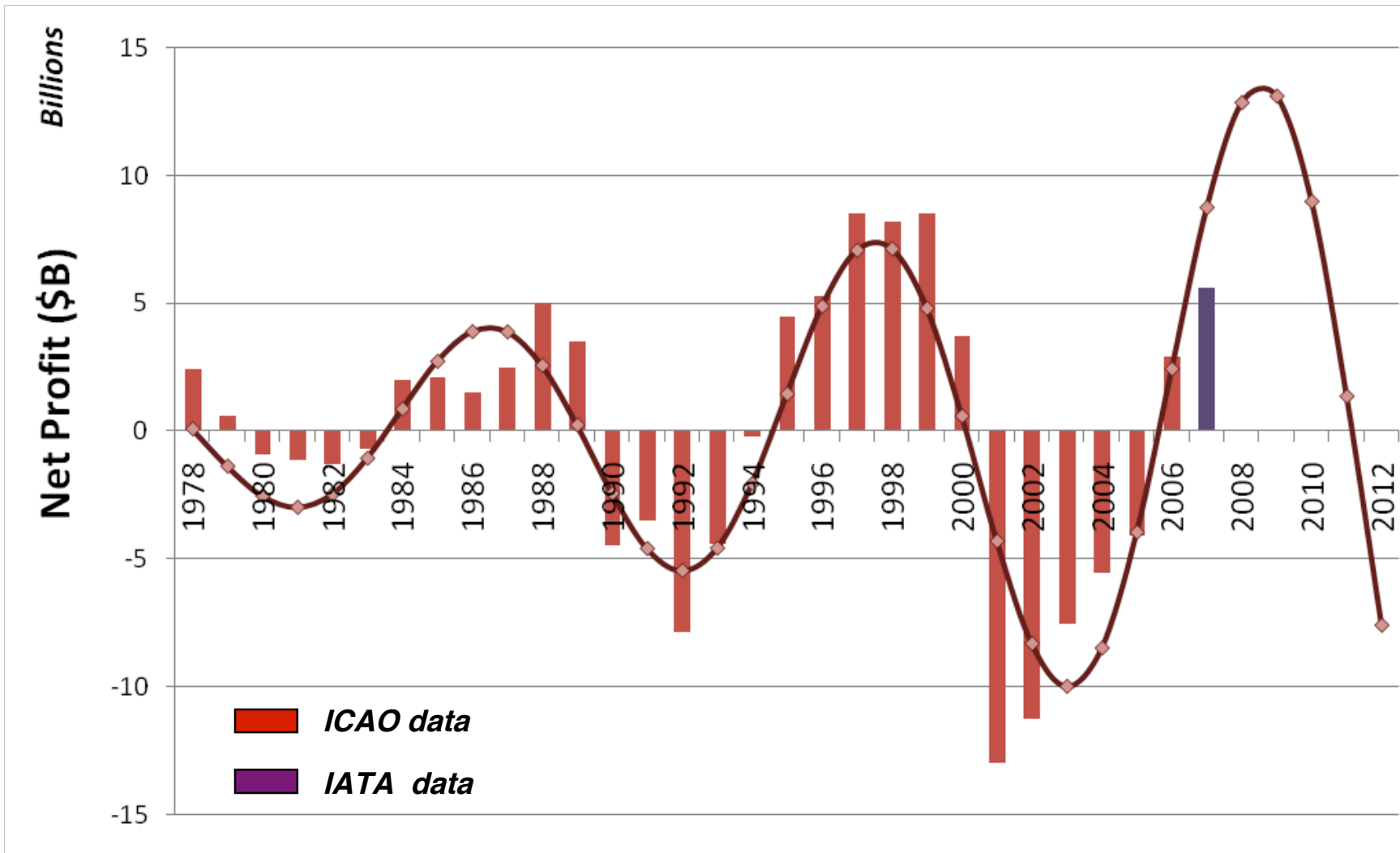
Data source: ATA - available at: www.airlines.org & Airline Quarterly Reports

*Note: Airlines; American Airlines, United Air Lines, Delta Air Lines, Northwest Airlines, Continental Airlines, US Airways, Southwest Airlines, JetBlue Airways, Alaska Airlines,
 Excludes; Continental airlines 2007 Q4 results, Includes: Delta Airlines & Northwest Airlines Q2 2007 reorganization items.



World Airlines Net Profit

historical data between 1978 to 2007 –
with projection to 2012



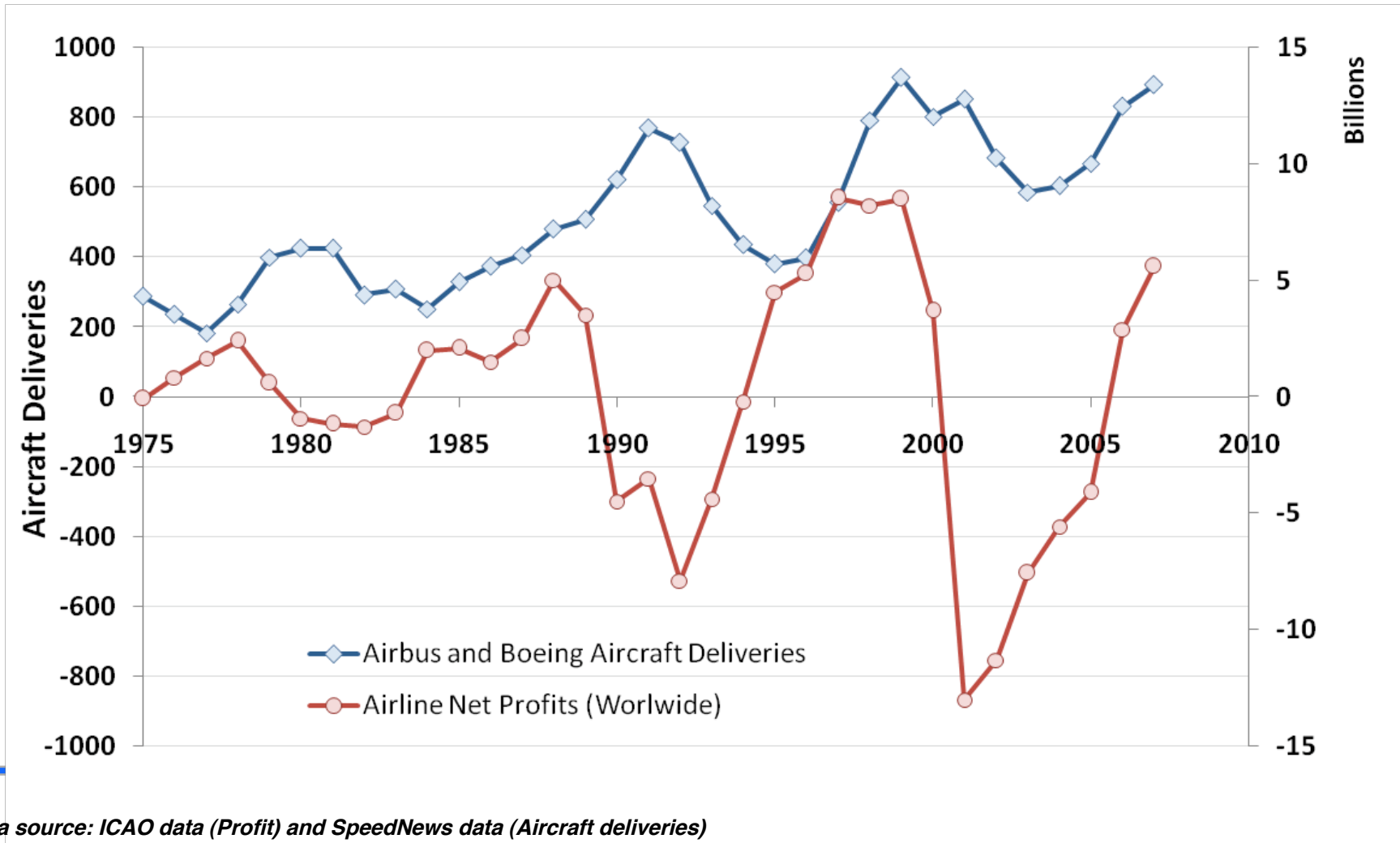
Data source: ICAO data (1978 to 2006) and IATA (2007)

Note: IATA represents 250 airlines comprising 94% of the international scheduled air traffic



Net Profit and Aircraft Deliveries

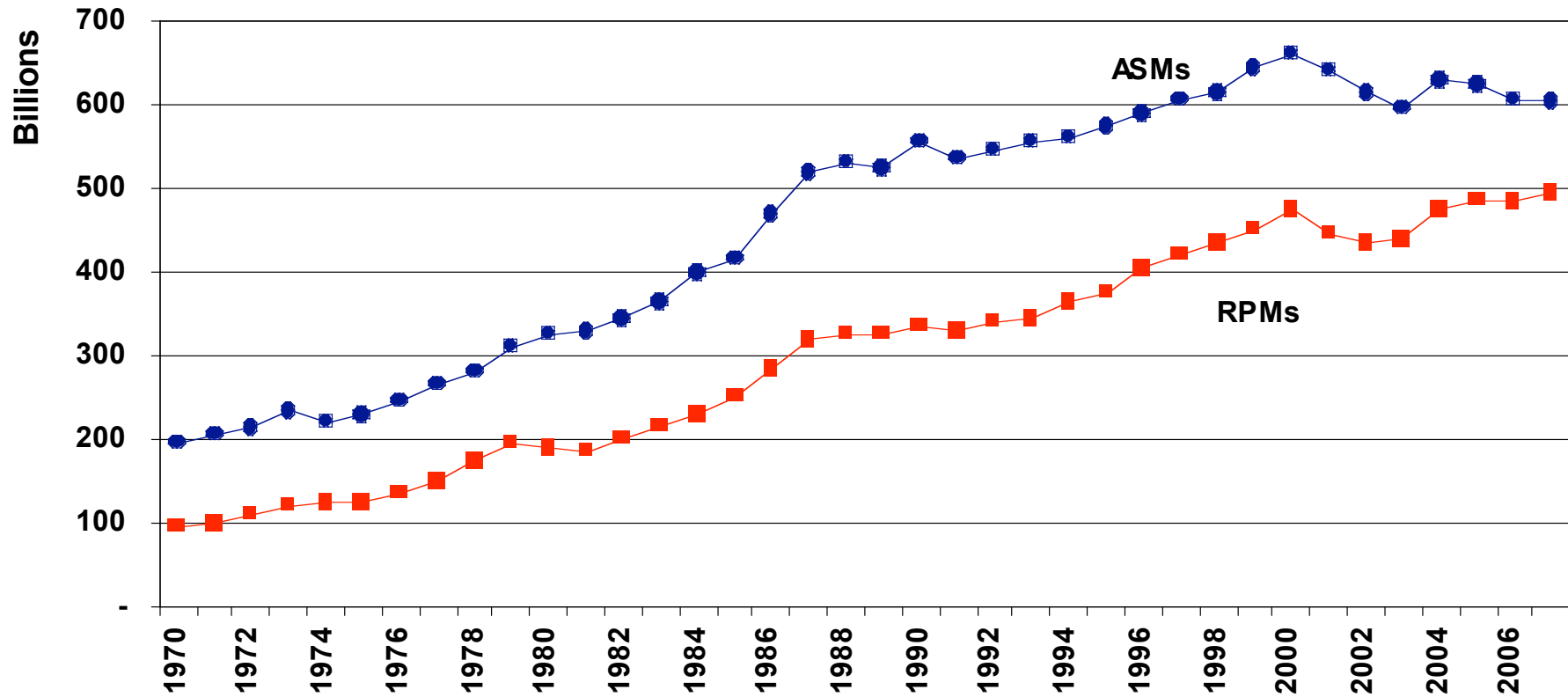
Hypothesize that instability driven by capacity response phase lag



Data source: ICAO data (Profit) and SpeedNews data (Aircraft deliveries)



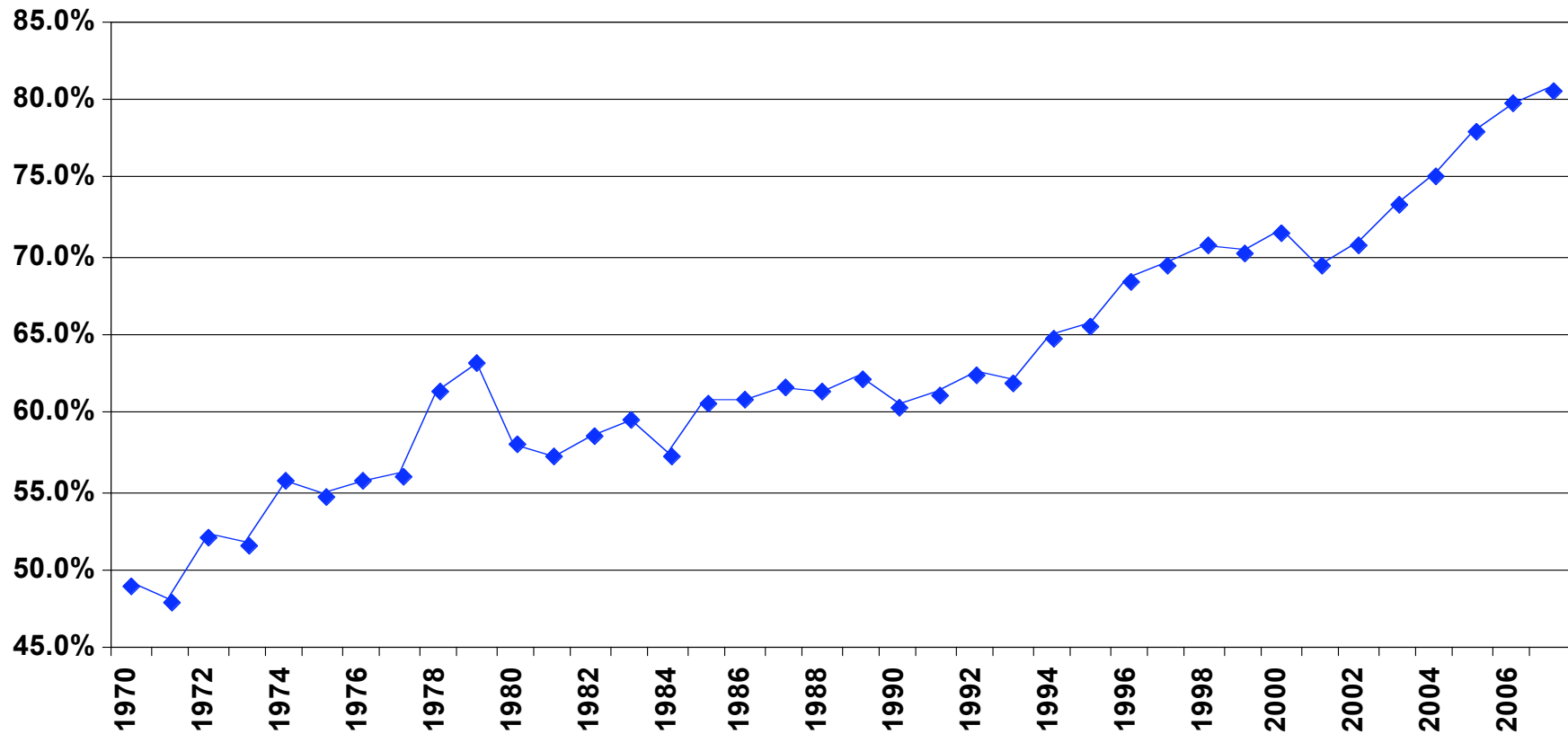
U.S. Domestic ASMs and RPMs



Data source: ATA, US member airlines, scheduled mainline service



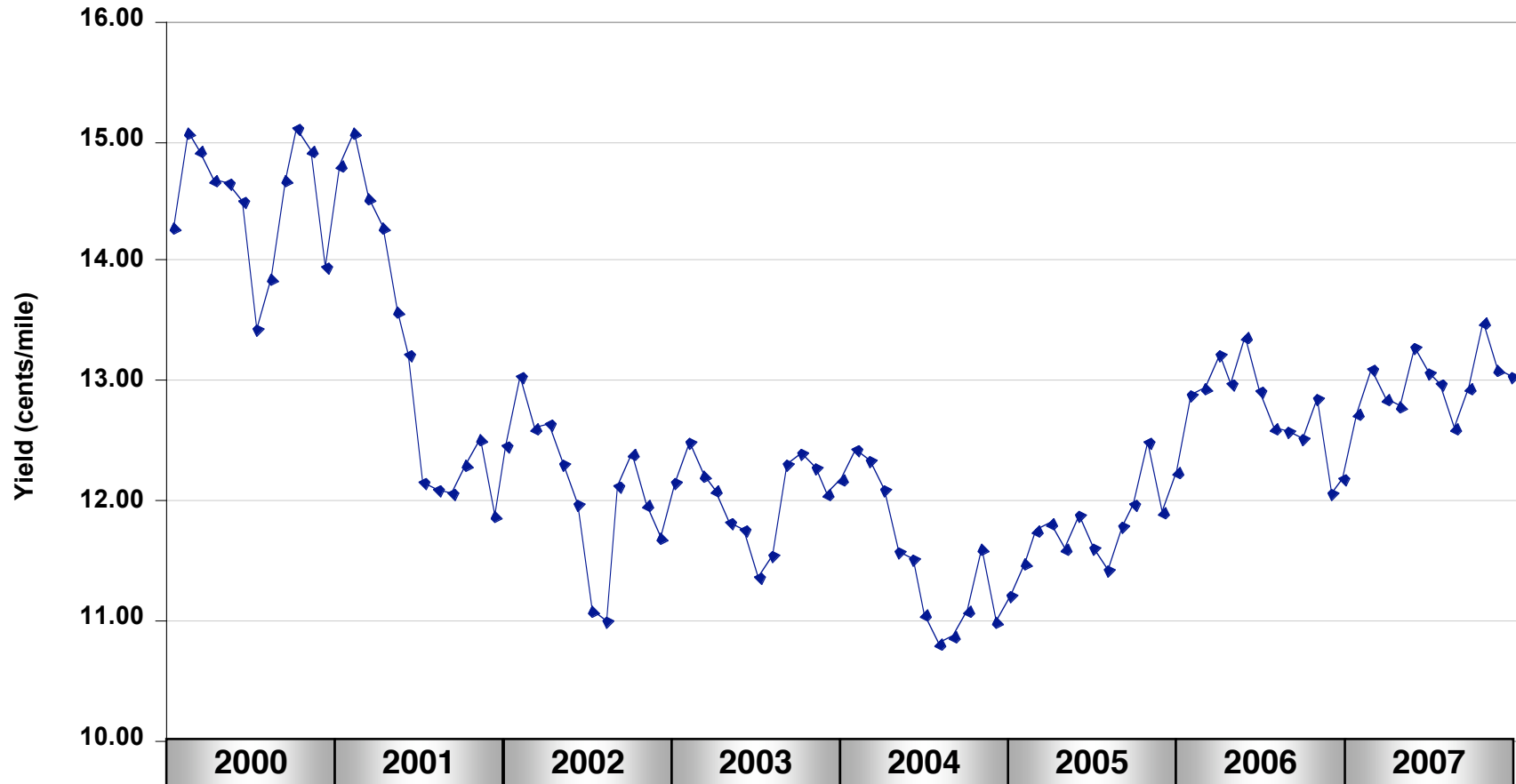
U.S. Domestic Average Load Factor



Data source: ATA, US member airlines, scheduled mainline service



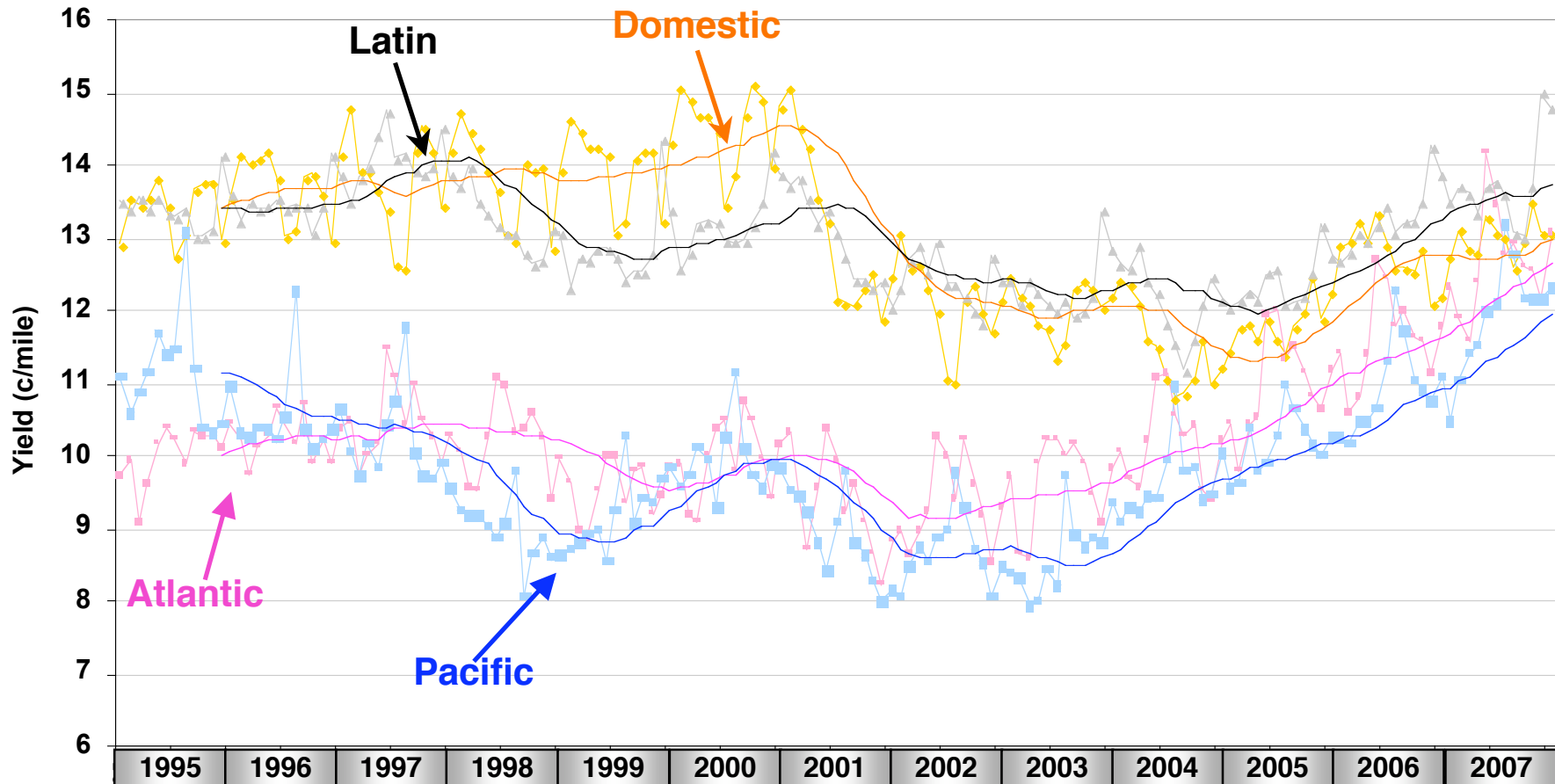
U.S. Average Domestic Yield



Data source: ATA Monthly Passenger Revenue Report, 7 US major airlines excluding Southwest (WN).



Historic Yield Trend 1995-2007

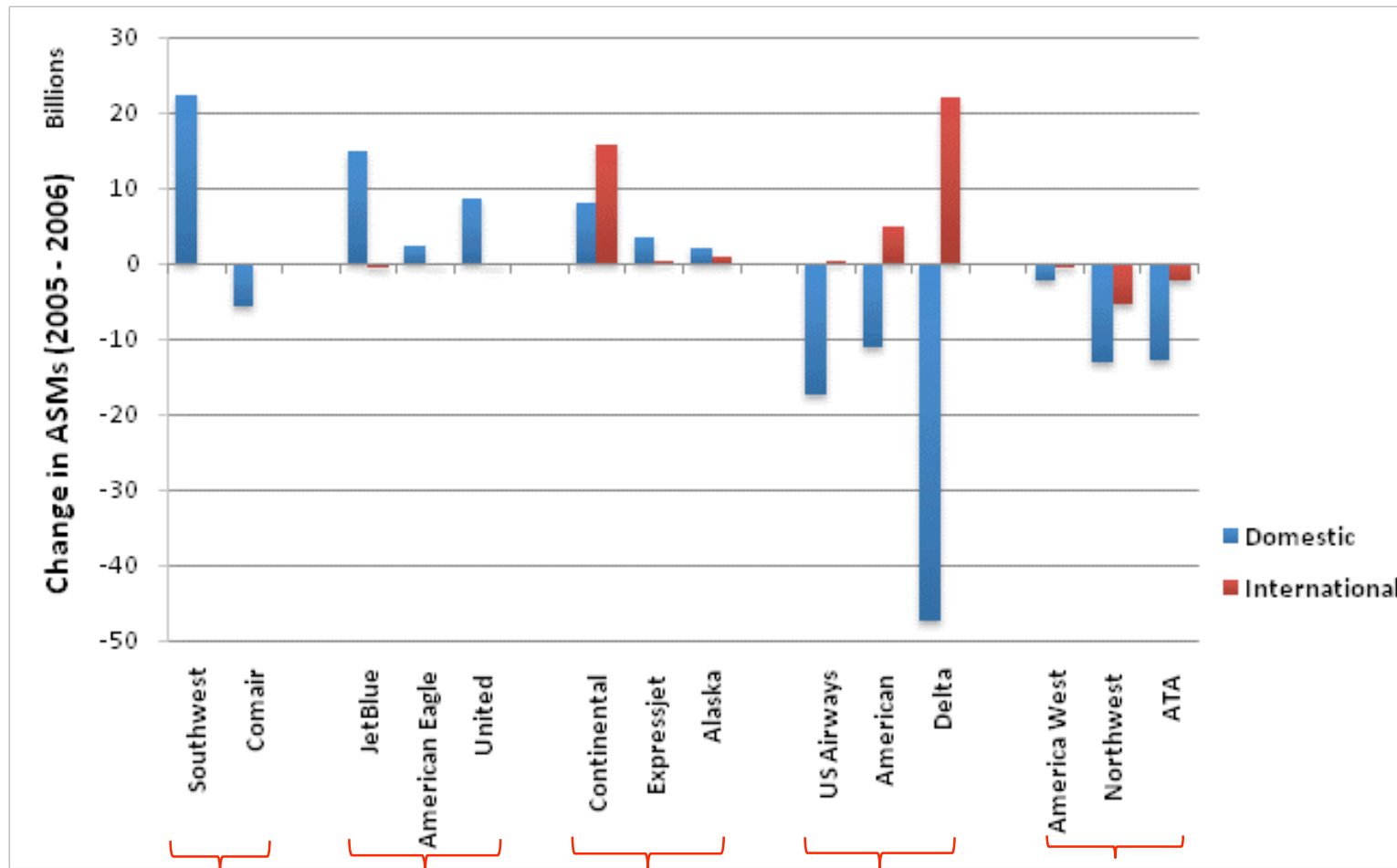


Data source: ATA Passenger Yield Report, 7 US major airlines excluding Southwest (WN).



Capacity Allocation Strategies

(Domestic vs. International ASMs – from 2005 to 2006)



Domestic only

Domestic focus

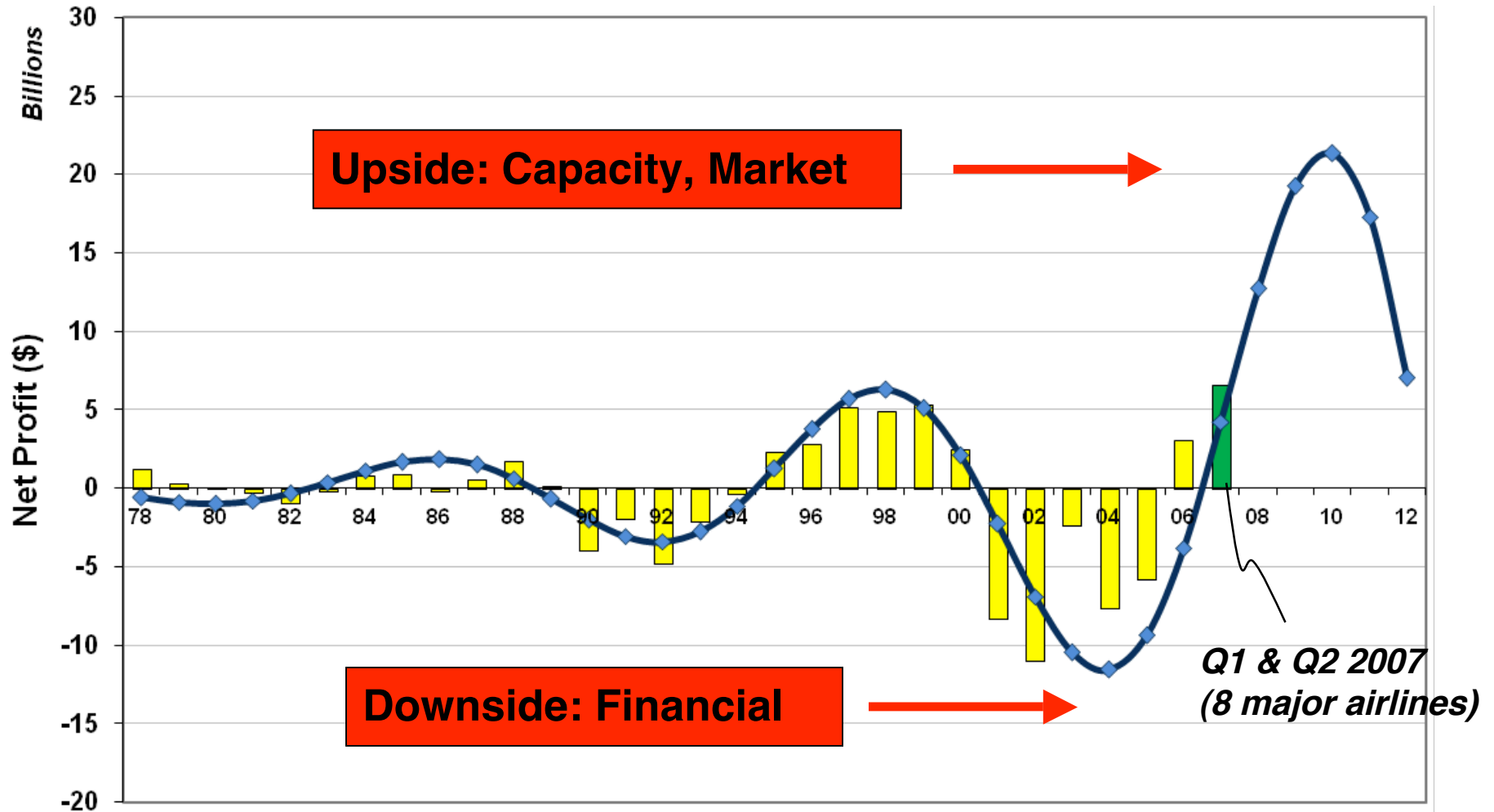
Scale up capacity in both segments

Shift from domestic to int.

Scale down capacity in both segments



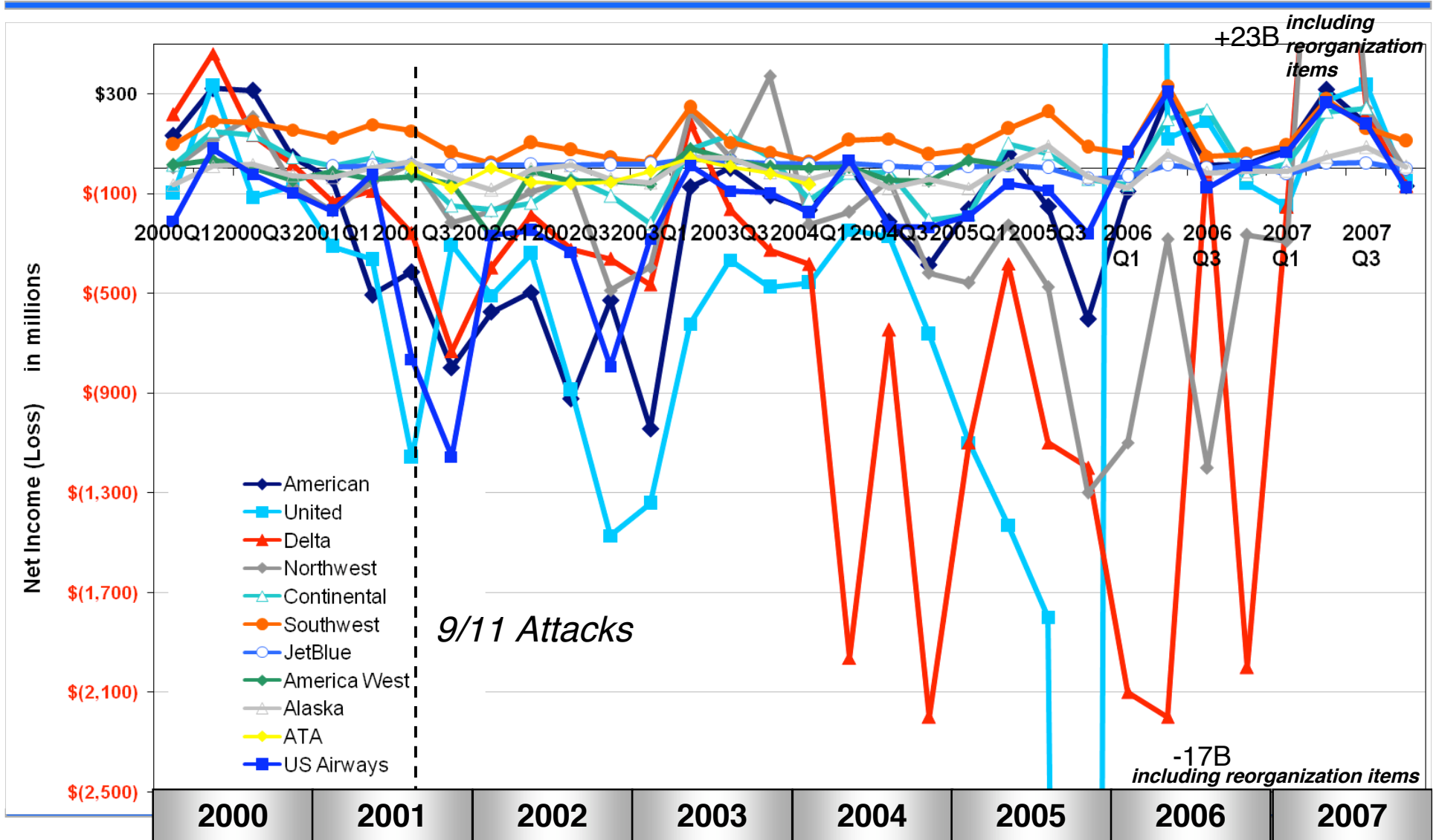
Growth Limits Constraints vs Damping



Data source: ATA - available at: www.airlines.org & Airline Quarterly Reports



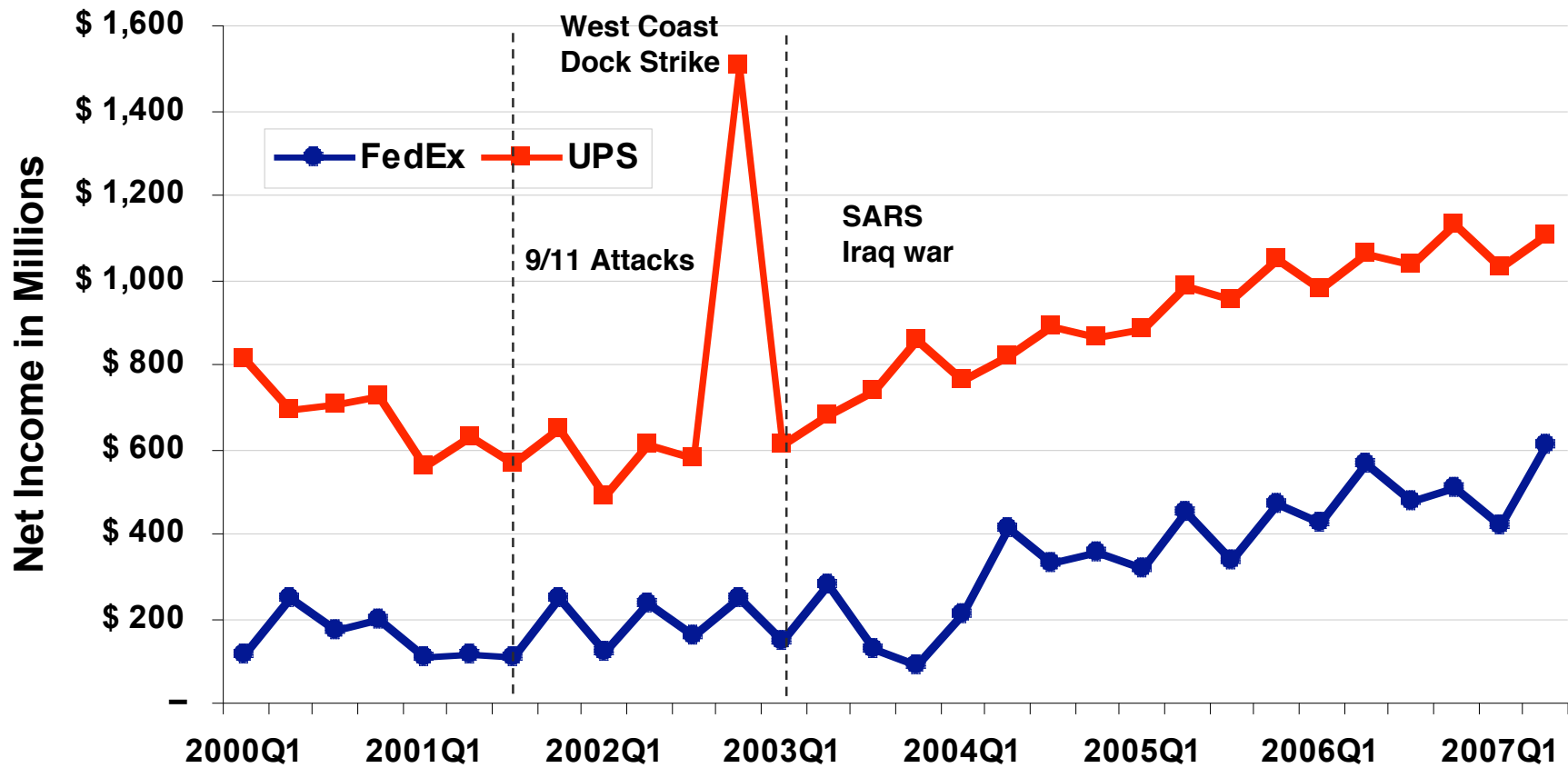
Airline Profits



Data source: Airline quarterly reports, profits and losses including reorganization items



Cargo Operations Profitable

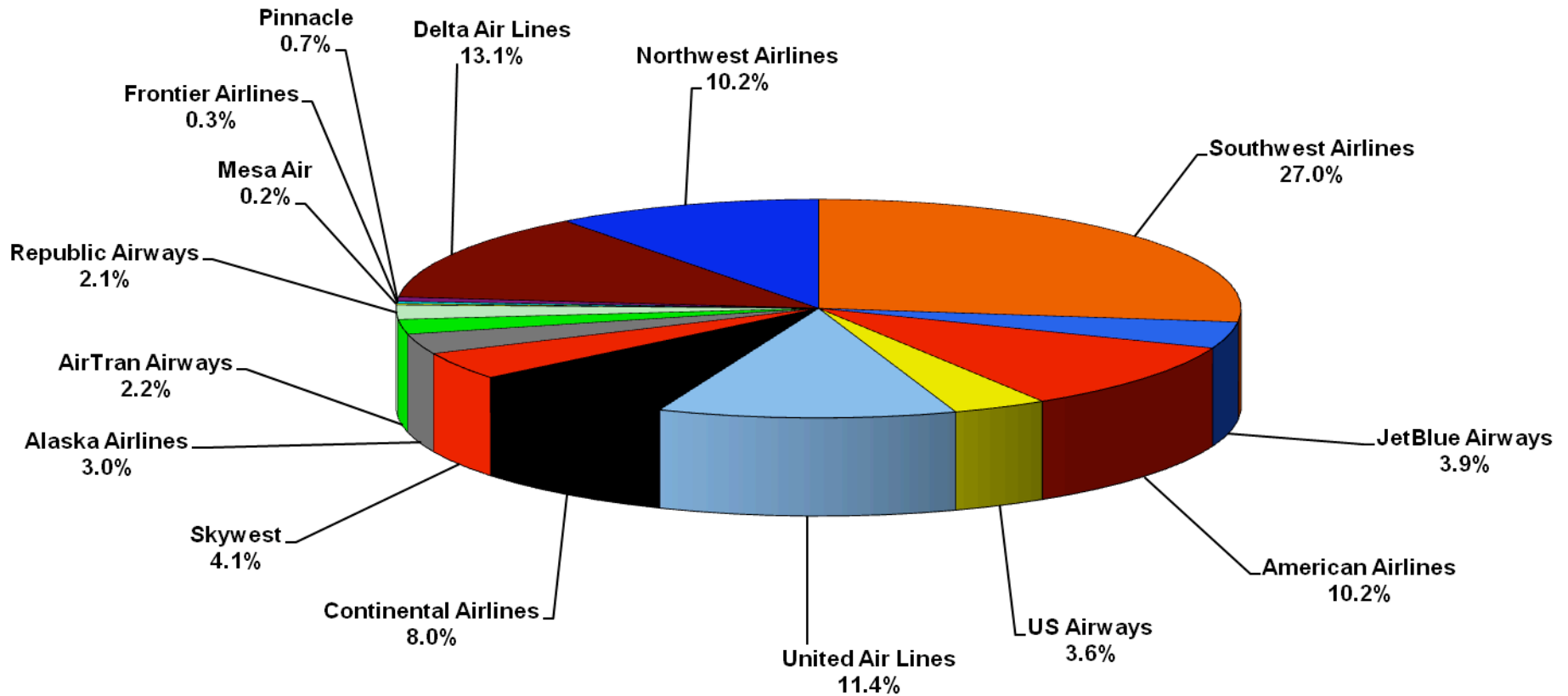


Data source: Companies' annual reports



Market Cap: US Majors

26-Feb-2008

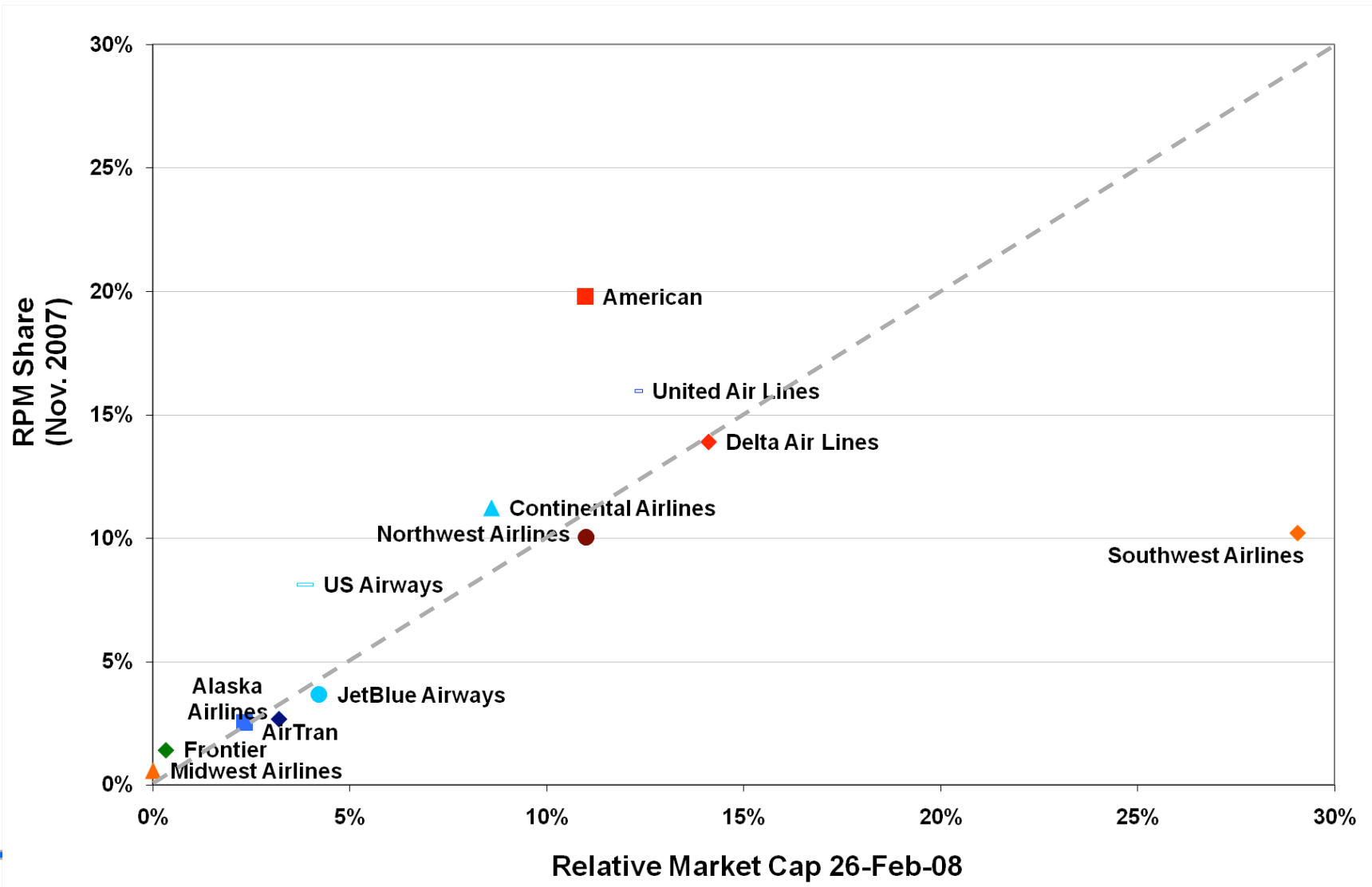


Total Market Cap: \$ 35.2 billion



RPM Share vs. Market Cap

(RPM: May 2007 / Market Cap: Sept 4th 2007)

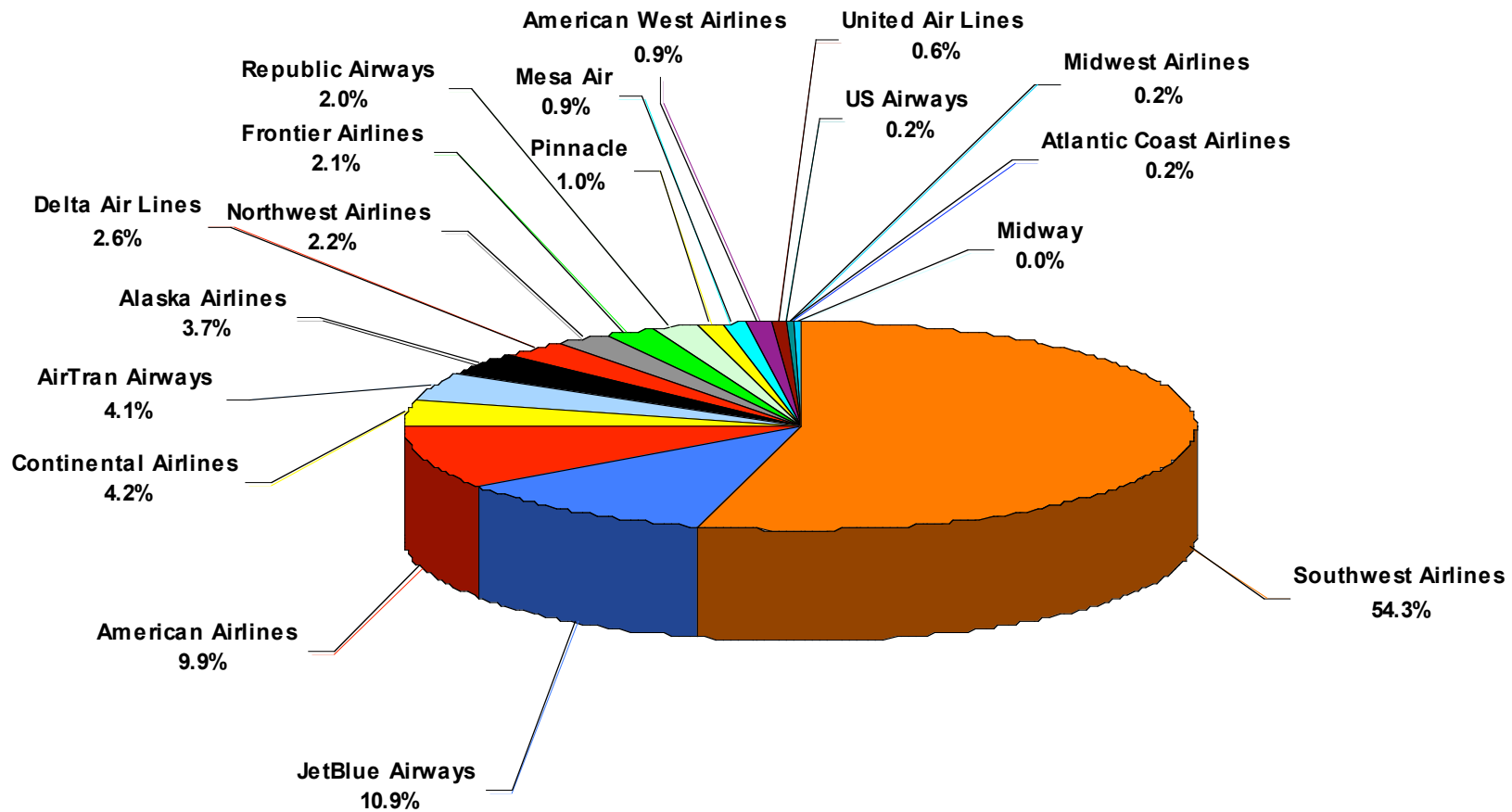


Source: Yahoo! Finance and Bureau of Transportation Statistics



Market Cap: US Majors

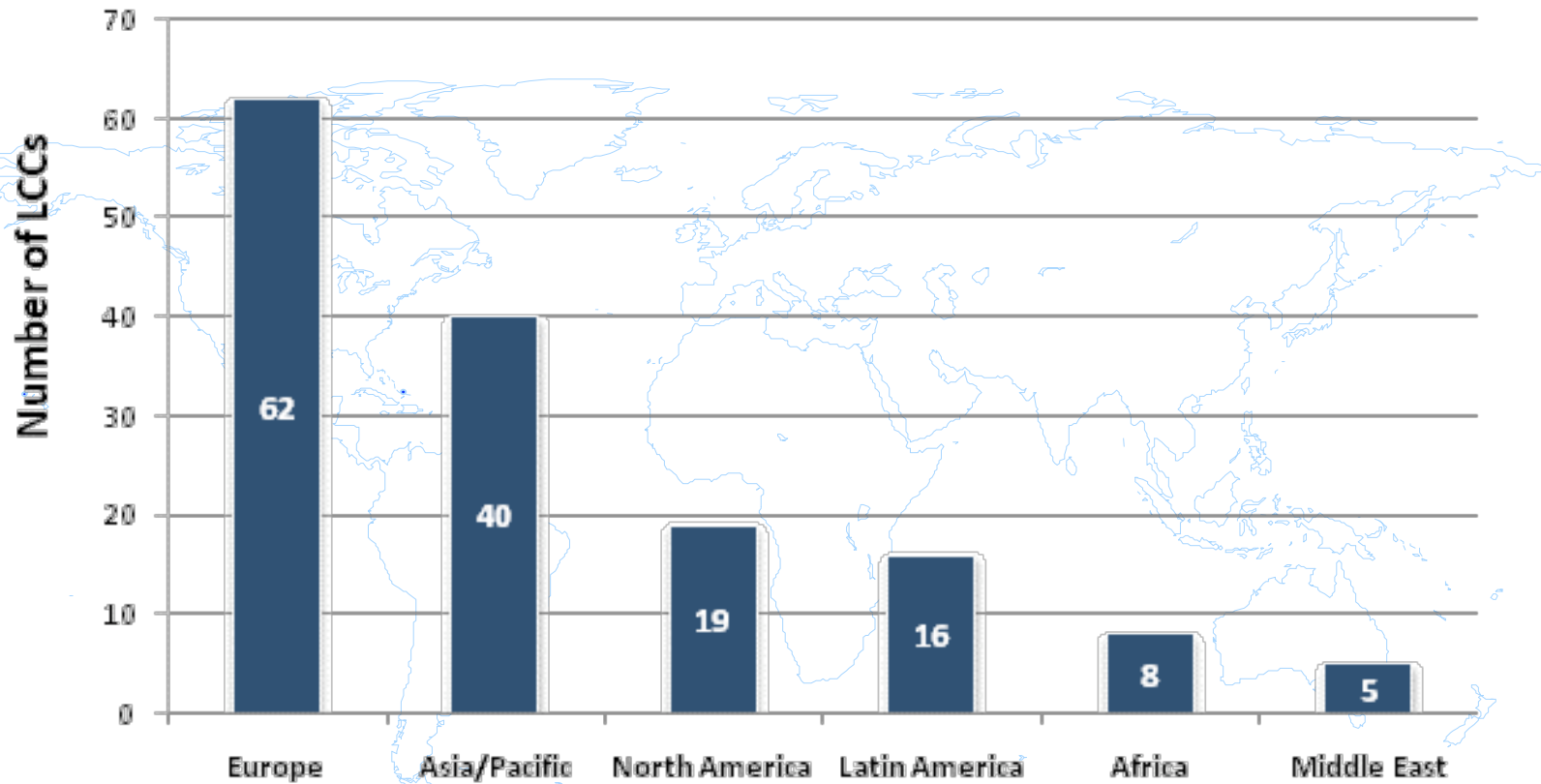
26-May-2005



Total Market Cap: \$21.2 billion



Low-Cost Carriers around the World



Source: *Airline websites and Wikipedia low cost carrier list*



Consolidation Trend

- **Recent International Consolidation**
 - Air France and KLM
 - Air France and Alitalia ??
 - Lufthansa and Swiss
 - China Southern and China Northern and Xingiang
 - Cathy Pacific and Dragon
 - **Recent US Consolidation**
 - USAir and America West
 - **Merger Discussions**
 - Delta and Northwest
 - Potential for Additional Reactionary Moves
 - **International Strategic Investment**
 - Lufthansa and JetBlue
 - Virgin and Virgin America
-



EU-US Open Skies Agreement

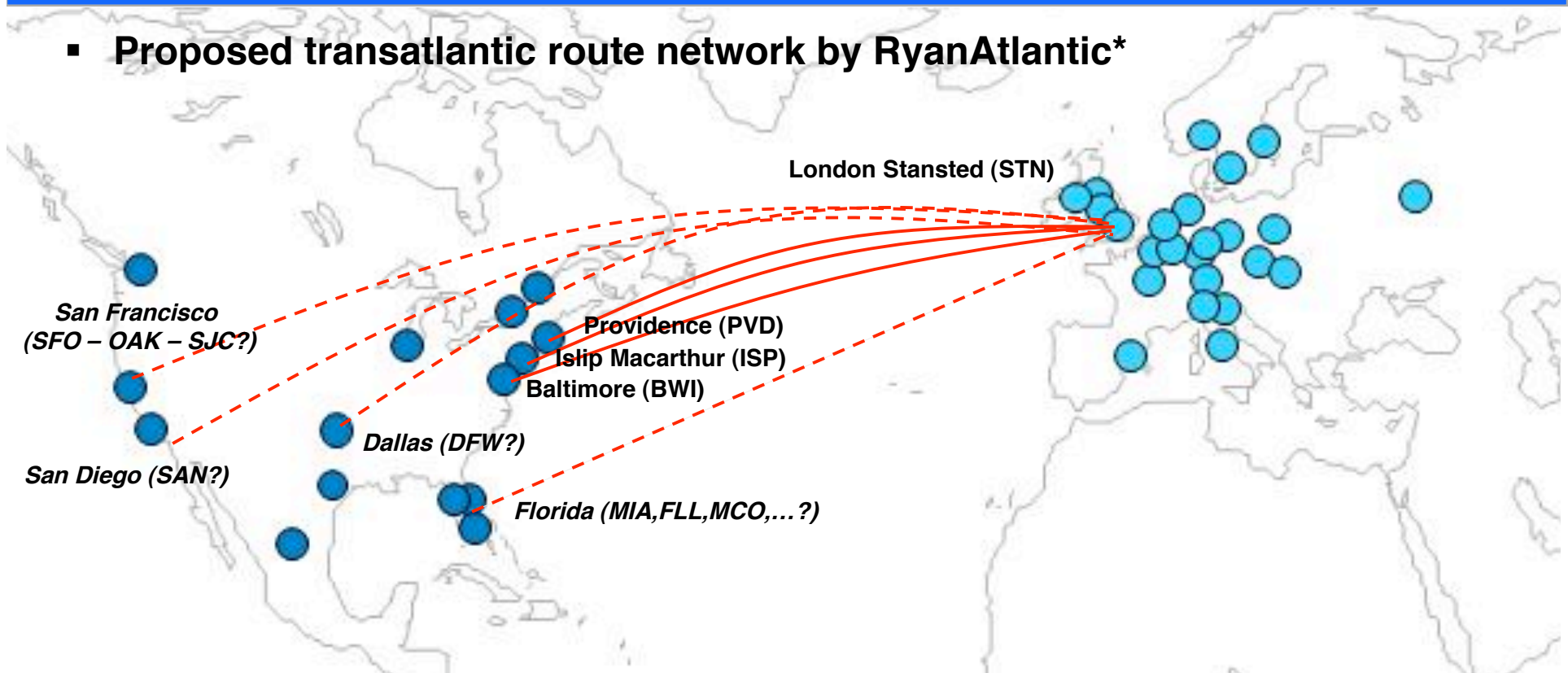
- **On April 30, 2007 E.U. and U.S. signed a preliminary Open Skies accord**
 - ❑ Allows EU airlines to operate direct flights between U.S. and any EU country (and some others)
 - ❑ Allows U.S. airlines reciprocal right, and ability to fly between EU city-pairs
 - ❑ Agreement will replace 22 bilateral air service agreements currently in place between the U.S. and the Member States
 - ❑ Implications for **Alliance Anti-Trust Immunity**
 - ❑ In effect **March 30, 2008**

 - **E.U. has made liberalized foreign control a prerequisite for a permanent agreement**
 - o U.S. domestic market lucrative as standalone and hub-feeder
 - ◆ Cabotage rights only granted to U.S. Incorporated airlines
 - ◆ U.S. incorporation requires meeting ownership caps
 - ◆ Without control, network composition cannot be shaped
 - o Match EU's 49% foreign control restriction
-



The North Atlantic: Market for Low Cost Carrier Expansion

- Proposed transatlantic route network by RyanAtlantic*



- Development of international parallel networks
- Phenomenon observed within the United States and Europe with the development on point-to-point parallel networks (between secondary airports) by Southwest and Ryanair

* Data source: Article from USA today April 12 2007, http://blogs.usatoday.com/sky/2007/04/ryanair_ceo_tal.html,



Airline Alliances

US DOT Antitrust Immunity



Star Alliance

- Adria Airways (JP)
- Air Canada (AC)
- Air New Zealand (NZ)
- ANA (NH)
- Asiana Airlines (OZ)
- Austrian Airlines (OS)
- Blue1 (KF)
- **bmi (BD)**
- Croatia Airlines (OU)
- LOT Polish Airlines (LO)
- **Lufthansa (LH)**
- **SAS (SK)**
- Singapore Airlines (SQ)
- South African (SA)
- Spanair (JK)
- Swiss Intl Air Lines (LX)
- TAP Portugal (TP)
- Thai Airways Intl (TG)
- Turkish Airlines (TK)
- **United (UA)**
- **US Airways (US)**



Oneworld

- **American Airlines (AA)**
- **British Airways (BA)**
- Cathay Pacific (CX)
- **Finnair (AY)**
- Iberia (IB)
- Japan Airlines (JL)
- **LAN (LA)**
- Malév (MA)
- Qantas (QF)
- Royal Jordanian (RJ)



SkyTeam

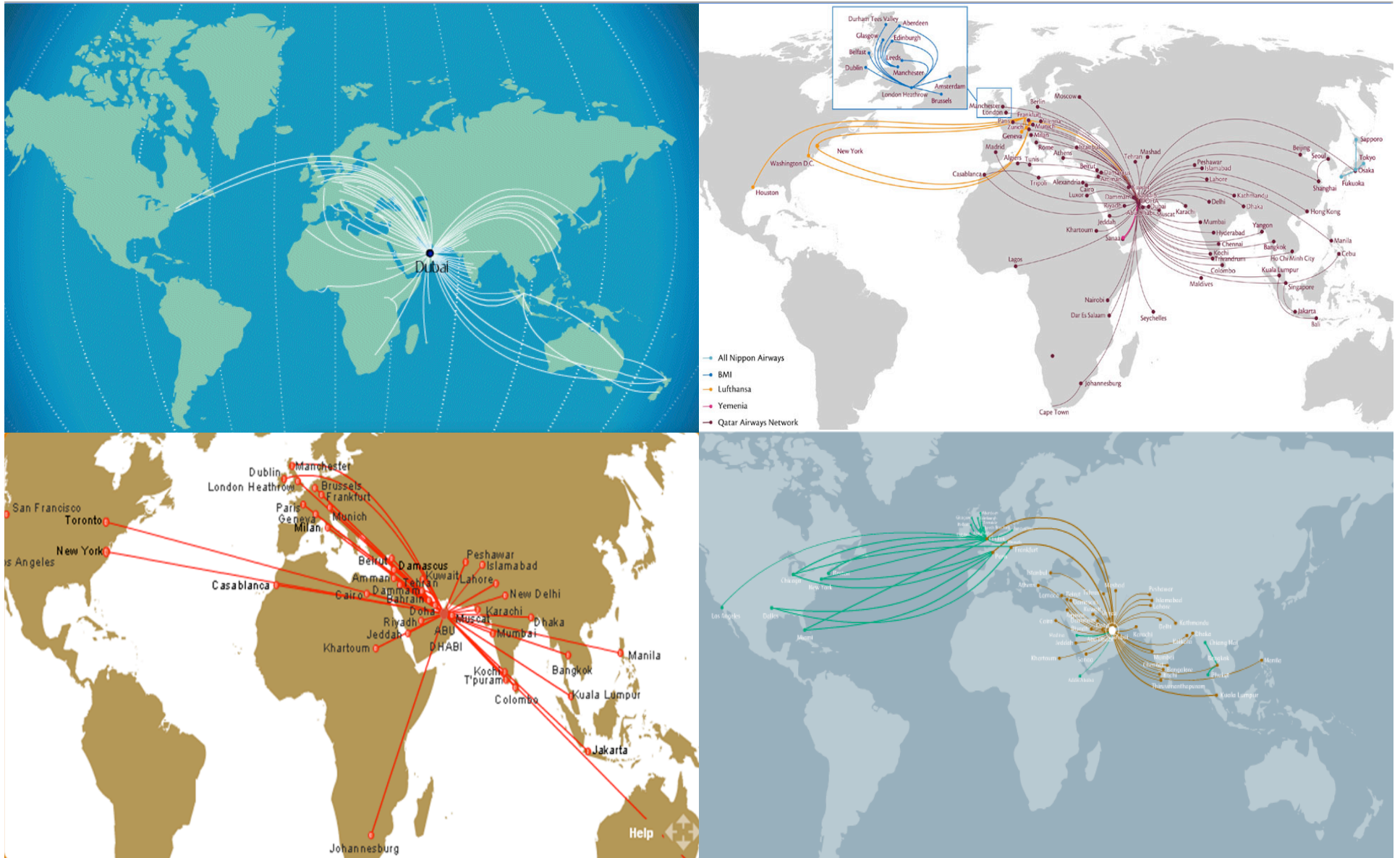
- Aeroflot (SU)
- Aeroméxico (AM)
- **Air France (AF)**
- **Alitalia (AZ)**
- Continental (CO)
- **Czech Airlines (OK)**
- **Delta (DL)**
- **KLM (KL)**
- Korean Air (KE)
- **Northwest (NW)**

Existing Immunity

Immunity Application In Progress



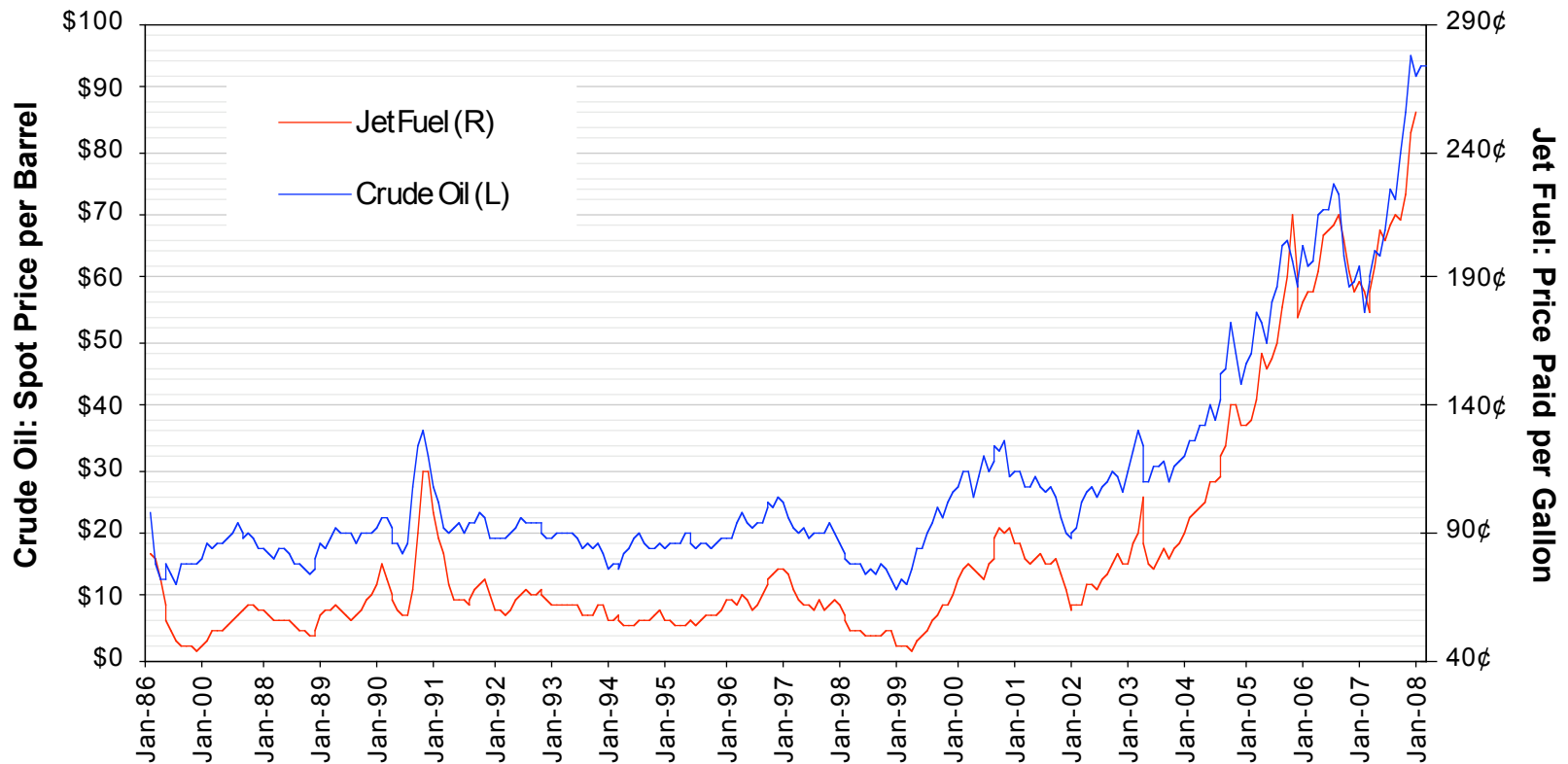
Challenges of Competition from Middle East Hubs





Trends in Fuel Price

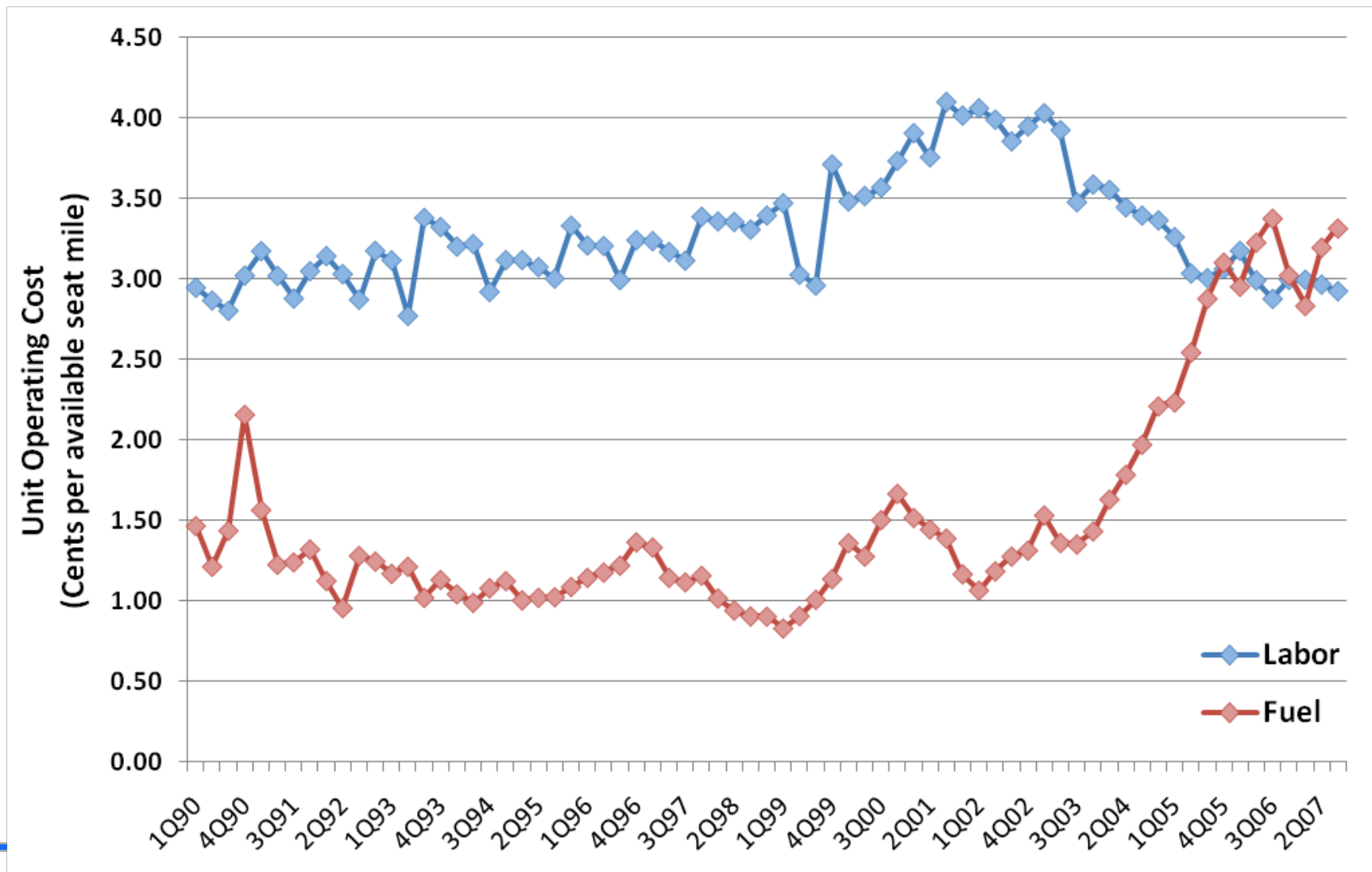
Average Crude Oil and Jet Fuel Prices



Data source: ATA: Fuel Cost and Consumption (oil data through Feb 2008, jet fuel data through Dec 2007)



Unit Costs for Labor and Fuel

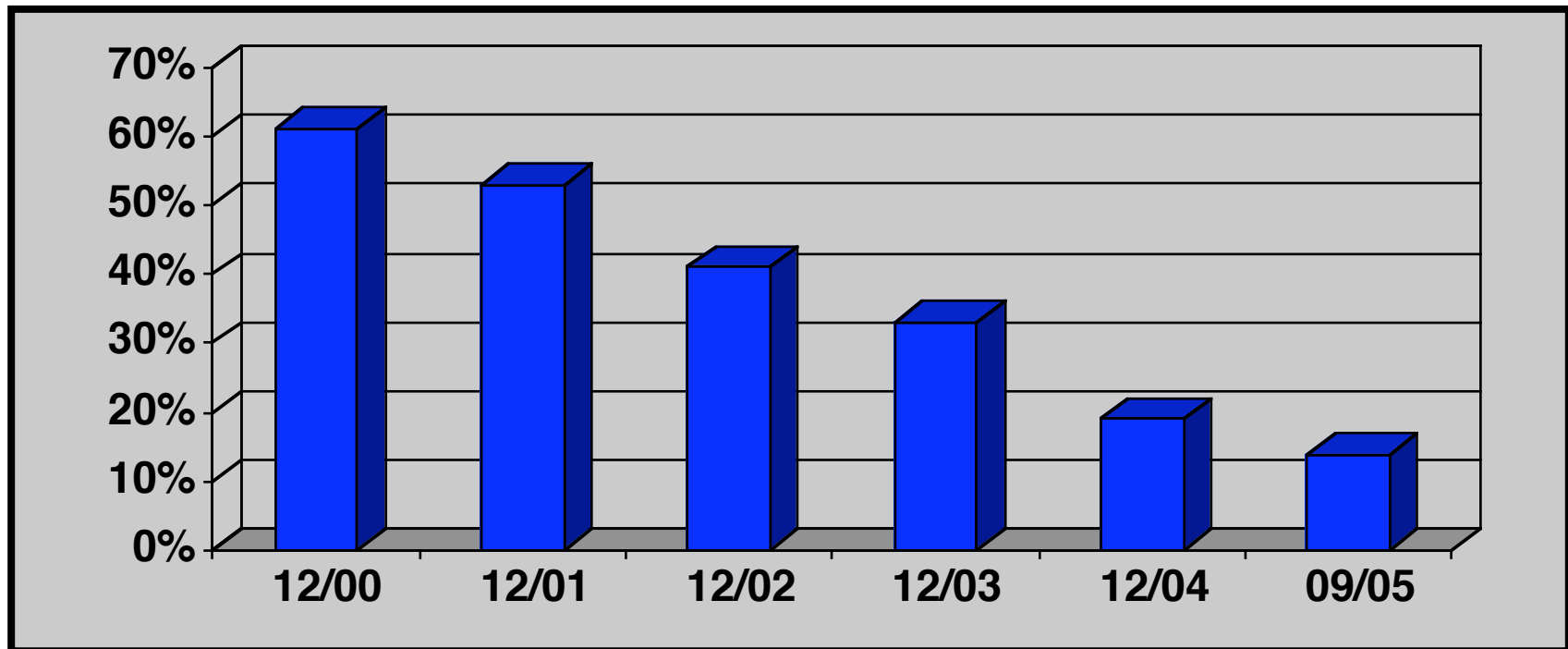


Data source: ATA U.S. Airline Cost Index, through 4th Quarter 2007



Positive Views of Employee Morale

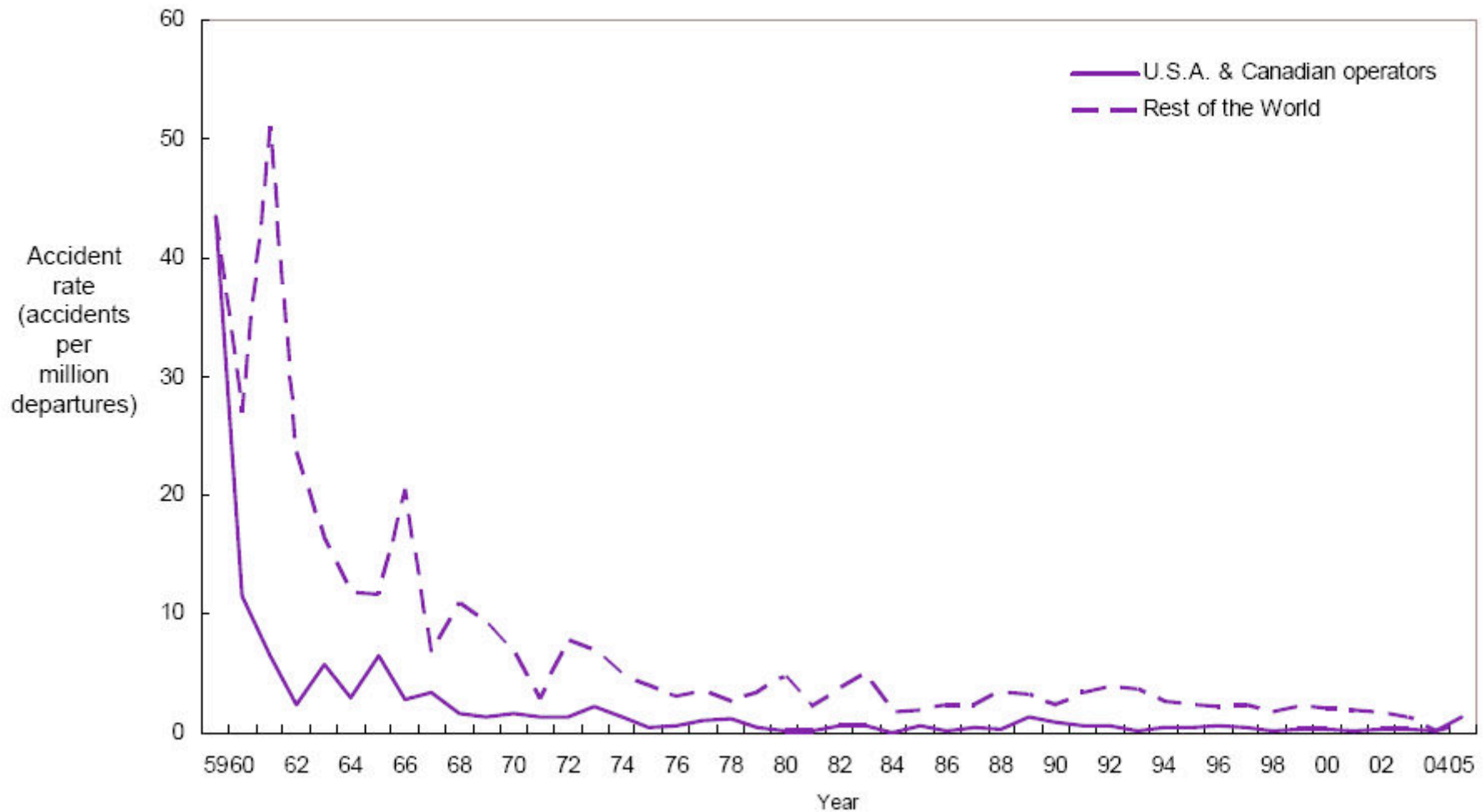
Don't have current survey data trend may have reversed



Source: The Wilson Center for Public Research, Inc. – based on 150,674 interviews conducted with pilots or flight attendants from 1/1/2001 to 9/20/2005

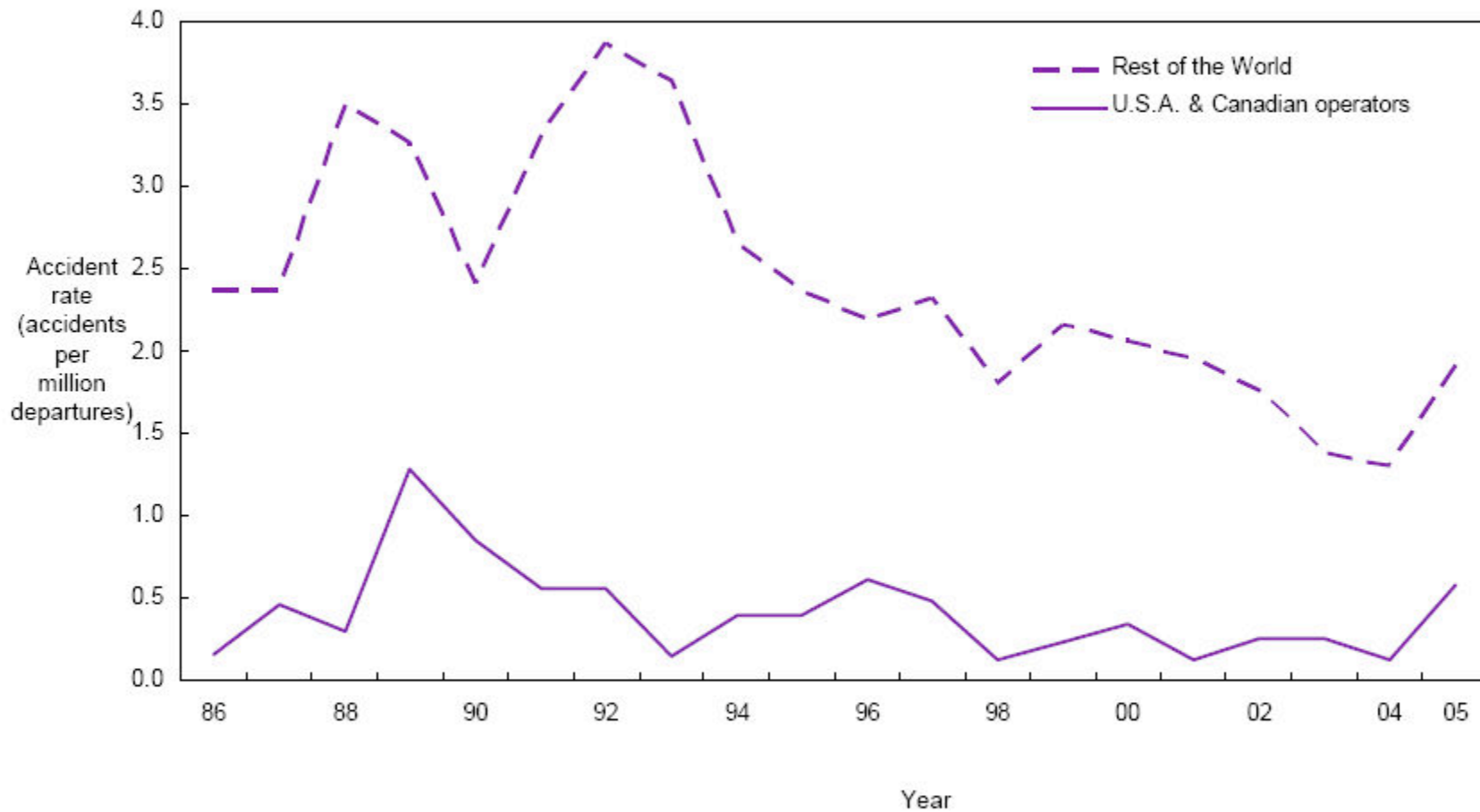
U.S.A. and Canadian Operators Accident Rates

Hull Loss and/or Fatal accidents – Worldwide Commercial Jet Fleet – 1959 through 2005



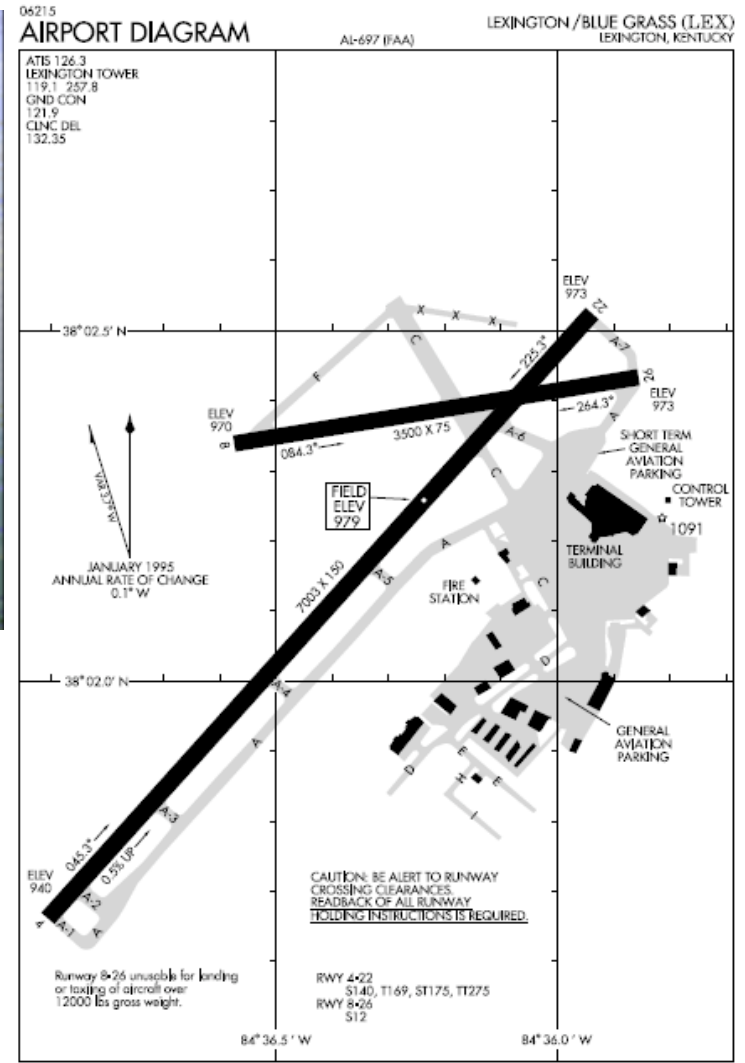
U.S.A and Canadian Operators Accident Rates

Hull Loss and/or Fatal accidents – Worldwide Commercial Jet Fleet – 1986 through 2005





Comair Accident 27 - Aug - 2006



AIRPORT DIAGRAM
0921.5
LEXINGTON, KENTUCKY
LEXINGTON /BLUE GRASS (L,EX)



Sao Paulo Runway Overrun

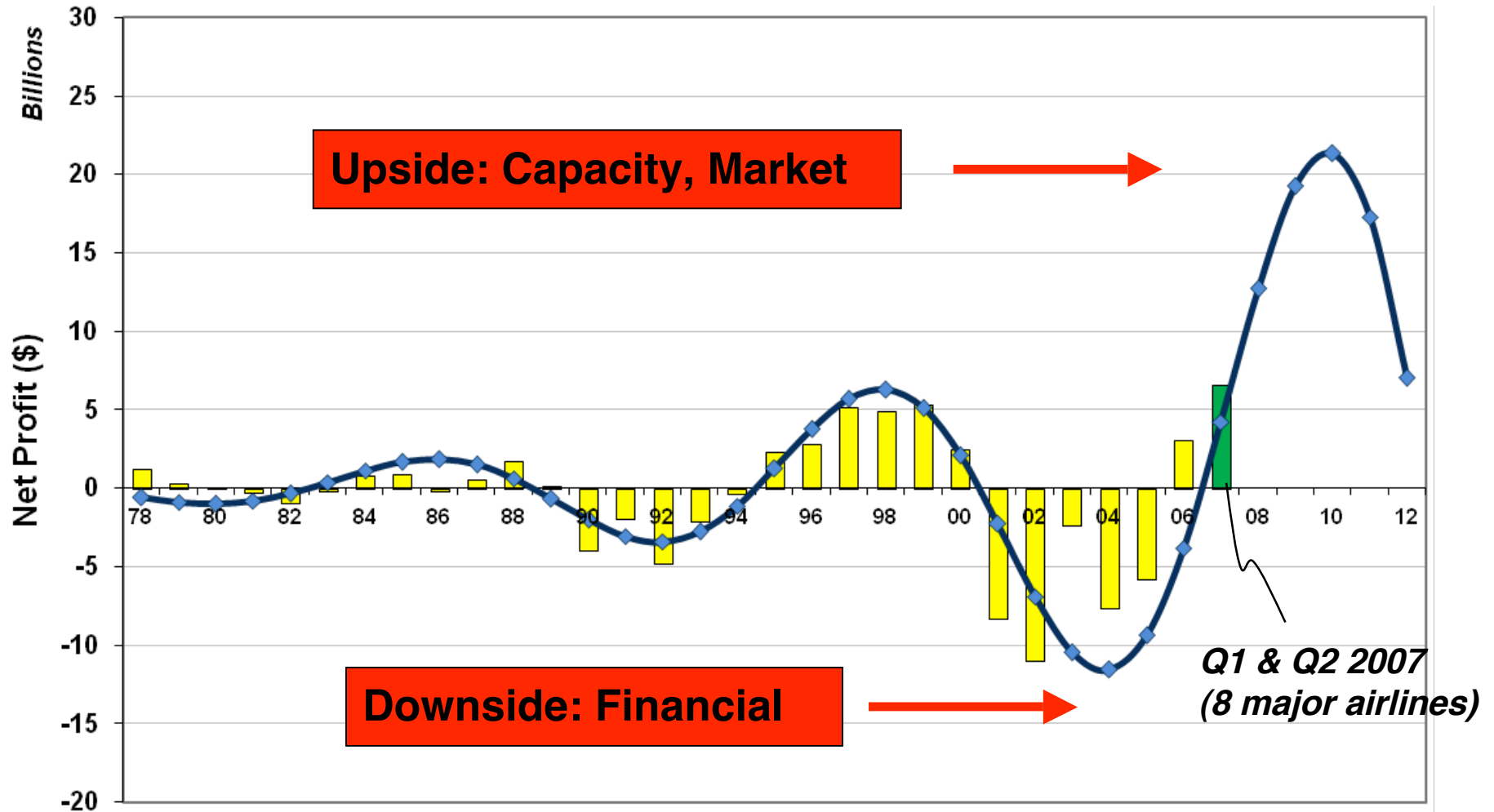
17 Jul 2007



Source: Intl Herald Tribune



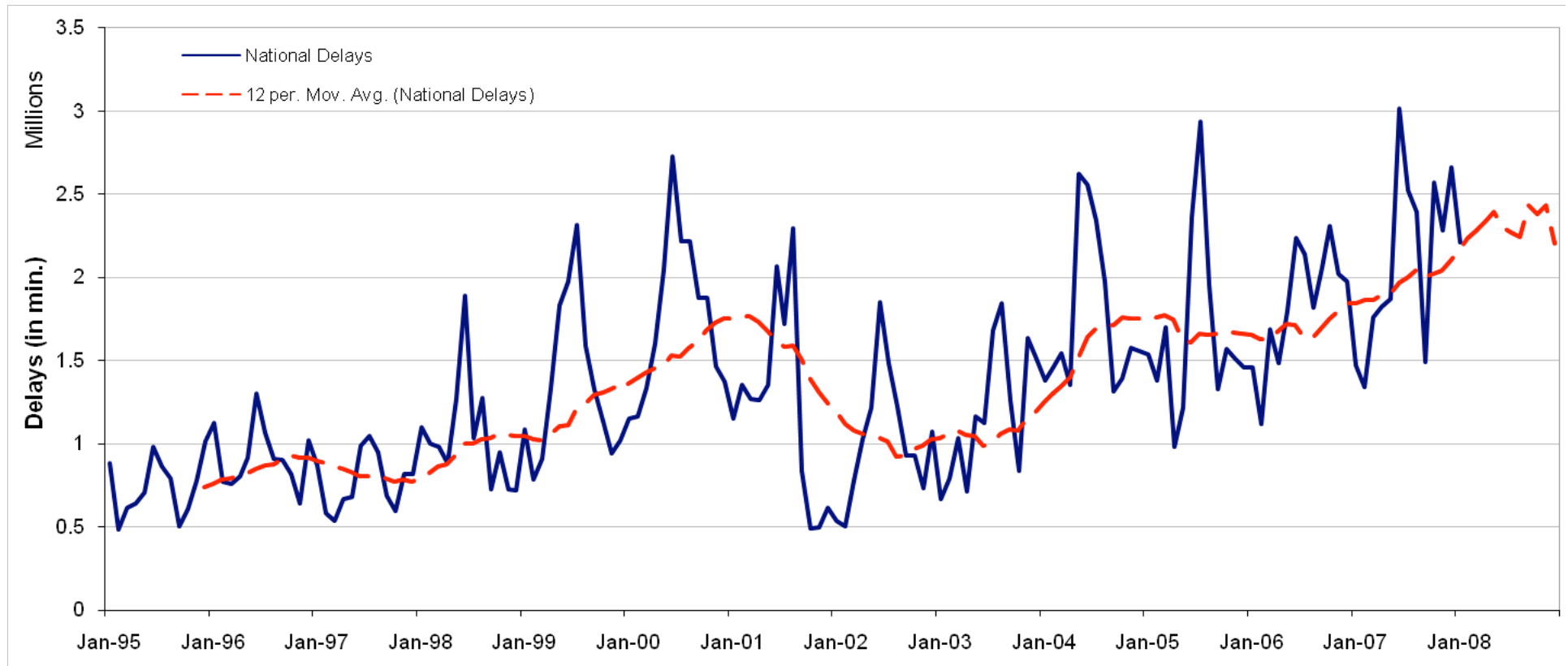
Growth Limits Constraints vs Damping





US Flight Delays

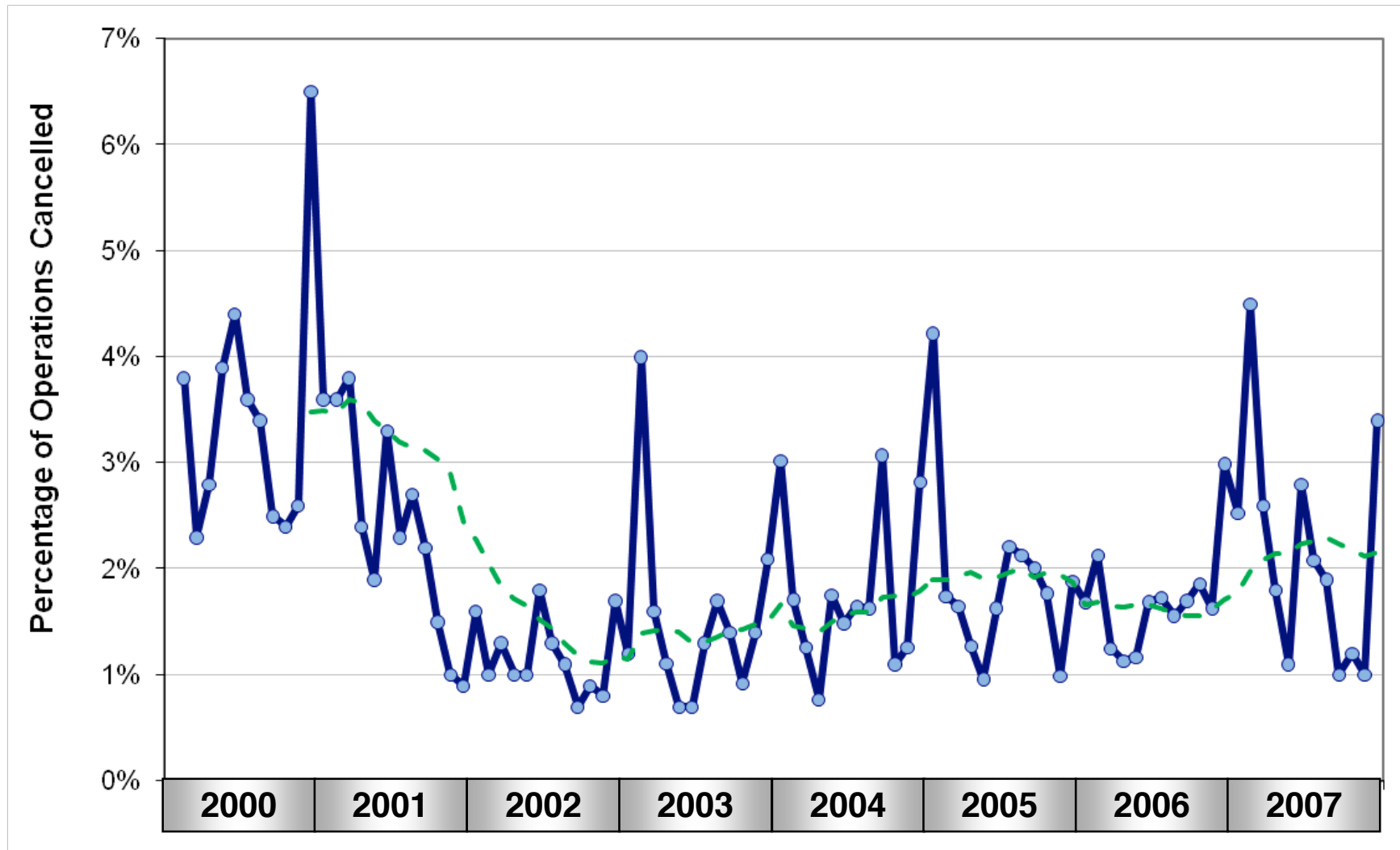
from 1995 to 2007



Data source: FAA Operational Network (OPSNET)

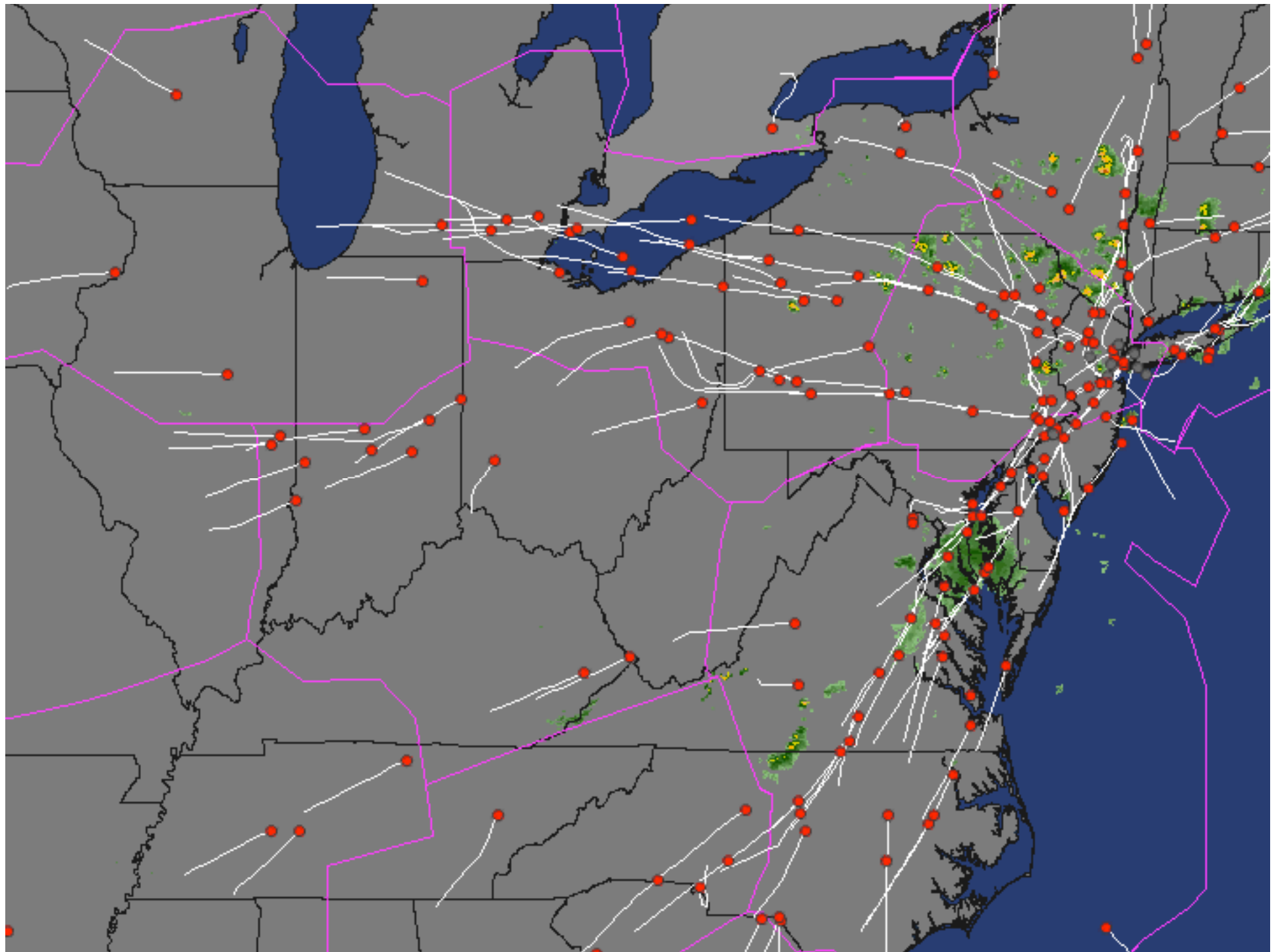


Flight Cancellations from 2000 to 2007 (by month)



Source: DOT, Air Travel Consumer Report, <http://airconsumer.ost.dot.gov/> & BTS On Time Performance data

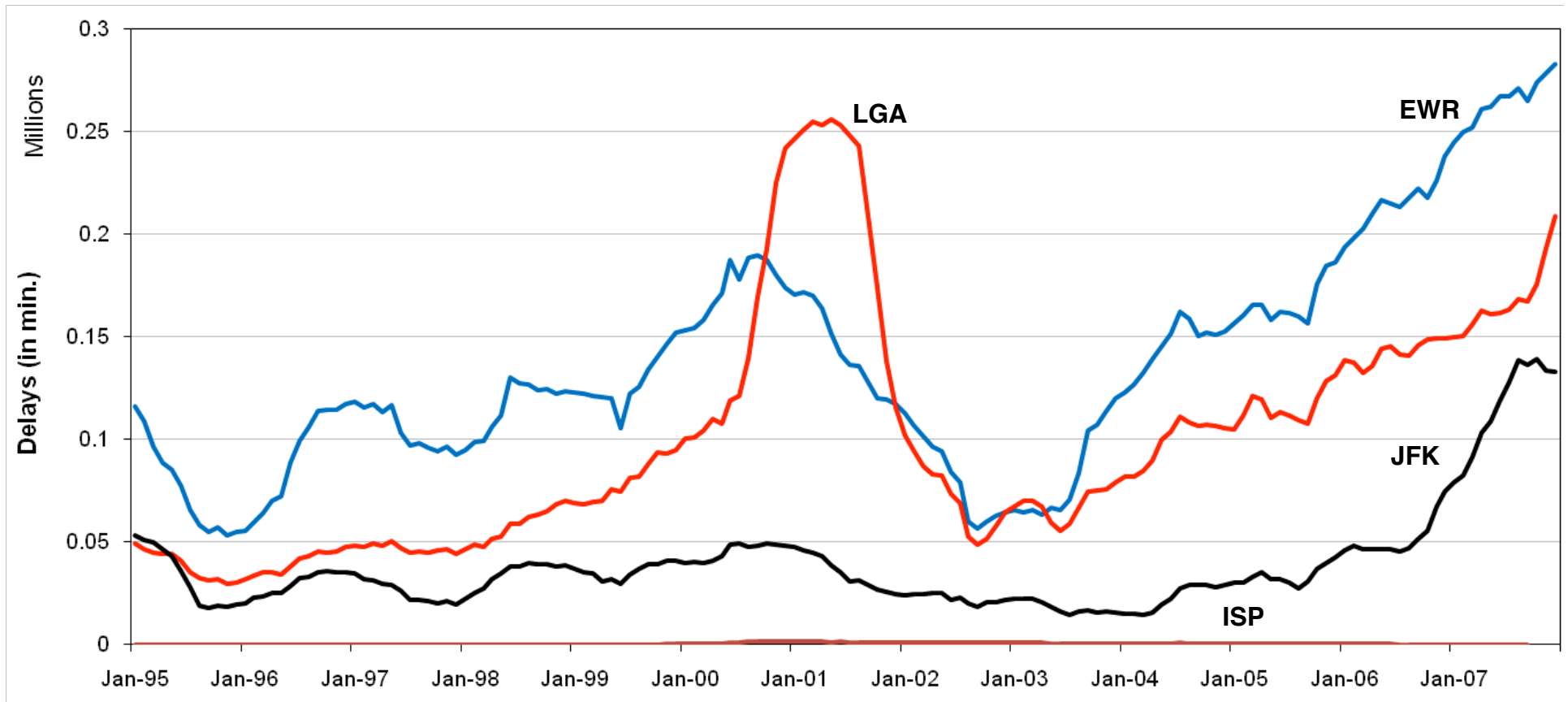
(top 11 airlines from 2000 to 2002, top 20 airlines from 2003 to 2007)





New York Airport Flight Delays* from 1995 to 2007

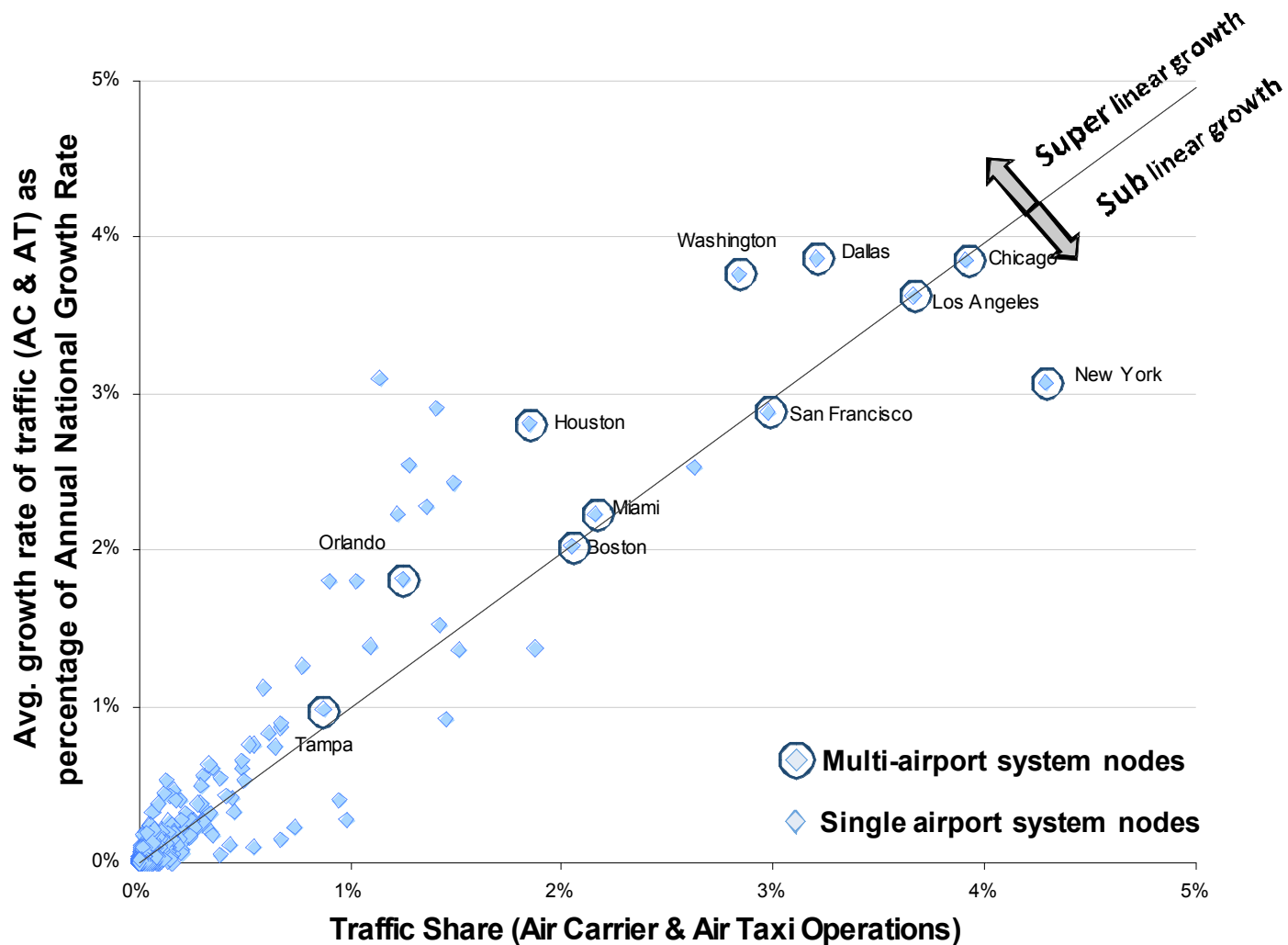
* Note: 12 month moving average



Data source: FAA Operational Network (OPSNET)



Sub-linear Growth of New York System

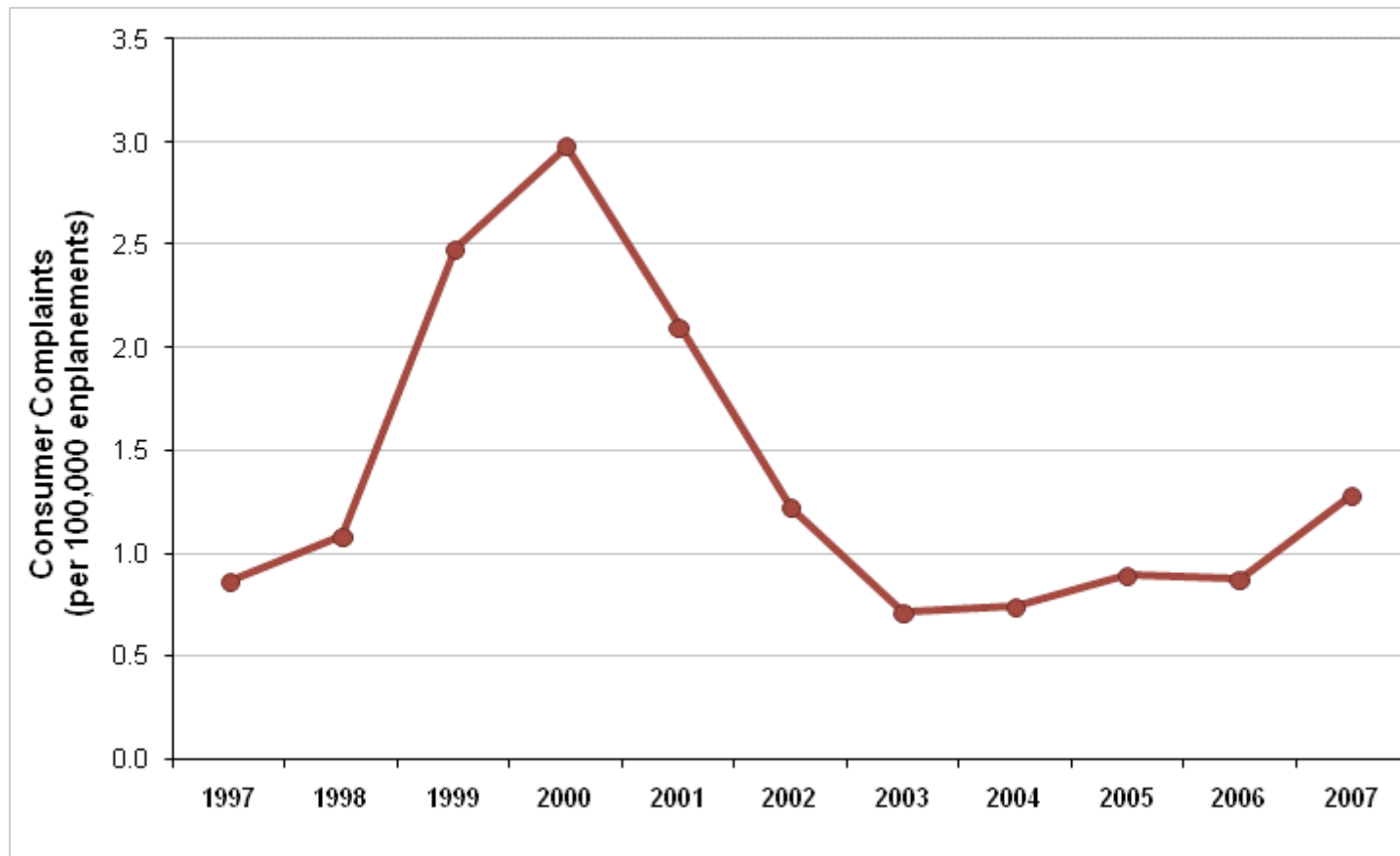


• Analysis of average annual growth rate from 1976 to 2005

*Data source: Historical data from FAA Terminal Area Forecast (1976-2004), AC: Air Carrier, AT: Air Taxi (analysis by P. Bonnefoy)



Consumer Complaints from 1997 to 2007*

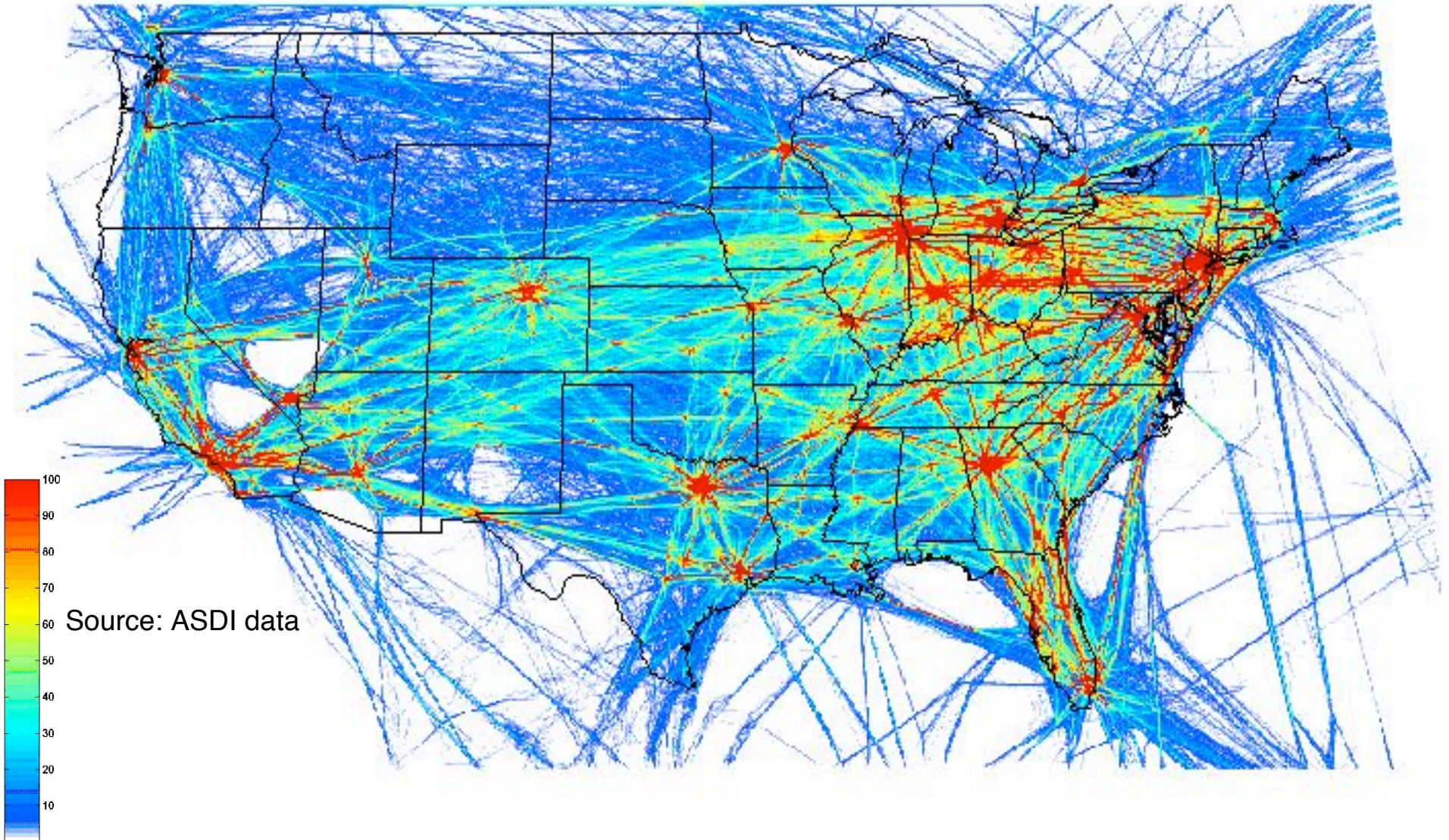


Note: 2007 data point represents average consumer complaints (per 100,000 enplanements) for January to March 2007

Data source: DOT Aviation Consumer Protection Division, available at: <http://airconsumer.ost.dot.gov/>



Congestion Driven Schedule Creep

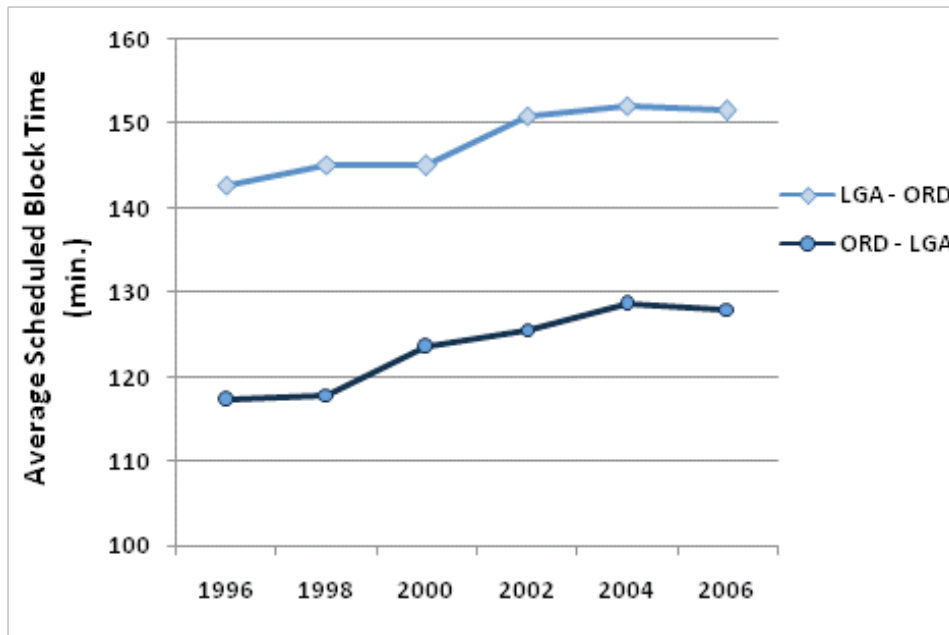




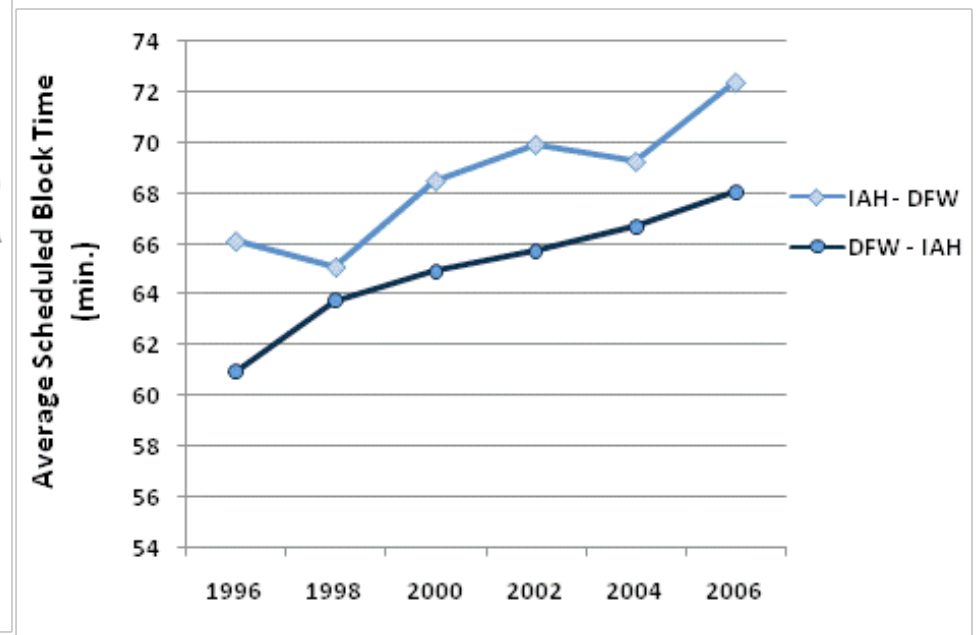
Historical Evolution of Scheduled Block Time

(Month of April / from 1996 to 2006)

NY La Guardia – Chicago O’Hare



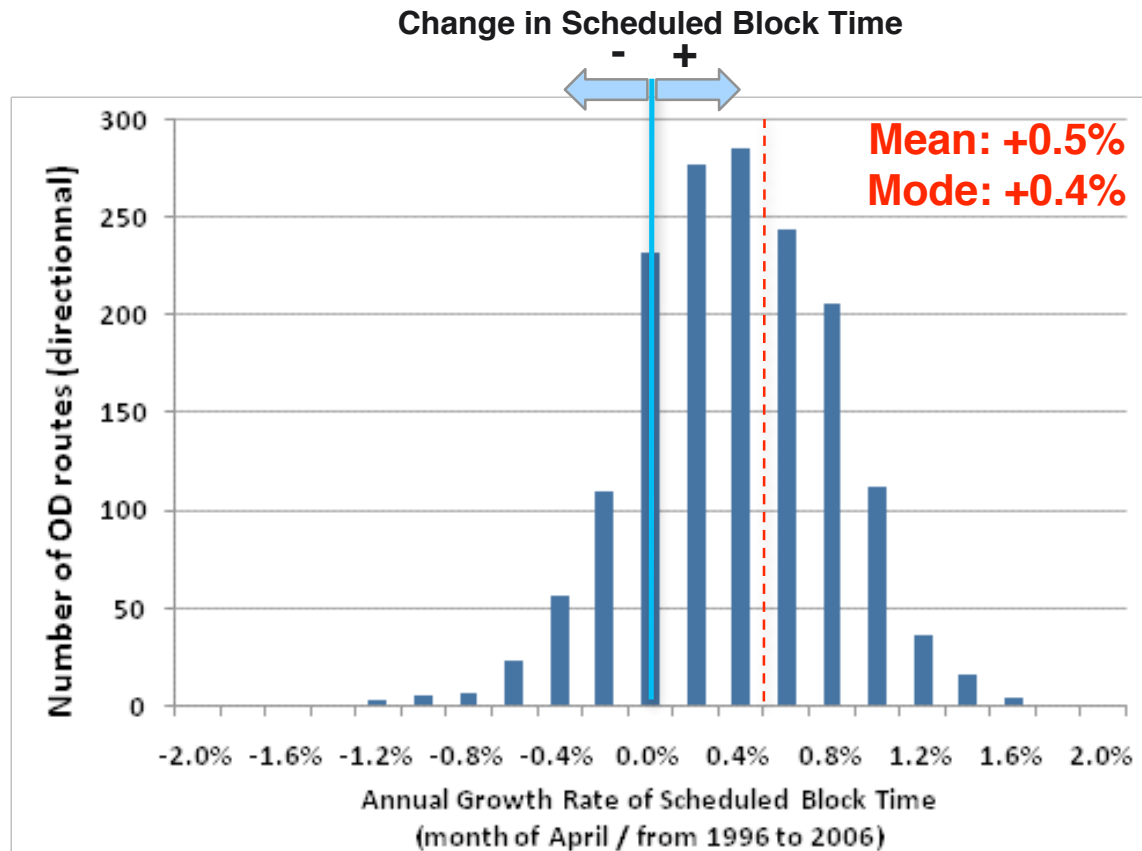
Houston – Dallas





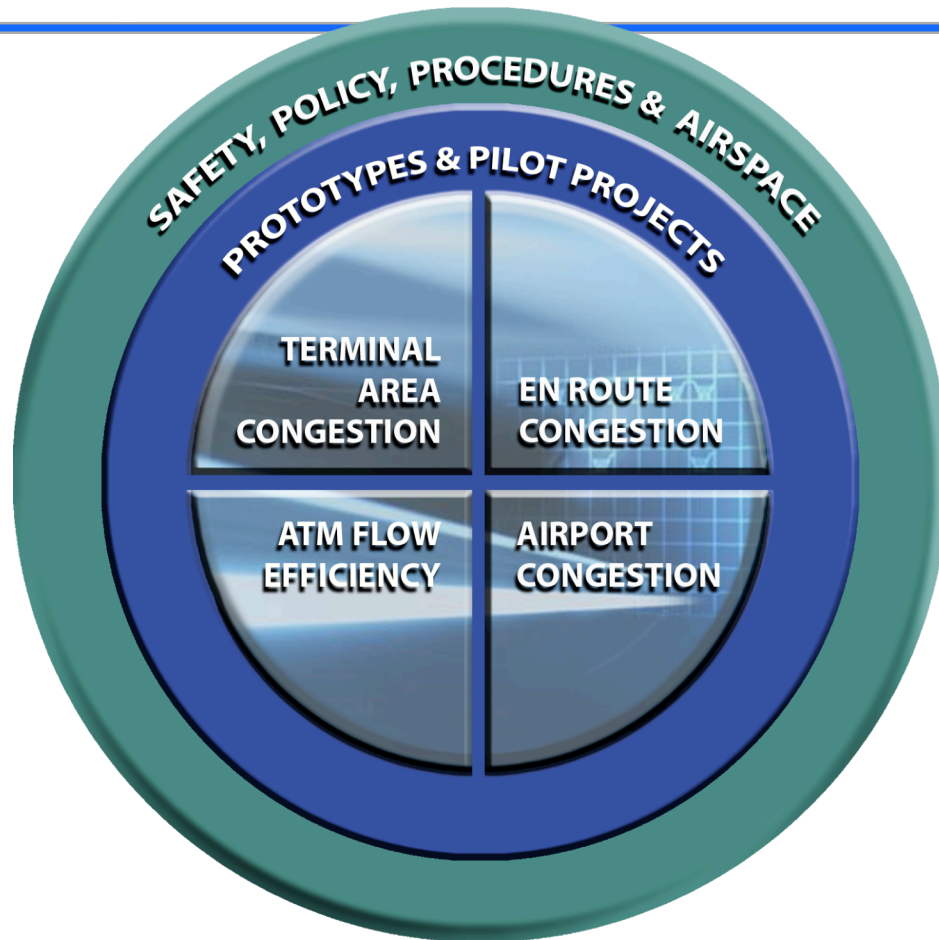
Annual Growth Rate of Scheduled Block Time (top 1950 OD routes)

- Analysis based on top 3000 OD routes (US Domestic – by US carriers)
- Filtered down to 1950 OD routes with uninterrupted service between 1996 and 2006 (April)
- OD routes covering 76% of total passengers in the U.S. in 2006





OEP and NGATS



10 Year Plan
FAA

RNP
RNAV
ADS-B

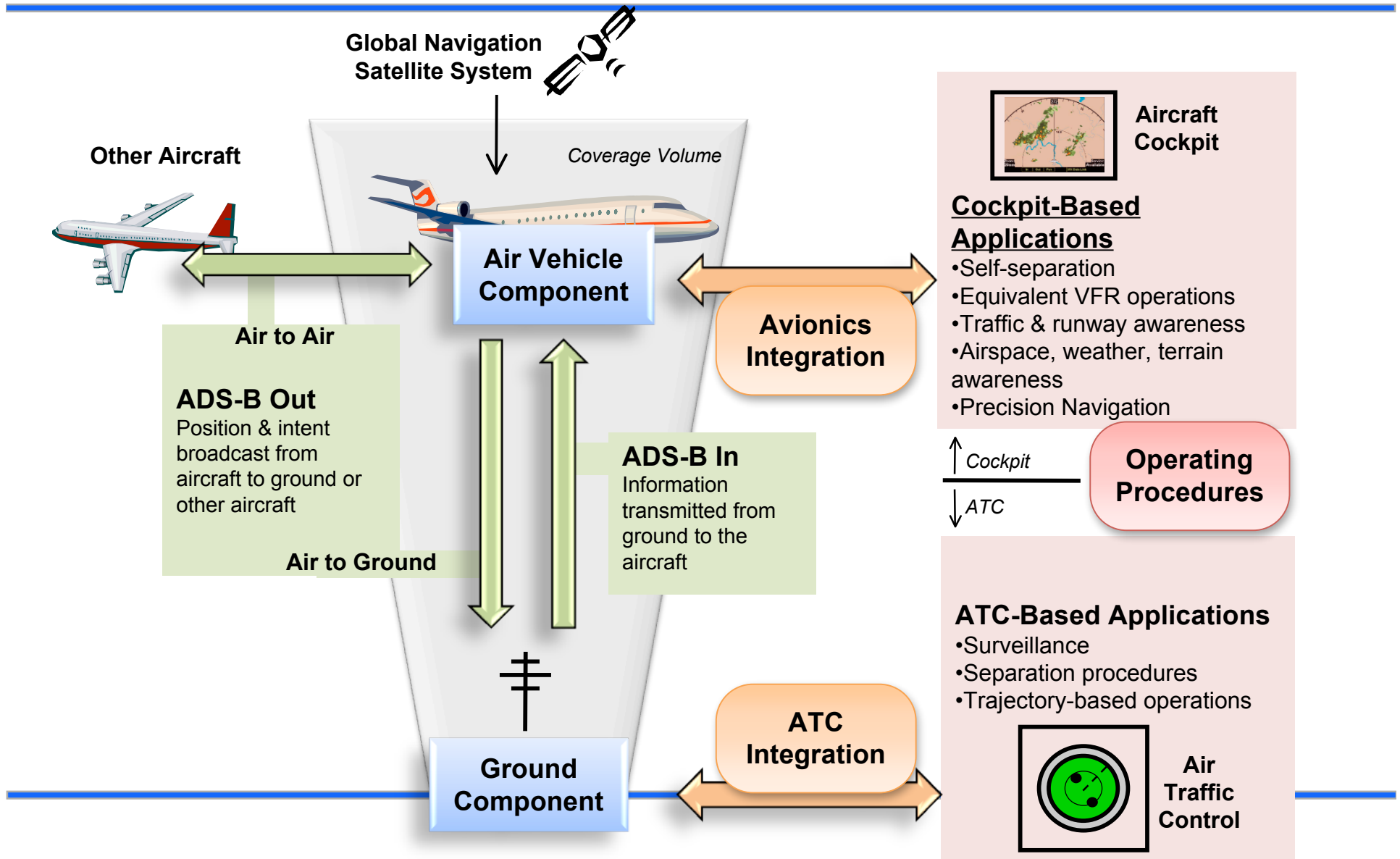


20 Year Plan
Multi-Agency

FAA, DOD, Commerce
DHS, NASA, DOT, OSTP



Automatic Dependent Surveillance Broadcast (ADS-B)





Automatic Dependent Surveillance Broadcast (ADS-B) Mandate NPRM

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No. FAA-2007-29305; Notice No. 07-15]

RIN 2120-A192

Automatic Dependent Surveillance—Broadcast (ADS-B) Out Performance Requirements To Support Air Traffic Control (ATC) Service

AGENCY: Federal Aviation Administration (FAA), DOT.

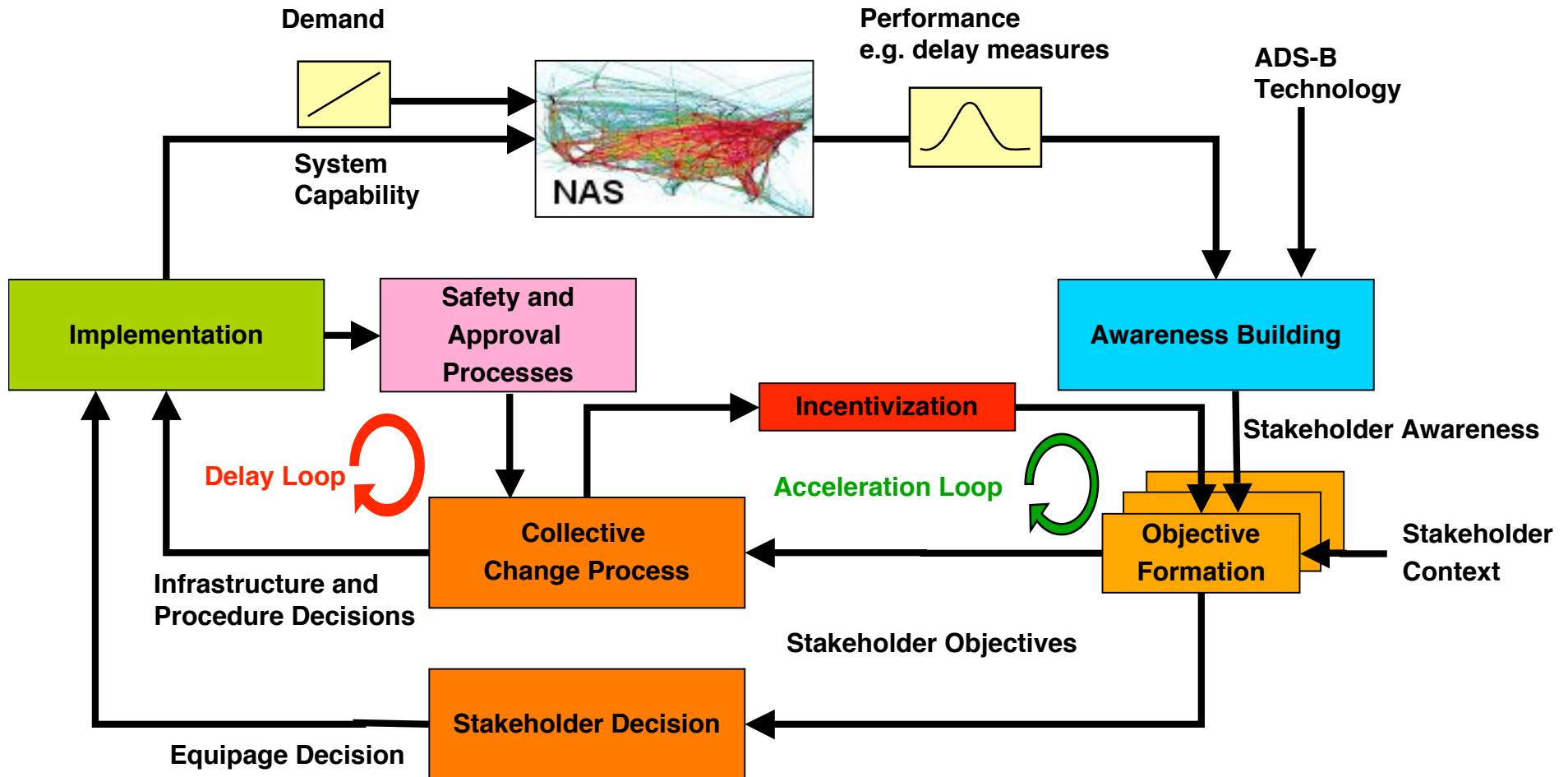
ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: This notice proposes performance requirements for certain avionics equipment on aircraft operating

- **ADS-B “ Out” mandate by 2020**
- **Impacts**
 - Class A, B, C
 - Mode C veil (30 nm radius)
 - Class E above 10,000
- **Requires DO-260A Change 2**
- **Nav Source Requirements**
 - NAC of 9 ~30 meters
 - NIC of 7 (0.3 nm)
- **Final commitment date of 2013 for all ground infrastructure**



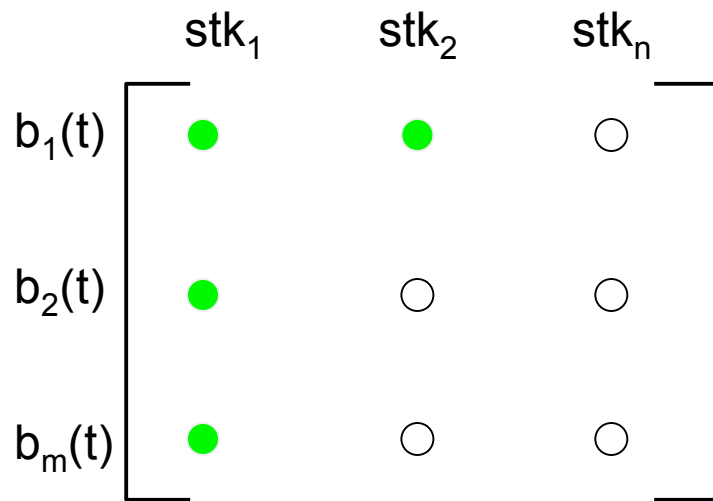
Model of System Transition *Acceleration and Delay Loops*



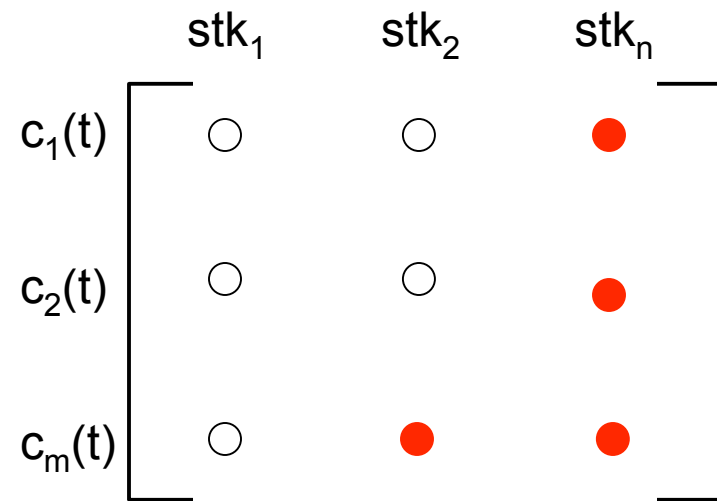


Multi- Stakeholder Value Distribution

- How are costs and benefits distributed between stakeholders?



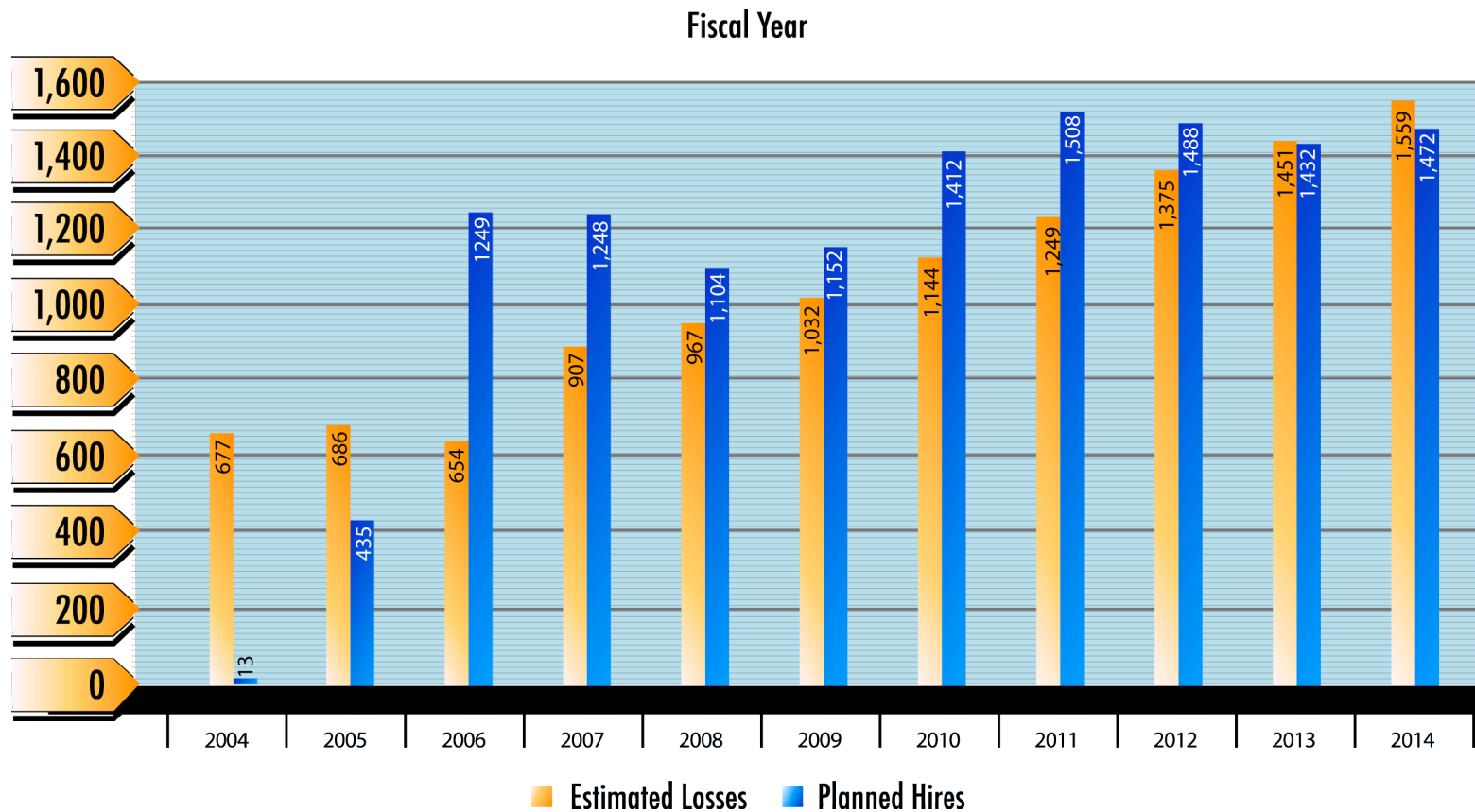
Benefits



Costs

Air Traffic Controller Staffing

ATO Hiring Forecast vs. Losses



Time to CPC (Certified Professional Controller)

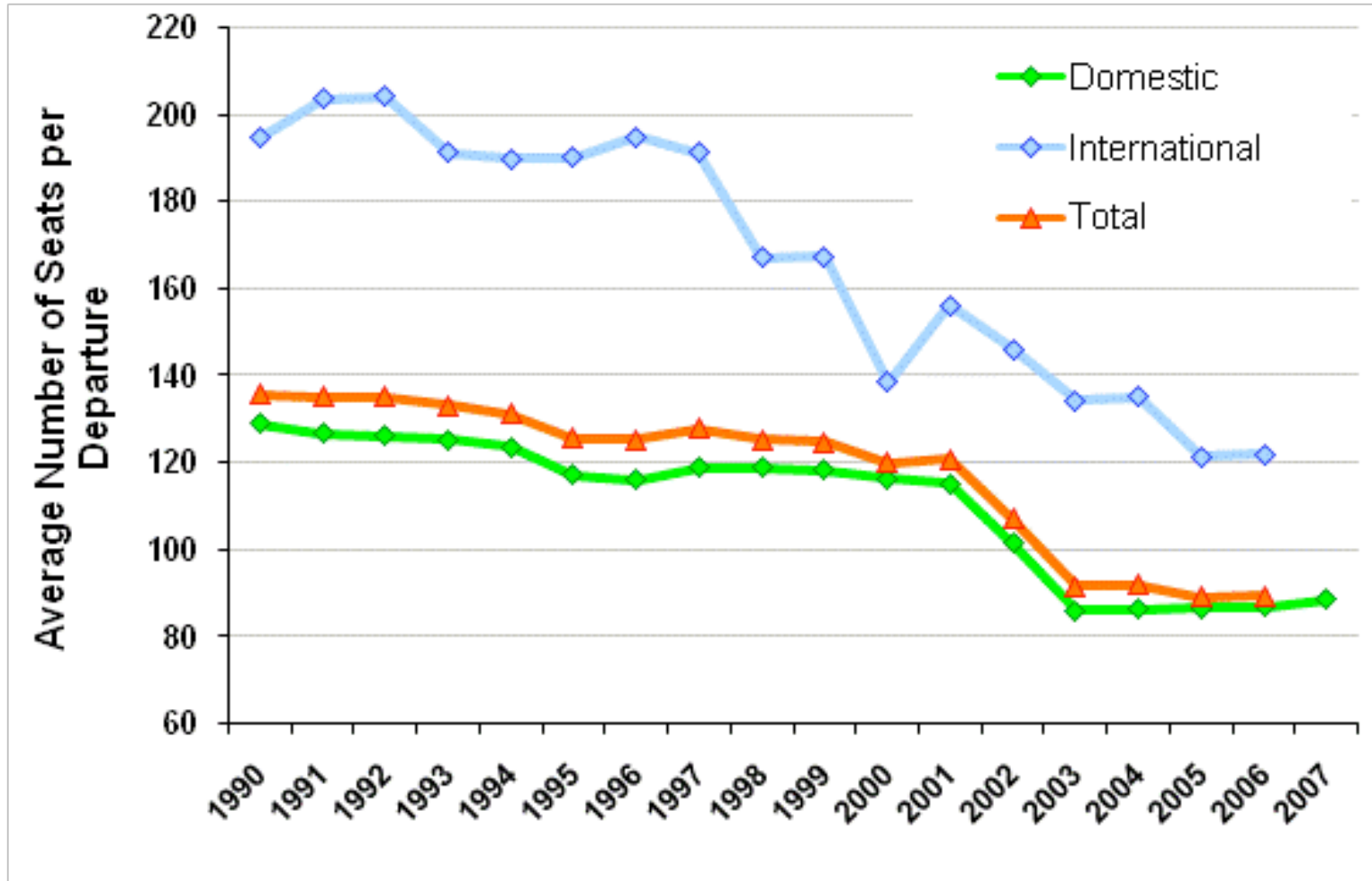
Terminal; 8 - 24 months

Enroute: 36 - 60

Source: *Air Traffic Controller Workforce Plan - 2004*



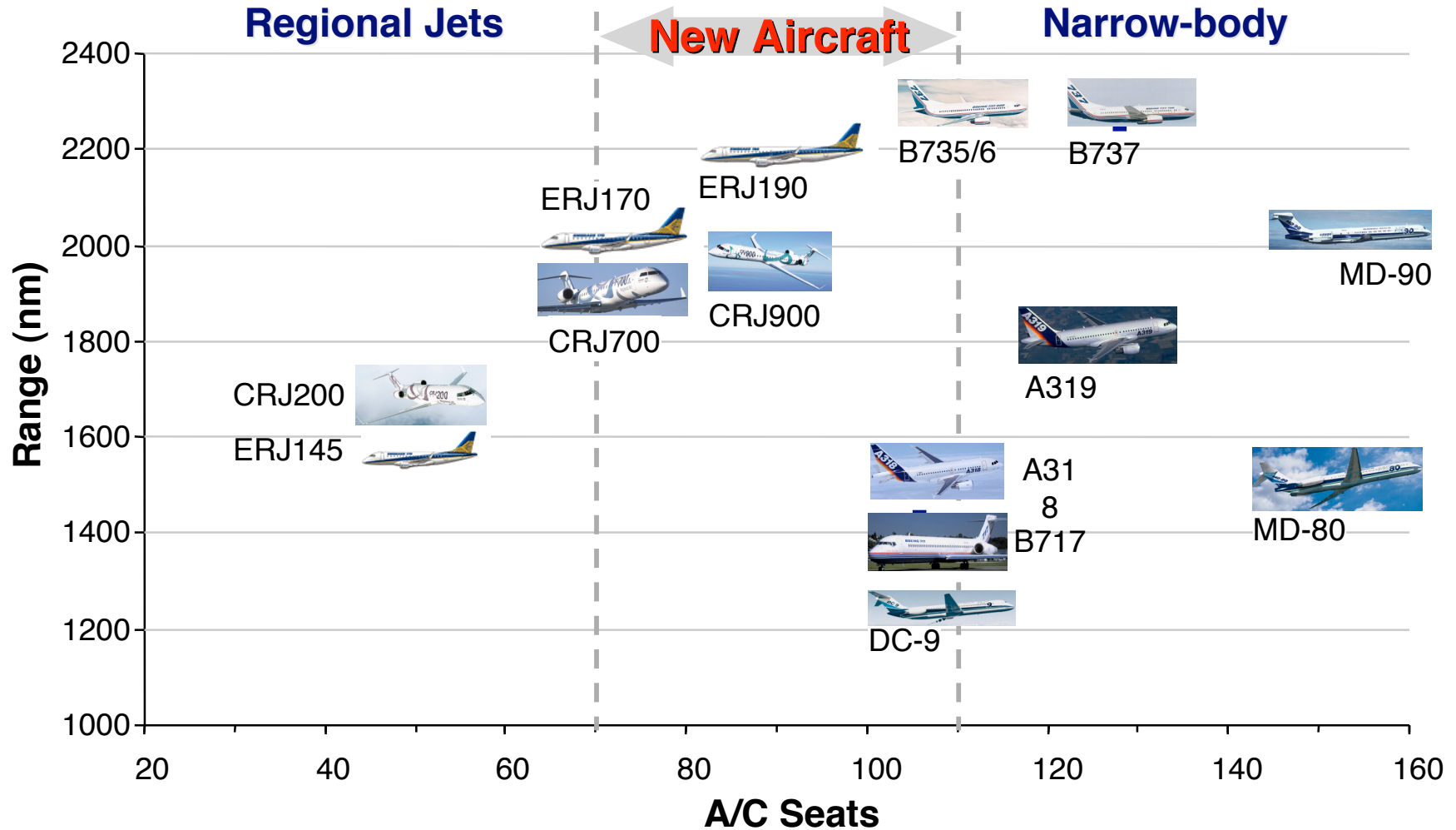
Trends in Aircraft Size



Data source: Form 41 Traffic data from Bureau of Transportation Statistics (US carriers)



RJ-NB Boundary Blurred



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

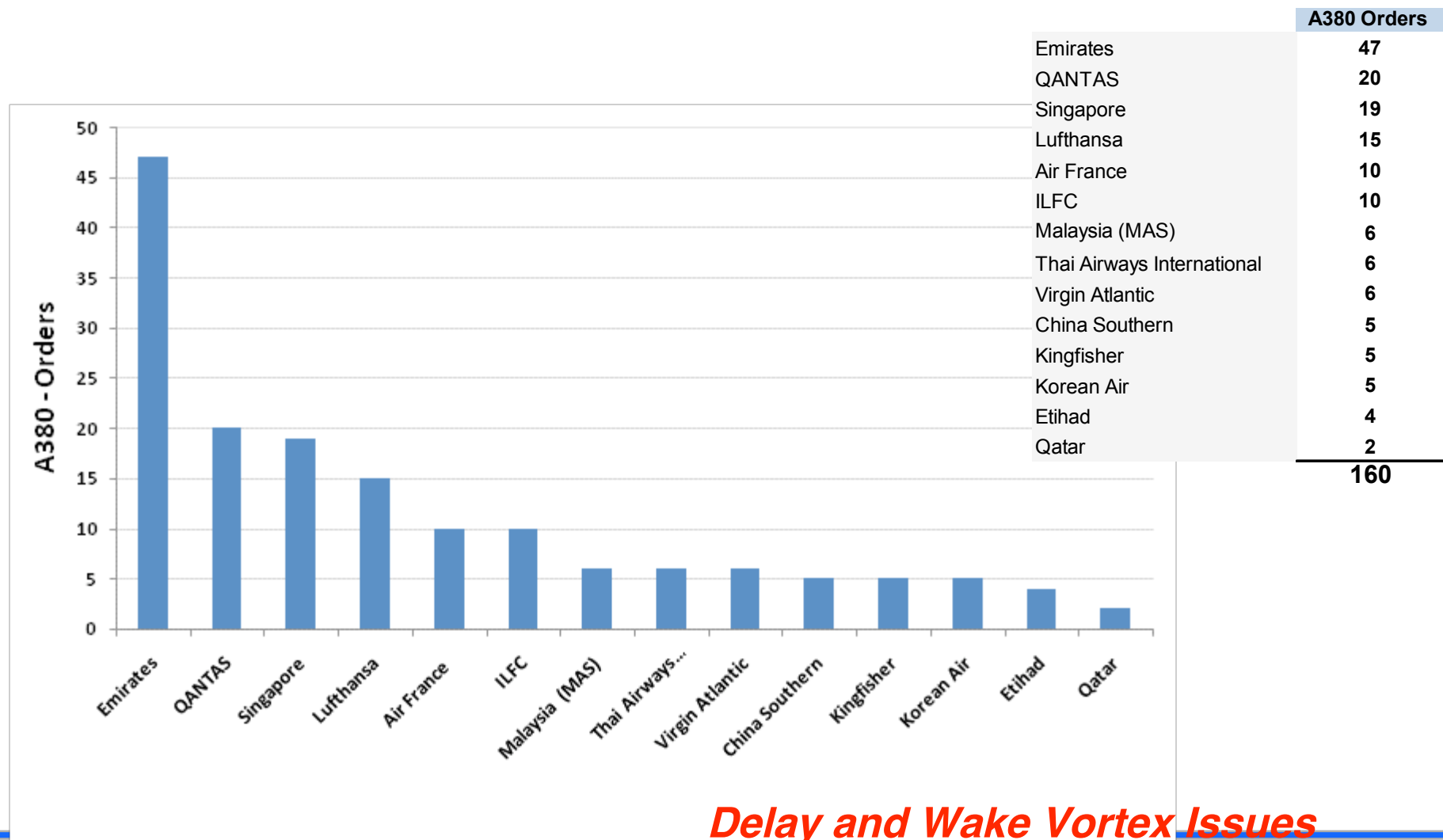


A-380





A 380 Orders



Delay and Wake Vortex Issues
Break Even Aprox 420

Data source: Aircraft manufacturers website
 Airbus – orders through May 31st 2007



A-380 First Delivery





B-787



-300 (290-330 pax) (3000-3500 nm)

-800 (210-250 pax) (8000-8500 nm)

-900 (250-290 pax) (8600-8800 nm)



B 787 Orders

aprox 710 firm orders

-
- **Aeroflot**
 - **Aeromexico**
 - **Air Berlin**
 - **Air Canada**
 - **Air China**
 - **Air India**
 - **Air New Zealand**
 - **Air Pacific**
 - **ALAFCO (leasing company)**
 - **All Nippon airways**
 - **Arik Air**
 - **Arkia Israel Airlines**
 - **Avianca**
 - **Aviation Capital Group**
 - **Azerbaijan Airlines**
 - **Boeing Business Jet**
 - **CASGC**
 - **China Eastern Airlines**
 - **China Southern Airlines**
 - **CIT Aerospace (leasing company)**
 - **Continental Airlines**
 - **Ethiopian Airlines**
 - **First Choice Airways**
 - **Garuda Indonesia**
 - **Hainan Airlines**
 - **Hong Kong Airlines**
 - **Icelandair**
 - **ILFC (leasing company)**
 - **Japan Airlines**
 - **Jet Airways**
 - **Kenya Airways**
 - **Korean Air**
 - **Kuwait Airways**
 - **LCAL (leasing company)**
 - **LOT Polish Airlines**
 - **Monarch Airlines**
 - **Northwest Airlines**
 - **Pegasus Aviation Finance (leasing company)**
 - **PrivatAir (BBJ)**
 - **Qantas**
 - **Royal Air Maroc**
 - **Royal Jordanian Airlines**
 - **S7 Airlines**
 - **Shanghai Airlines**
 - **Singapore Airlines**
 - **Travel Service**
 - **TUI Group**
 - **Vietnam Airlines**
 - **Virgin Atlantic Airways**
-



B-787 First Flight and Initial Delivery Delays



- Out of sequence production work
- Parts shortages
- Software
- Systems Integration

“All New” A350

Not your fathers A330



13 Orders Prior to Paris Air Show
182 Firm Orders Currently

250-300 Seats

7500-8800 nm Range

Source: <http://www.airbus.com>



High Fuel Price Favoring Turboprops



	ATR42/72*	Bombardier Q series**
Backlog (firm orders)	179	113

* as of Aug 2nd 2007

** as of July 31th 2007



Very Light Jets

Small turbofan aircraft



Eclipse500
Eclipse Aviation



Mustang
Cessna



Adam700
Adam Aircraft



Phenom-100
Embraer



ProJet
Avocet Aircraft



D-Jet
Diamond Aircraft



Epic LT
Epic



HondaJet
Honda



Safire26
Safire Aircraft



Excel Sport Jet



Spectrum 33



Eviation EV-20

Aircraft characteristics*

- Passengers:
4 to 8
- Acquisition price:
\$m 1.4 to 3.6
- Cruise speed:
340 to 390 kts
- Operating ceiling:
41,000ft to 45,000ft
- Range:
1100 to 1750 NM
- Take off field length:
2200ft to 3400ft

Orders

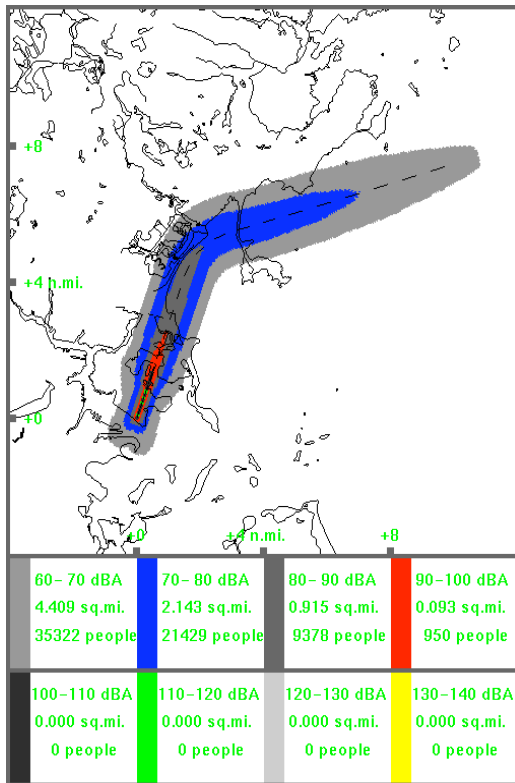
- Eclipse: **2300**
- Adam: **75**
- Mustang: **330+**

** for twin-engine VLJs (excludes D-Jet)*



Environmental Issues

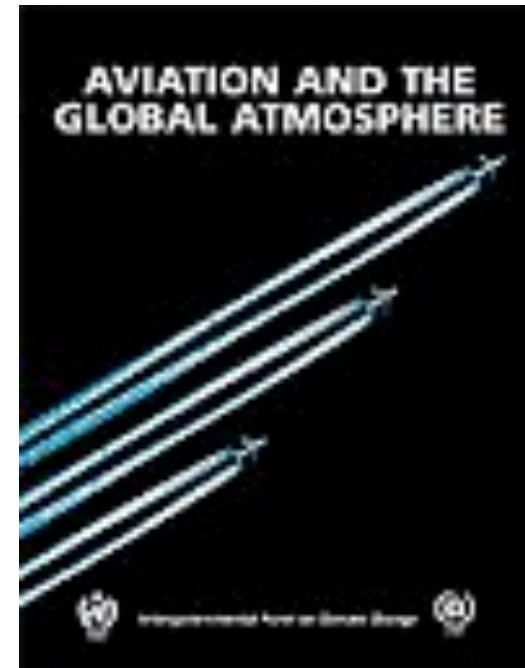
Noise



Stage 4 (Equipment)

Airports (Capacity)

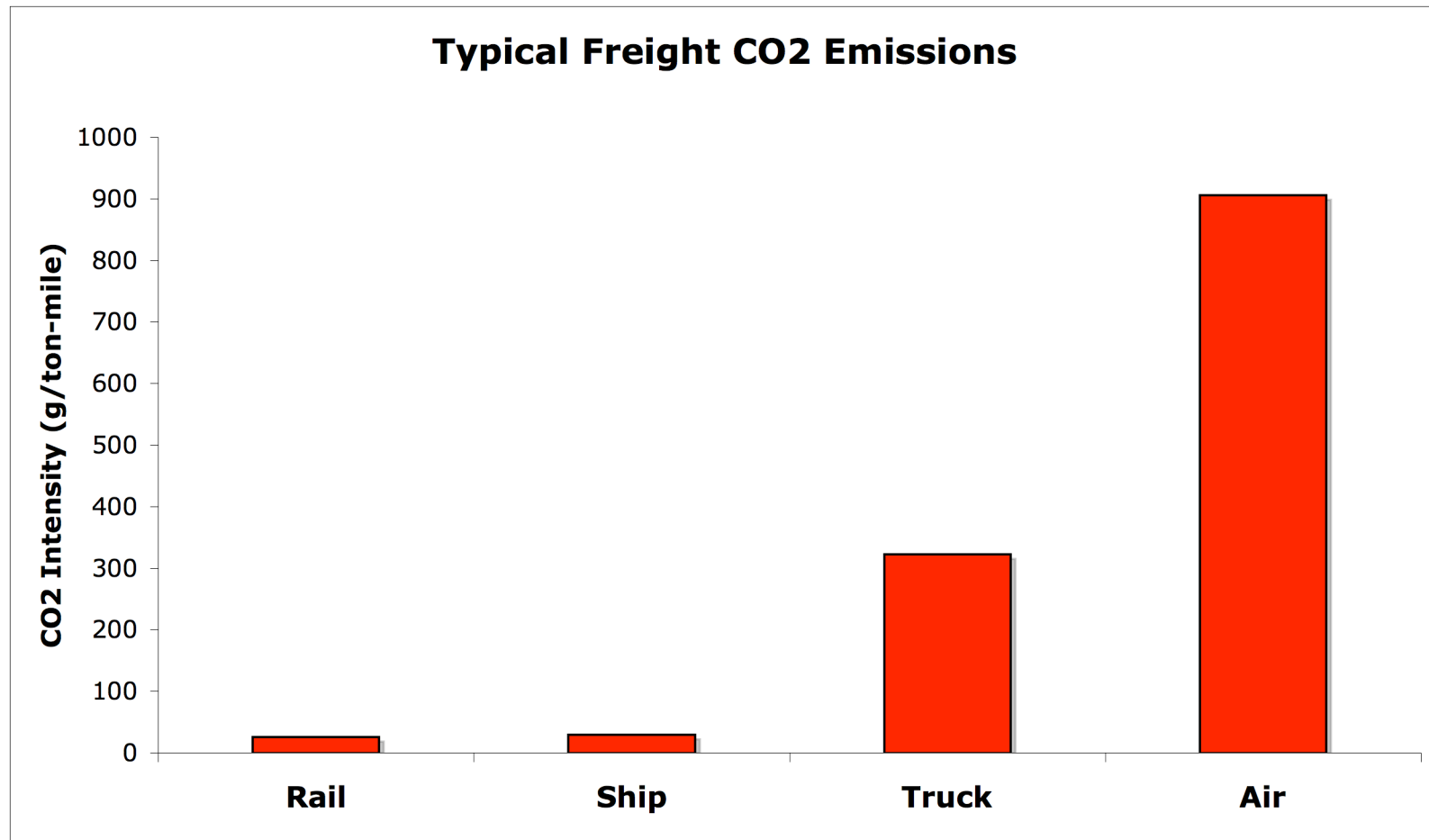
Emissions

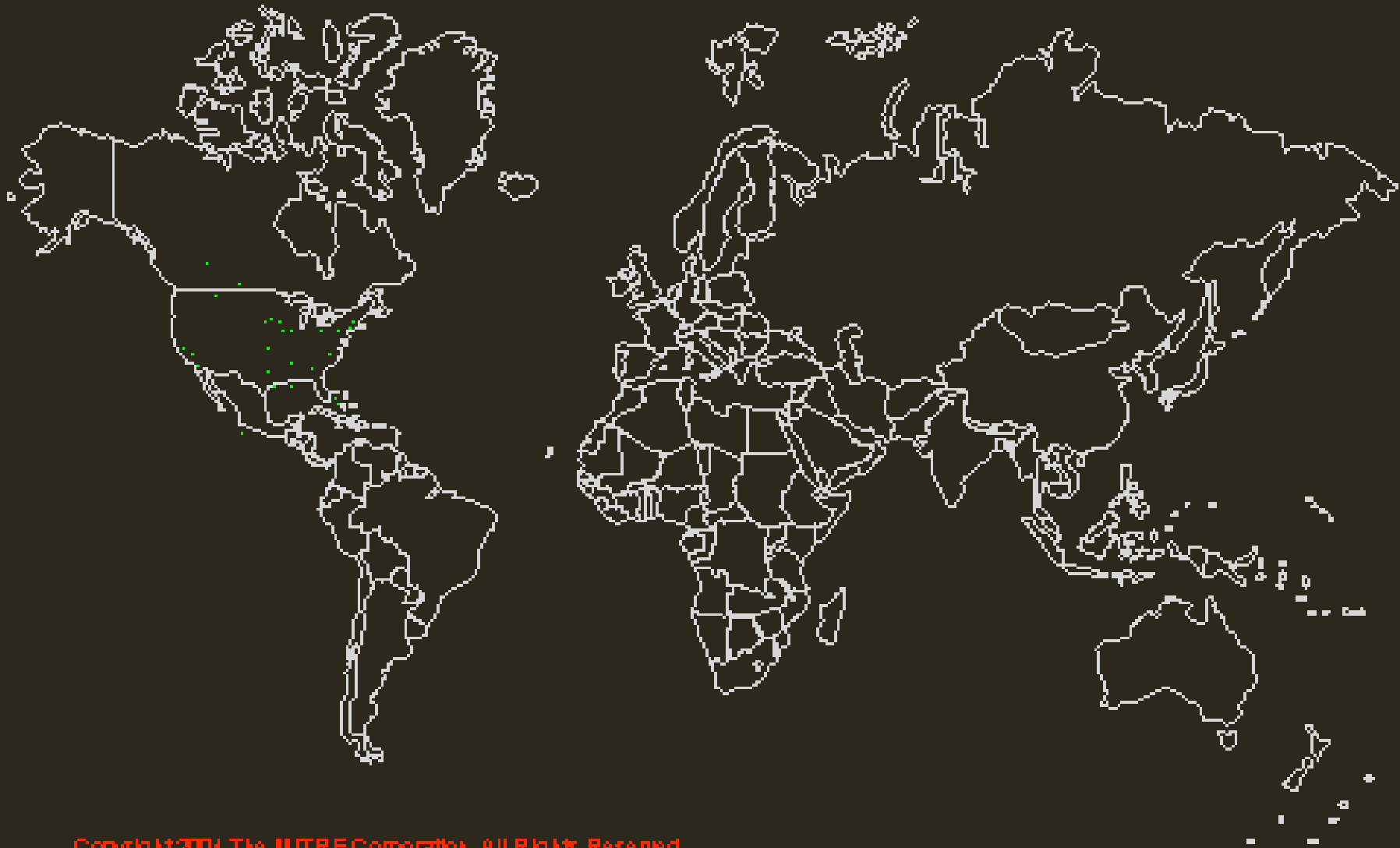


Intergovernmental Panel on Climate Change



Greenhouse Gas Emissions





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