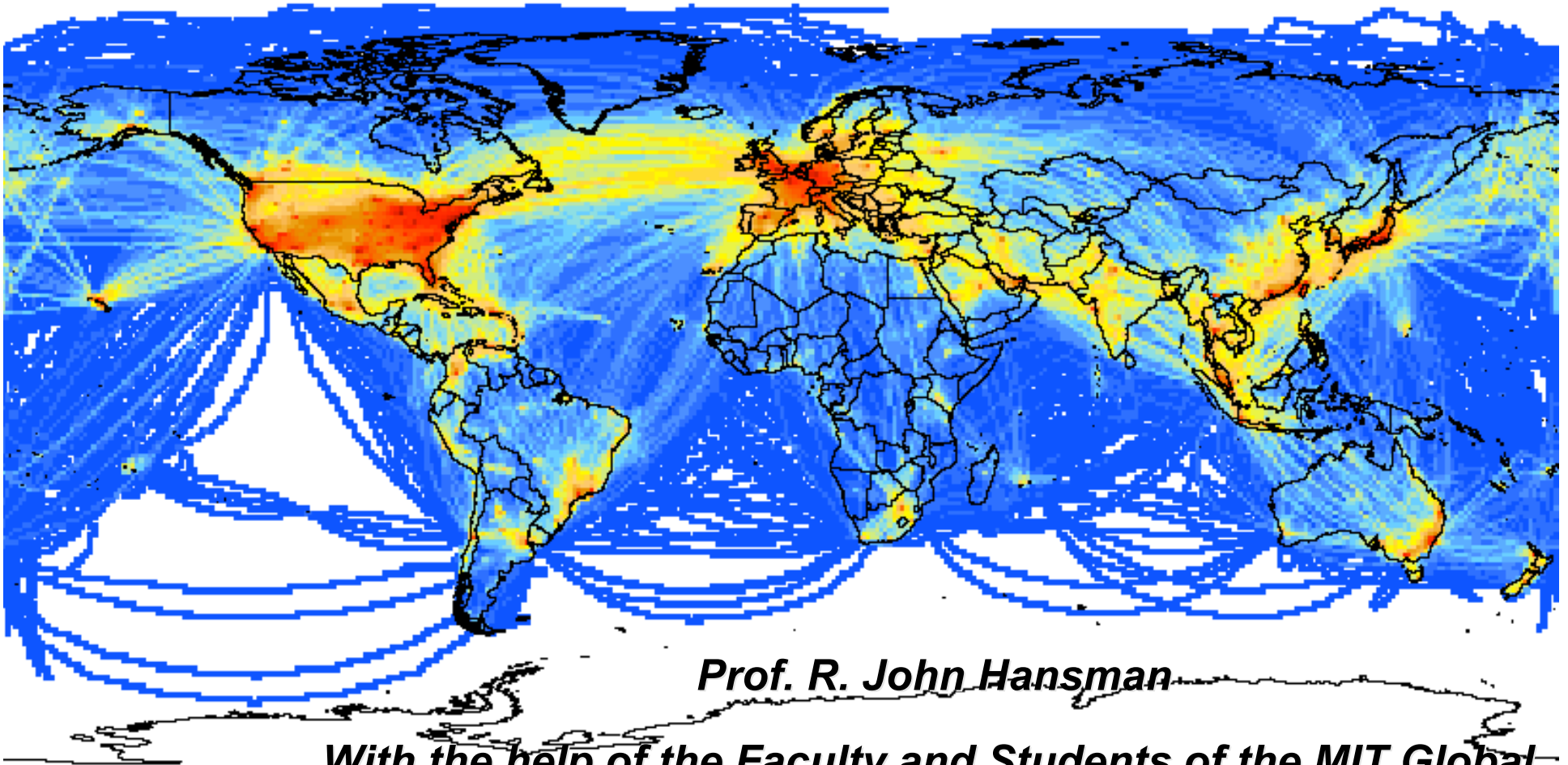




Airline Industry Recent Trend Update (October 2007)

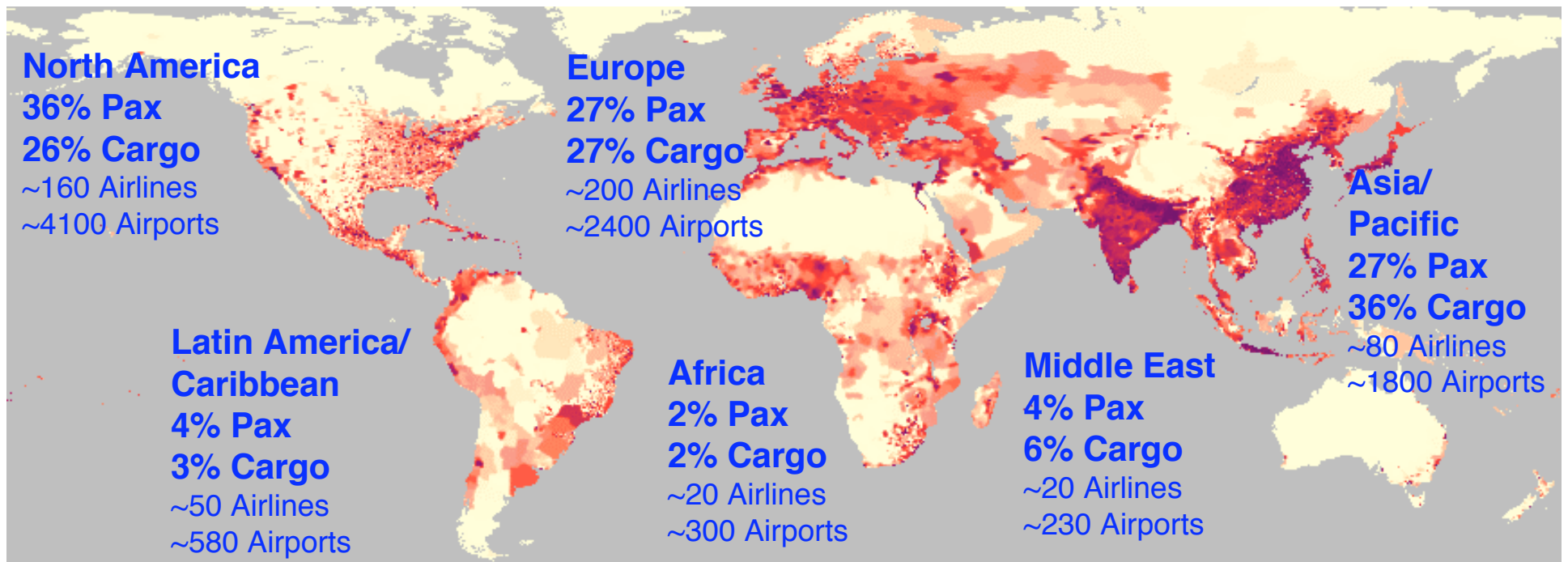


Prof. R. John Hansman

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



World Population Distribution & 2004 Air Transportation Activity

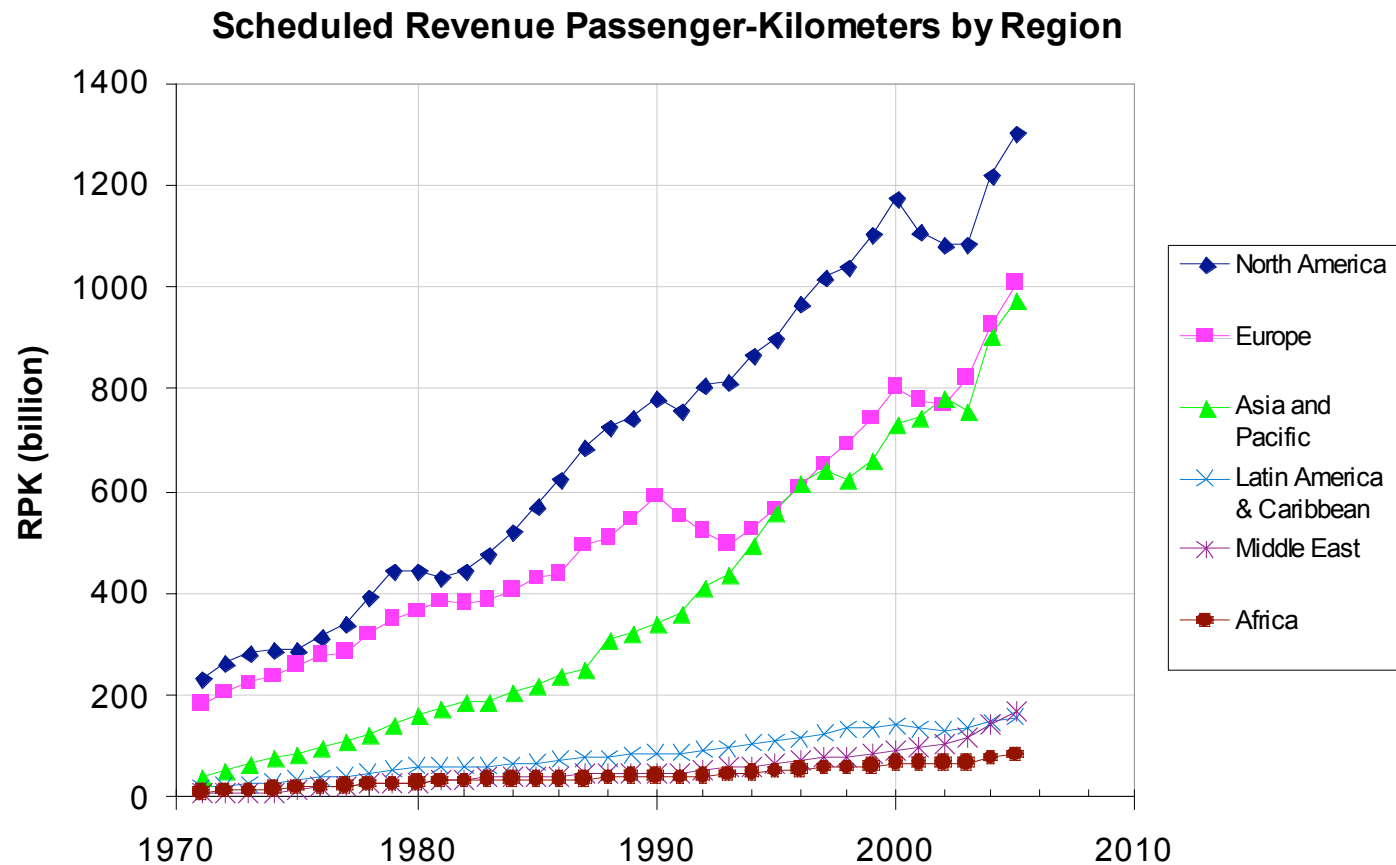


Data source: Population: [URL:<http://www.ciesin.org/datasets/gpw/globldem.doc.html>]

Air Transport: ICAO, R. Schild/Airbus

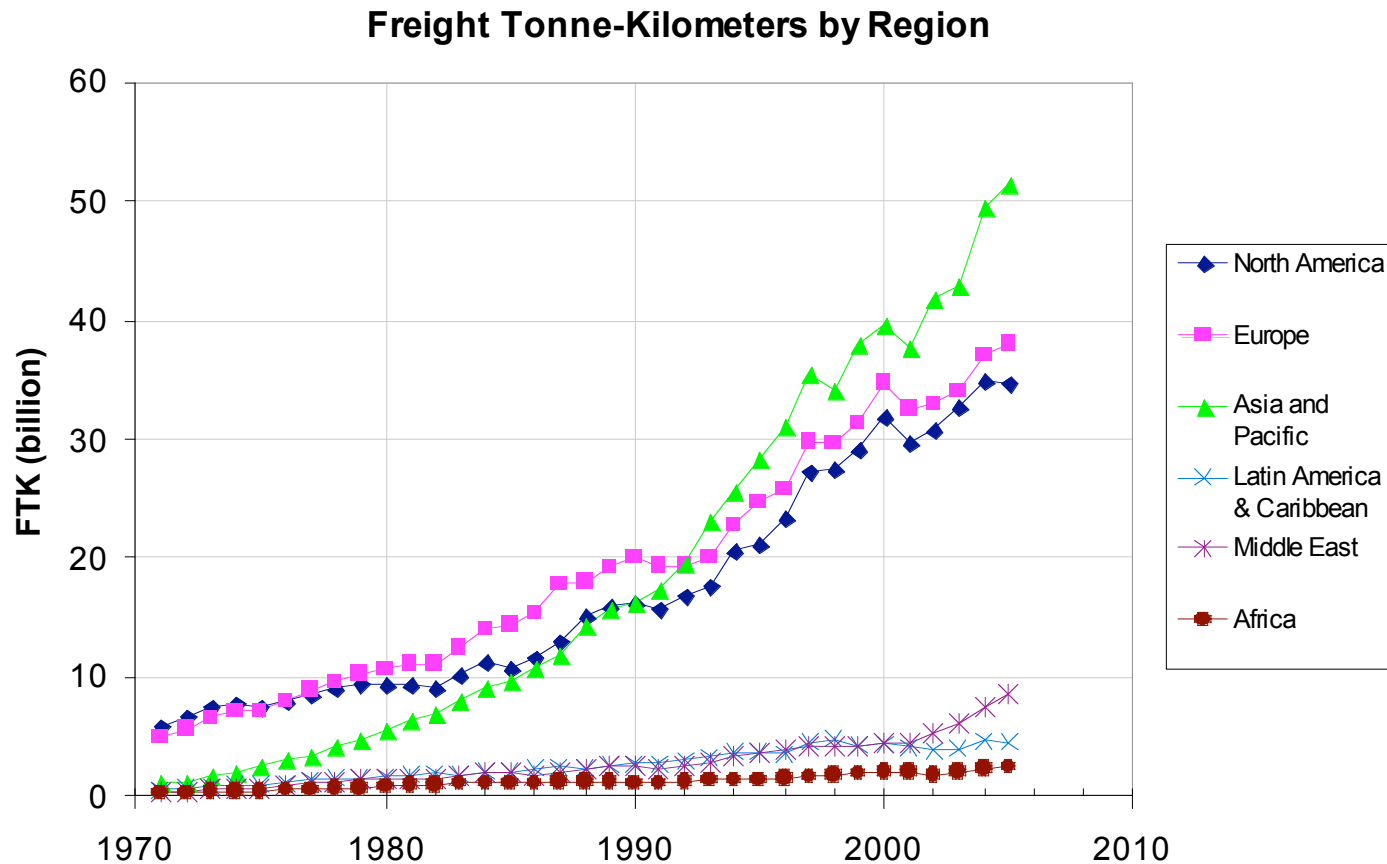
Passenger and freight traffic represent RPK and FTK share in 2004

RPK by Region





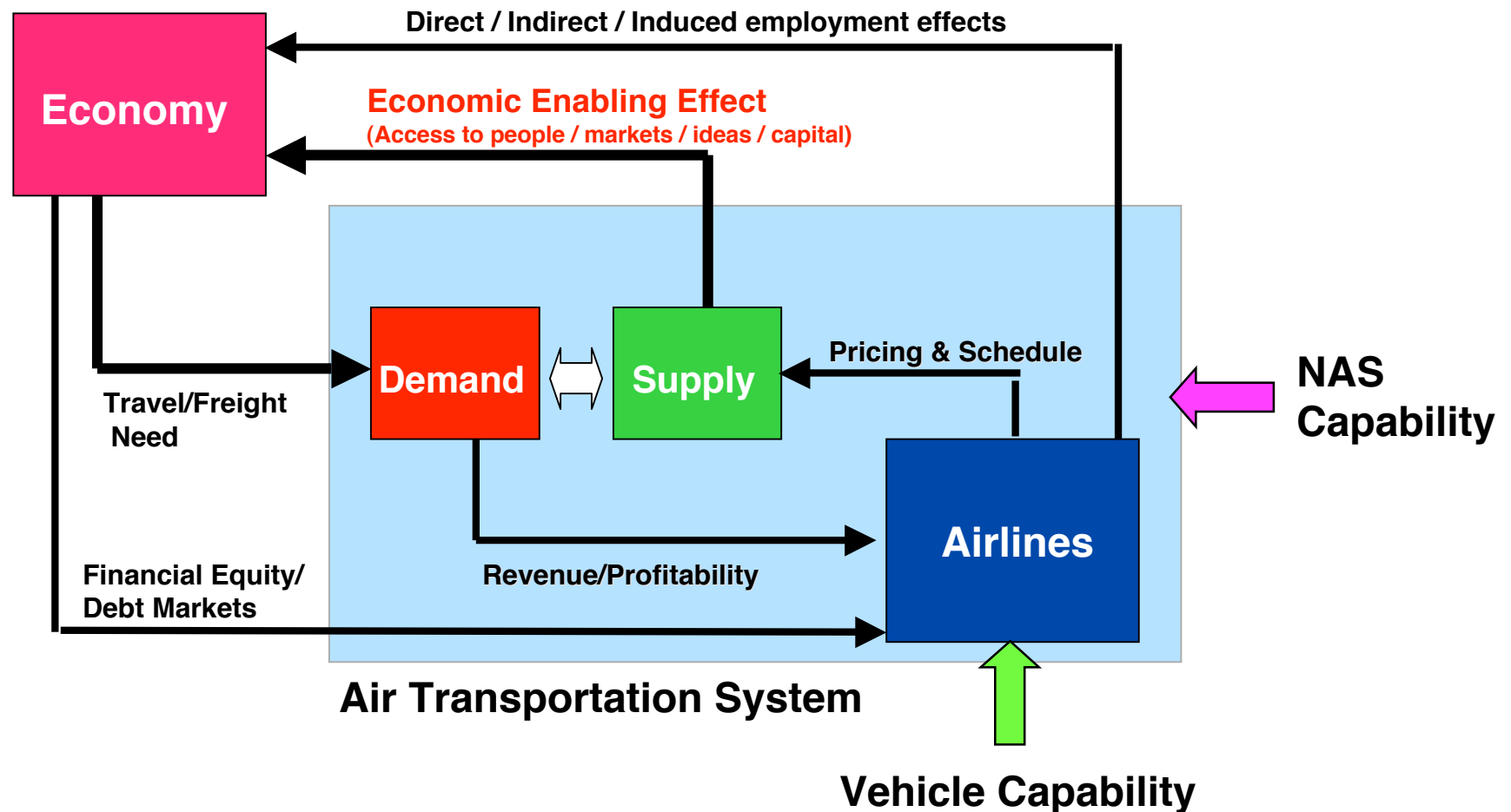
Freight Trends by Region



Data source: ICAO, scheduled services of commercial air carriers (through 2005)

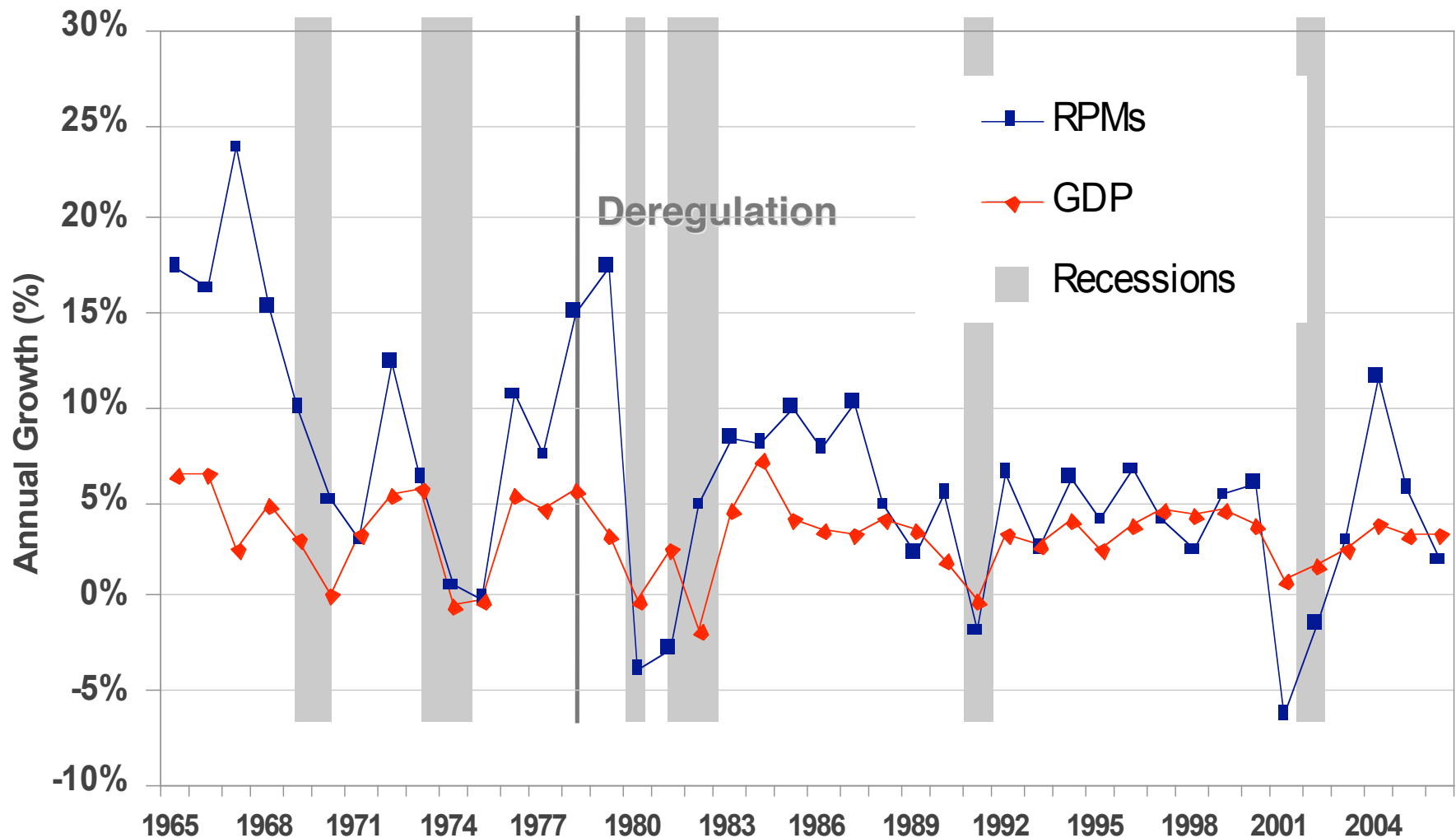


Relationship Between Economy and Air Transportation





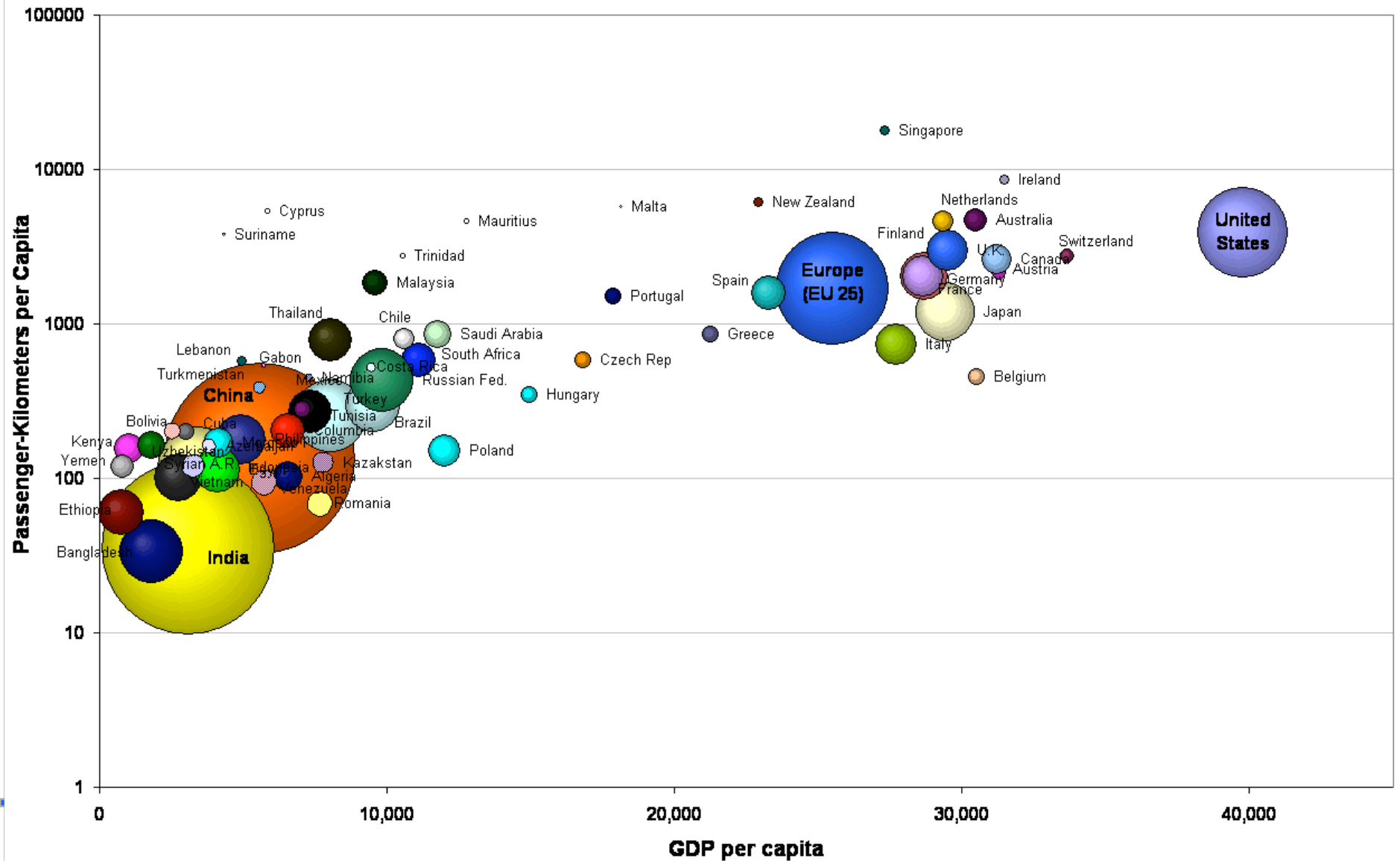
Correlation Between US GDP and Passenger Traffic



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

GDP: US Bureau of Economic Analysis

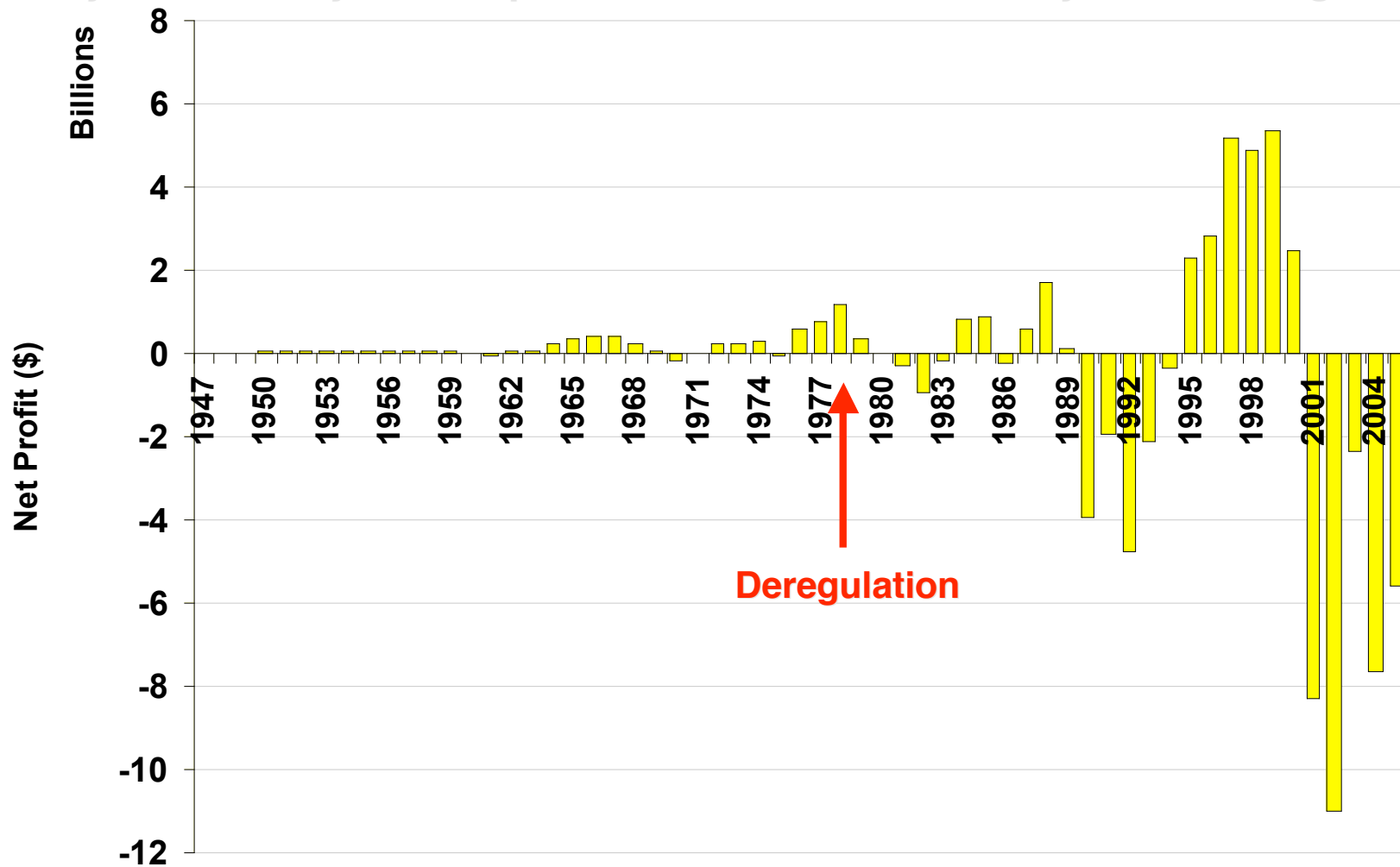
Recession data: National Bureau of Economic Research





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

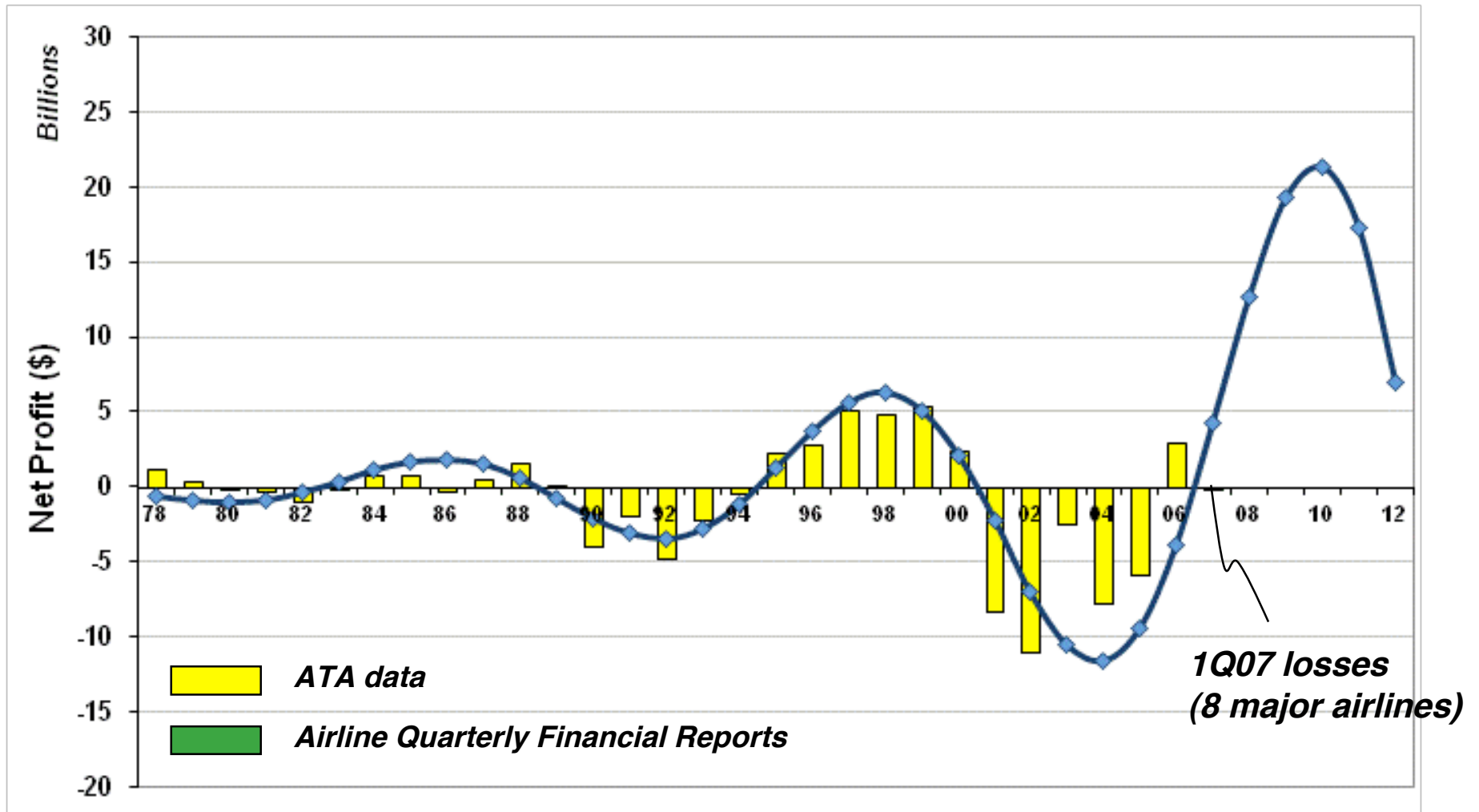


US Airlines Net Profit

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

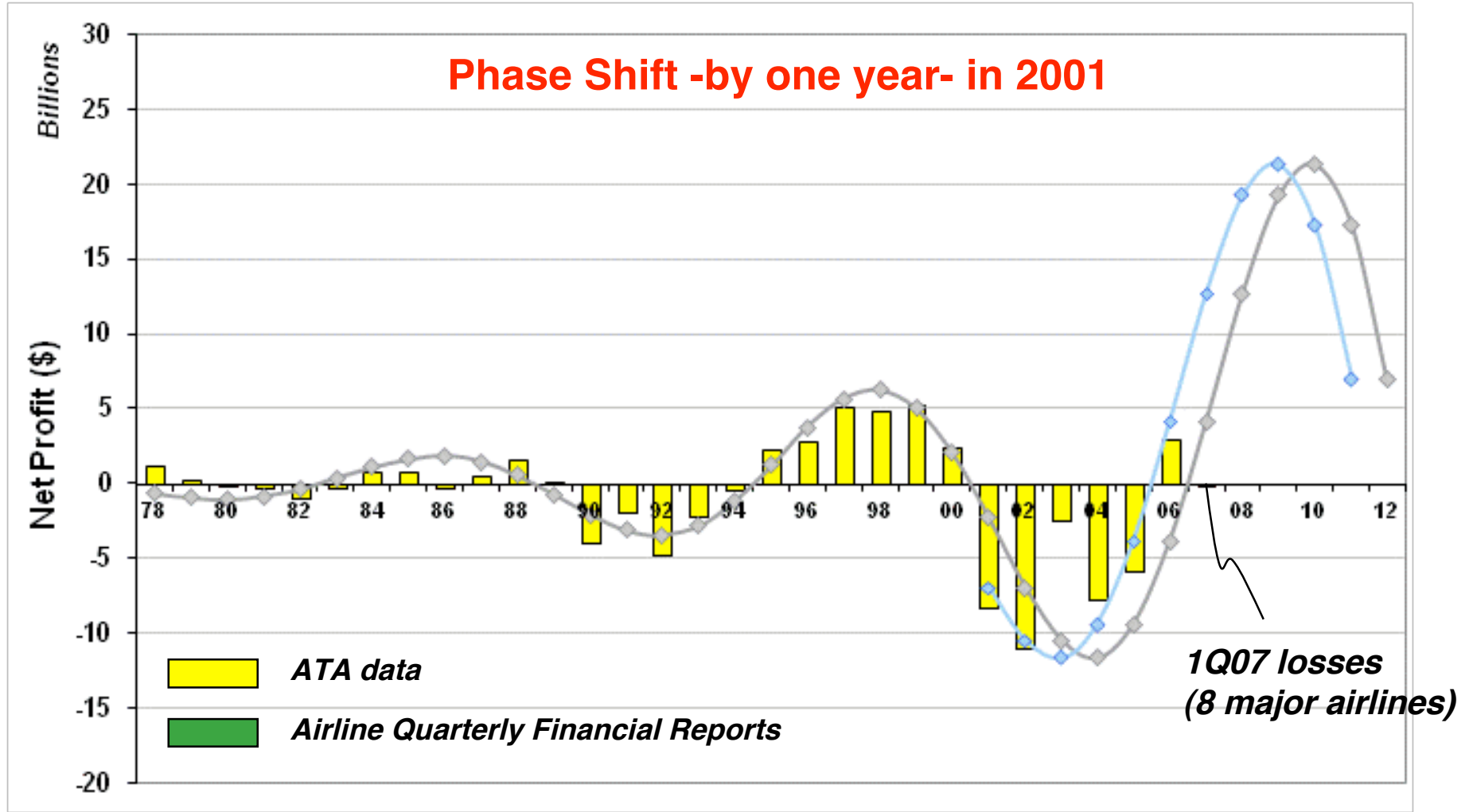


US Airlines Net Profit

Best Fit of Undamped Oscillation

Cycle Period = 11.3 yr

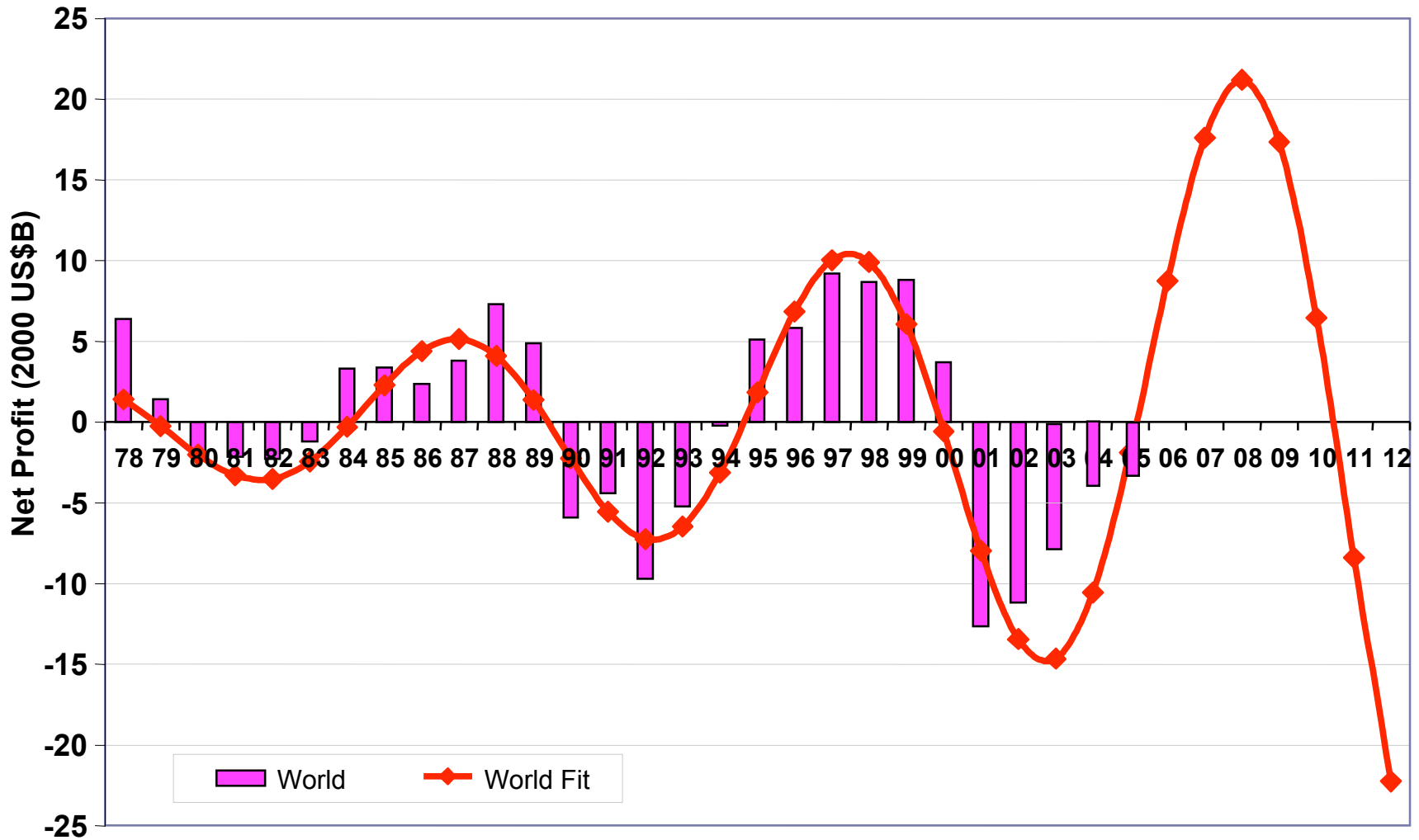
eFolding Time = 7.9 yr





World Airlines Net Profit Model

Best Fit of Undamped Oscillation (2002 data)
Cycle Period = 10.5 yr eFolding Time = 14.9 yr



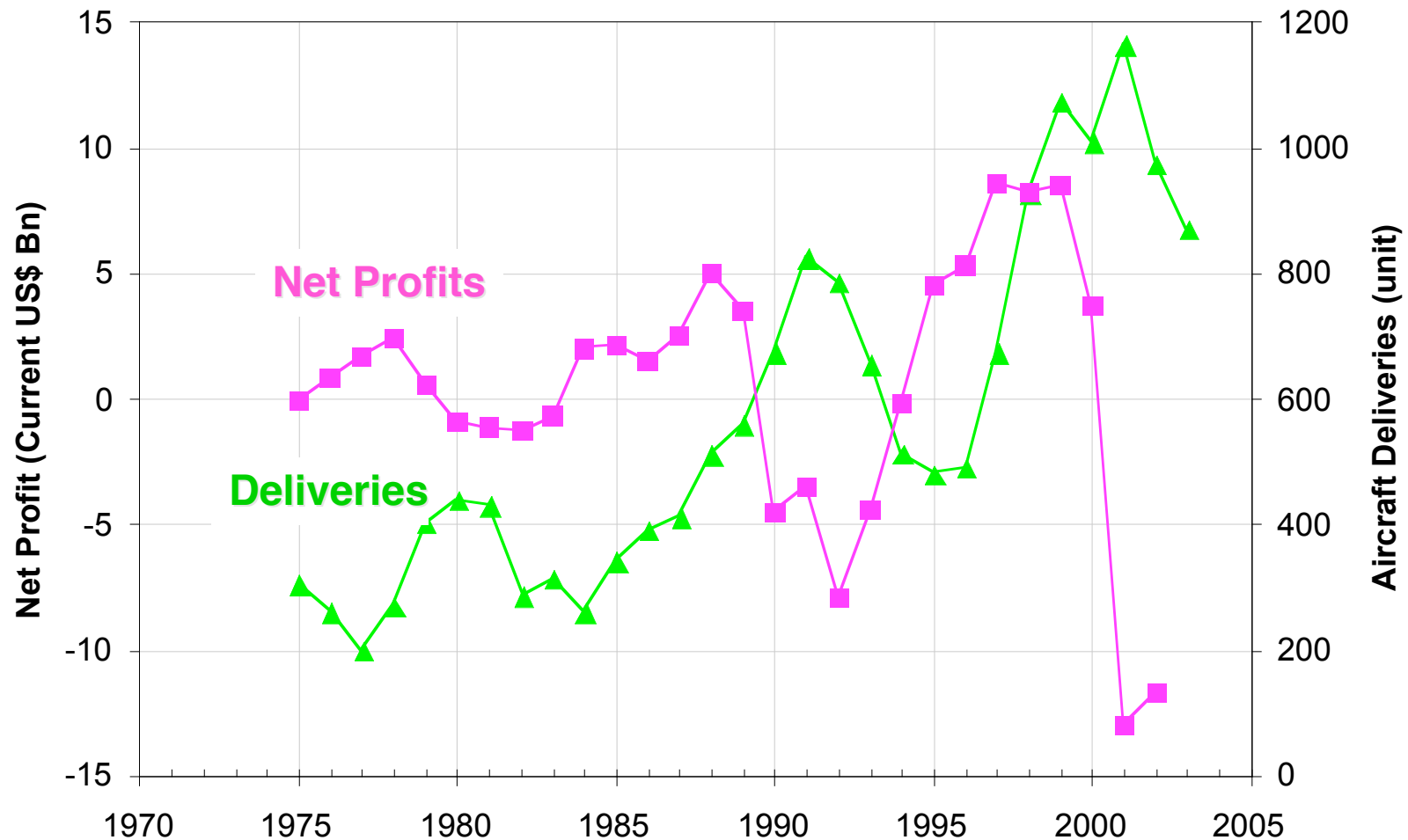
Data source: ICAO Reports and ICAO News Releases



Net Profit and Aircraft Deliveries

Hypothesize that instability driven by capacity response phase lag

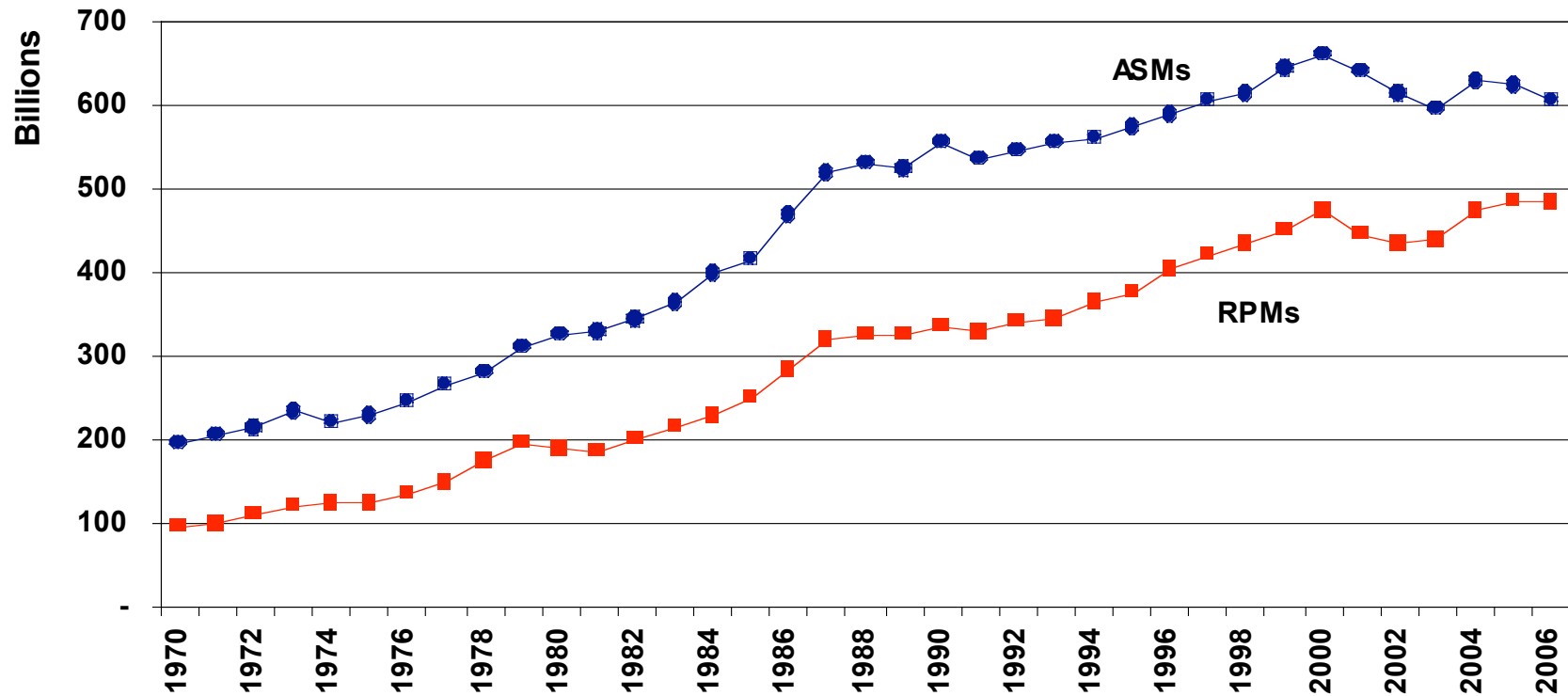
World Airlines Net Profits vs. Aircraft Deliveries



Source: ICAO data



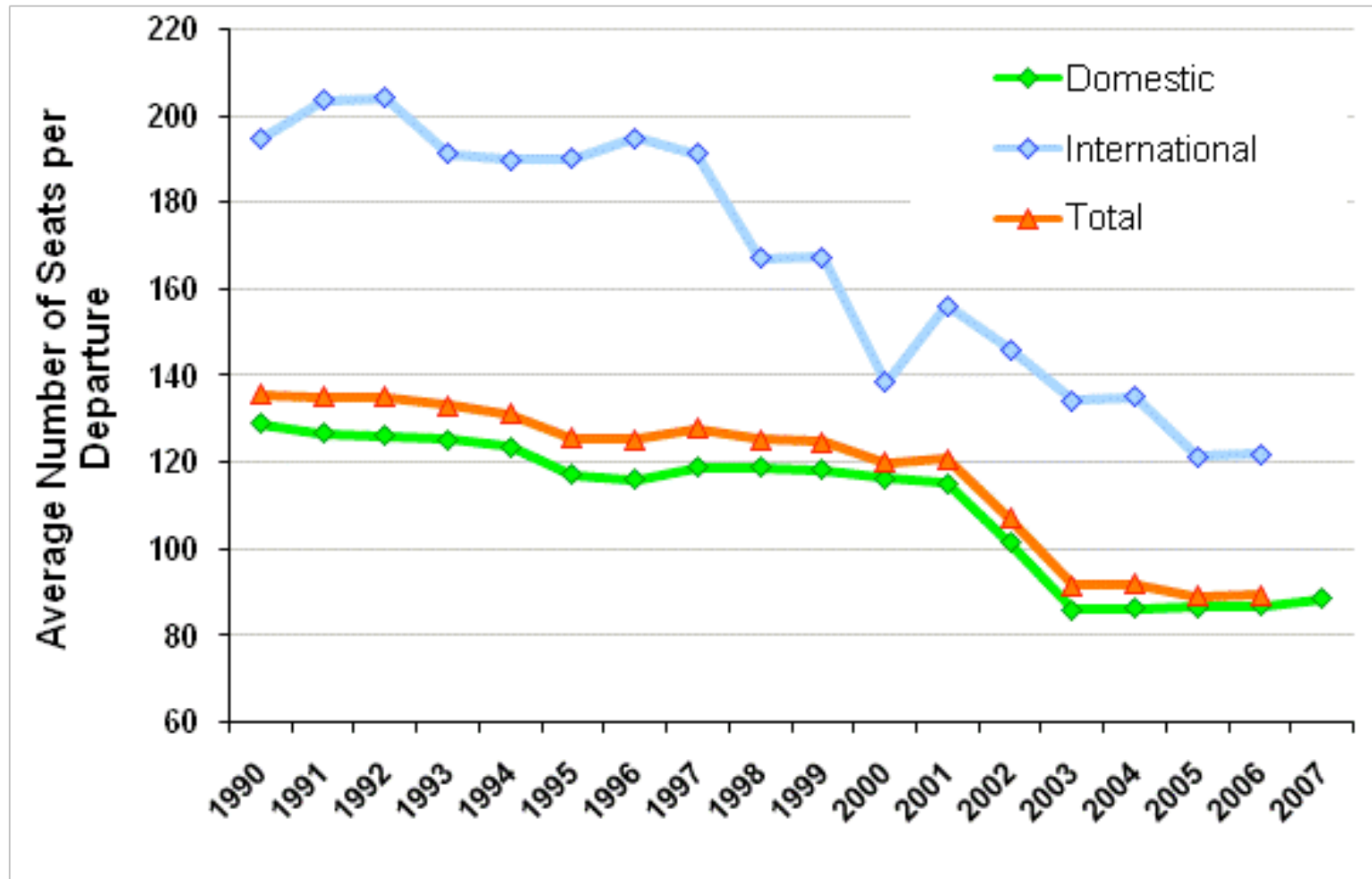
U.S. Domestic ASMs and RPMs



Data source: ATA, US member airlines, scheduled mainline service (through 2006)



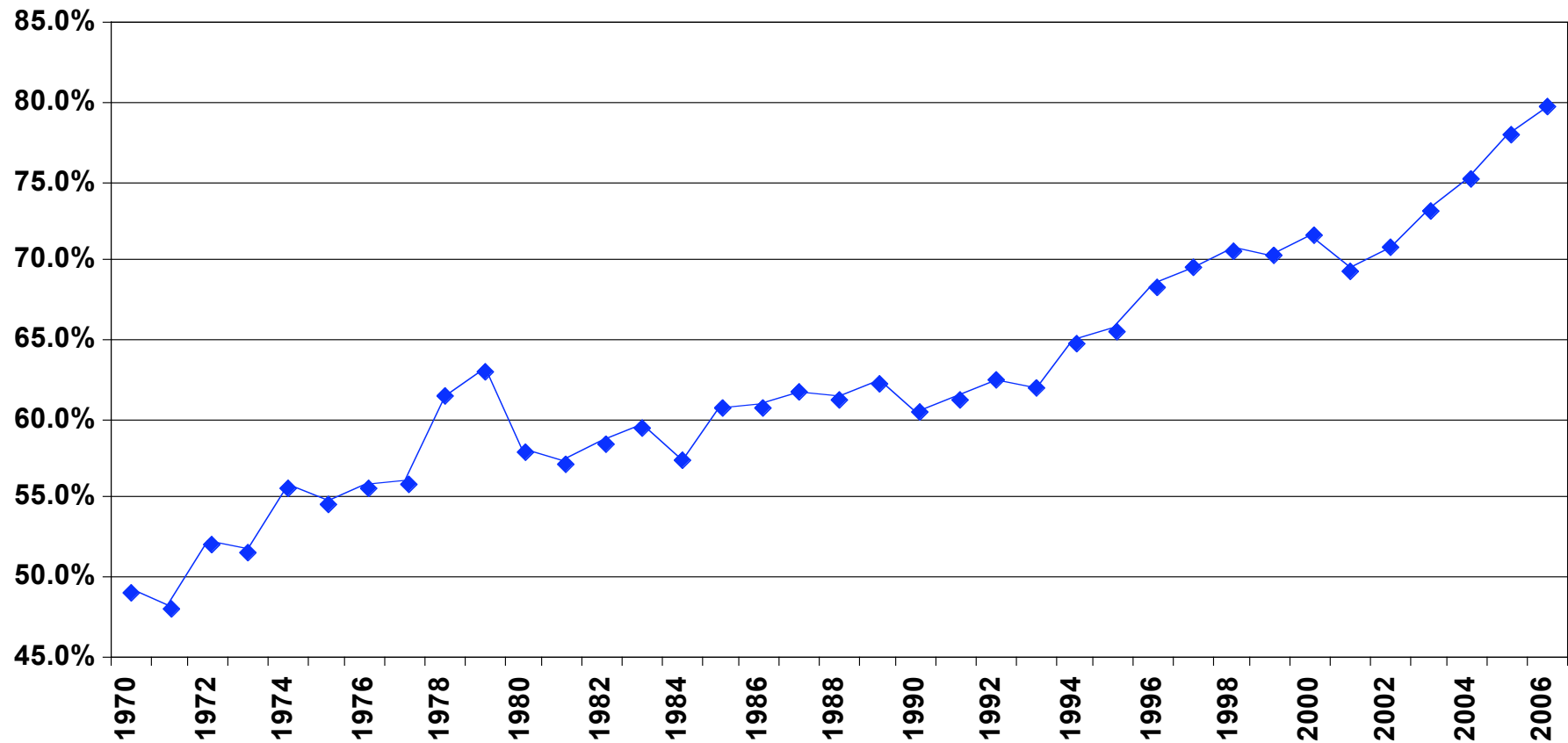
Trends in Aircraft Size



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



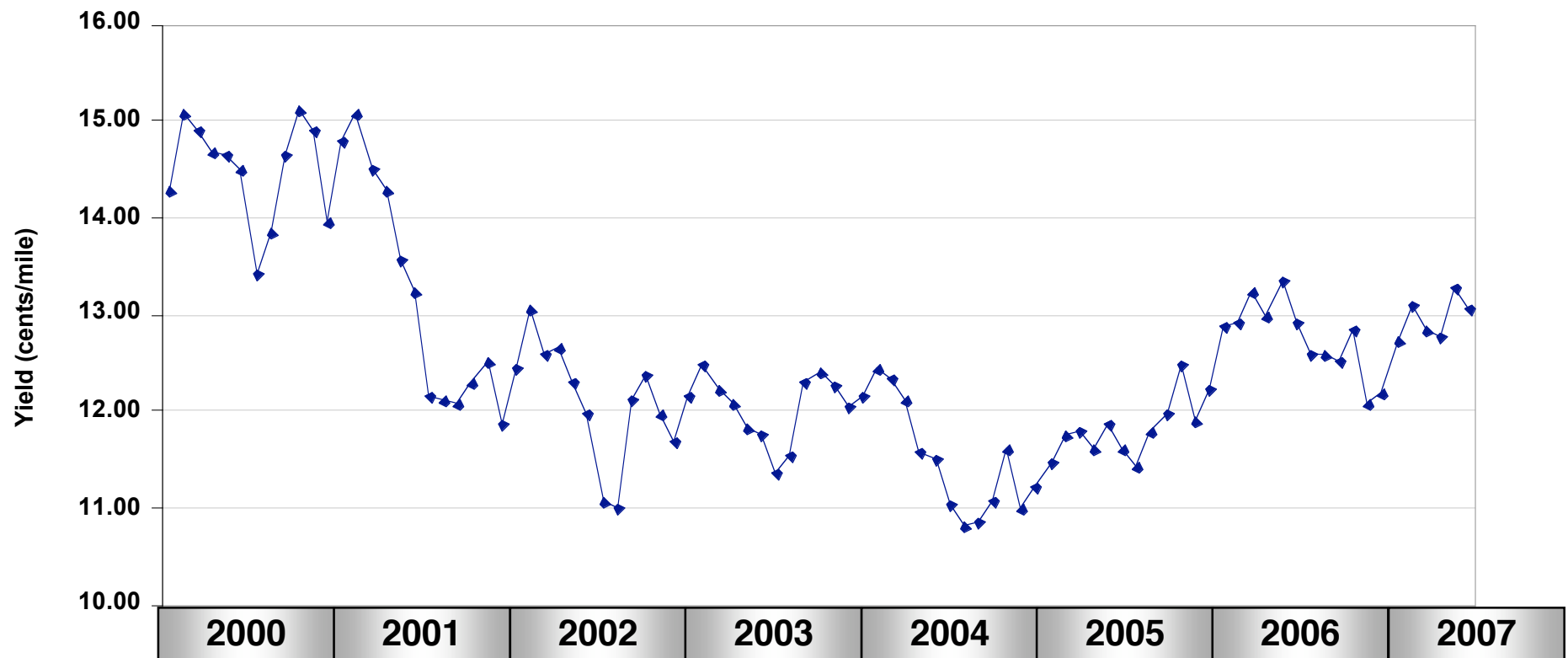
U.S. Domestic Average Load Factor



Data source: ATA, US member airlines, scheduled mainline service (through 2006)



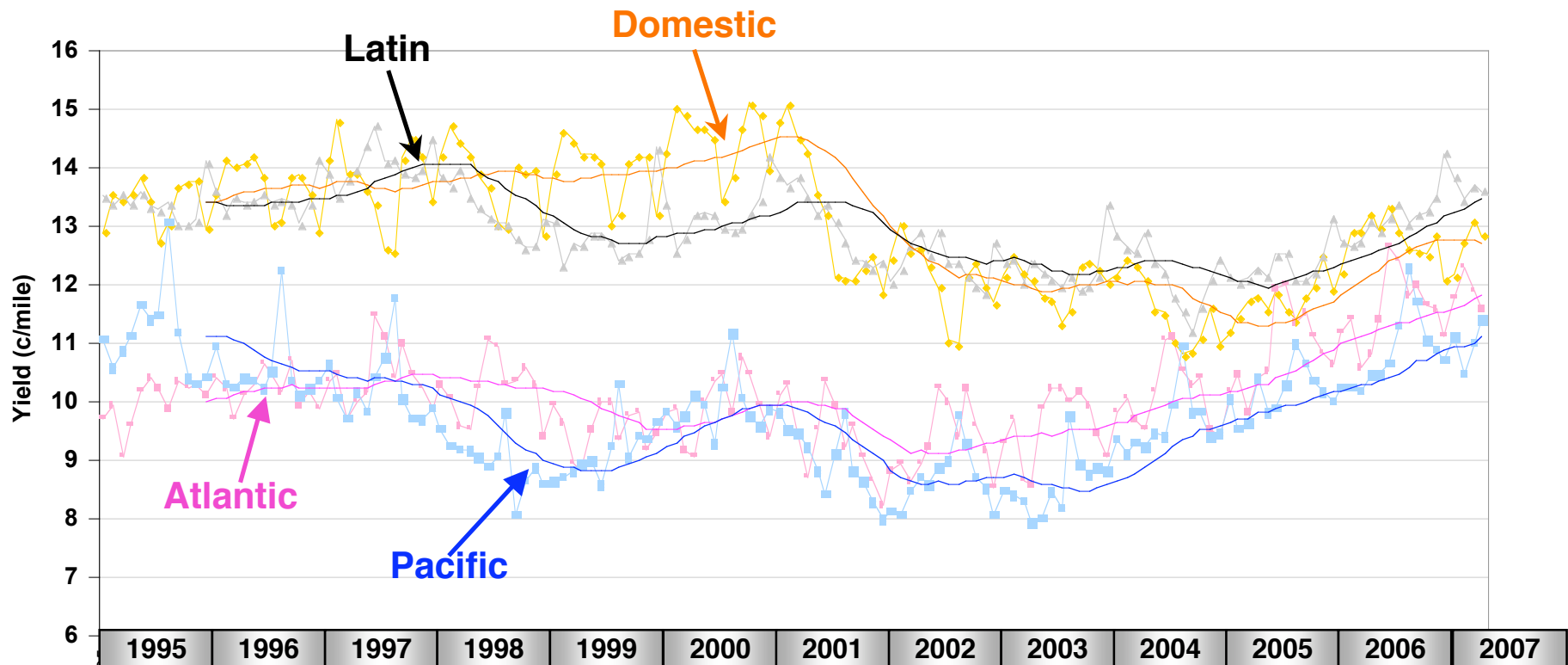
U.S. Average Domestic Yield



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



Historic Yield Trend 1995-2007

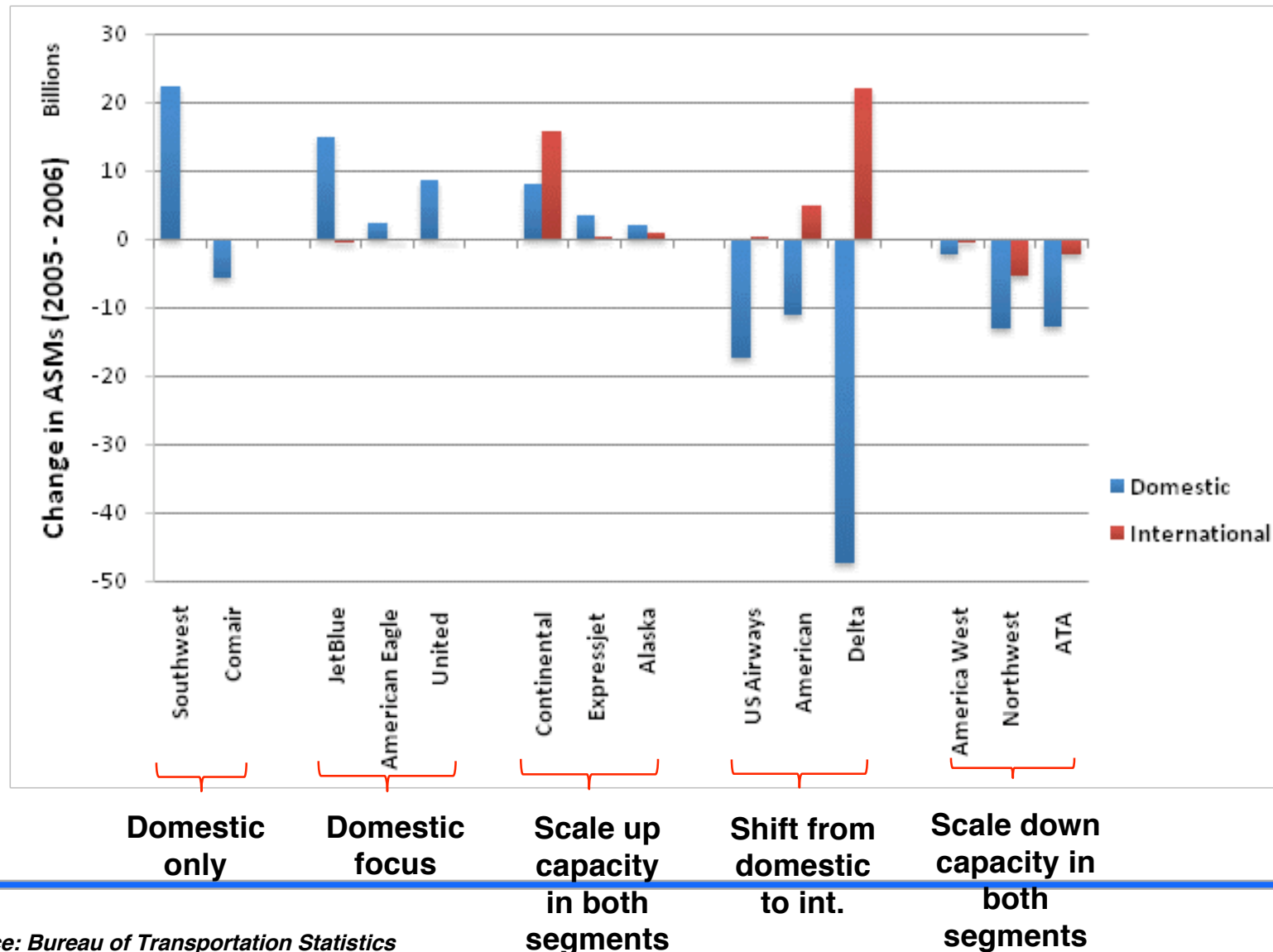


Data source: ATA Passenger Yield Report, 7 US major airlines excluding Southwest (WN).



Capacity Allocation Strategies

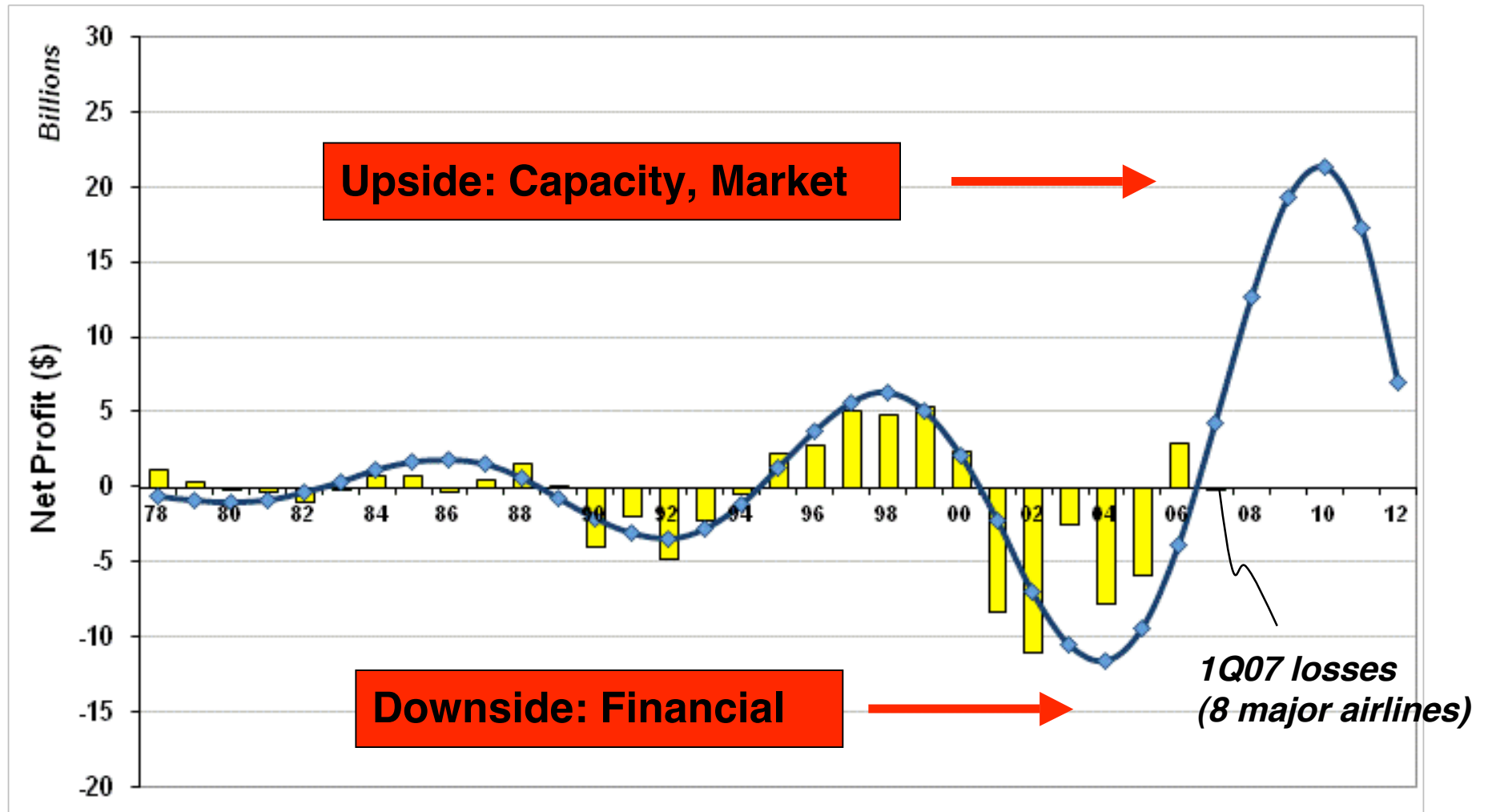
(Domestic vs. International ASMs – from 2005 to 2006)



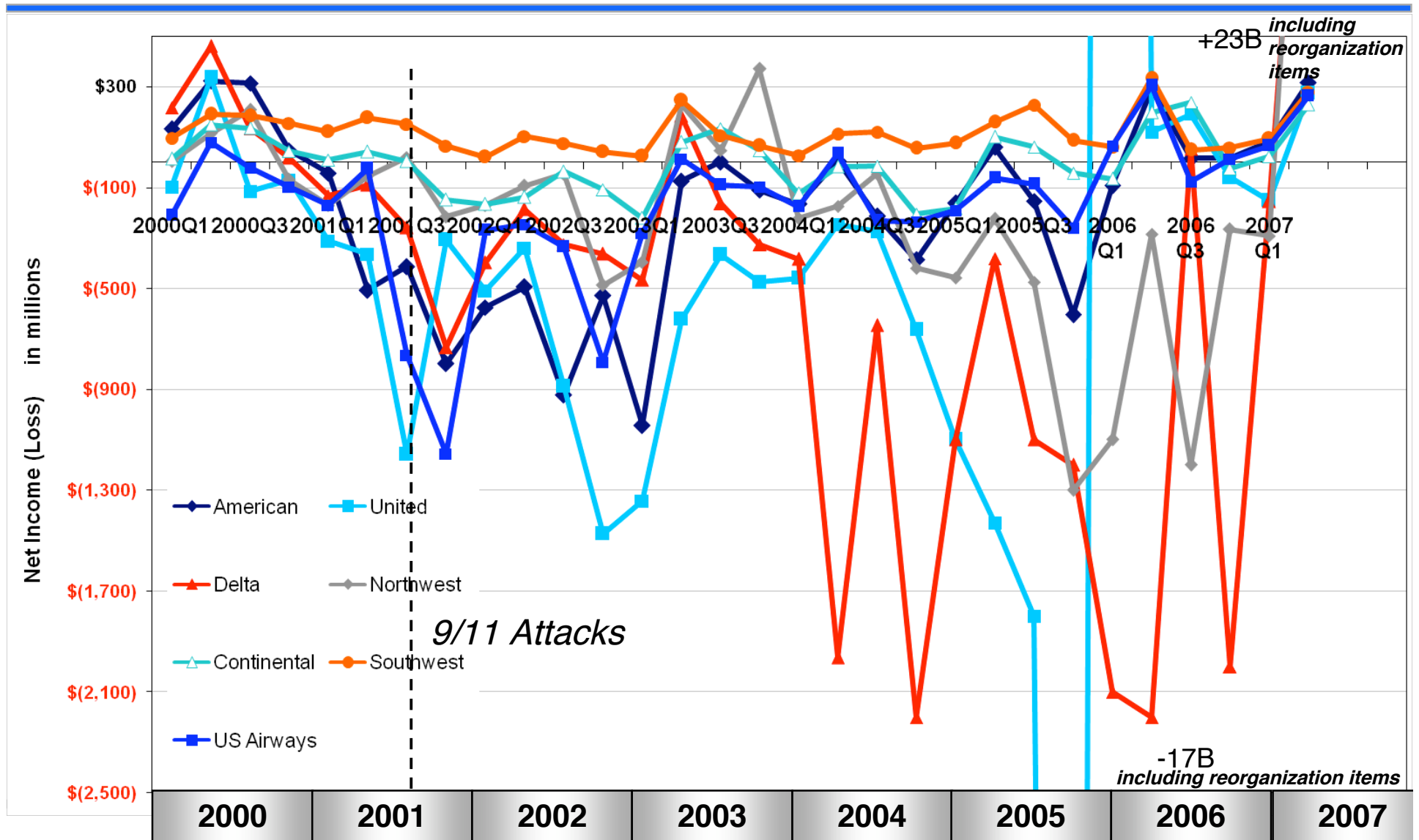
Data source: Bureau of Transportation Statistics



Growth Limits Constraints vs Damping



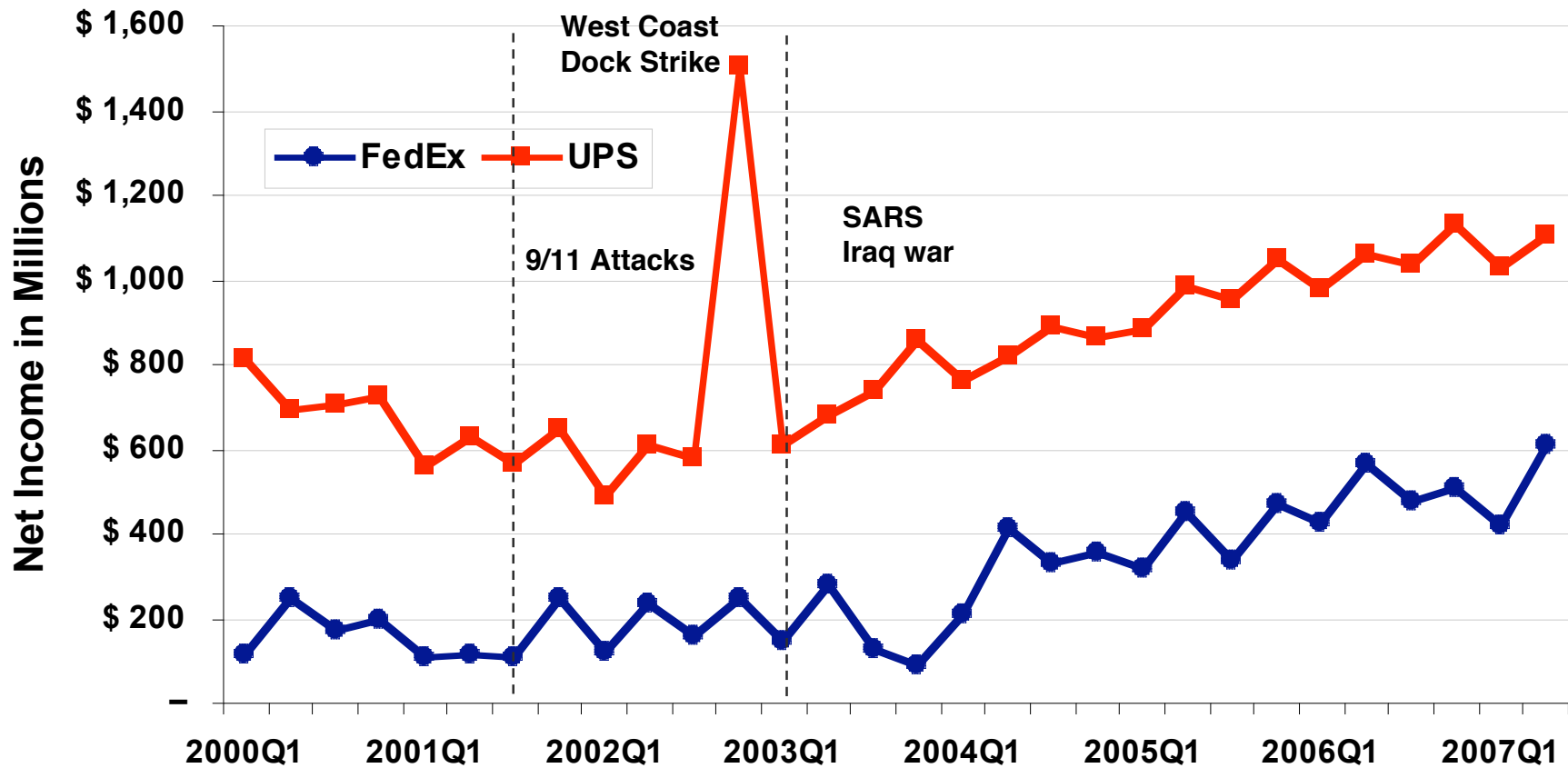
Airline Profits



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



Cargo Operations Profitable

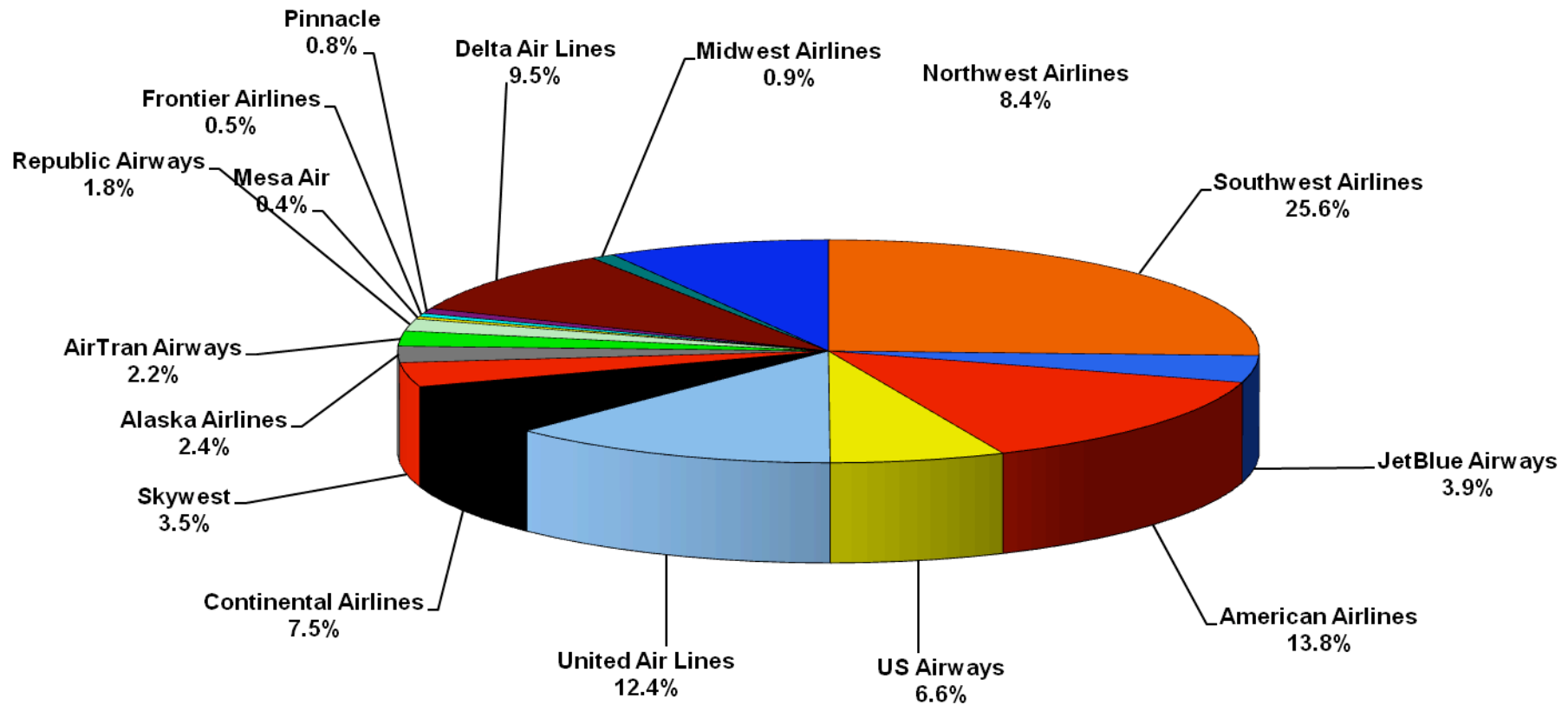


Data source: Companies' annual reports



Market Cap: US Majors

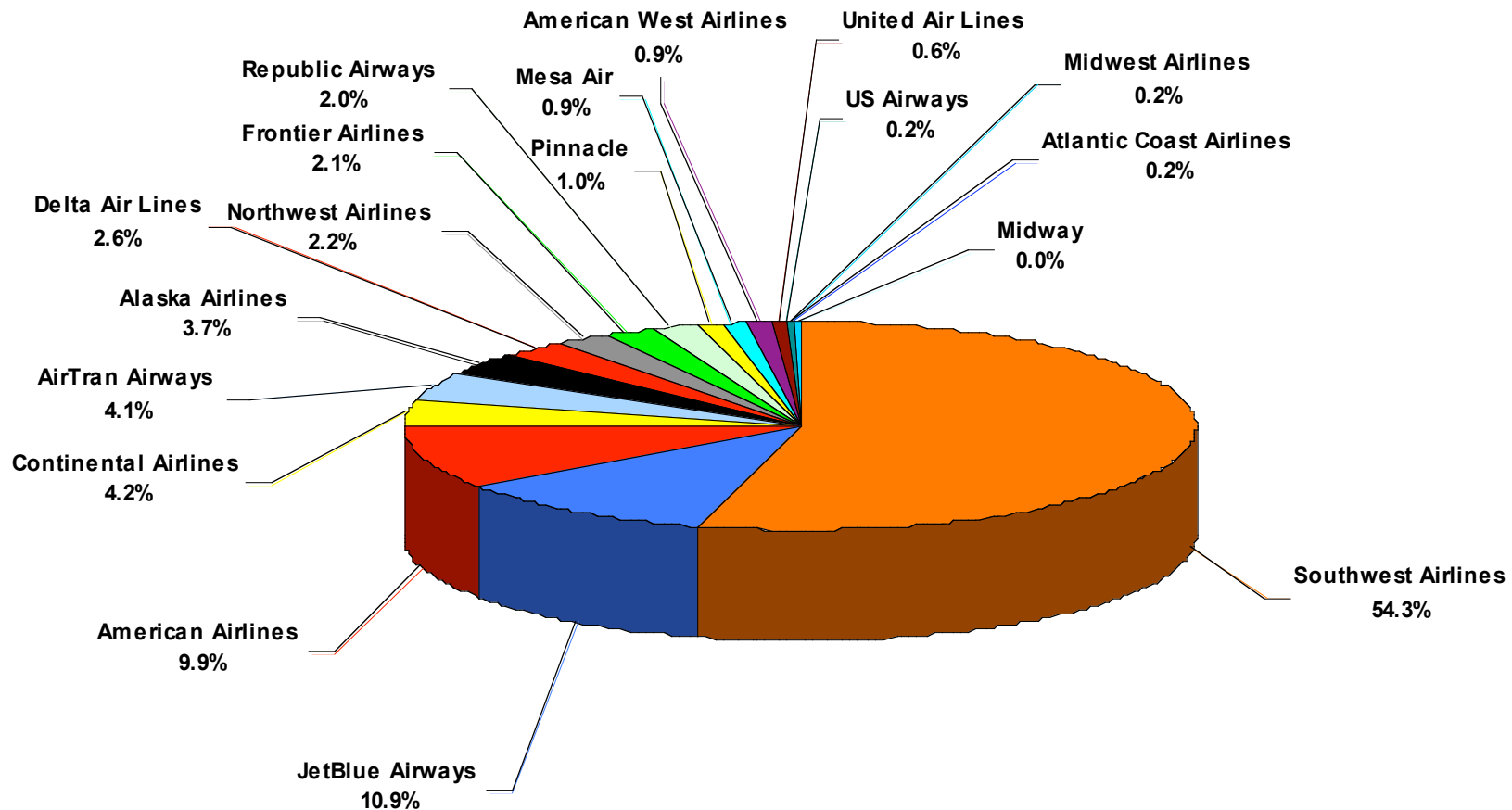
4-Sept-2007



Total Market Cap: \$ 44.5 billion



Market Cap: US Majors, 26-May-2005

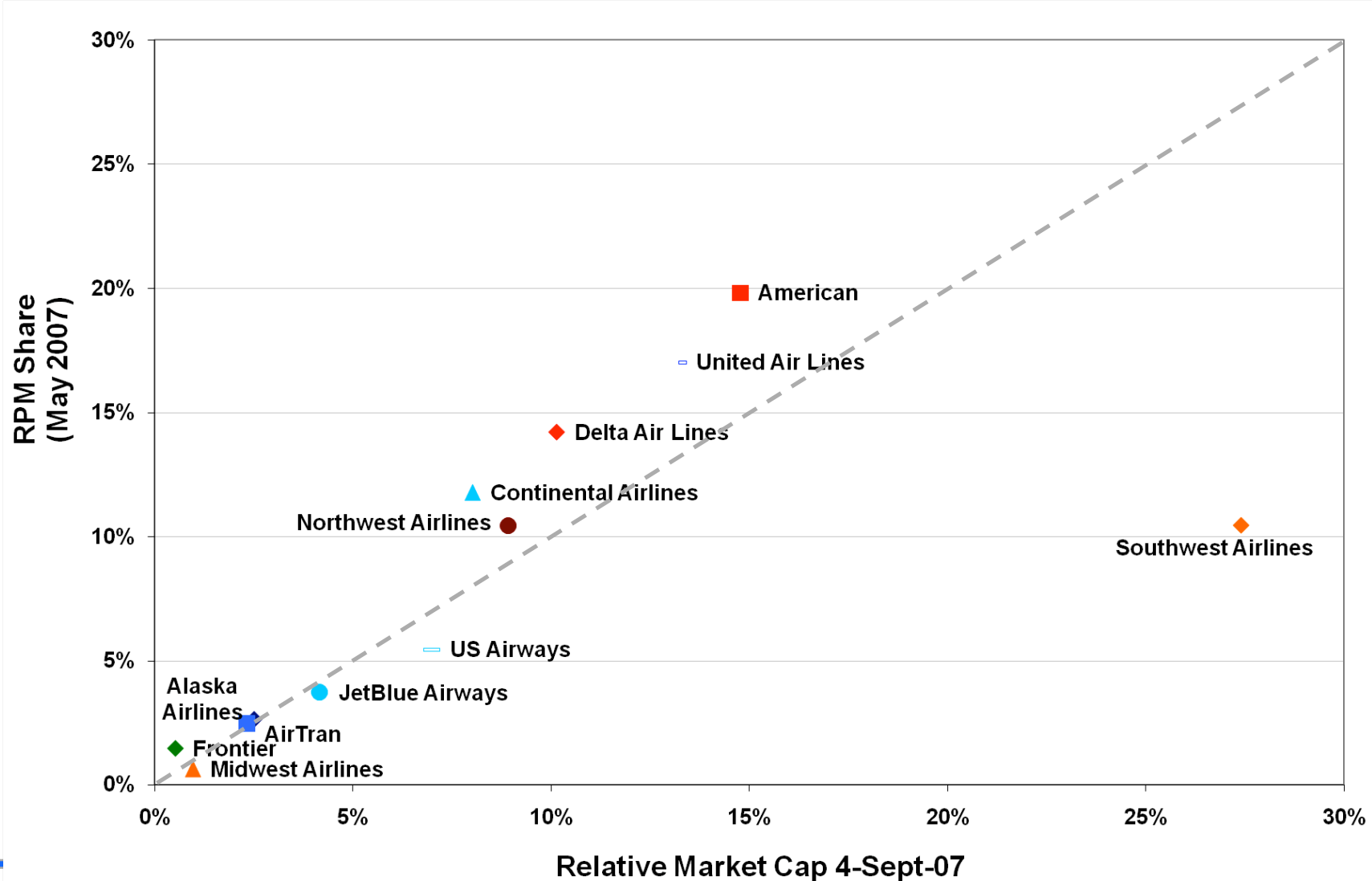


Total Market Cap: \$21.2 billion



RPM Share vs. Market Cap

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



Source: Yahoo! Finance and Bureau of Transportation Statistics



Low-Cost Carrier Envy

Emergence of LCCs

Canada (7, 1 in 2004)

CanJet
HMY Airways
JetsGo Airlines
Tango Airlines
Westjet
Zip
Canada West

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
Sun Country Airlines
USA 3000 Airlines
Vacation Express
Ted
Independence Air
Virgin USA

Europe (60, 3 in 2004)

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

Smart Wings
Wizz Air
Hop

Asia/Pacific (20, 8 in 2004)

Air Arabia
Air Asia
Air Deccan
Athena Air Services
Citilink
Freedom Air
Lion Airways
One-Two-Go
Skymark Airlines
Skynet Asia Airways
Aero Asia
Awair
Spice Jet
ValuAir
Virgin Blue
Air Blue
Air One
BackpackersXpress
Jetstar
Nok Air
Pacific Blue
SkyAsia
Tiger Airways
Spring
Kingfisher
Bangkok Air
Jazeera Airways

Legend:

New in 2003 / 2004

New in 2005 / 2006

Inter continental LCCs

Air Madrid
Condor
East Jet
LTU
Martinair
Zoom Airlines

South America (3)

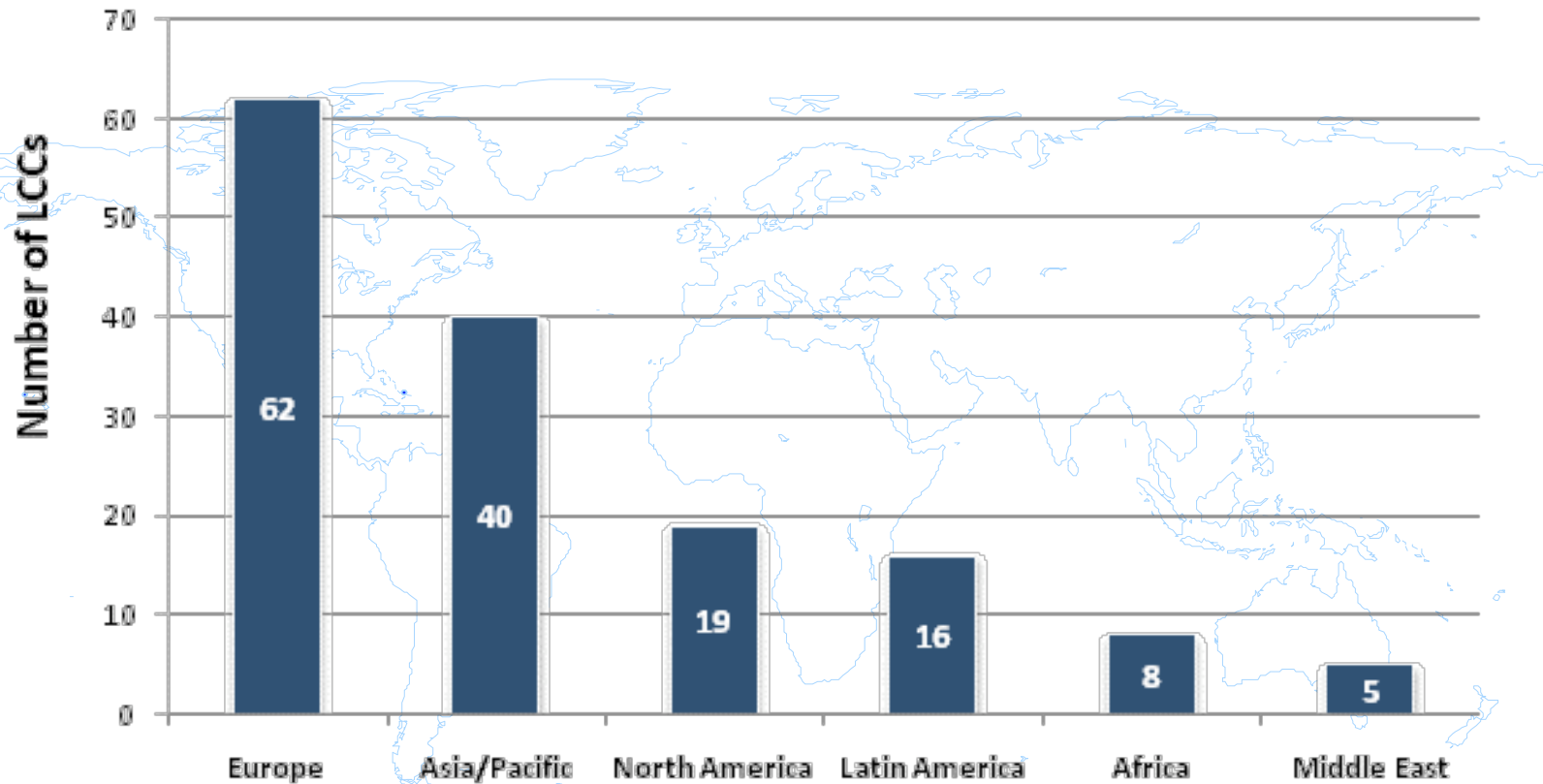
Bra
Gol
U Air

Africa (2)

1Time
Kulula



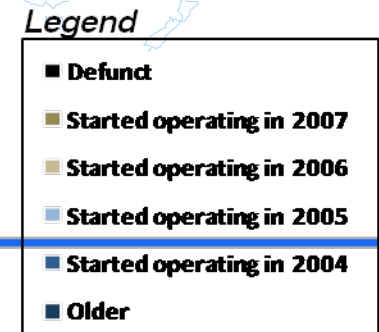
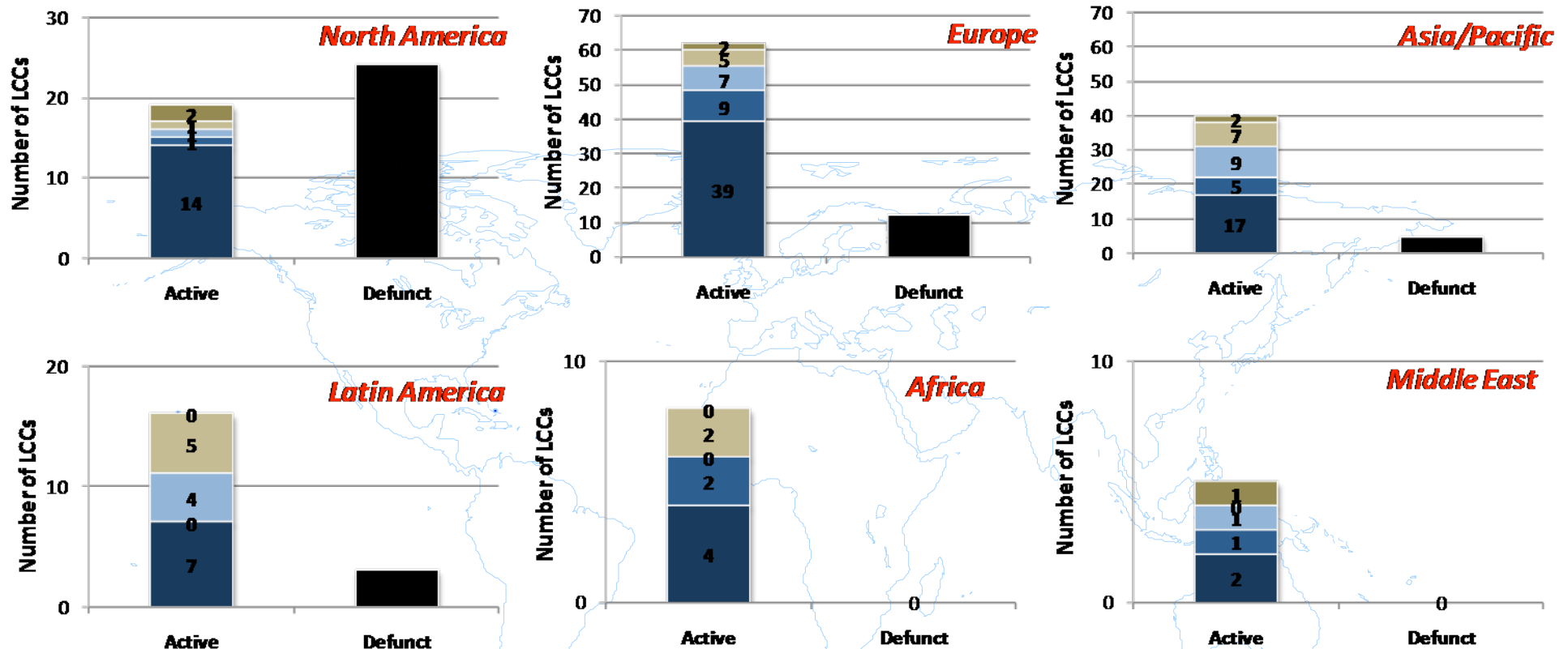
Low-Cost Carriers around the World



Source: Airline websites and Wikipedia low cost carrier list



Birth & Death of Low-Cost Carriers around the World





EU-US Open Skies Agreement

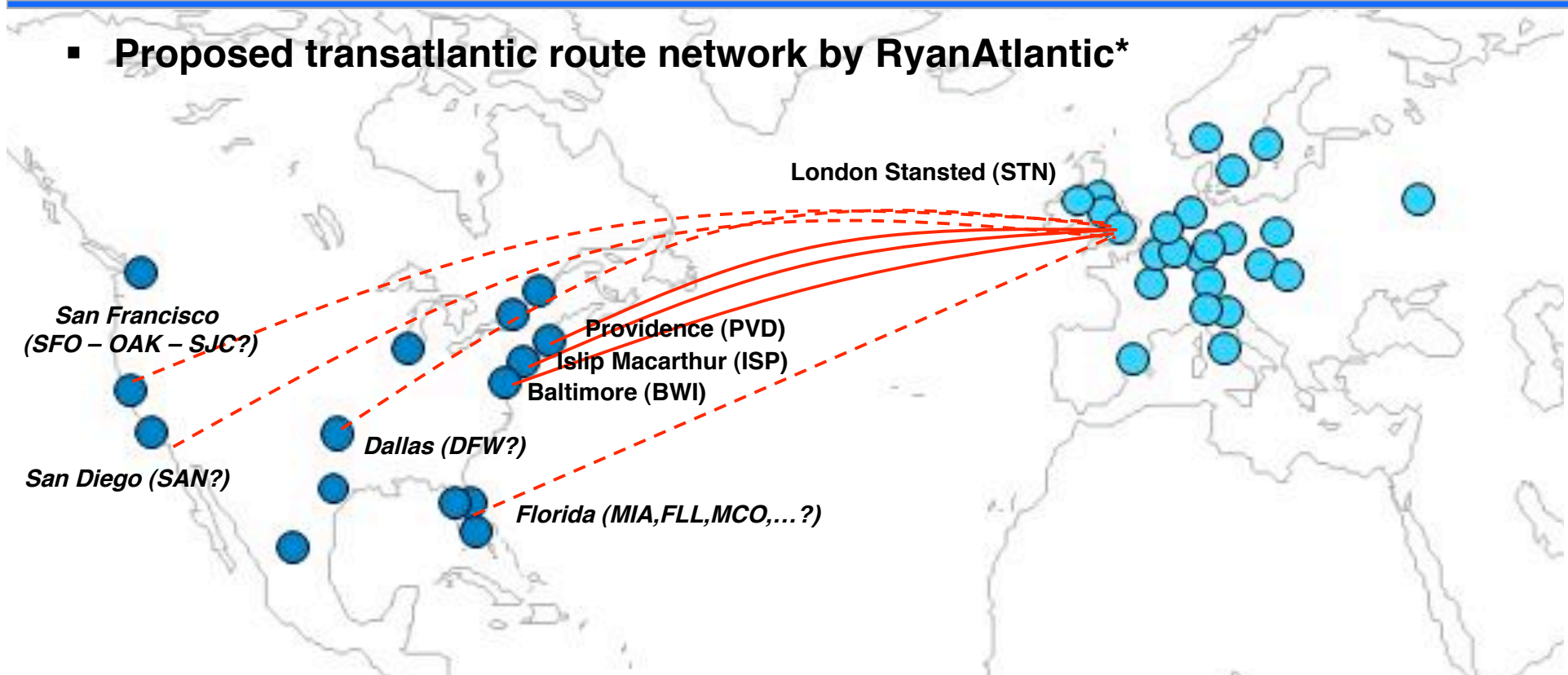
- **On April 30, 2007 E.U. and U.S. signed a preliminary Open Skies accord**
 - ❑ Allows EU airlines to operate direct flights between U.S. and any EU country (and some others)
 - ❑ Allows U.S. airlines reciprocal right, and ability to fly between EU city-pairs
 - ❑ Agreement will replace 22 bilateral 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



U.S. – China Aviation Agreement

Nonstop to China

Four carriers are competing for one new route to China. Here's what each carrier proposes.

Continental Airlines

Route: Newark, N.J. to Shanghai
Seats: 283
Flight Time: 14 hr.

United Airlines

Route: Washington, D.C. to Beijing
Seats: 347
Flight Time: 15 hr. 15 mins.

Northwest Airlines

Route: Detroit to Shanghai
Seats: 335
Flight Time: 14 hr. 45 mins.

American Airlines

Route: Dallas/Ft. Worth to Beijing
Seats: 247
Flight Time: 14 hr. 30 mins.

Source: Detroit Free Press 10/18/2006

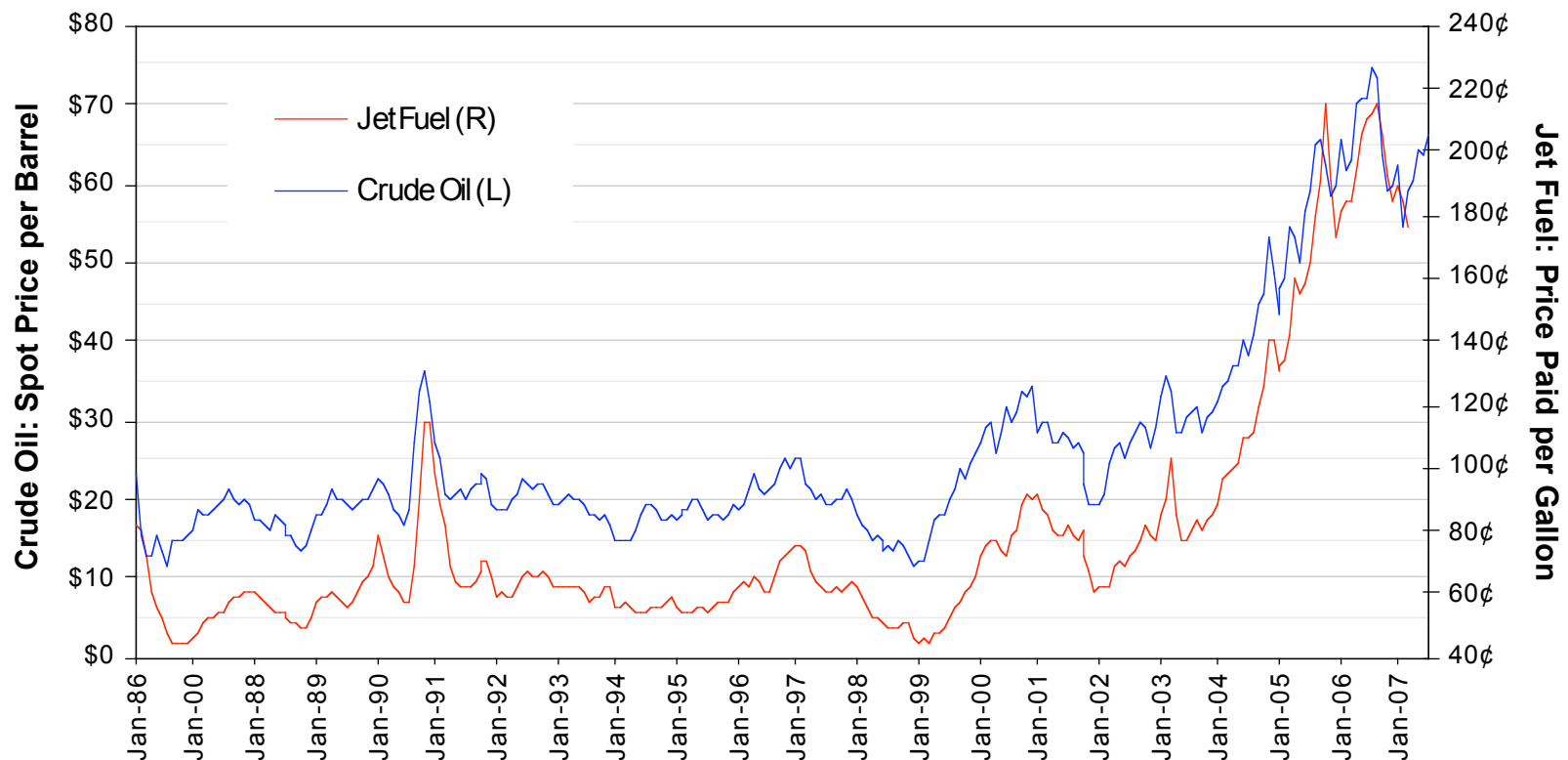
Detroit Free Press

- **Strong Competition in 2006**
 - ❑ IAD- Beijing United
- **New Routes Assigned Sept 2007**
 - ❑ Atlanta-Shanghai Delta 2008
 - ❑ San Fran-Guangzhou United 2008
 - ❑ Chicago-Beijing American 2009
 - ❑ Newark-Shanghai Continental 2009
 - ❑ Detroit-Shanghai Northwest 2009
 - ❑ Phil-Beijing USAirways 2011.



Trends in Fuel Price

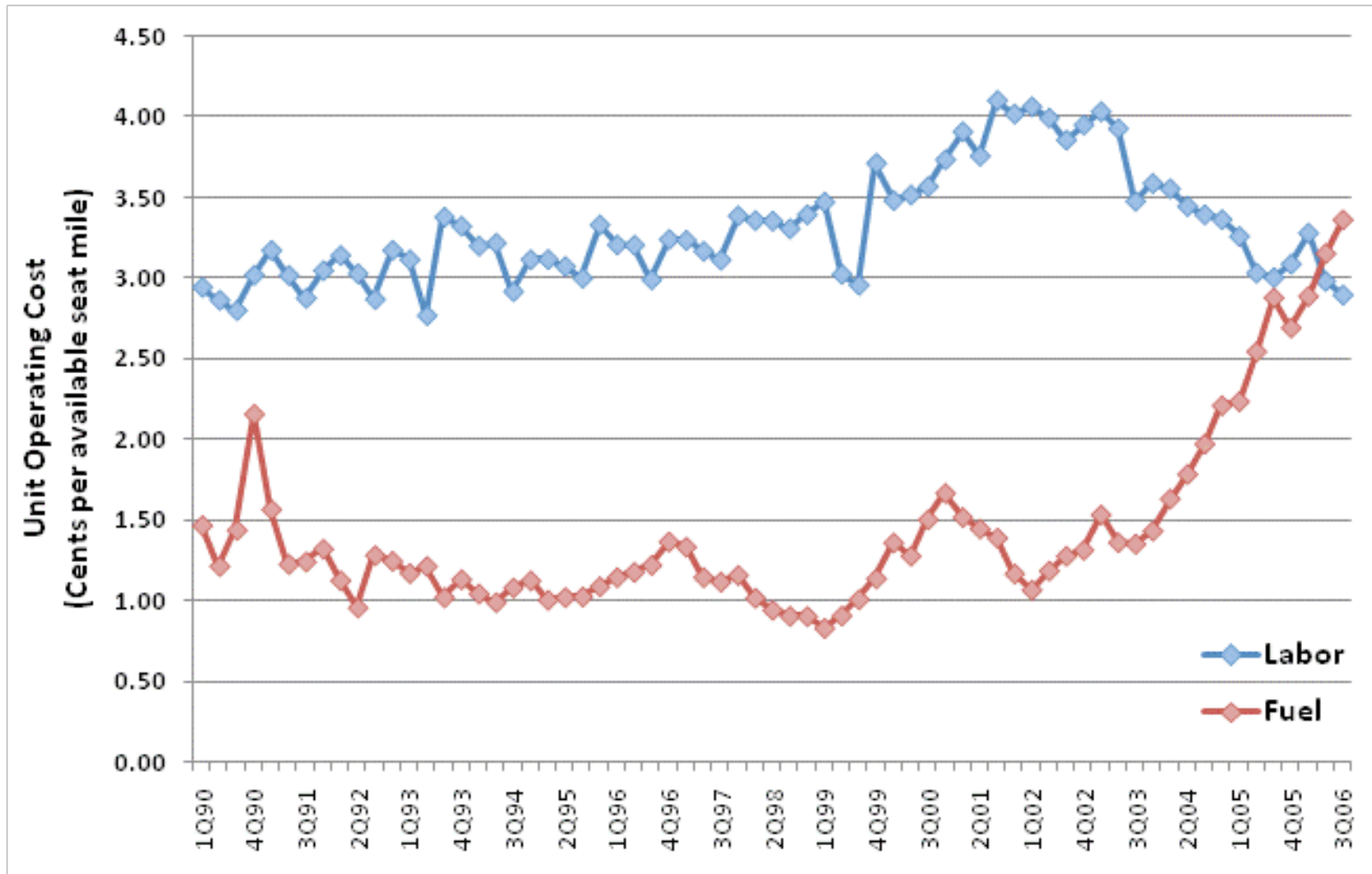
Average Crude Oil and Jet Fuel Prices



Data source: ATA: Fuel Cost and Consumption (oil data through Jun 2007, jet fuel data through Mar 2007)



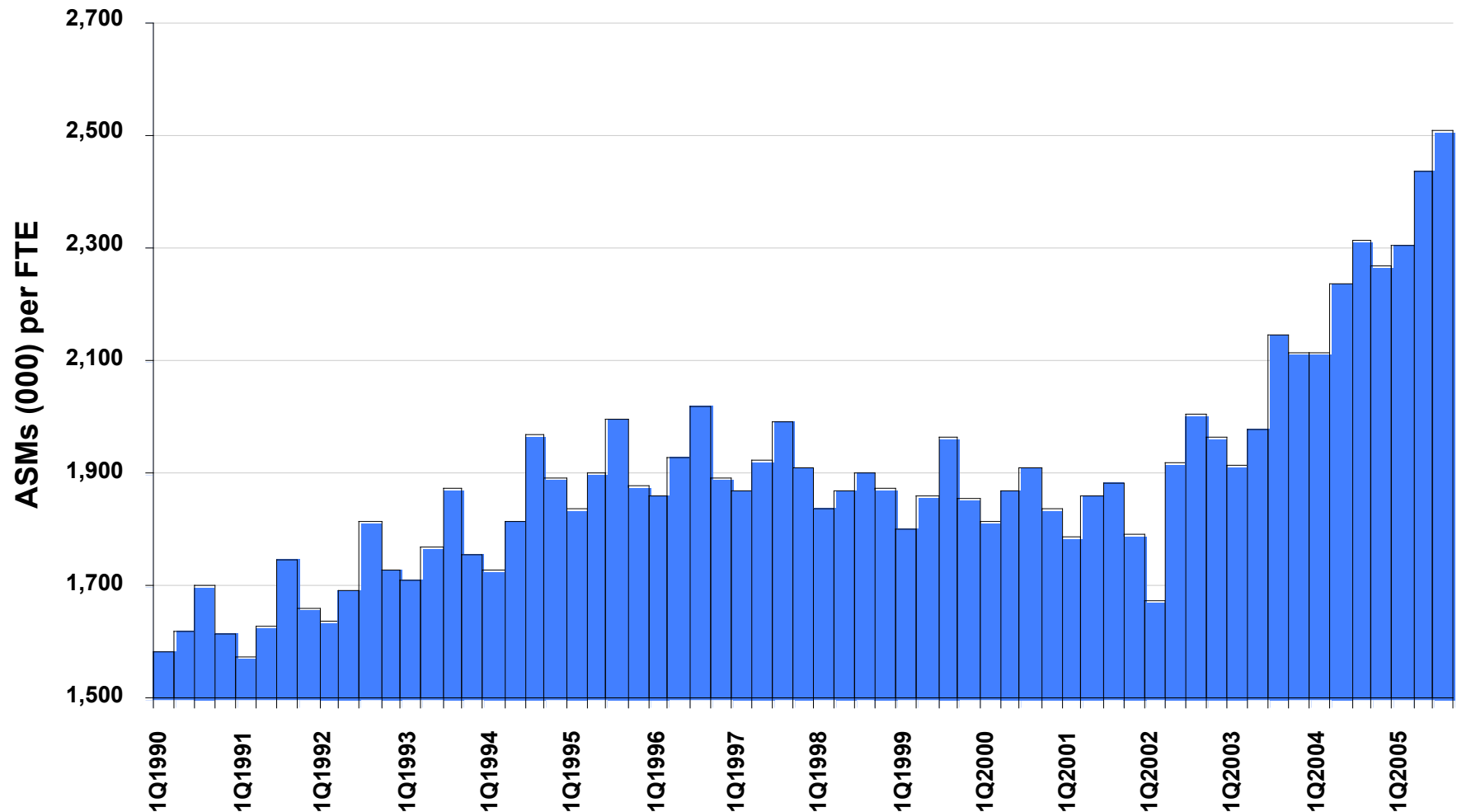
Unit Costs for Labor and Fuel



Data source: ATA U.S. Airline Cost Index, 3rd Quarter 2006.



Productivity Improvements Driving Cost Relief Network Restructuring, Work Rules, Human Capital, Outsourcing, Technology

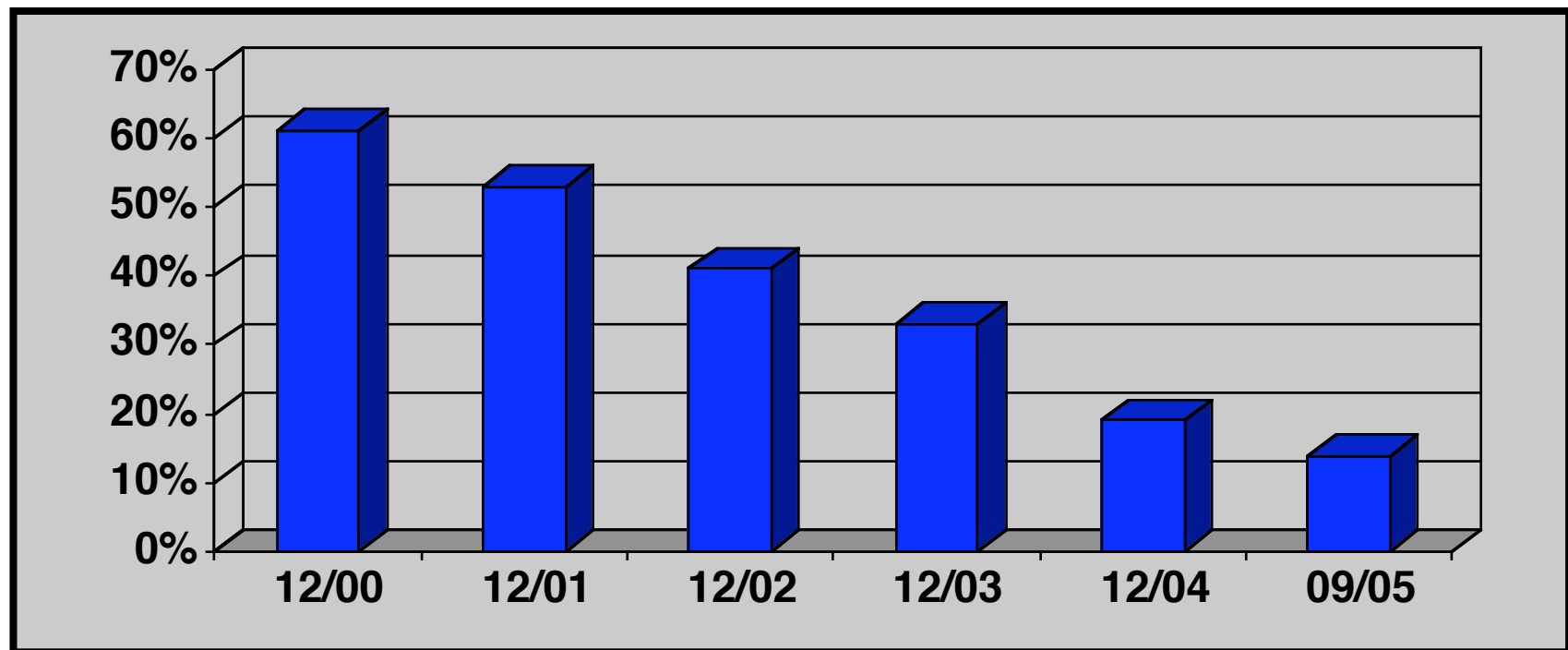


Source: ATA US Airline Cost Index: Major & National Passenger Carriers, Q3 2005



Positive Views of Employee Morale

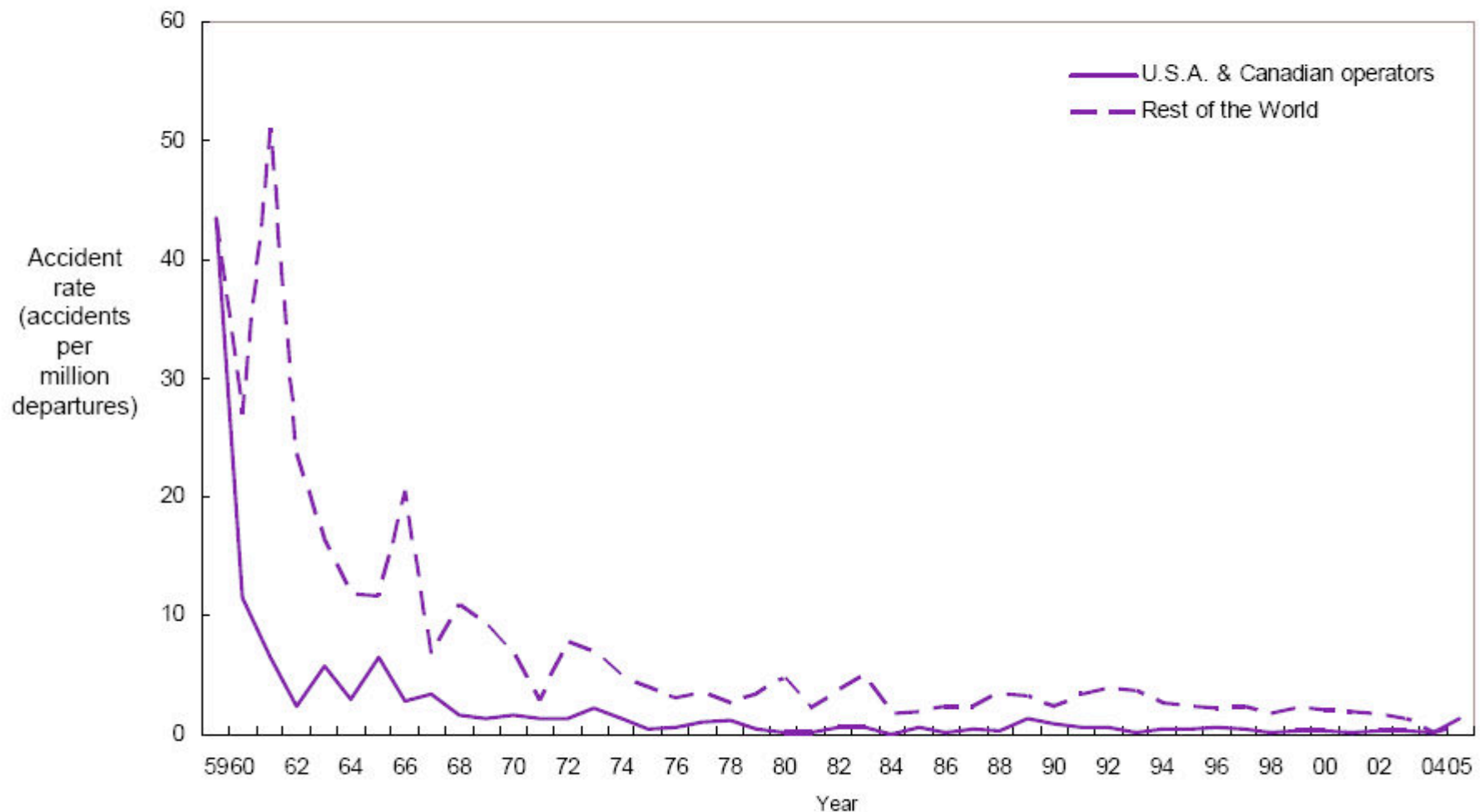
Don't have current survey data trend may have reversed



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

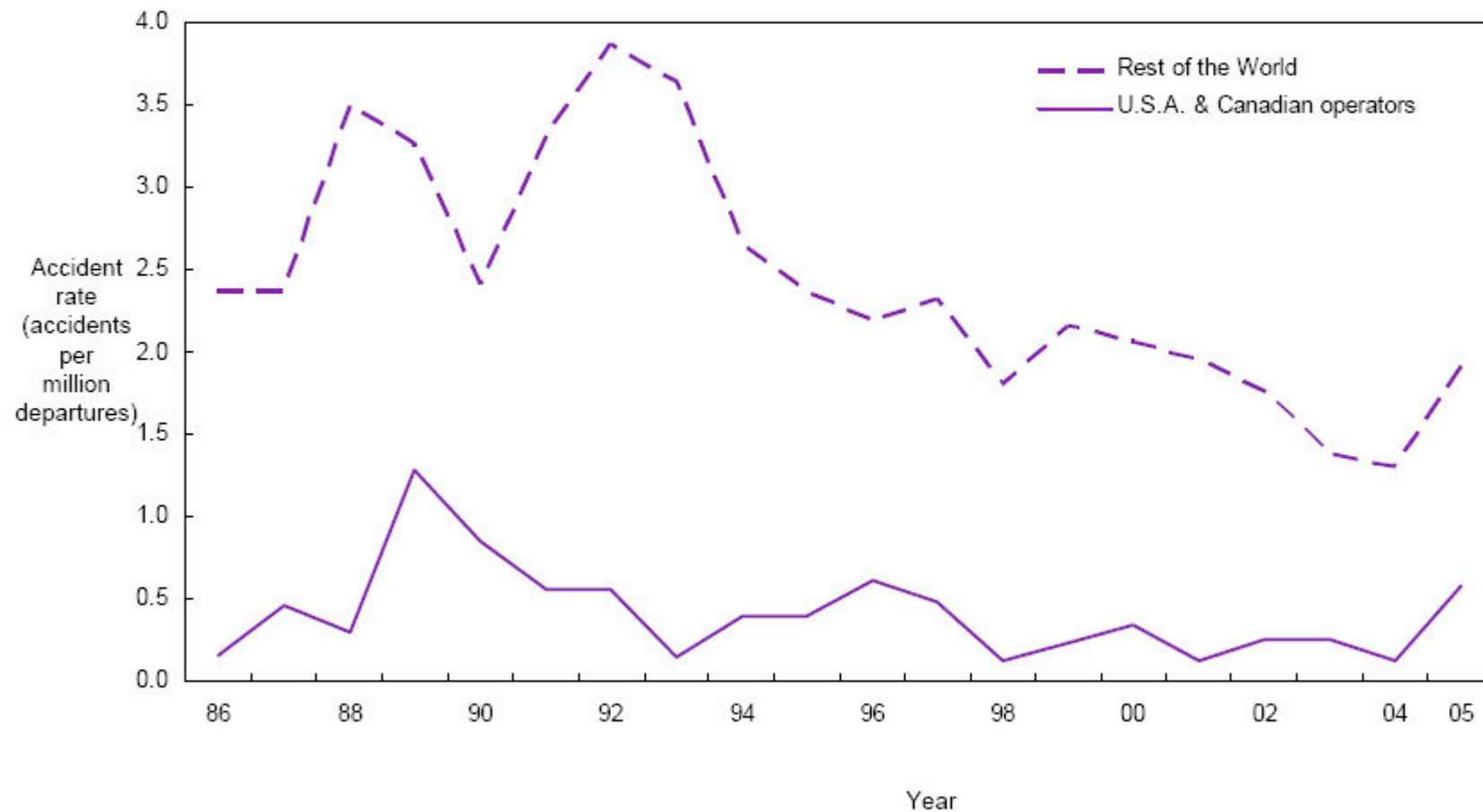
U.S.A. and Canadian Operators Accident Rates

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



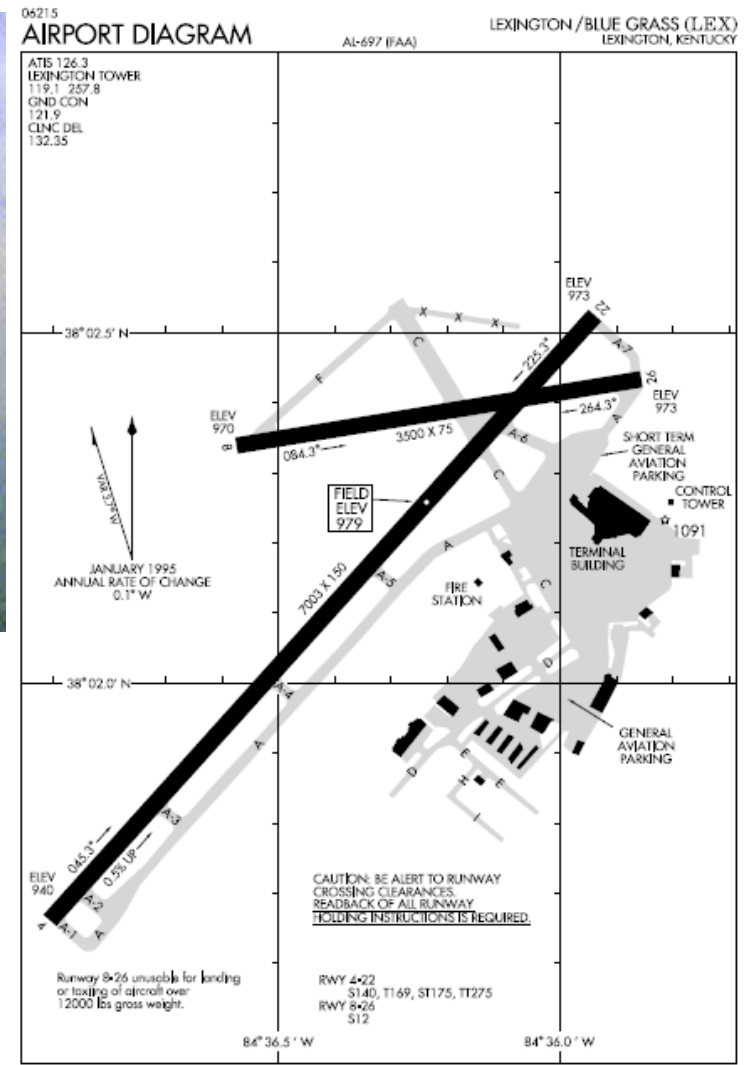
U.S.A and Canadian Operators Accident Rates

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



Comair Accident

27 - Aug - 2006



AIRPORT DIAGRAM

05215

LEXINGTON, KENTUCKY
LEXINGTON /BLUE GRASS (LEX)



Sao Paulo Runway Overrun

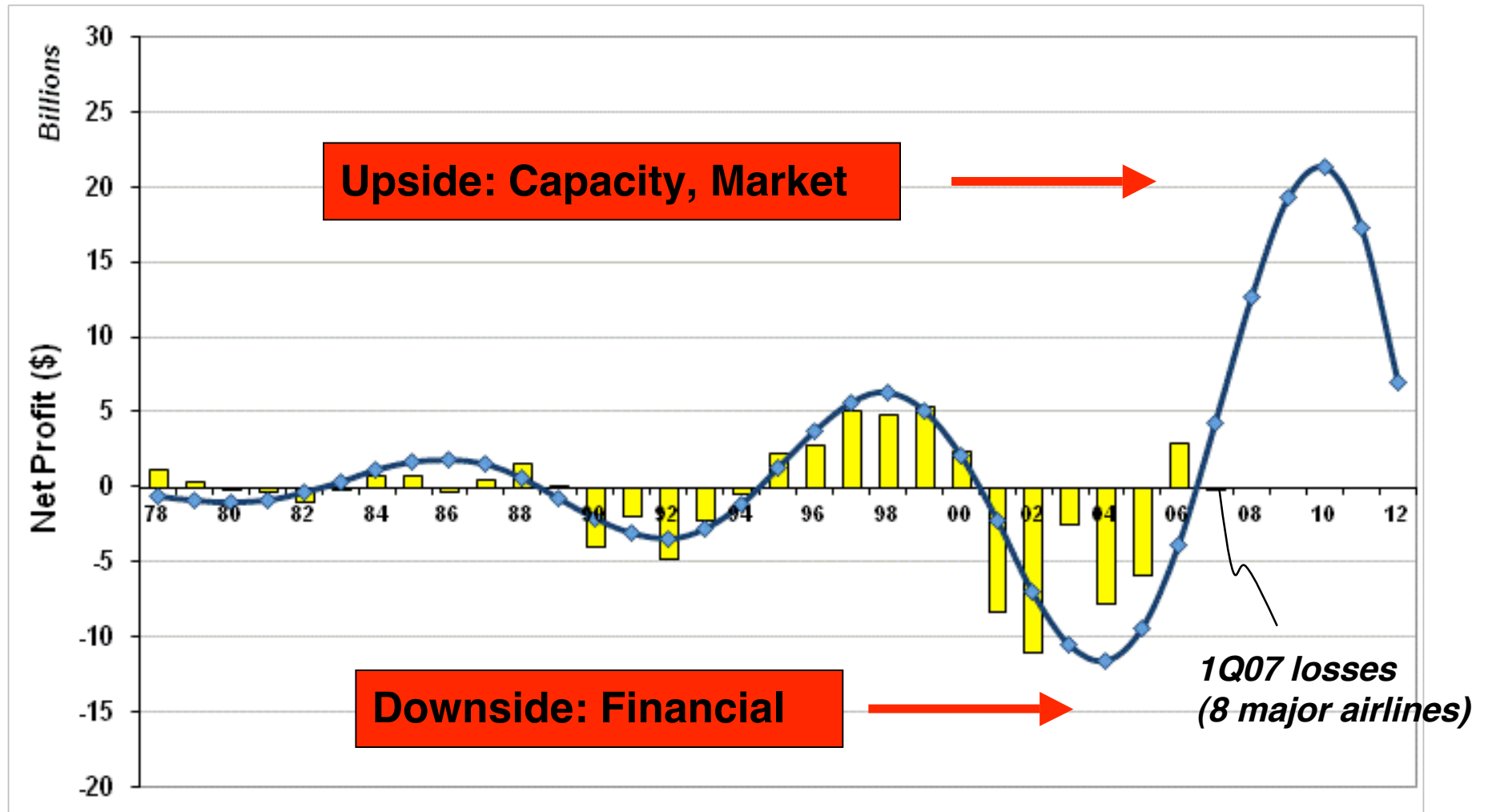
17 Jul 2007



Source: Intl Herald Tribune



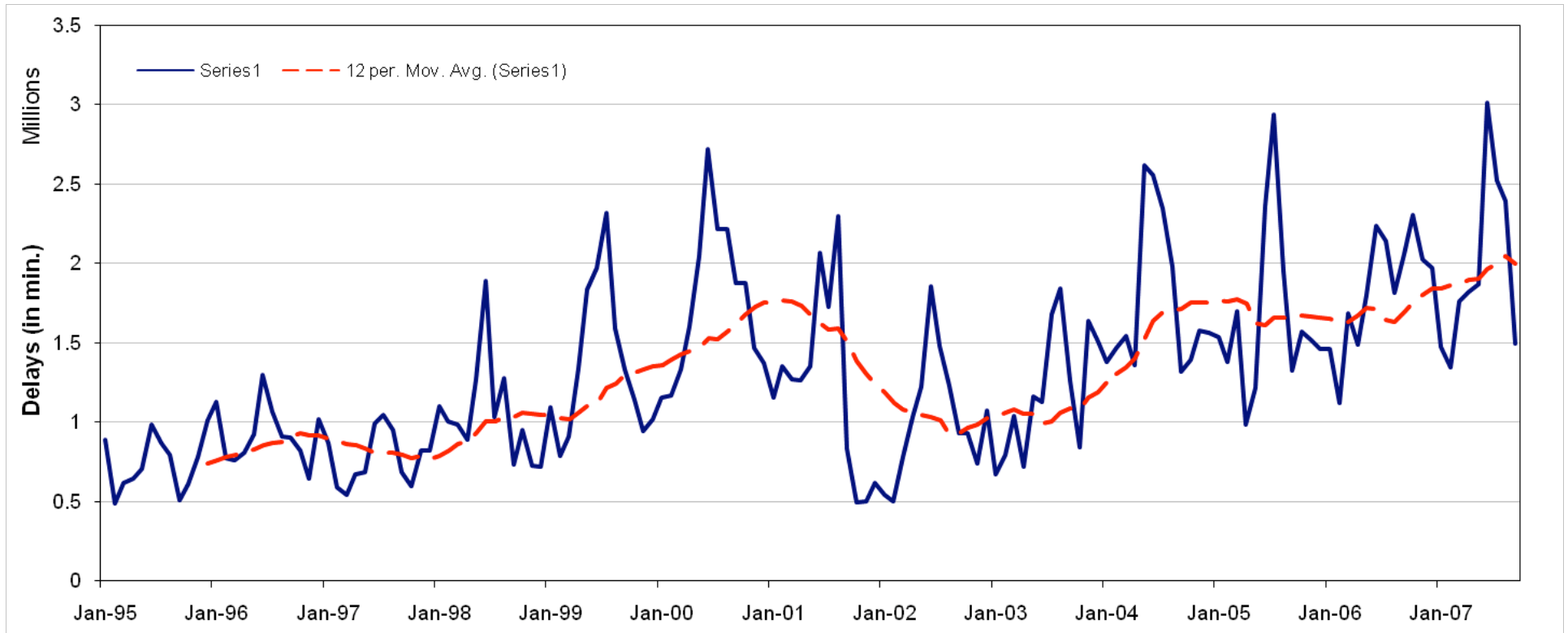
Growth Limits Constraints vs Damping





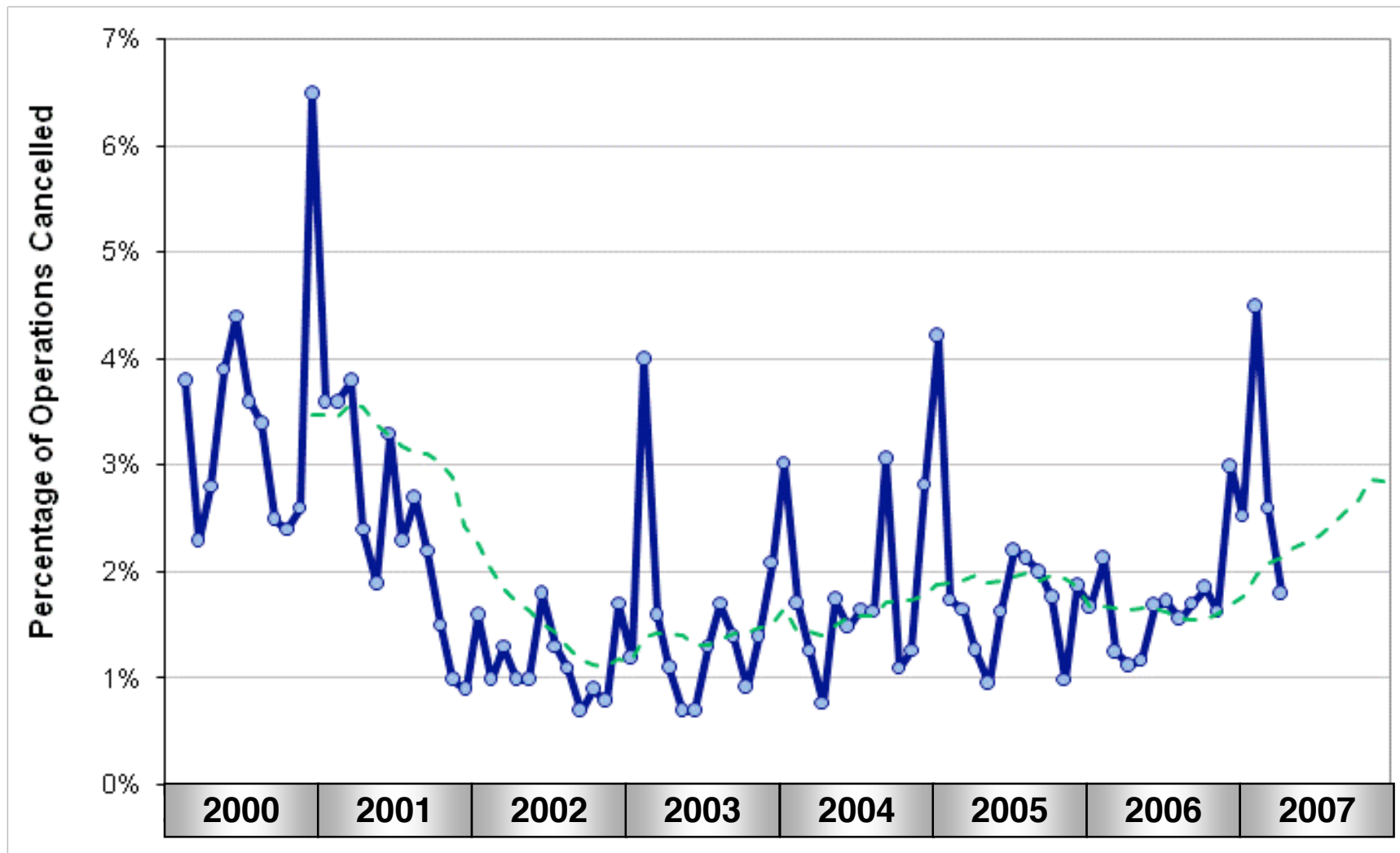
US Flight Delays

from 1995 to 2007



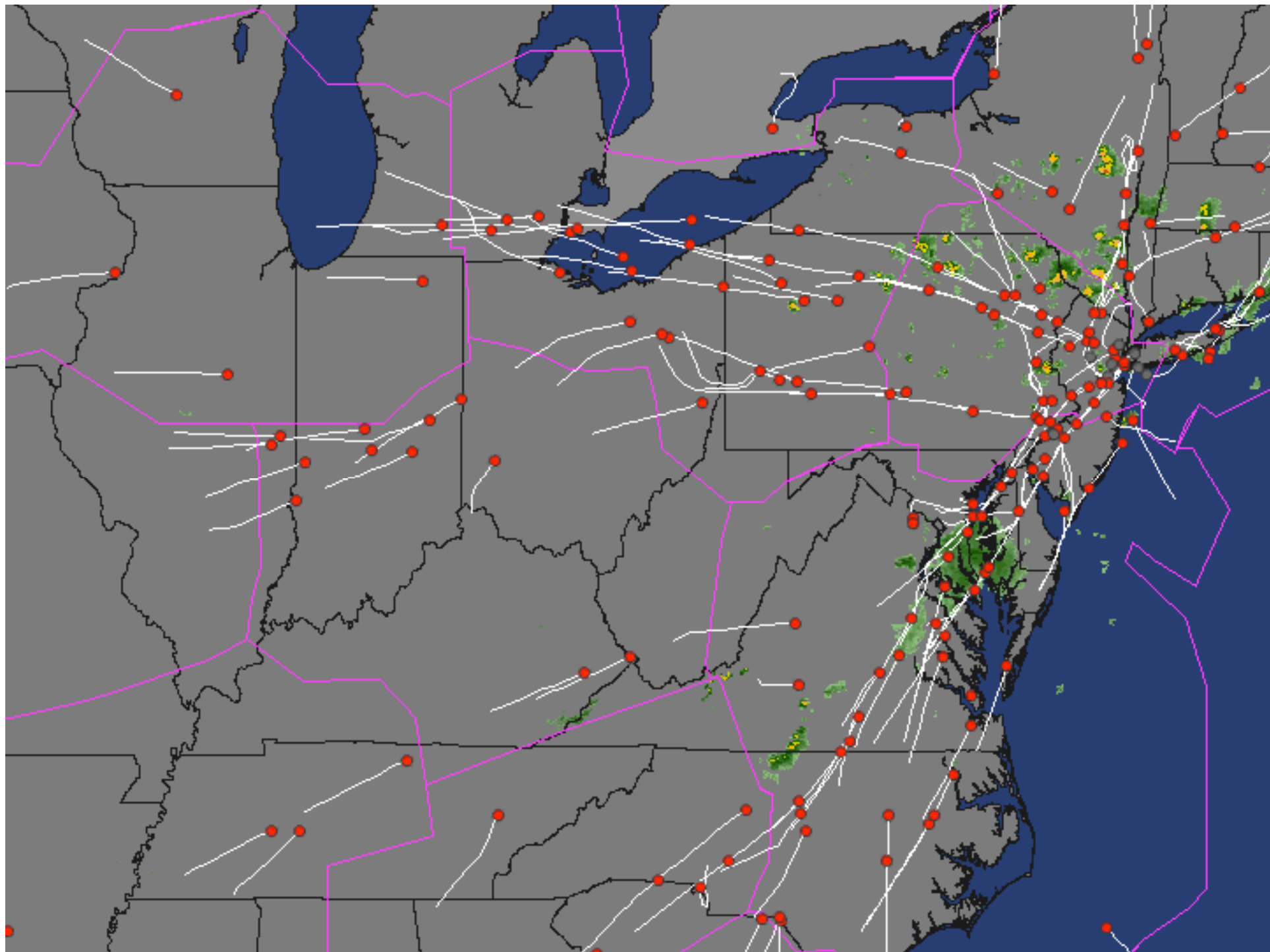


Flight Cancellations from 2000 to 2007 (by month)



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)

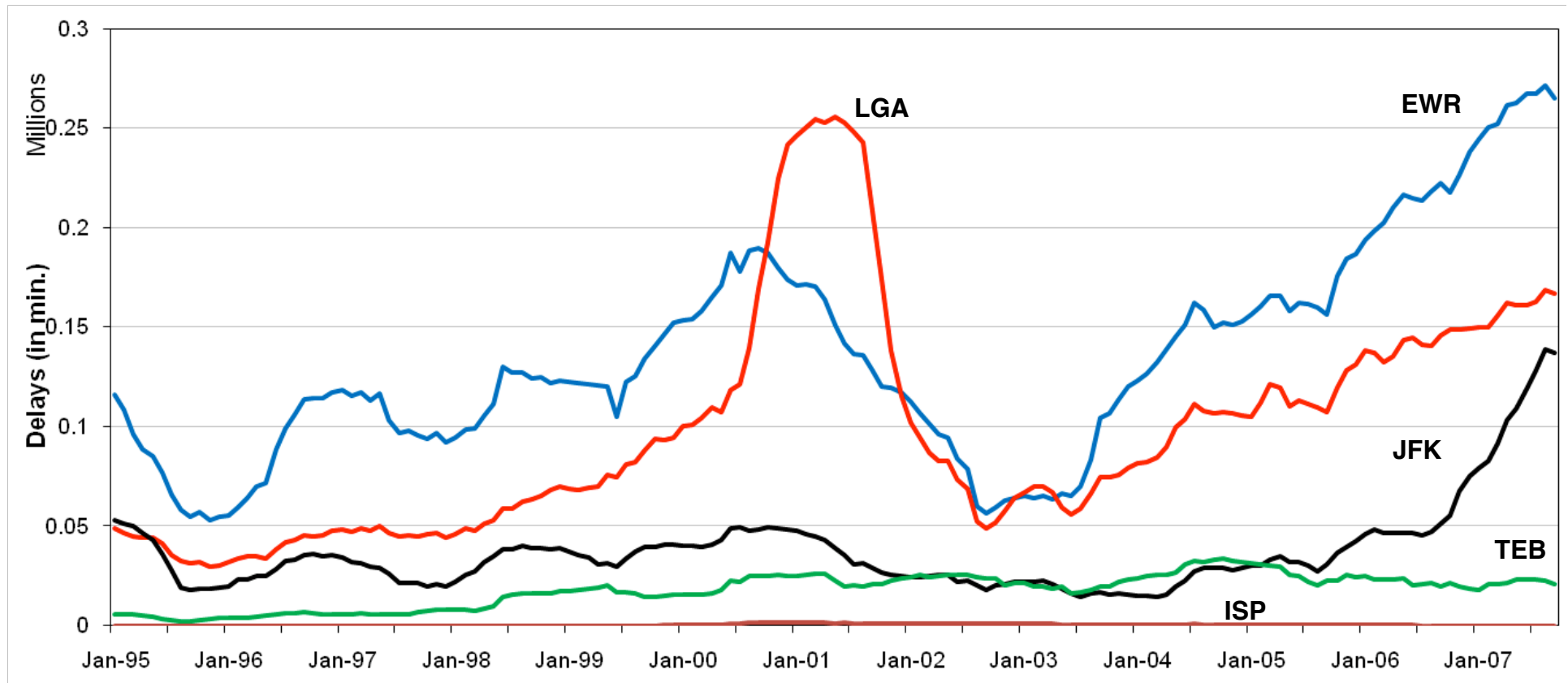




New York Airport Flight Delays*

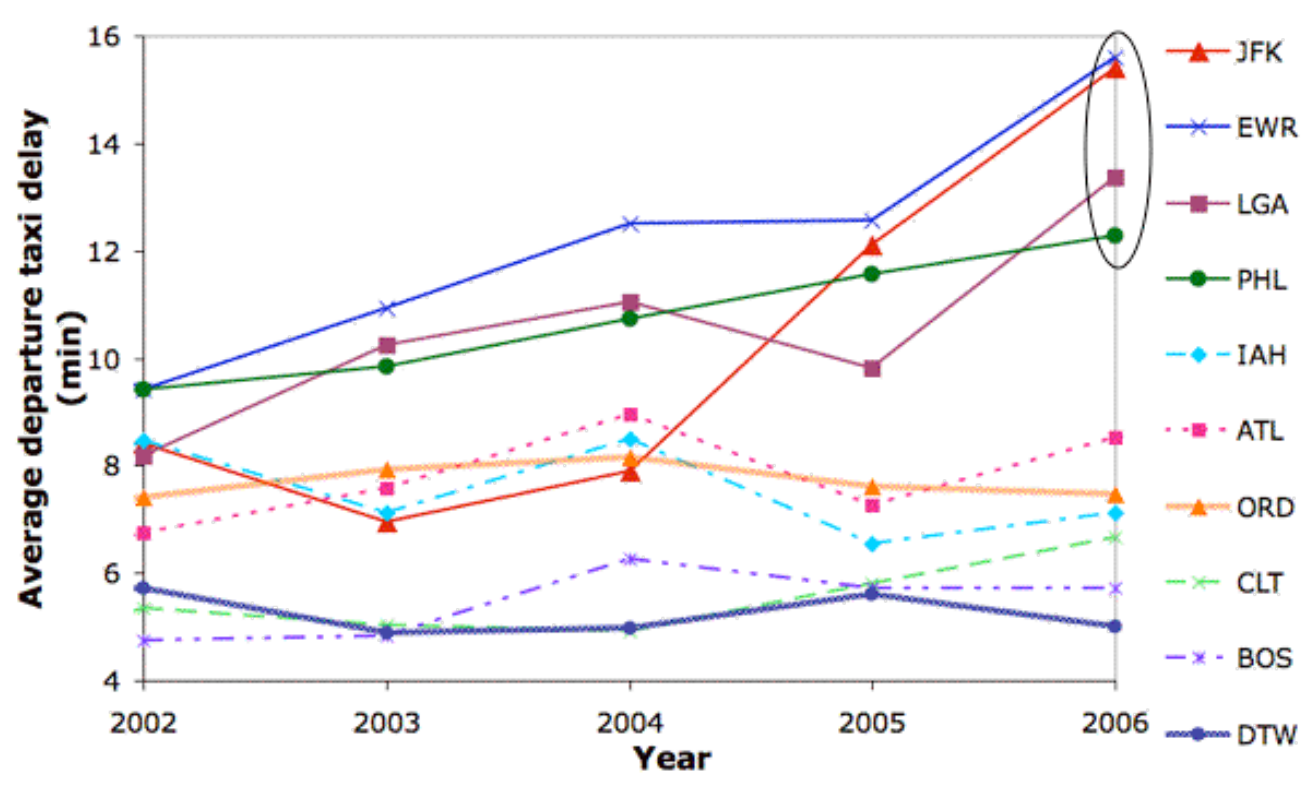
from 1995 to 2007

* Note: 12 month moving average



Data source: FAA Operational Network (OPSNET)

Taxi Out Times





Consumer Complaints from 1997 to 2007*

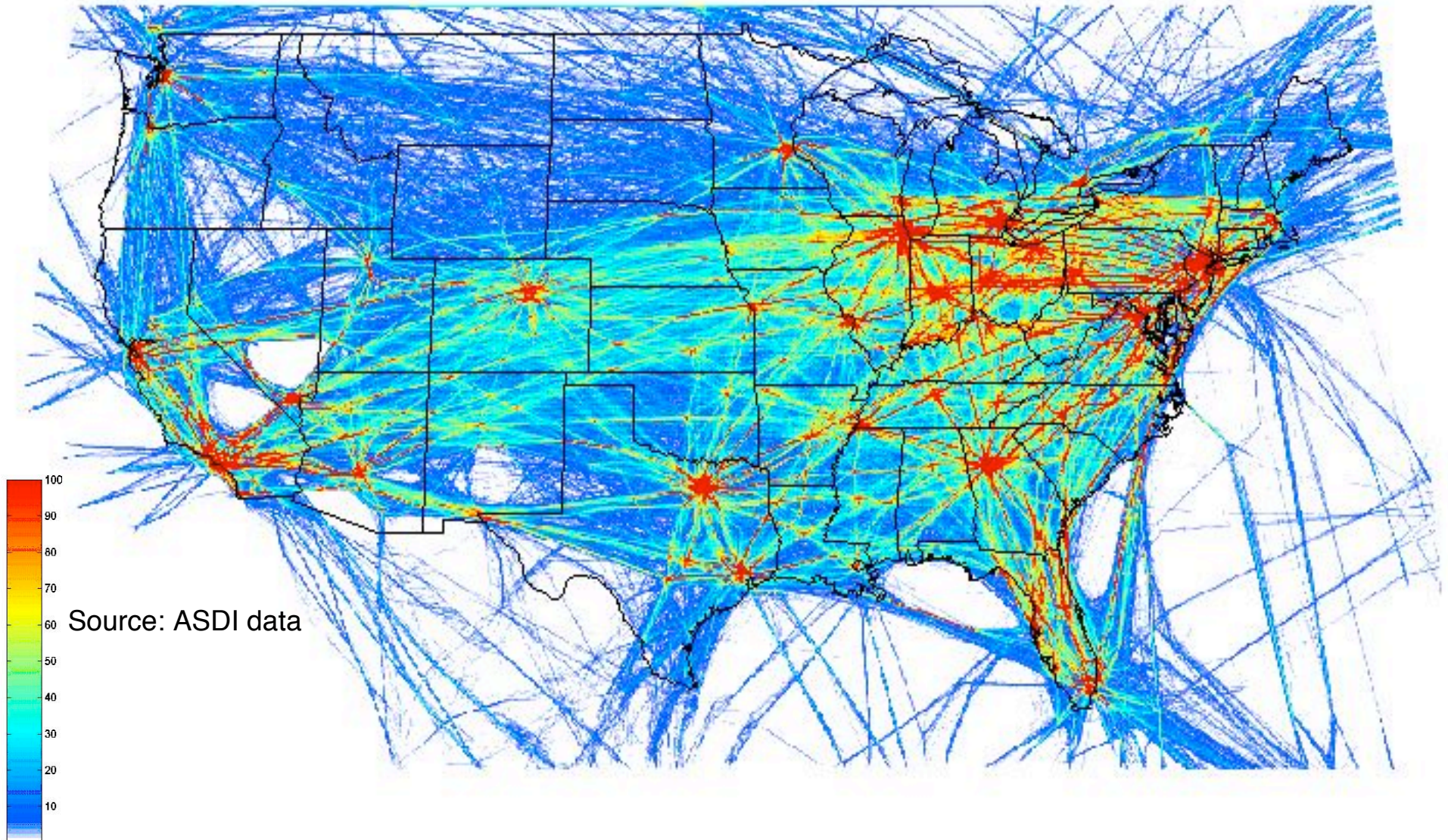


Note: 2007 data point represents average consumer complaints (per 100,000 enplanements) for January to March 2007

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



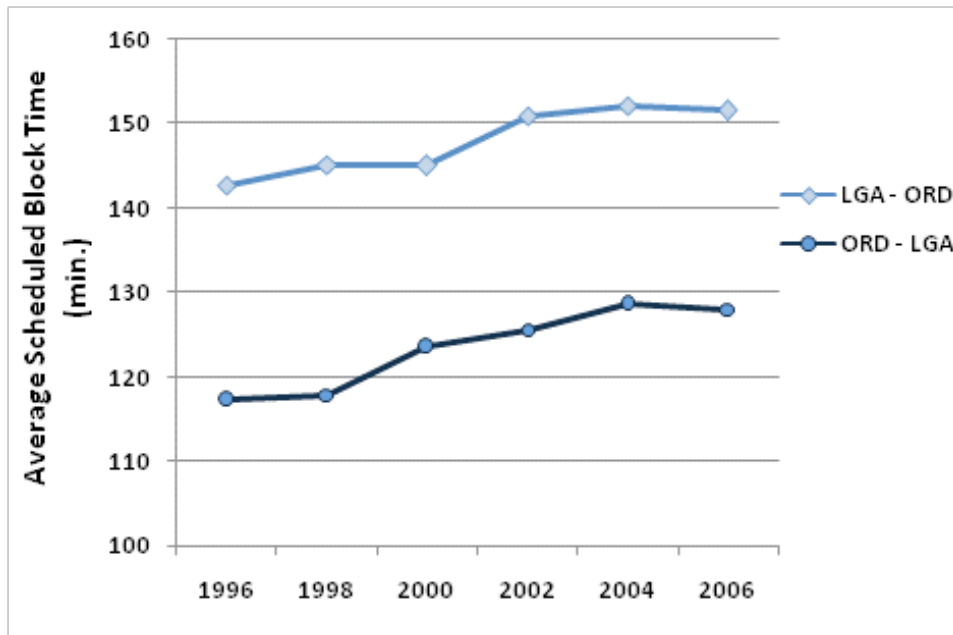
Congestion Driven Schedule Creep



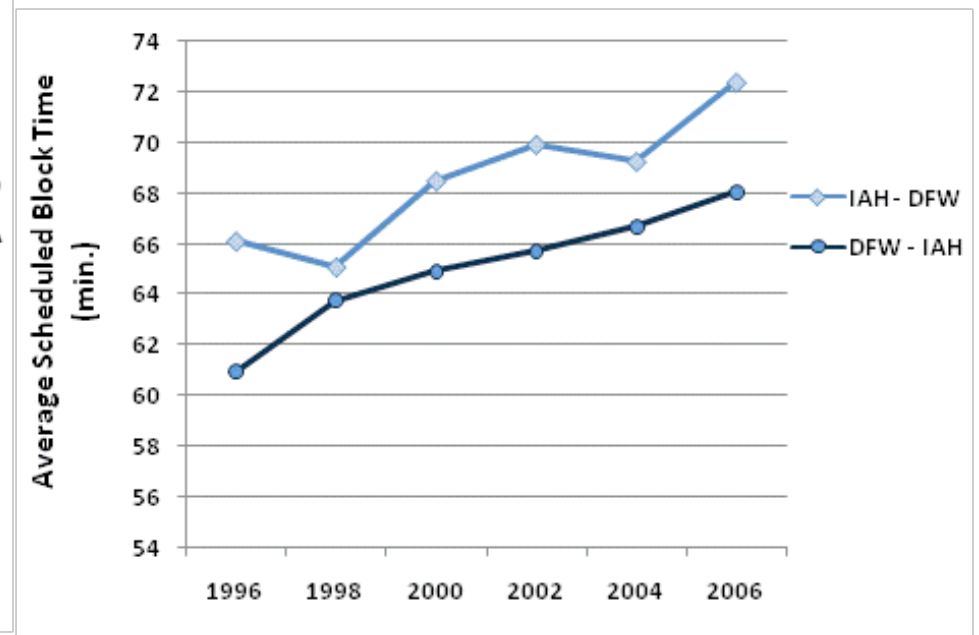


Historical Evolution of Scheduled Block Time (Month of April / from 1996 to 2006)

NY La Guardia – Chicago O'Hare



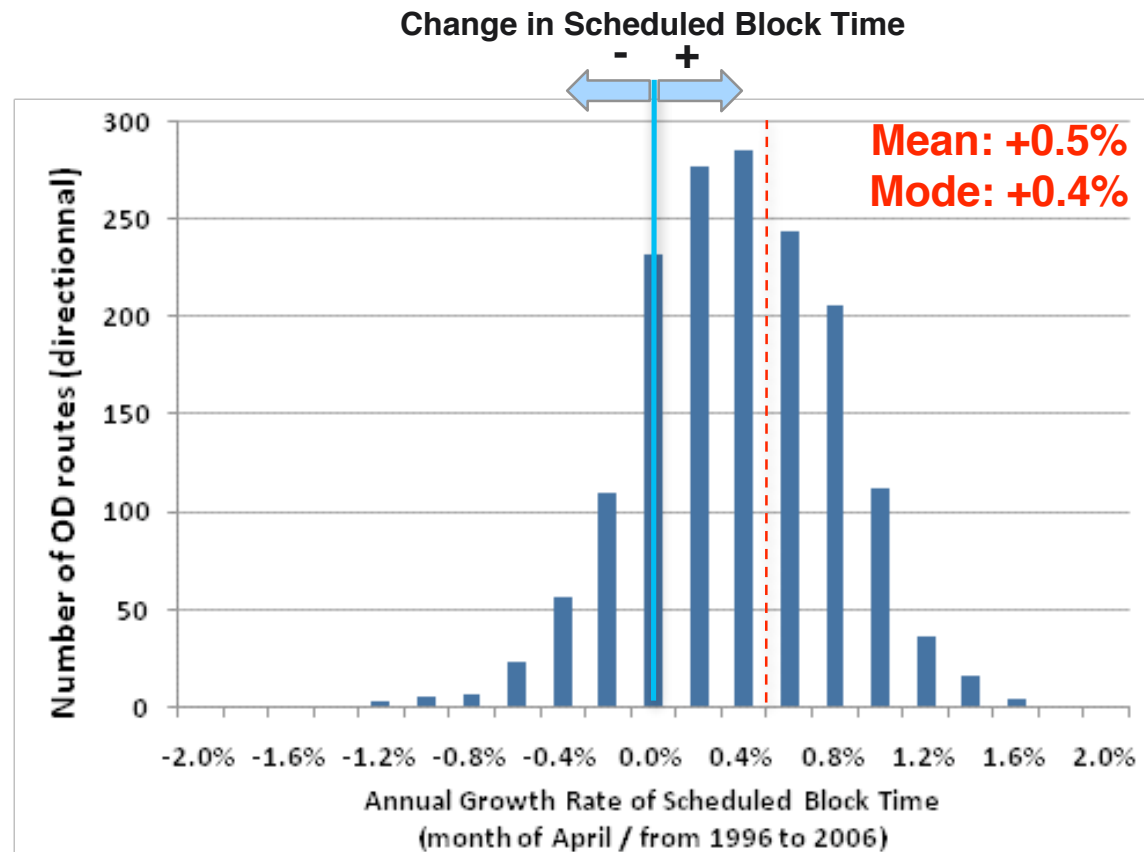
Houston – Dallas





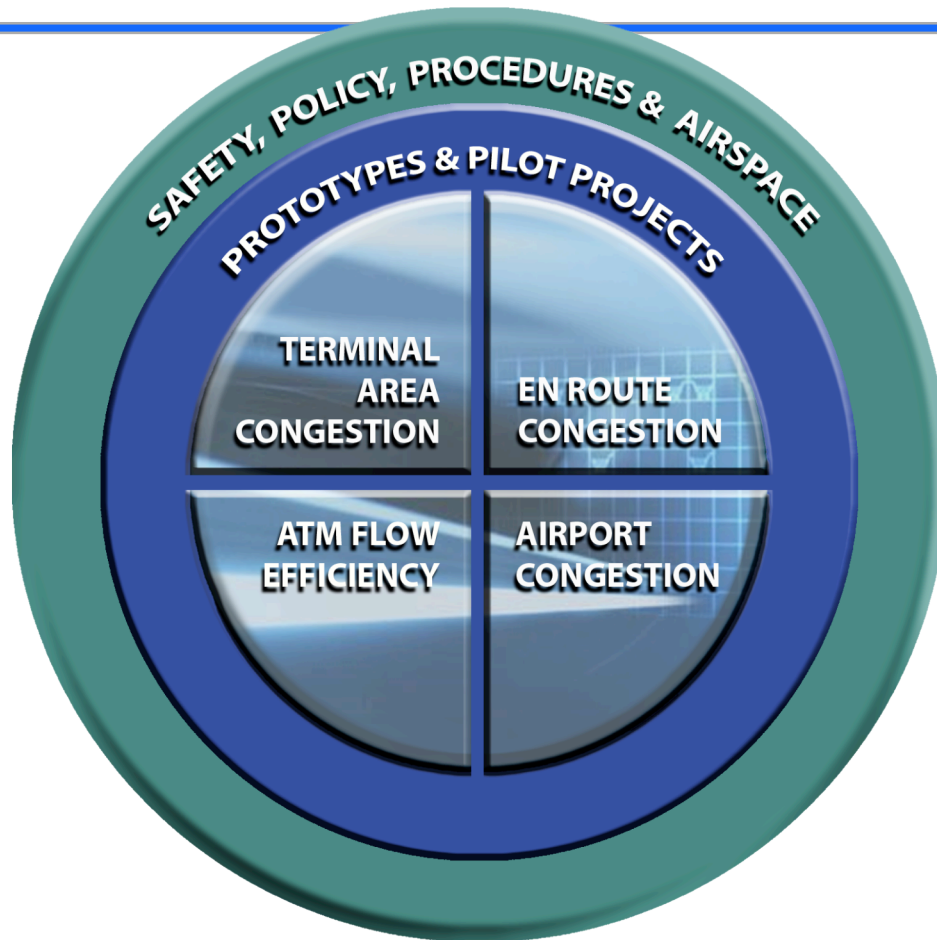
Annual Growth Rate of Scheduled Block Time (top 1950 OD routes)

- 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

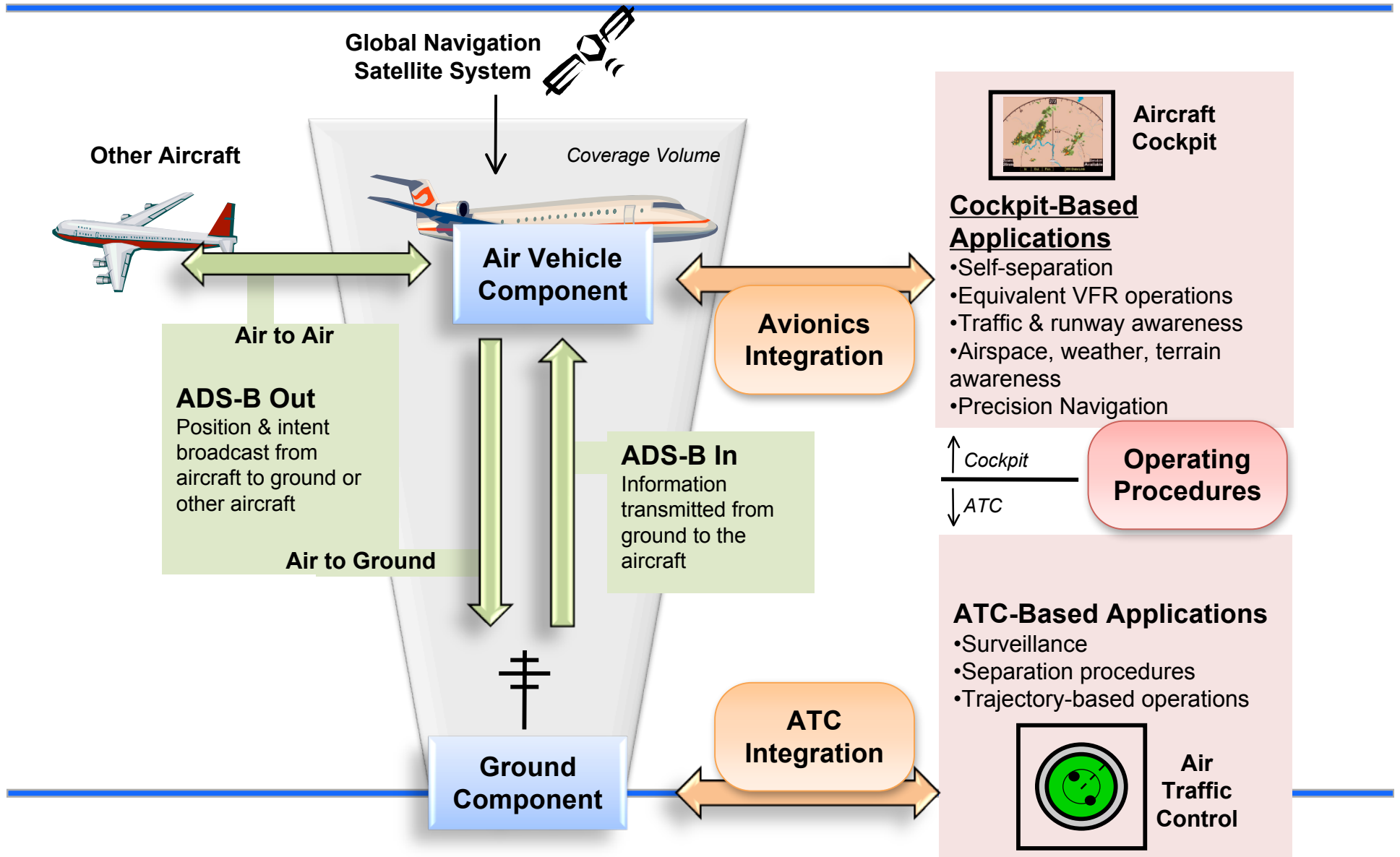


20 Year Plan
Multi-Agency

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.

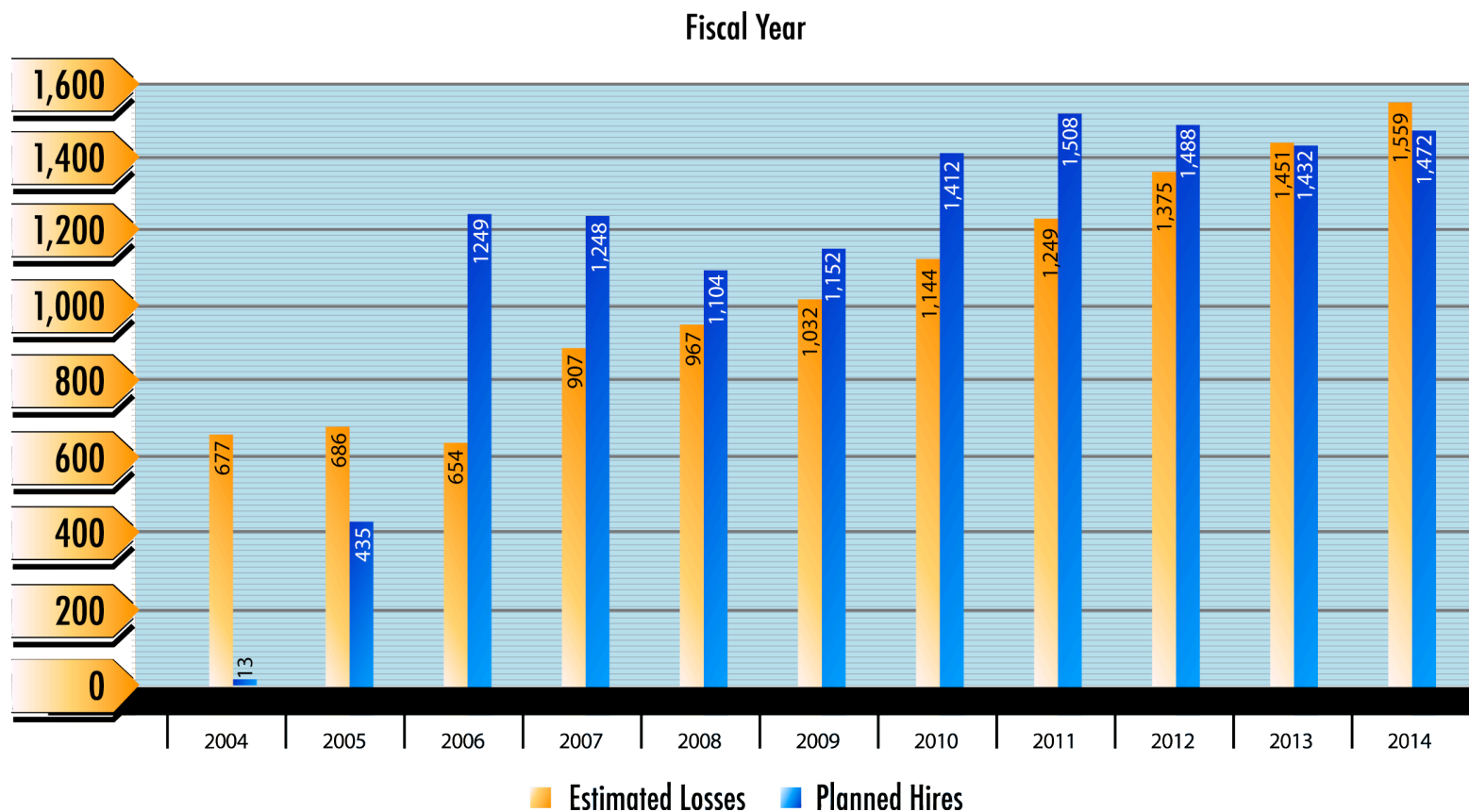
ACTION: Notice of proposed rulemaking (NPRM).

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**

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*



FAA Reauthorization '07

- **FAA Reauthorization bill: deadline Sept. 30, 2007**
- **Funding Modernization (NGATS)**
- **Contributions from the general fund? (18% > 50%)**
- **The “battle” over user fees:**
 - ❑ Airlines vs Business Aviation

<u>Tax</u>	<u>Rate</u>	<u>Percentage of Total Tax Collections in FY 2004</u>
Ticket Tax	7.5% on Airfares	49.7%
Segment Tax	\$3.20 per Flight Segment	19.6%
Rural Airport Tax	7.5% on Airfares from Rural Airports	0.8%
Waybill Tax	6.25% on Price of Freight and Mail Transferred by Air	5.4%
GA and Jet Fuel	GA Fuel: 19.3 cents/gallon Jet Fuel: 21.8 cents/gallon	1.9%
Commercial Jet Fuel	4.3 cents/gallon	5.8%
International Departures/Arrivals	\$14.10 per international departure/arrival	14.4%
Alaska/Hawaii Tax	\$7.00 per domestic departure/arrival to Alaska or Hawaii	0.8%
Frequent Flyer Tax	7.5% on proceeds of third party sales of frequent flyer miles	1.6%
Total		100%

Source: FAA



New FAA Leadership



- **Administrator**

- ☐ Nomination of Bobby Sturgel



- **COO ATO**

- ☐ Hank Krakowski
-



Aviation Remains Perceived Target Expanding Security Burden

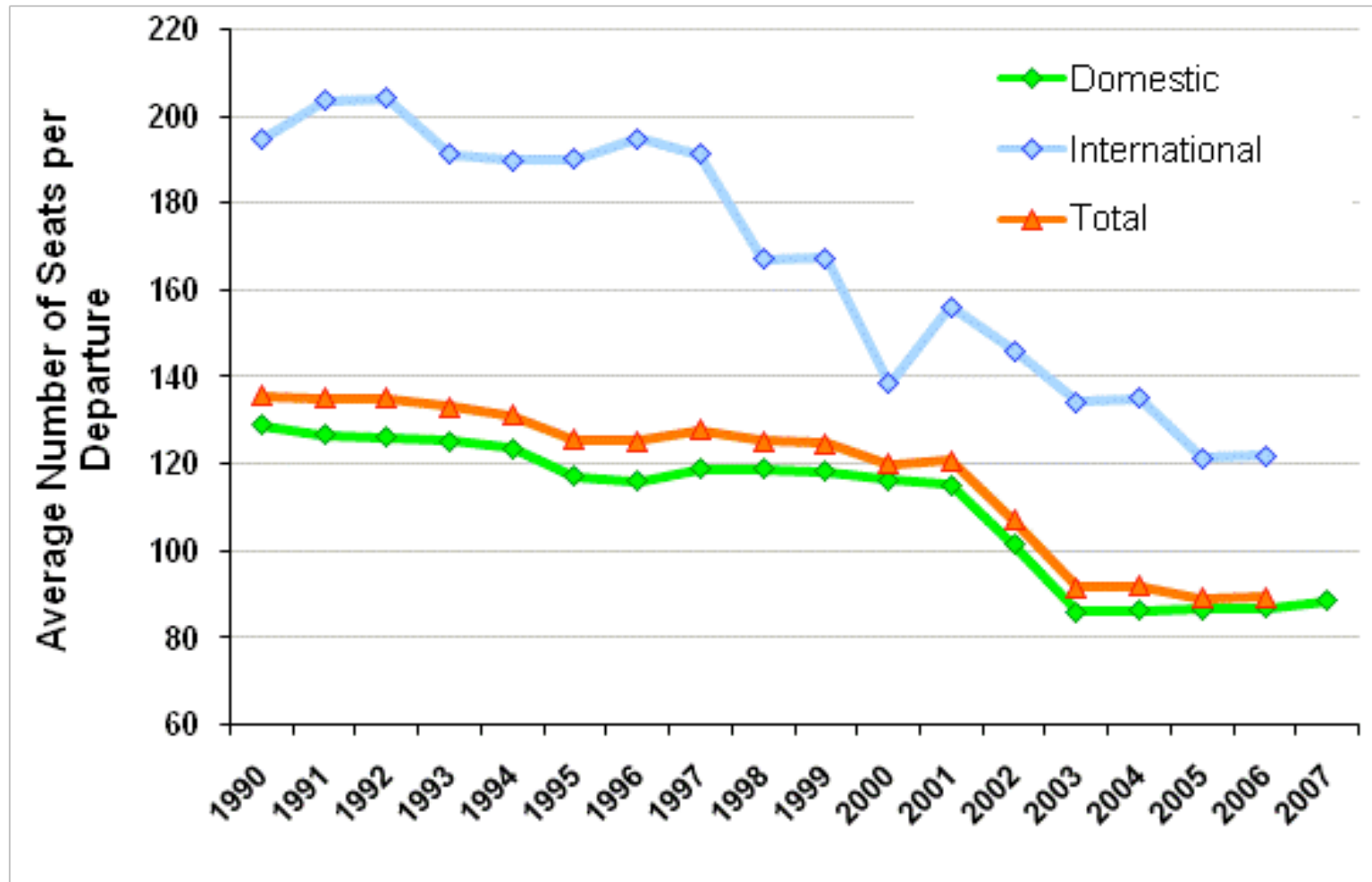


NO LIQUIDS OR GELS OF ANY KIND WILL BE PERMITTED IN CARRY-ON BAGGAGE. THESE ITEMS MUST BE IN CHECKED BAGGAGE. This includes all beverages, shampoo, suntan lotion, creams, tooth paste, hair gel, and other items of similar consistency. Read our [Permitted and Prohibited Items list](#)



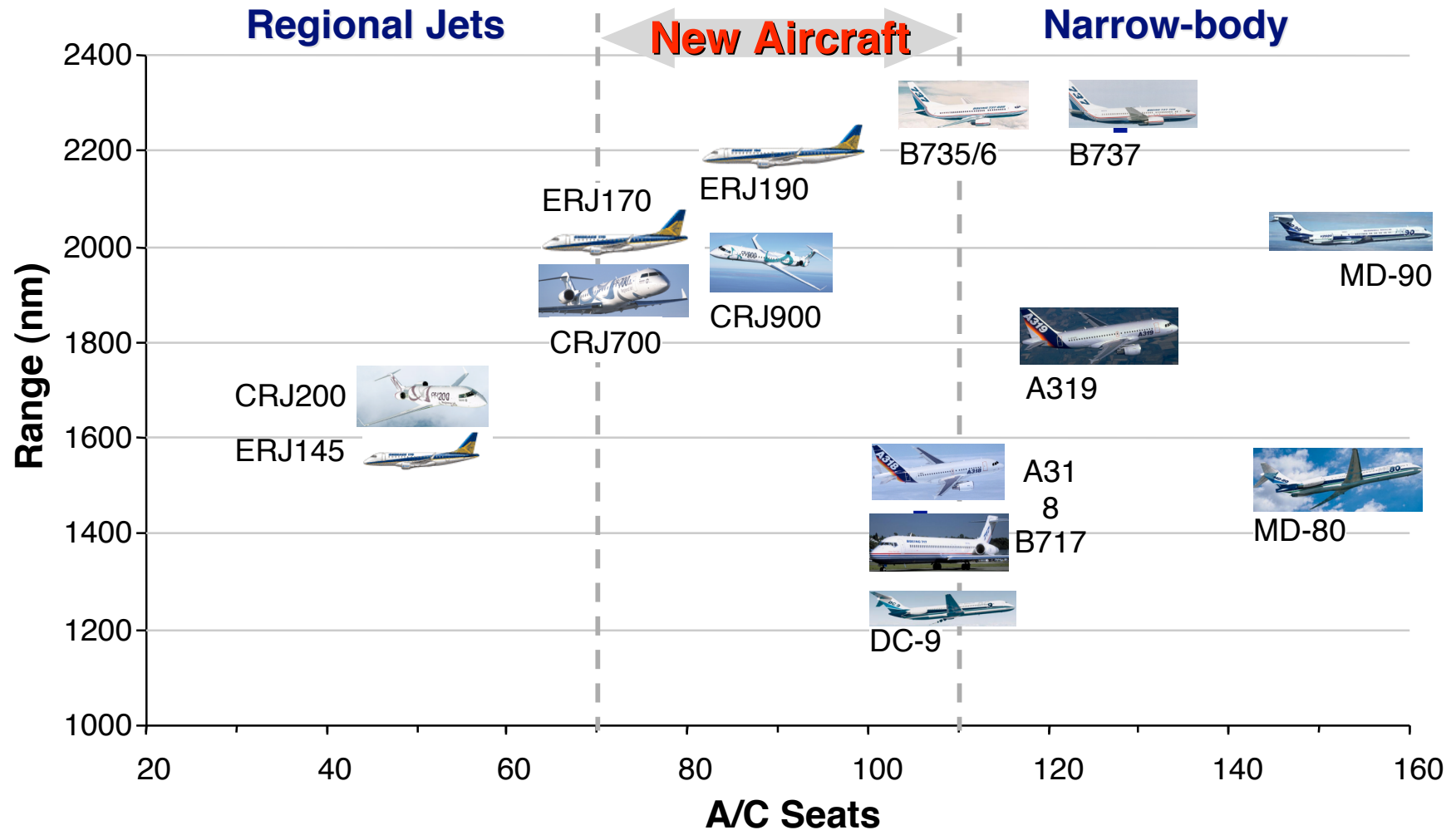


Trends in Aircraft Size



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

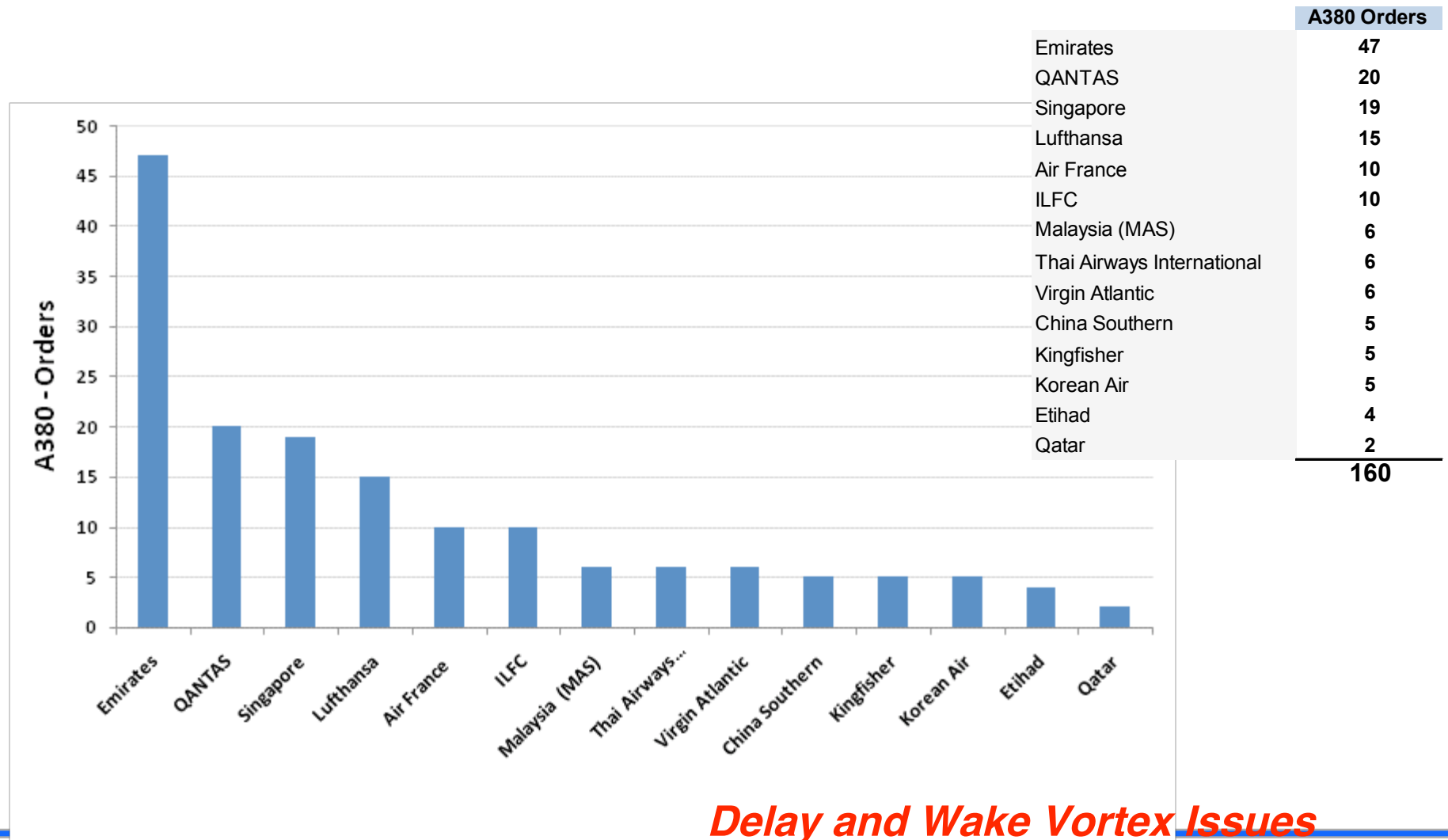


A-380





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 Delay (6 mo)



- 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

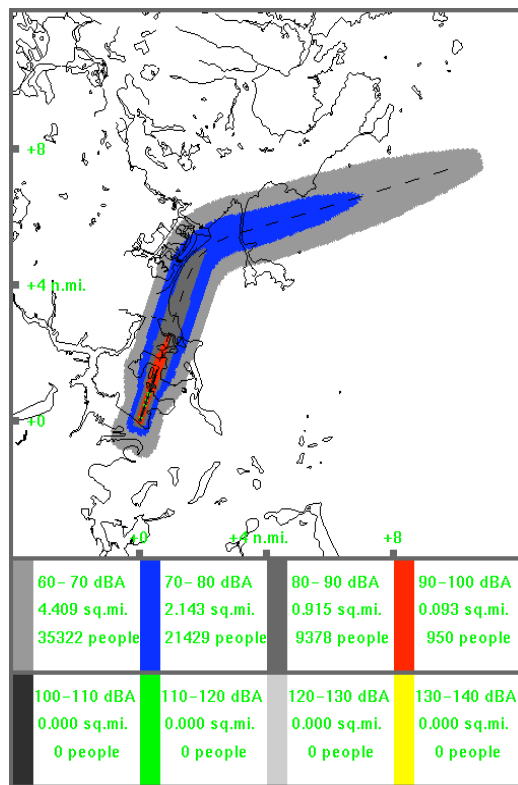
- ☐ Eclipse: **2300**
- ☐ Adam: **75**
- ☐ Mustang: **330+**

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



Environmental Issues

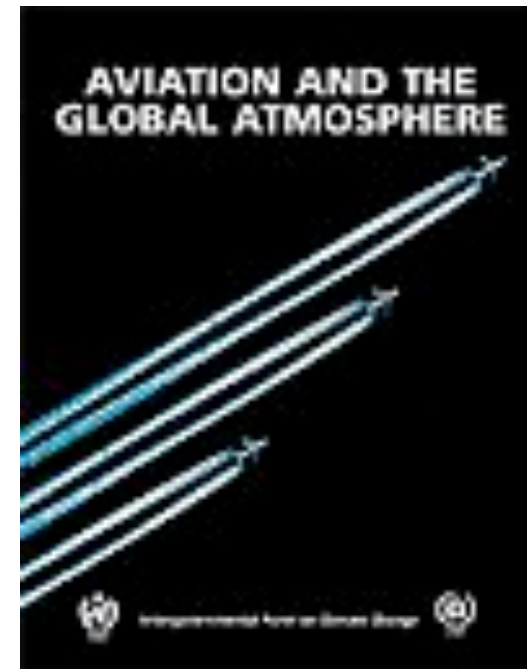
Noise



❑ Stage 4 (Equipment)

❑ Airports (Capacity)

Emissions



Intergovernmental Panel on Climate Change



Environmental Impacts

- **Aviation is responsible for**

- ☐ 2% of global carbon dioxide (CO₂) emissions today
- ☐ 13% of CO₂ emissions from all transport sources, compared to 75% from road transport
- ☐ Impact of NO_x, contrails, sulphate and soot particles is not well estimated
- ☐ From 1990 to 2003, the EU's Greenhouse gas emissions from international aviation increased by 73%, or 4.3% per year.⁽¹⁾

- **Fuel Efficiency**

- ☐ New aircraft are 70% more fuel efficient than 40 years ago and 20% better than 10 years ago.
- ☐ Modern aircraft achieve fuel efficiencies of 3.5 liters per 100 passenger km.
- ☐ Airlines are aiming for a further 25% fuel efficiency improvement by 2020.

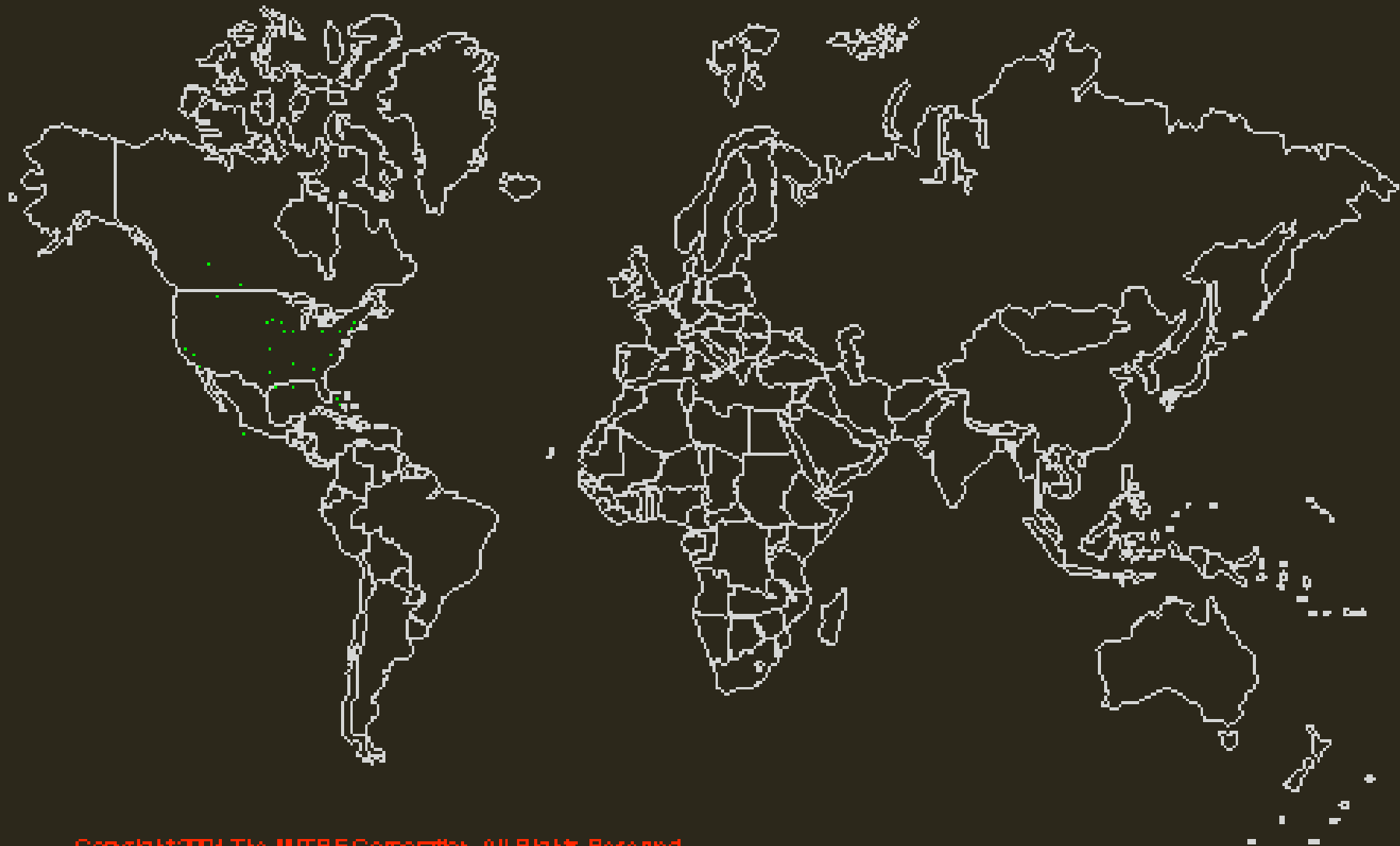
- **Aircraft Noise**

- ☐ New aircraft are 50% quieter than 10 years ago.
- ☐ The number of people exposed to aircraft noise worldwide has gone down by 35% between 1998 and 2004.
- ☐ Research initiatives target a further 50% reduction by 2020.



Environmental Marketing: Carbon-Offset Programs

Company	Type	Location	Partner/ Program	Mechanism
	Airline	United States		Tree planting/ River protection Portfolio of projects Clean energy projects
	Airline	United States		
	Travel Agency	United States		
	Travel Agency	United States	Go Zero	
	Business Av.	United States		
	Business Av.	United States		N/A
	Airline	Canada		Portfolio of projects
	Airline	Europe		Portfolio of projects
	Airline	Europe		Portfolio of projects



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