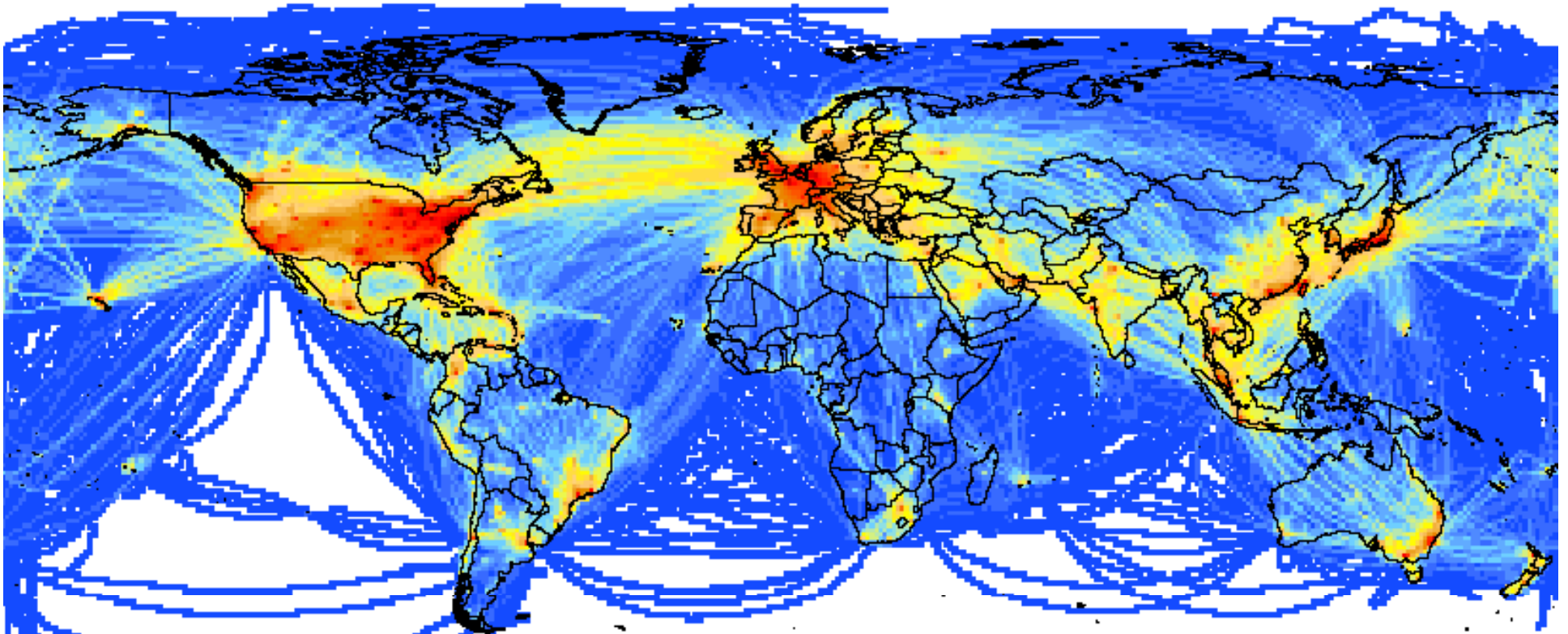




# ***Airline Industry Trend Update***

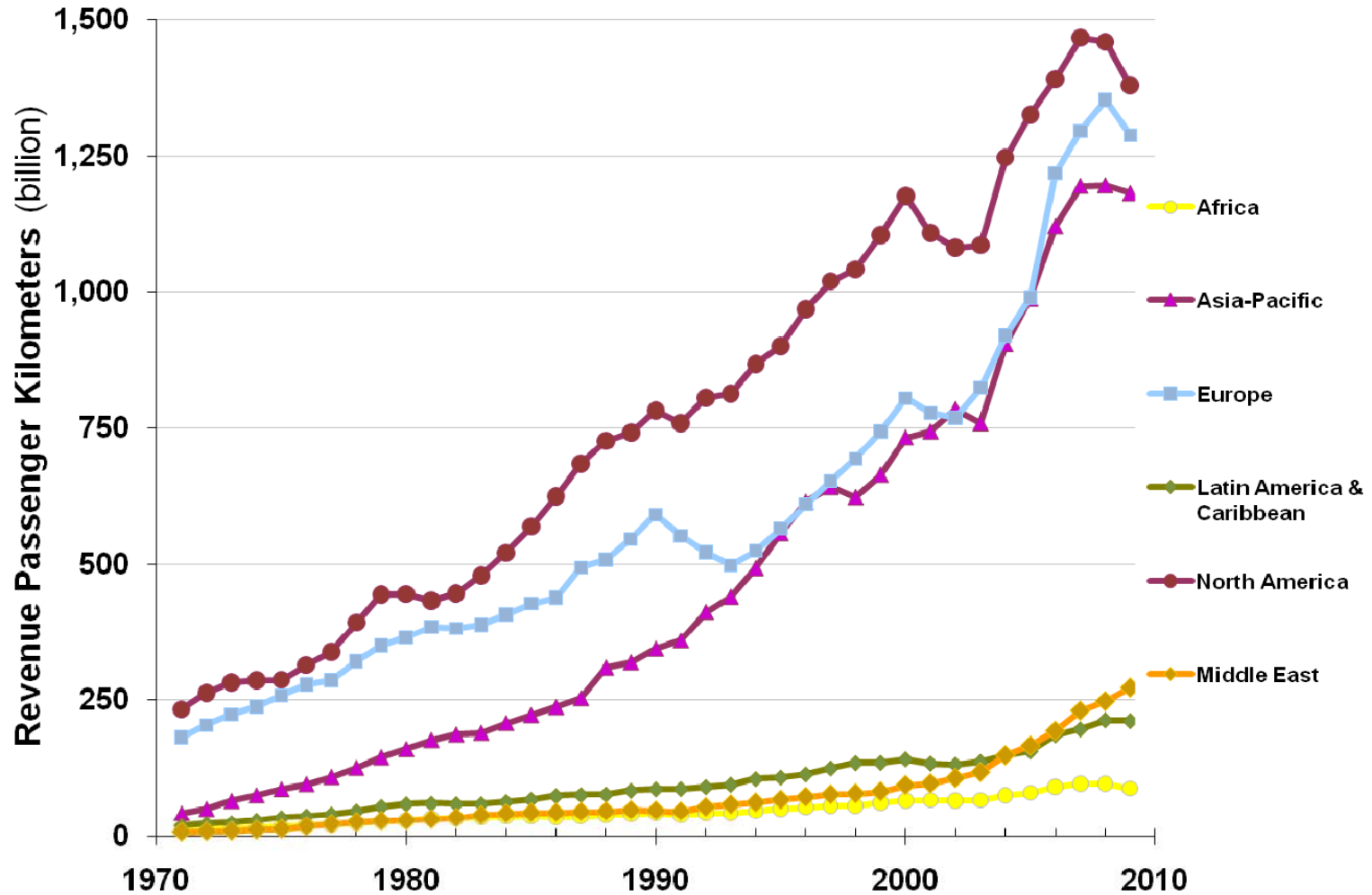


***Prof. R. John Hansman***

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

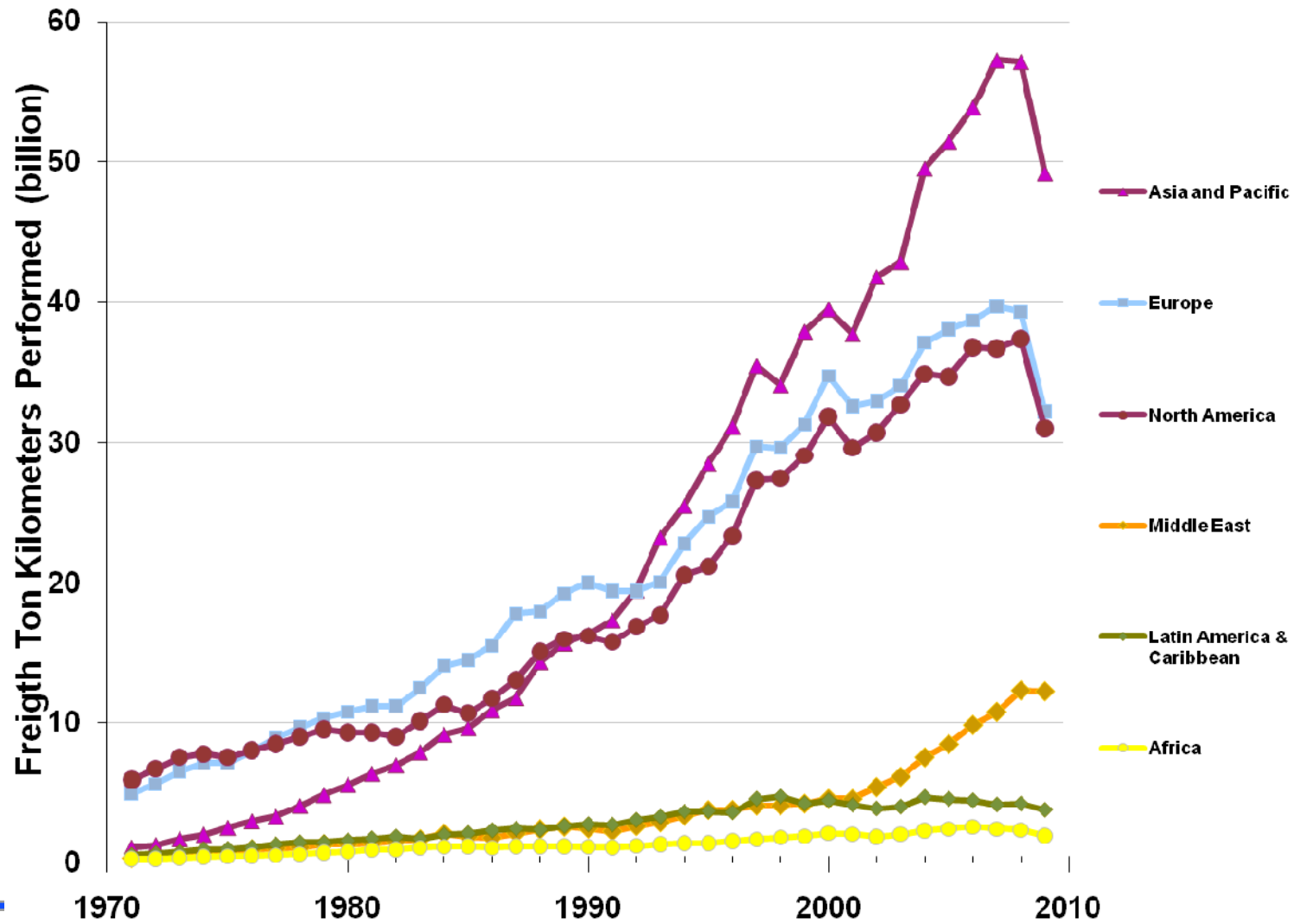


# Revenue Passenger Kilometers (RPK) by World Region





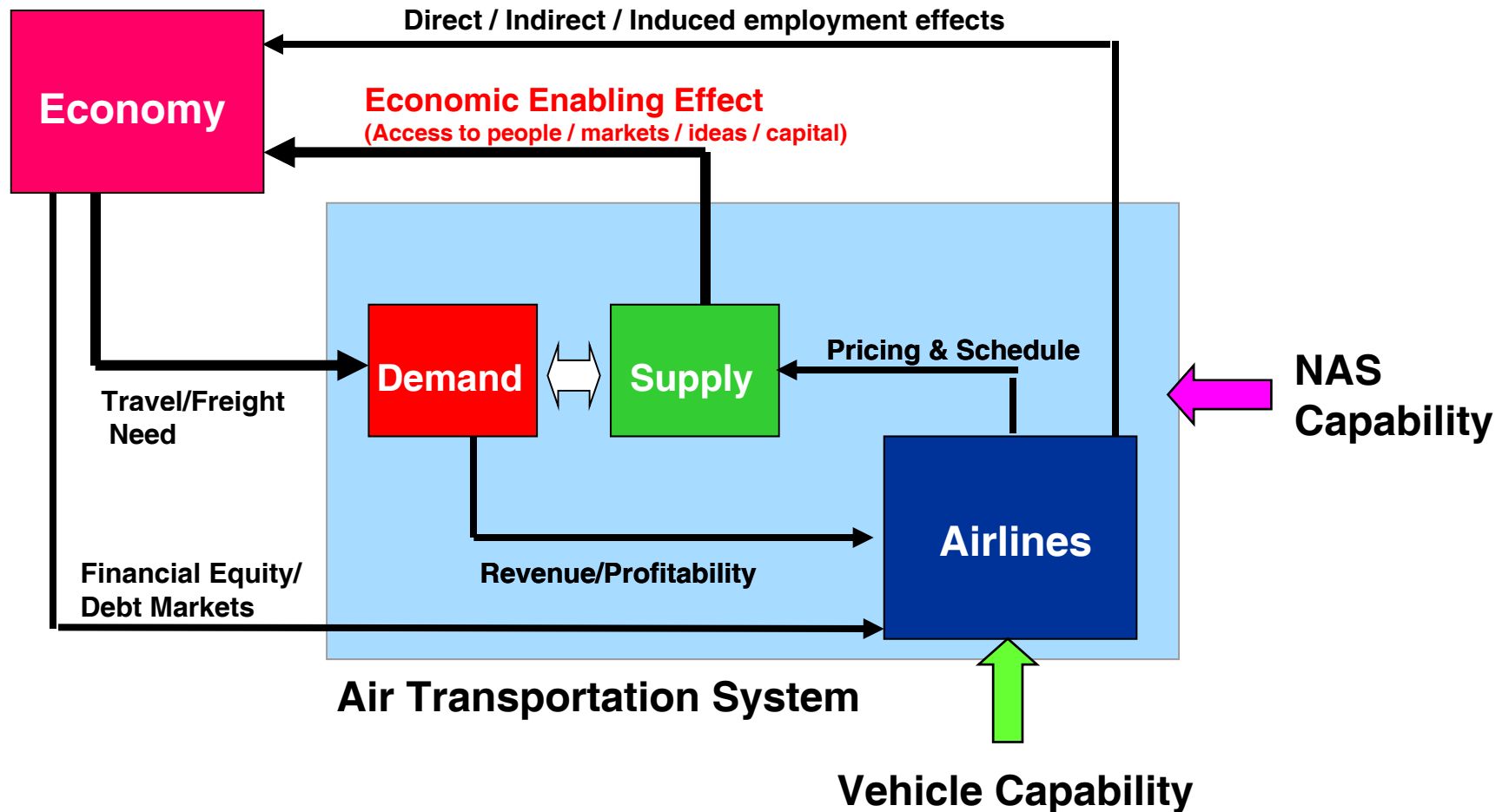
# Freight Tonne Kilometers (FTK) by World Region



Data source: ICAO for 1970 to 2009

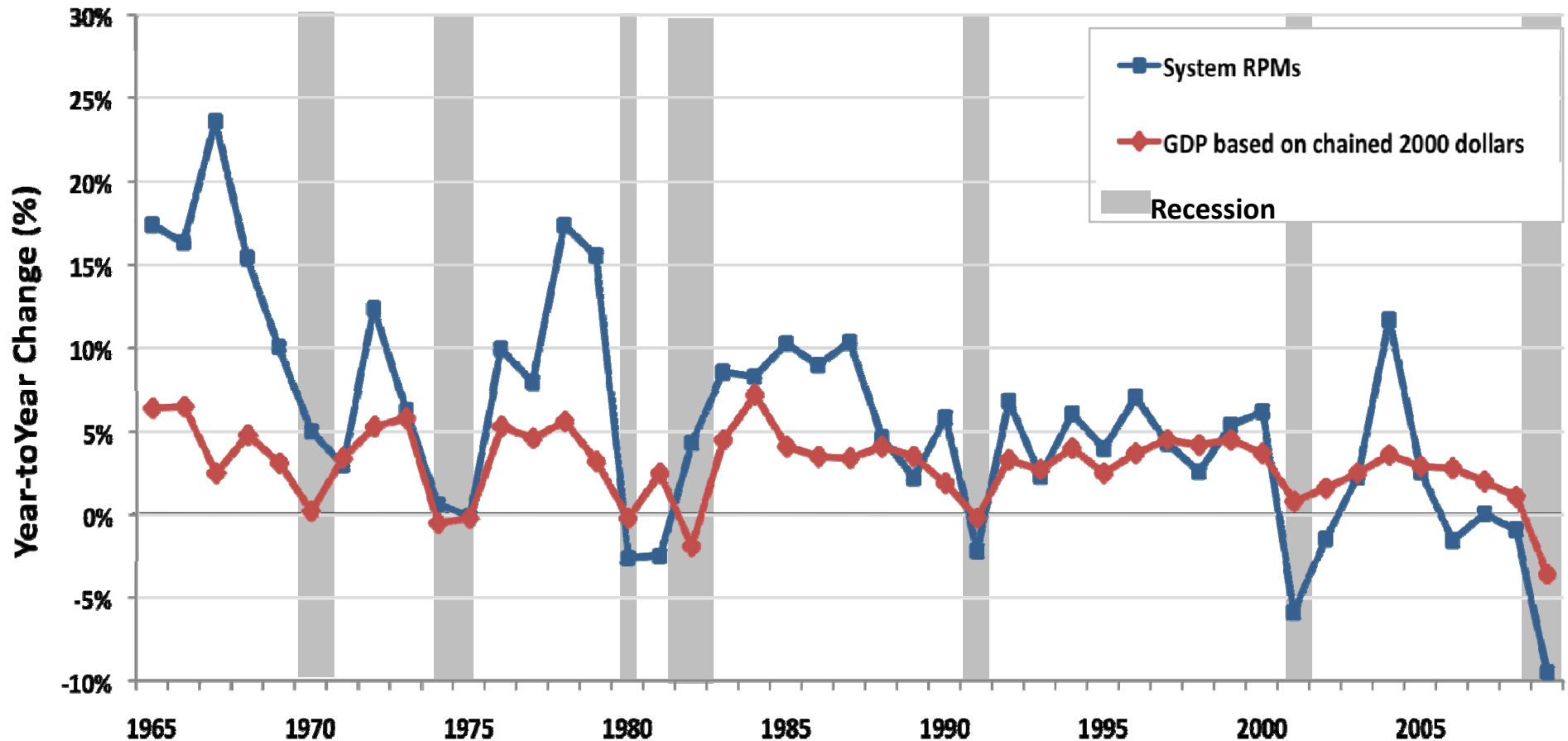


# Relationship Between Economy and Air Transportation





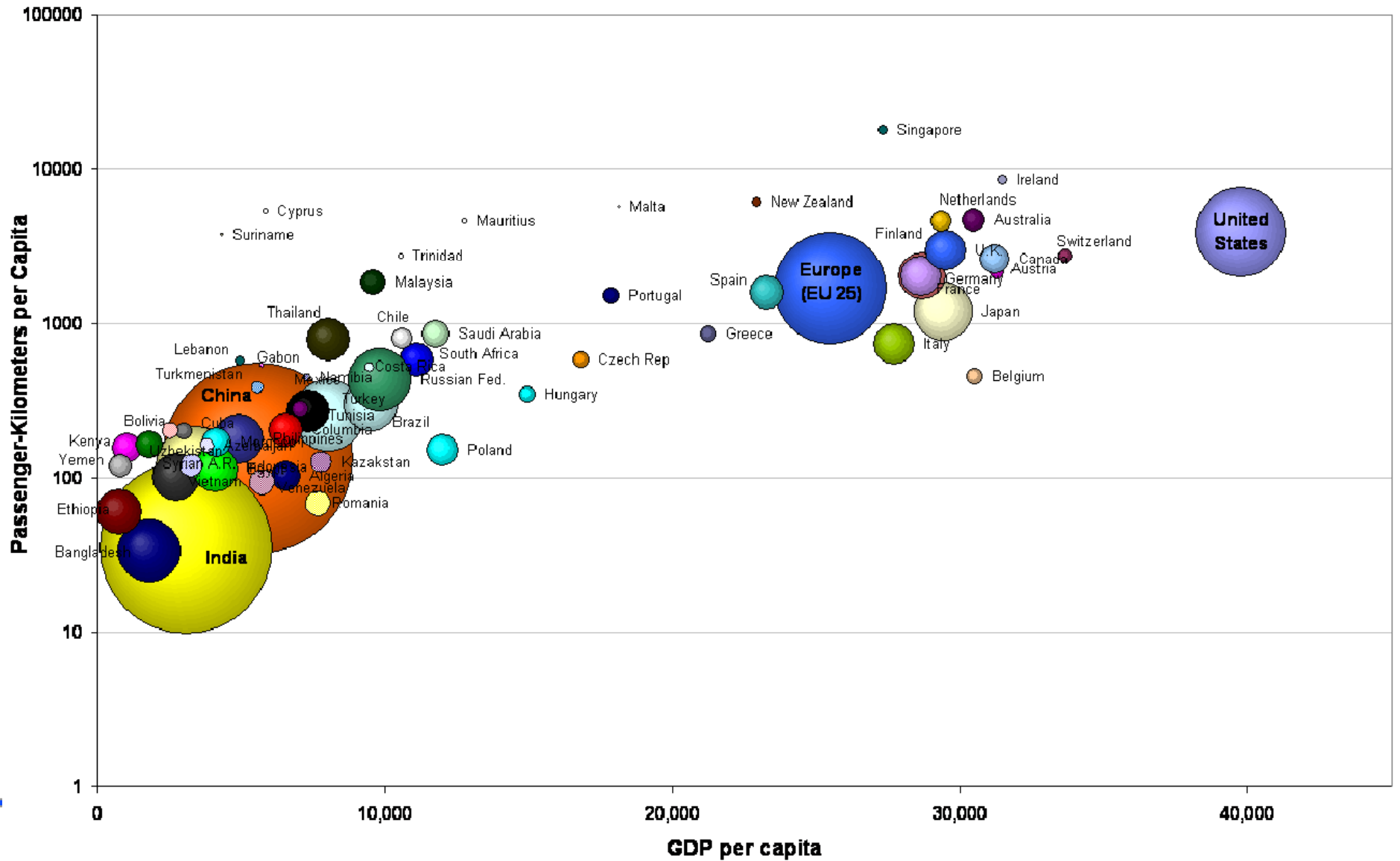
# Correlation Between US GDP and Passenger Traffic



Data source: RPMs: Bureau of Transportation Statistics, (BTS) for 1965 to 2008 and May 2009-May 2008 year-over-year data for 2009 (source: Dallas News)  
GDP: US Bureau of Economic Analysis through Q1 2009  
Recession data: National Bureau of Economic Research



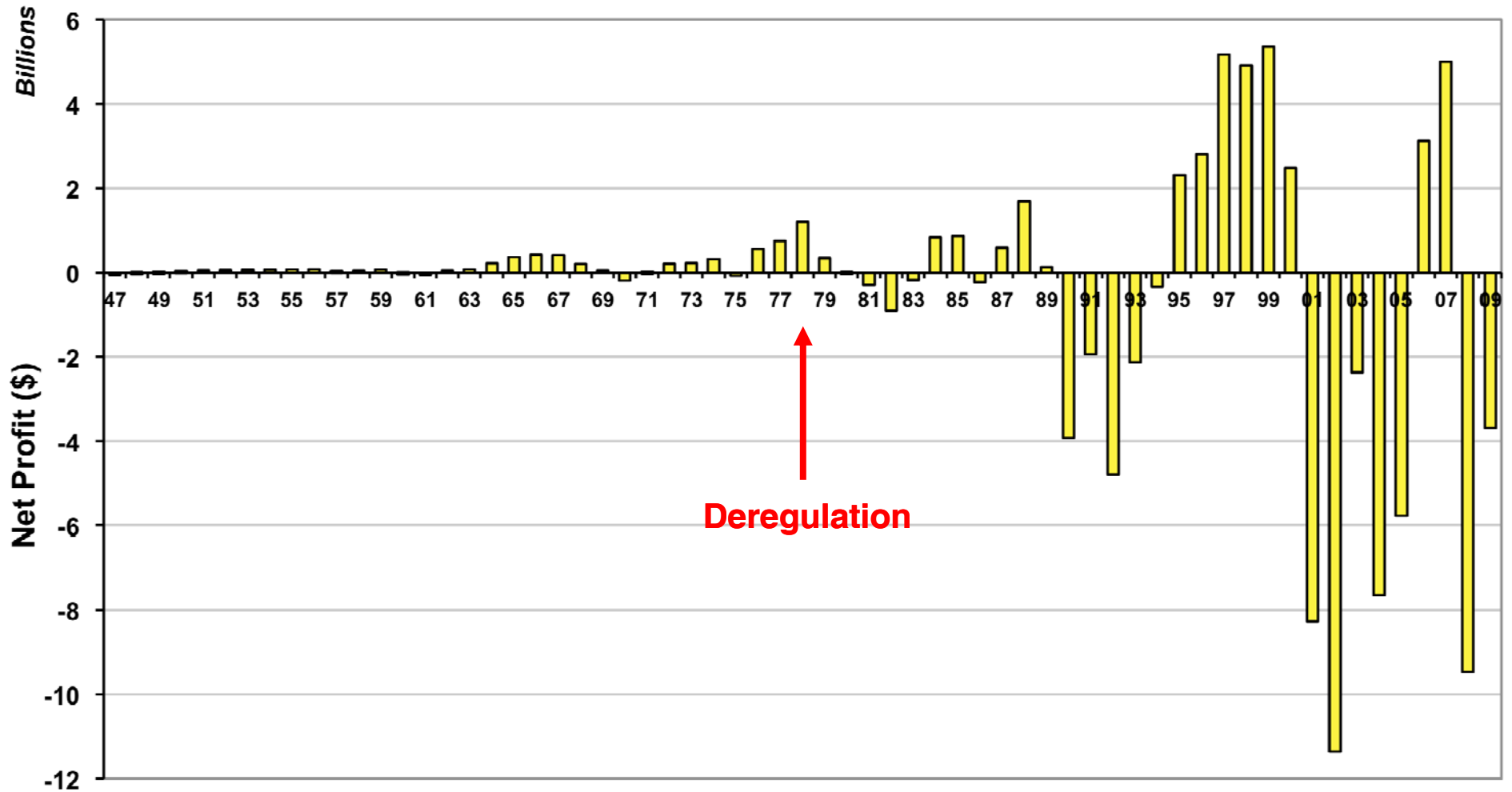
# Air Transportation Markets 2004 Data





# Macro Scale Drivers US Airline Net Profit

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

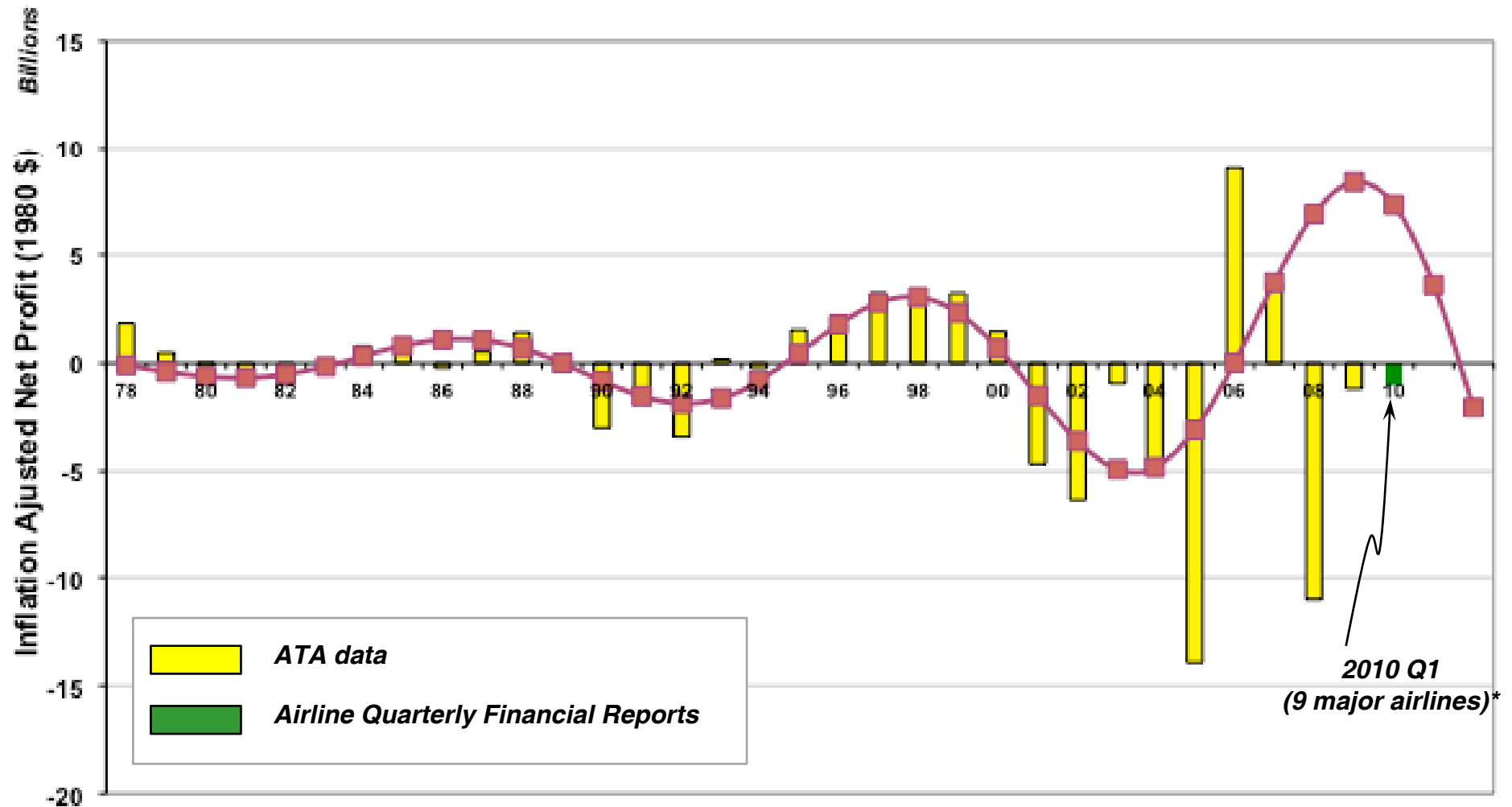


Data source: ATA Annual Revenue and Earnings - Net Profit and Loss



# U.S. Airlines Net Profit

## Best Fit of Undamped Oscillation – Cycle Period = 11.3 yr



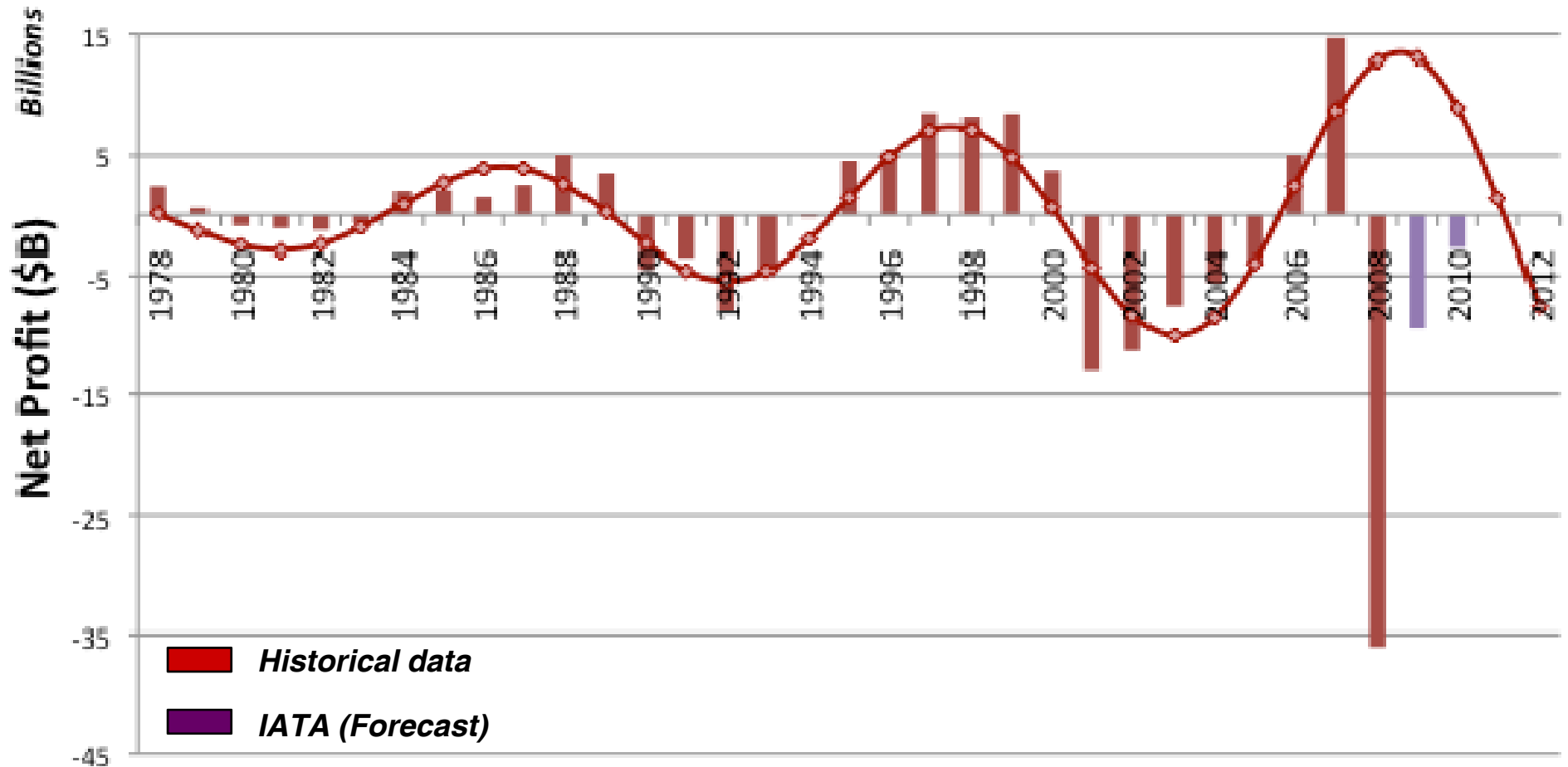
Data source: ATA - available at: [www.airlines.org](http://www.airlines.org) (accounting for 89 airlines) & Airline Quarterly Reports (Net Profits and Losses Exclude Special Items)

\* Note: 2010 data airlines include: American Airlines, United Air Lines, Delta Air Lines, Northwest Airlines, Continental Airlines, US Airways, Southwest Airlines, JetBlue Airways, Alaska Airlines





# World Airlines Net Profit

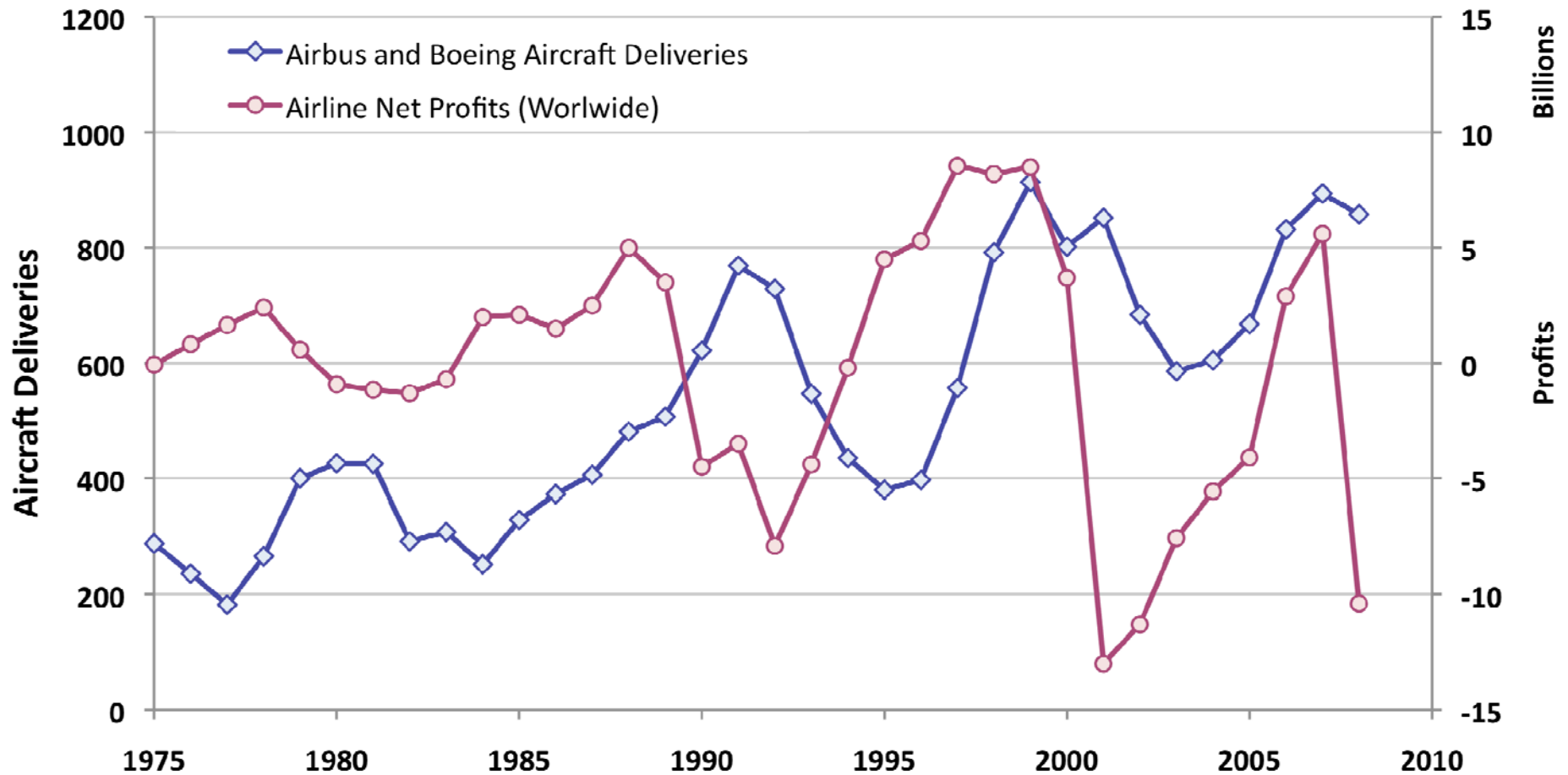


Note: IATA represents 250 airlines comprising 94% of the international scheduled air traffic  
 Data source: ICAO data (1978 to 2008) and IATA (2009-2010) Forecast from **March 2010**



# World Airlines Net Profits vs. Aircraft Deliveries

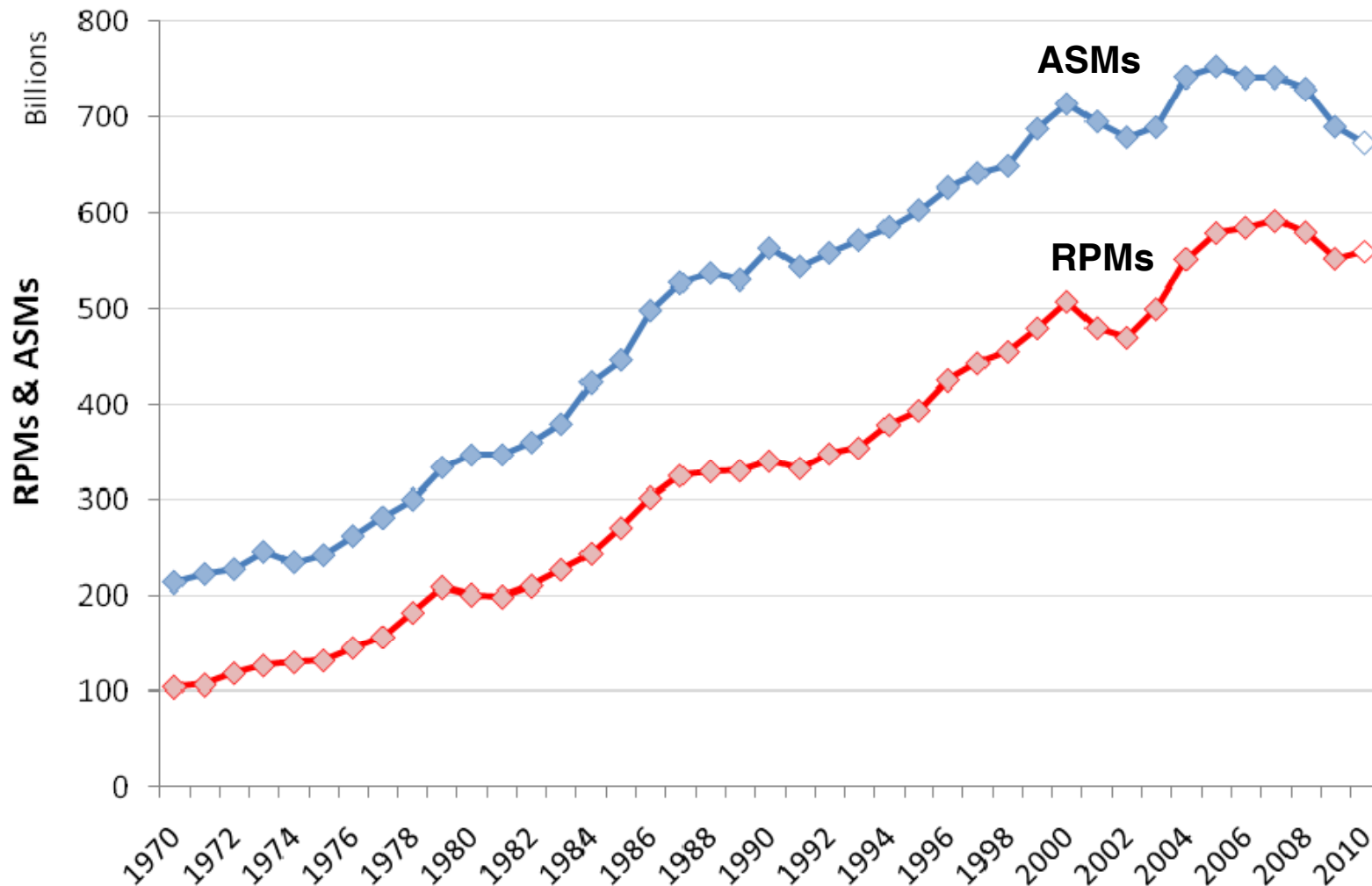
**Phase Lag between Airline Net Profits & Aircraft Deliveries:  
Hypothesize that instability driven by capacity response phase lag**



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



# U.S. Domestic ASMs and RPMs



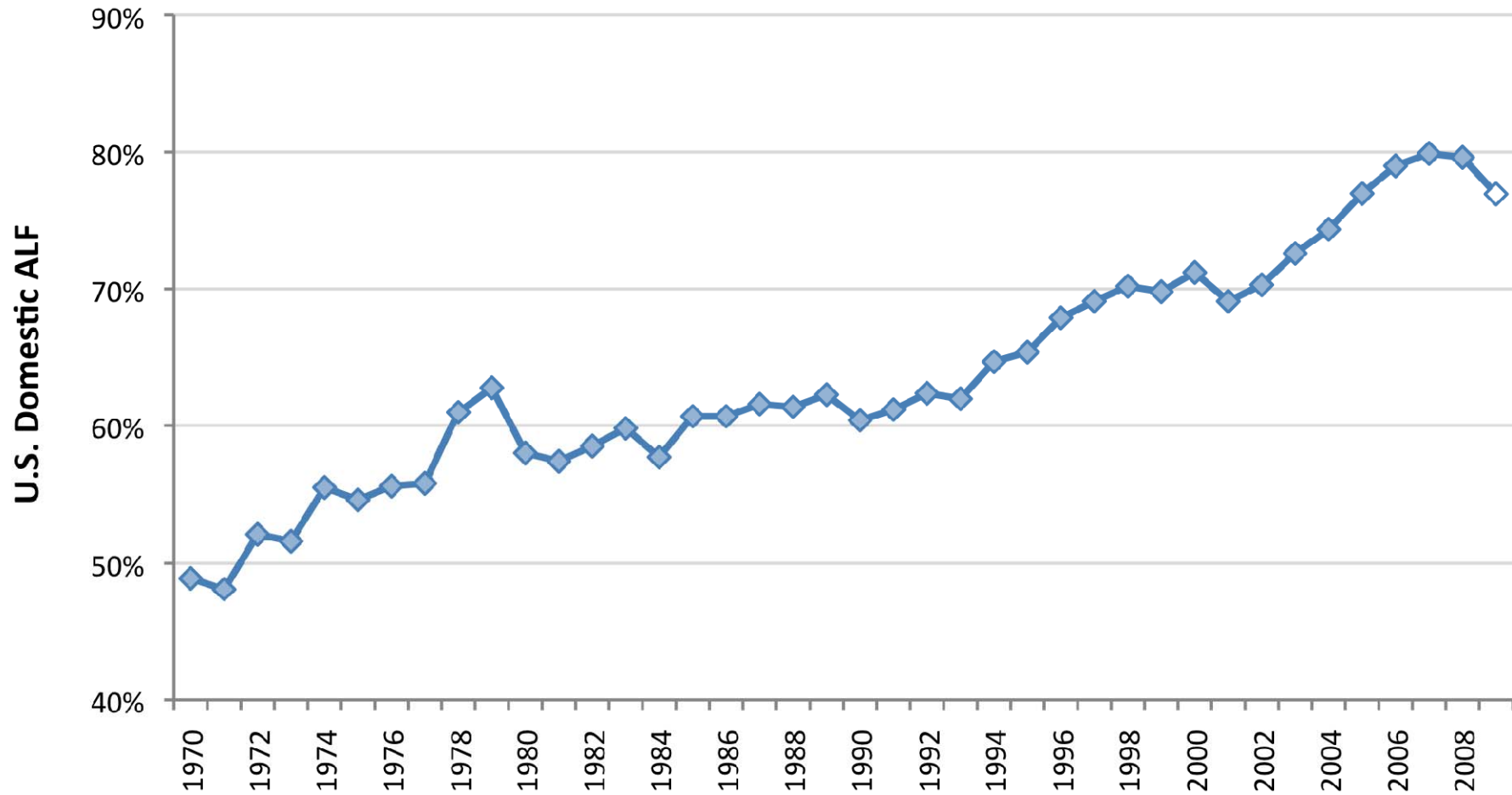
Note: Data for 2010 - Jan to Feb. - from DOT Form 41 available from BTS – Projected to full year 2010 based on Jan-Feb. data

Data source: ATA for 1970-2009, "U.S. Airlines" defined as U.S. Department of Transportation (DOT) in Form 41 Financial and Traffic Reports (total of 89 airlines)



# Load Factor Trends

## *US Domestic*

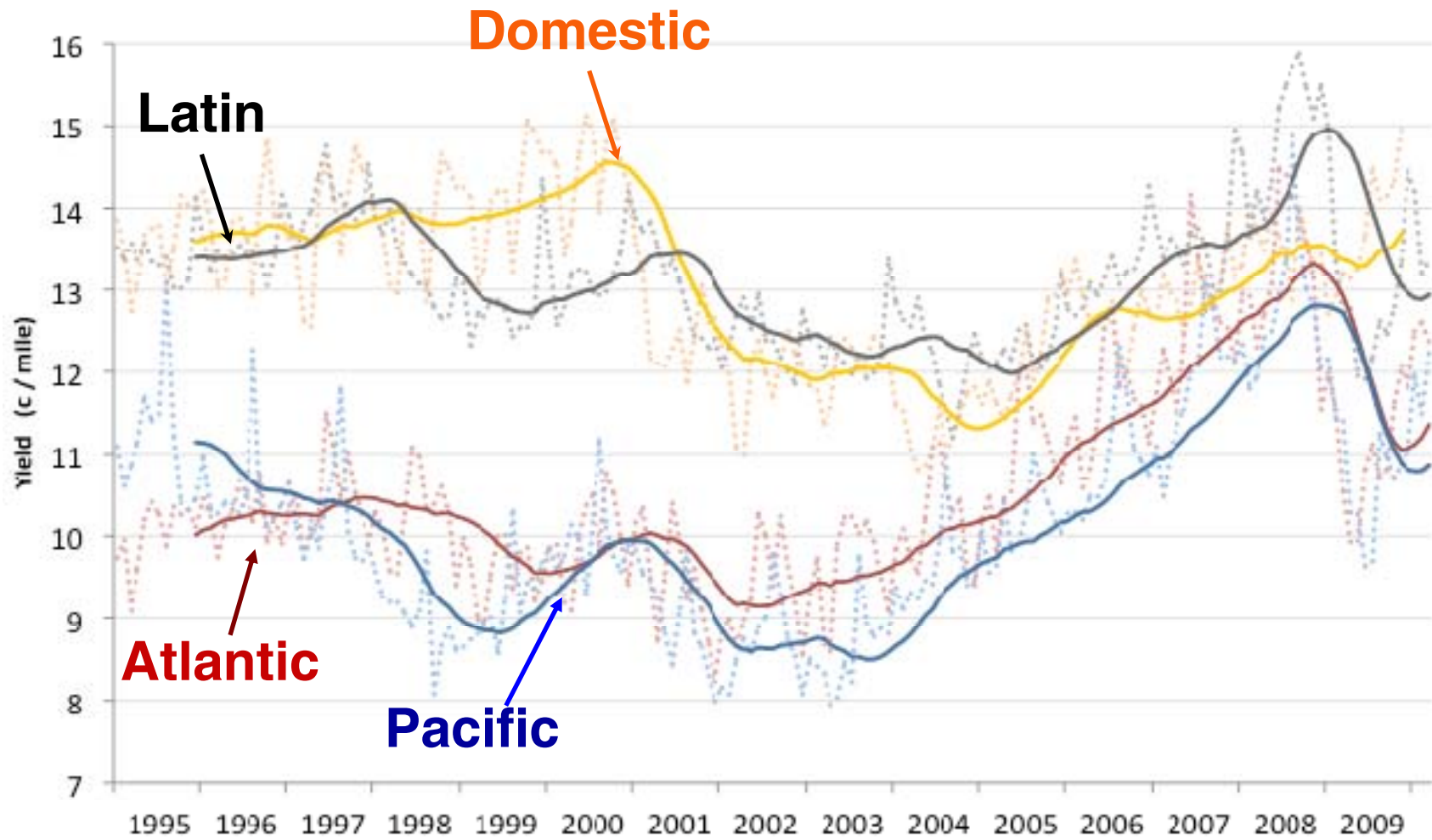


Note: Data for 2009 - Jan to May - from DOT Form 41 available from BTS

Data source: ATA for 1970-2008, "U.S. Airlines" defined as U.S. Department of Transportation (DOT) in Form 41 Financial and Traffic Reports (total of 89 airlines)

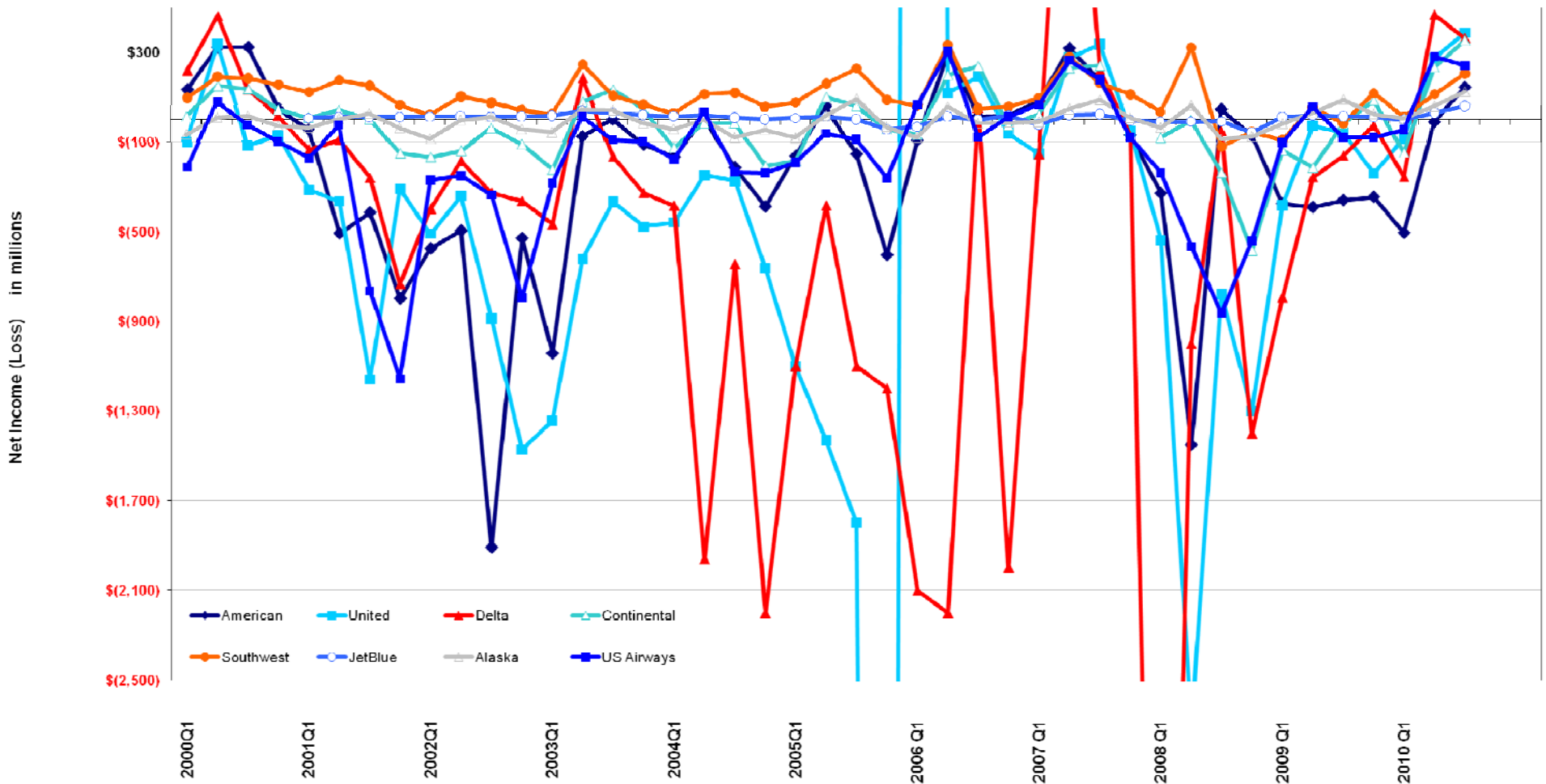


# Historic Yield by Region





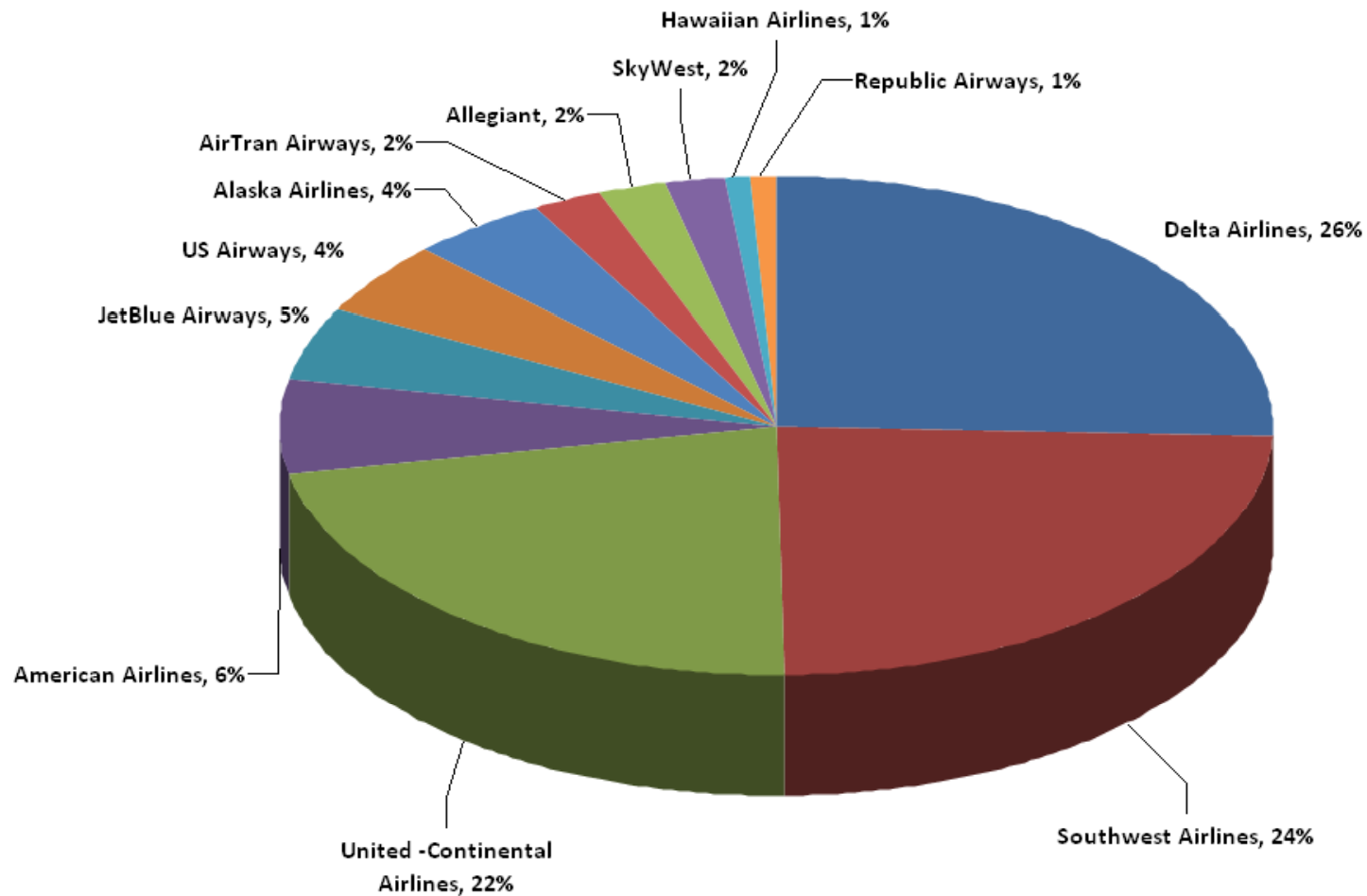
# U.S. Airline Quarterly Profits



Data sources: Airline Quarterly Reports (Net Profits and Losses Include Special Items)



# Market Cap: US Majors October 28<sup>th</sup> 2010

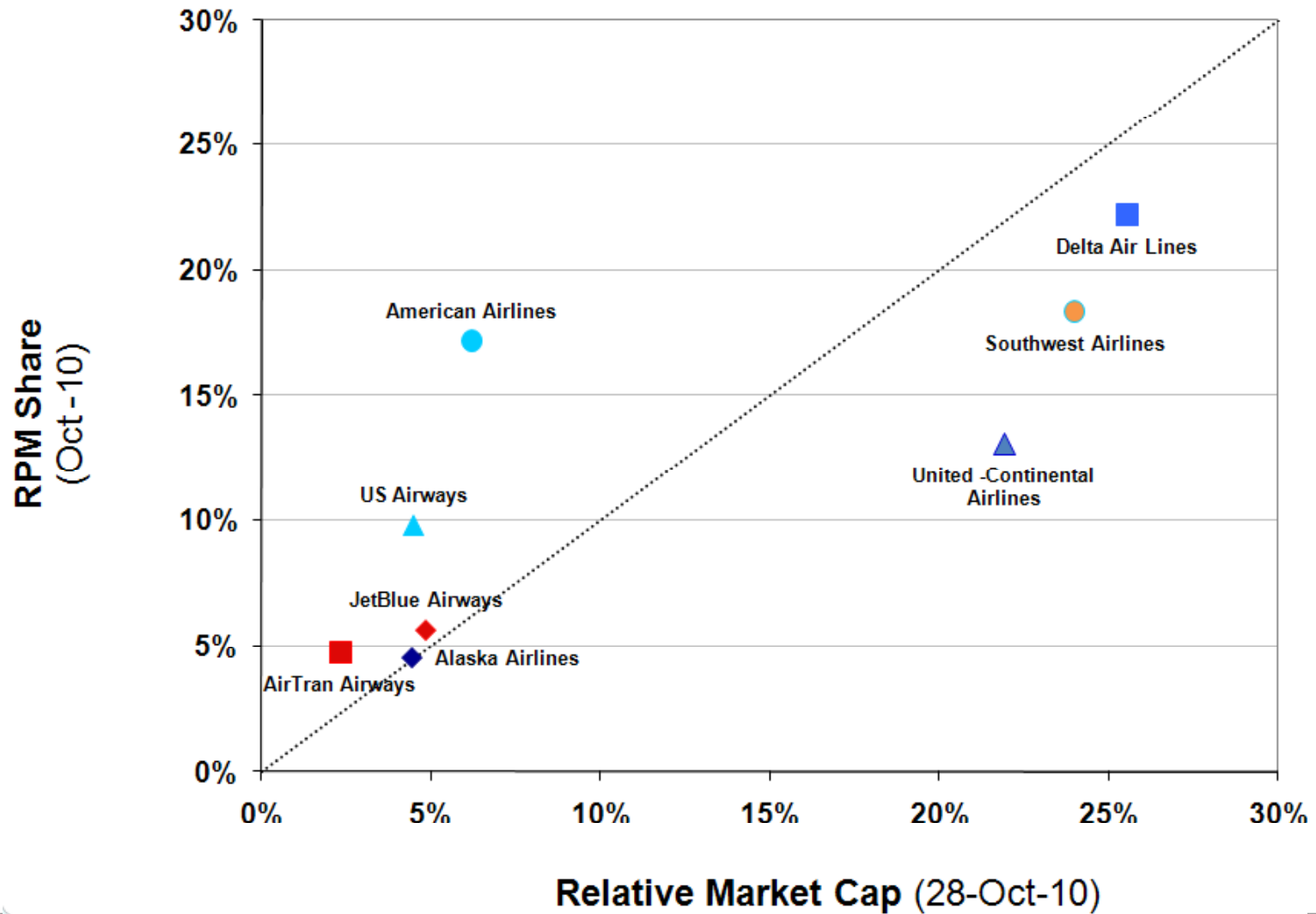


**Total Market Cap: \$ 43 billion**



# RPM Share vs. Market Cap

(RPMs: Oct 2010 - Market Cap: Oct 28<sup>th</sup> 2010)

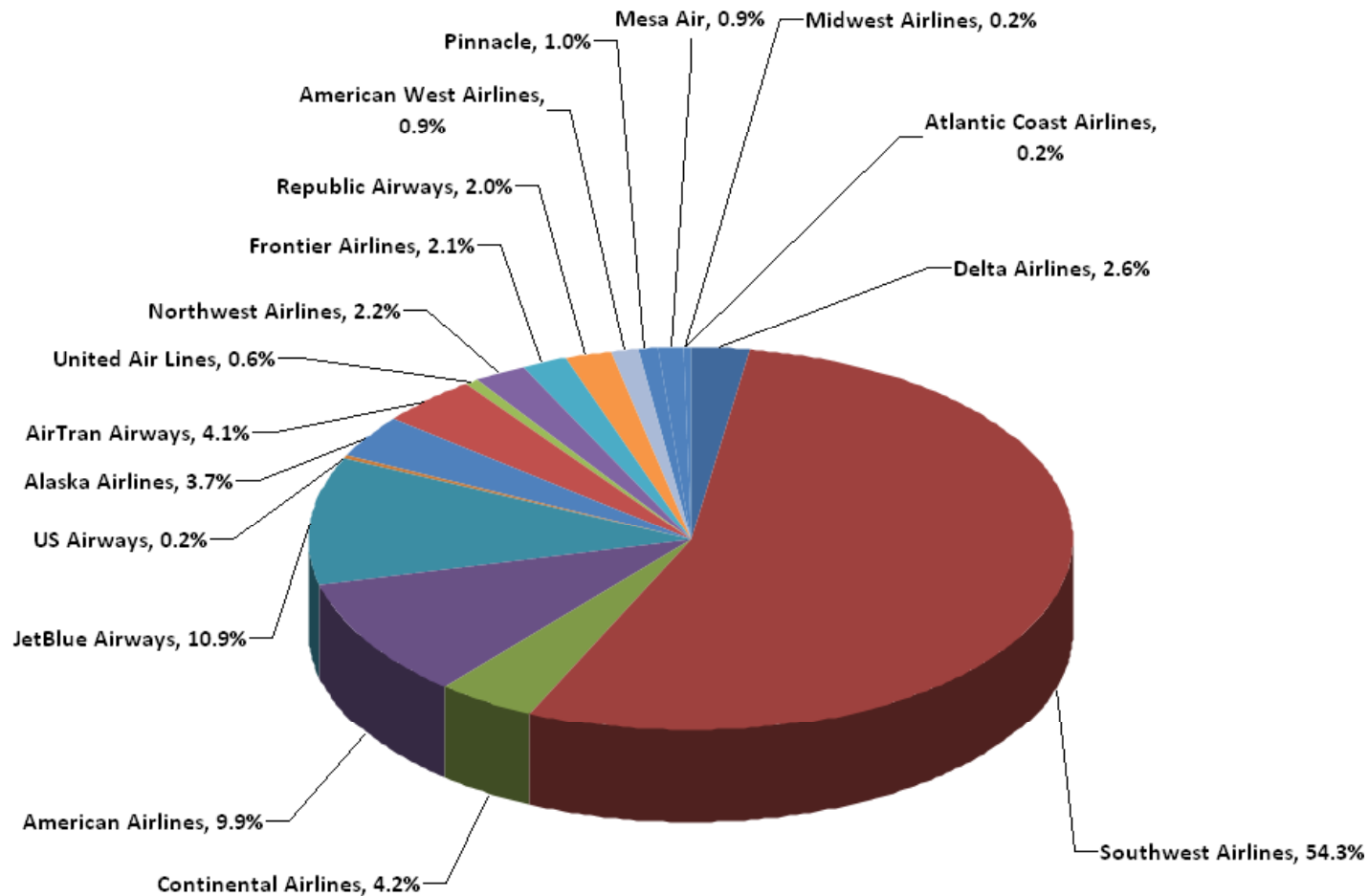






# Market Cap: US Majors

## 26-May-2005



**Total Market Cap: \$21.2 billion**



# Consolidation Trend

---

- **Recent US Consolidation**

- Southwest and AirTran (pending)
- United and Continental (approved)
- Delta and Northwest (Oct 09)
- USAir and America West
- Potential for Additional Reactionary Moves



- **Recent International Consolidation**

- Lufthansa and Austrian
- Air France and KLM
- Air France/KLM and Alitalia (25% ownership)
- Lufthansa and Swiss
- China Southern and China Northern and Xingiang
- Cathy Pacific and Dragon
- BMI and Lufthansa



- **International Strategic Investment in US Carriers**

- 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
-



# Airline Alliances

## US DOT Antitrust Immunity



### Star Alliance

- **Adria Airways (JP)**
- **Aegean Airlines (A3)**
- **Air Canada (AC)**
- **Air New Zealand (NZ)**
- **ANA (NH)**
- **Asiana Airlines (OZ)**
- **Austrian Airlines (OS)**
- **Blue1 (KF)**
- **bmi (BD)**
- **Brussels Airlines (SN)**
- **Continental (CO) NEW**
- **Croatia Airlines (OU)**
- **LOT Polish Airlines (LO)**
- **Lufthansa (LH)**
- **SAS (SK)**
- **Shanghai Airlines (FM)**
- **Singapore Airlines (SQ)**
- **South African (SA)**
- **Spanair (JK)**
- **Swiss Intl Air Lines (LX)**
- **TAM Airlines (JJ)**
- **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)**
- **Mexicana (MX)**
- **Qantas (QF)**
- **Royal Jordanian (RJ)**



### SkyTeam

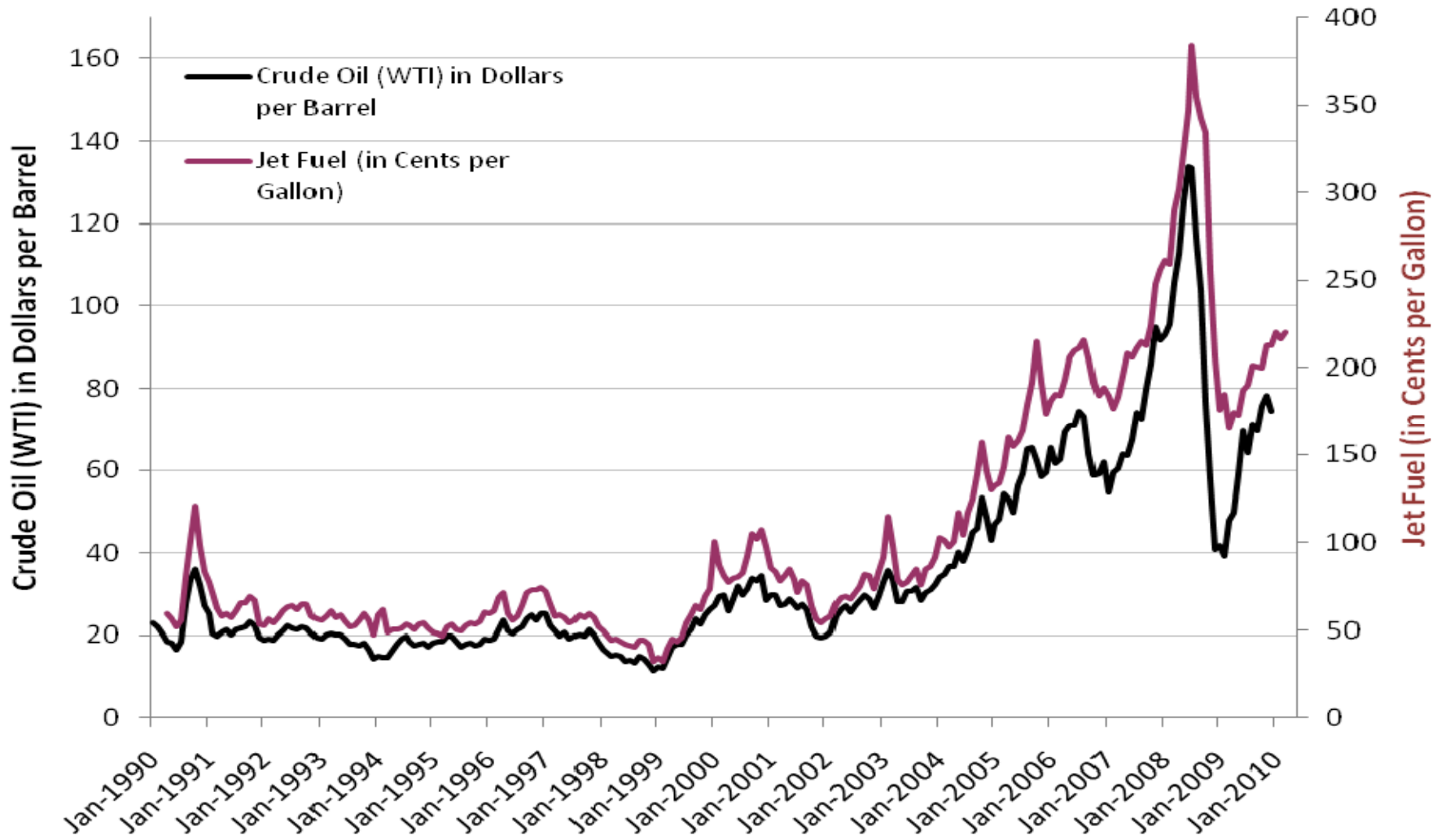
- **Aeroflot (SU)**
- **Aeroméxico (AM)**
- **Air Europa (UX)**
- **Air France (AF)**
- **Alitalia (AZ)**
- **China Southern Airlines (CZ)**
- **Czech Airlines (OK)**
- **Delta (DL)**
- **Kenya Airways (KQ)**
- **KLM (KL)**
- **Korean Air (KE)**
- **TAROM (RO)**
- **Vietnam Airlines (VN)**

**Prior Immunity**

**Immunity Application In Progress or Recently Approved**



# Crude Oil and Jet Fuel Price Trends

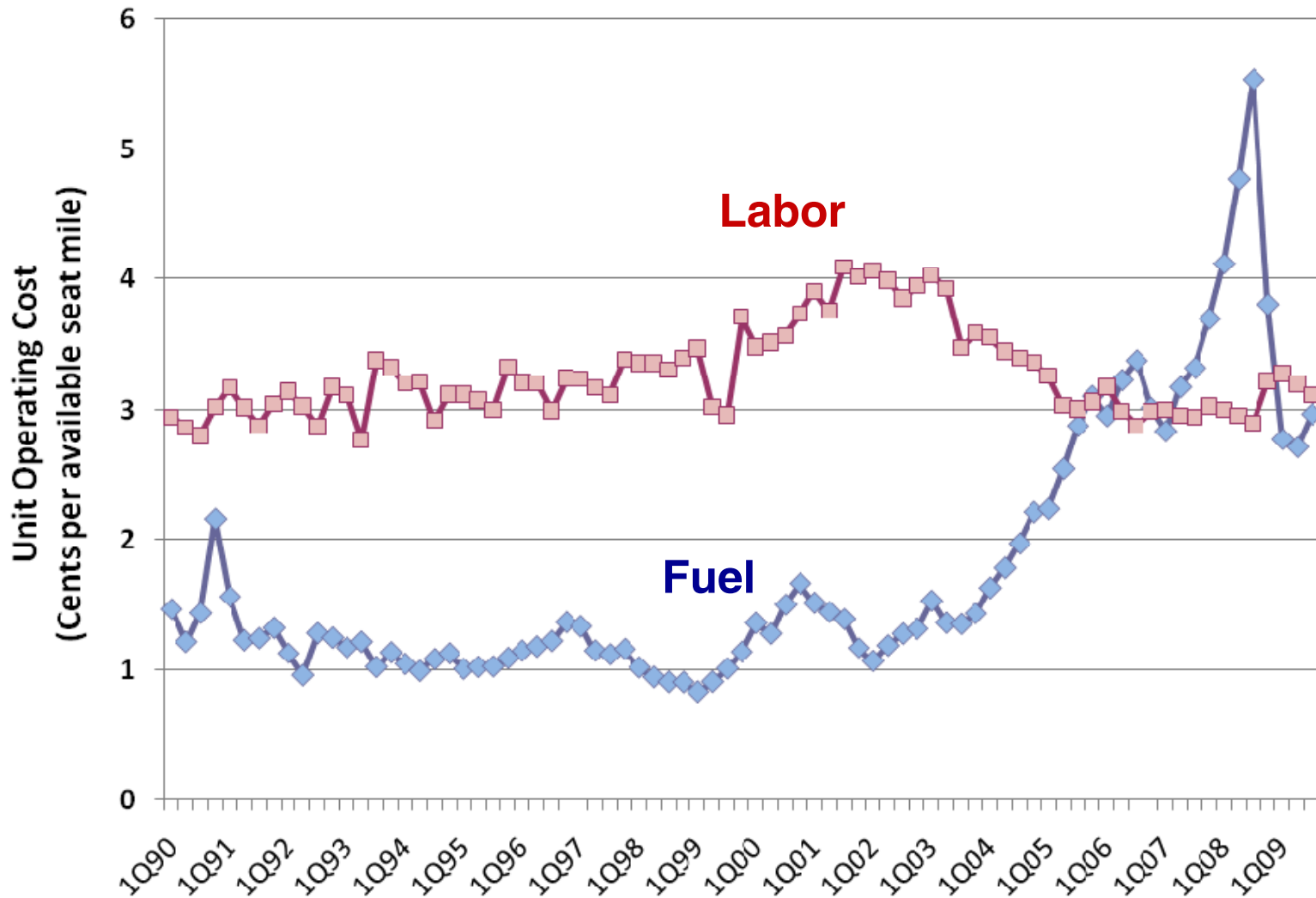


Data sources: ATA Fuel Cost and Consumption (oil data through Mar. 2009, jet fuel data through Aug. 2009) – Data for June 2009: market price for Oct 24<sup>th</sup> 09



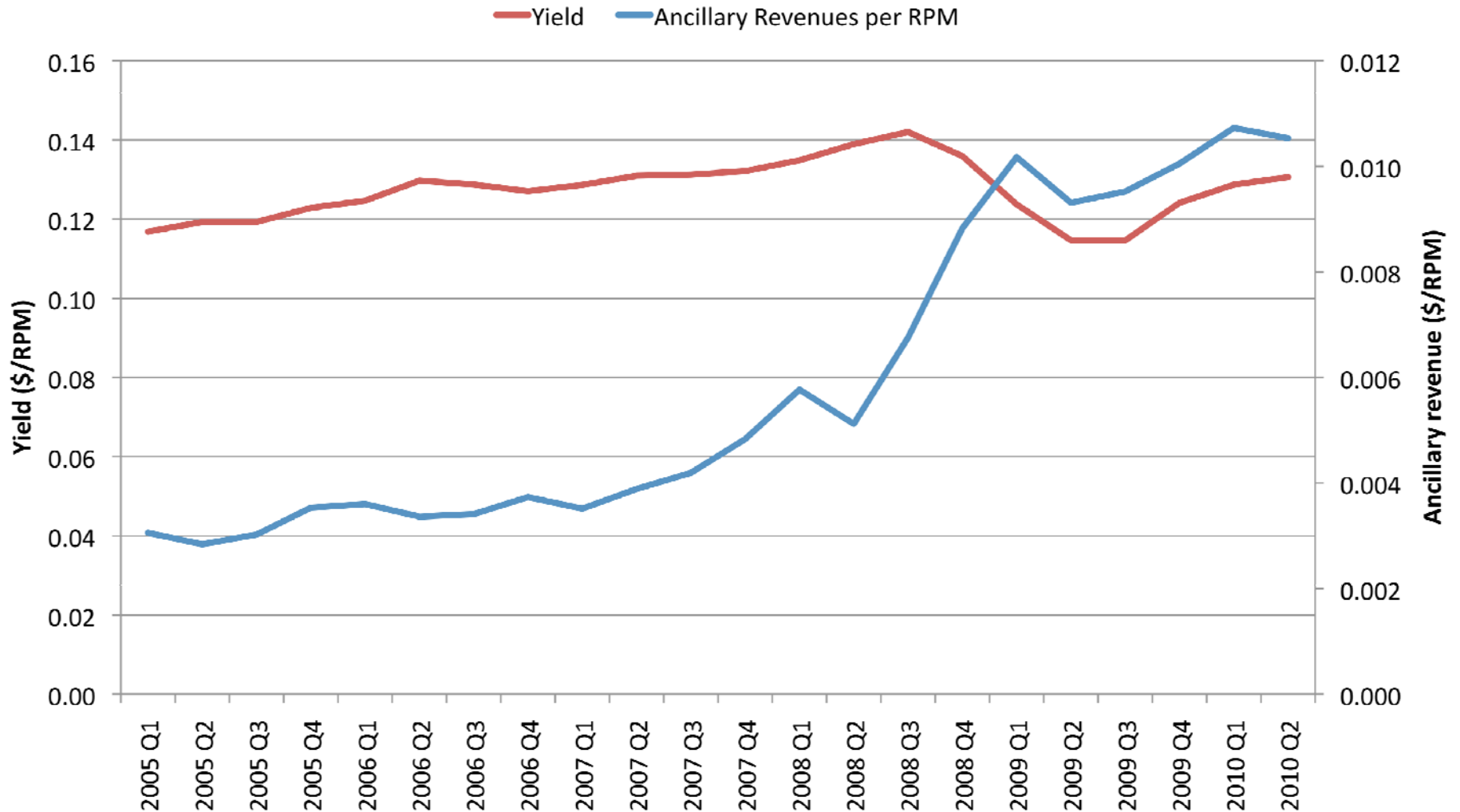
# Fuel and Labor Unit Cost Trends

## US Data





# Upward Trend in Ancillary Revenues (20 largest US Carriers)

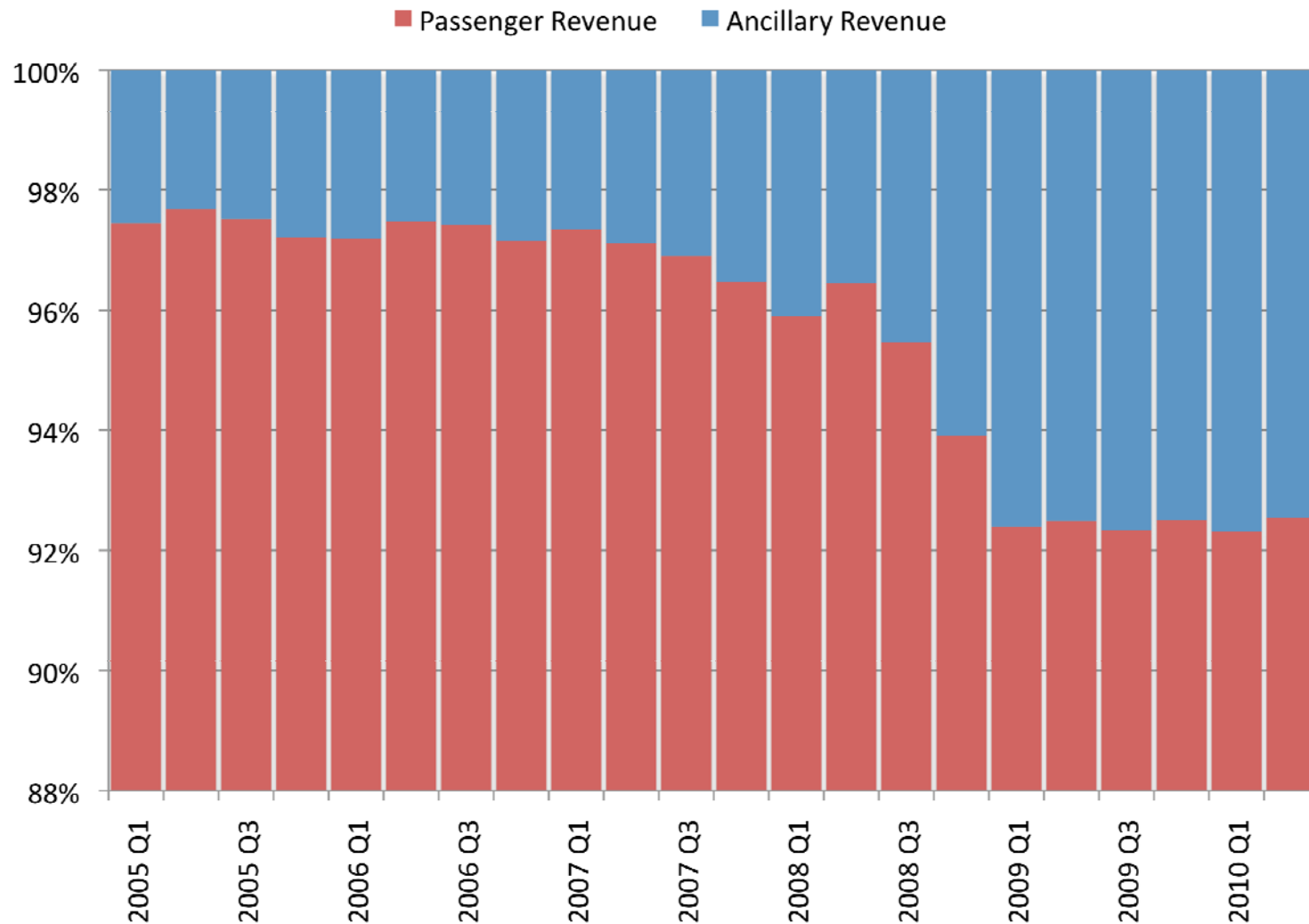


Source: BTS Form 41 schedules P-12 and T-2 for the 20 largest U.S. airlines

Ancillary revenue includes only: baggage fees, reservation change fees and miscellaneous operating revenue (the method used by the BTS)  
Revenue from seating assignments and on-board sales of food, drink, pillows, blankets, entertainment, or any other ancillary items is NOT included



# Proportion of Revenue from Ancillary Sources (20 largest US Carriers)



Source: BTS Form 41-schedules P-12 and T-2 for the 20 largest U.S. airlines

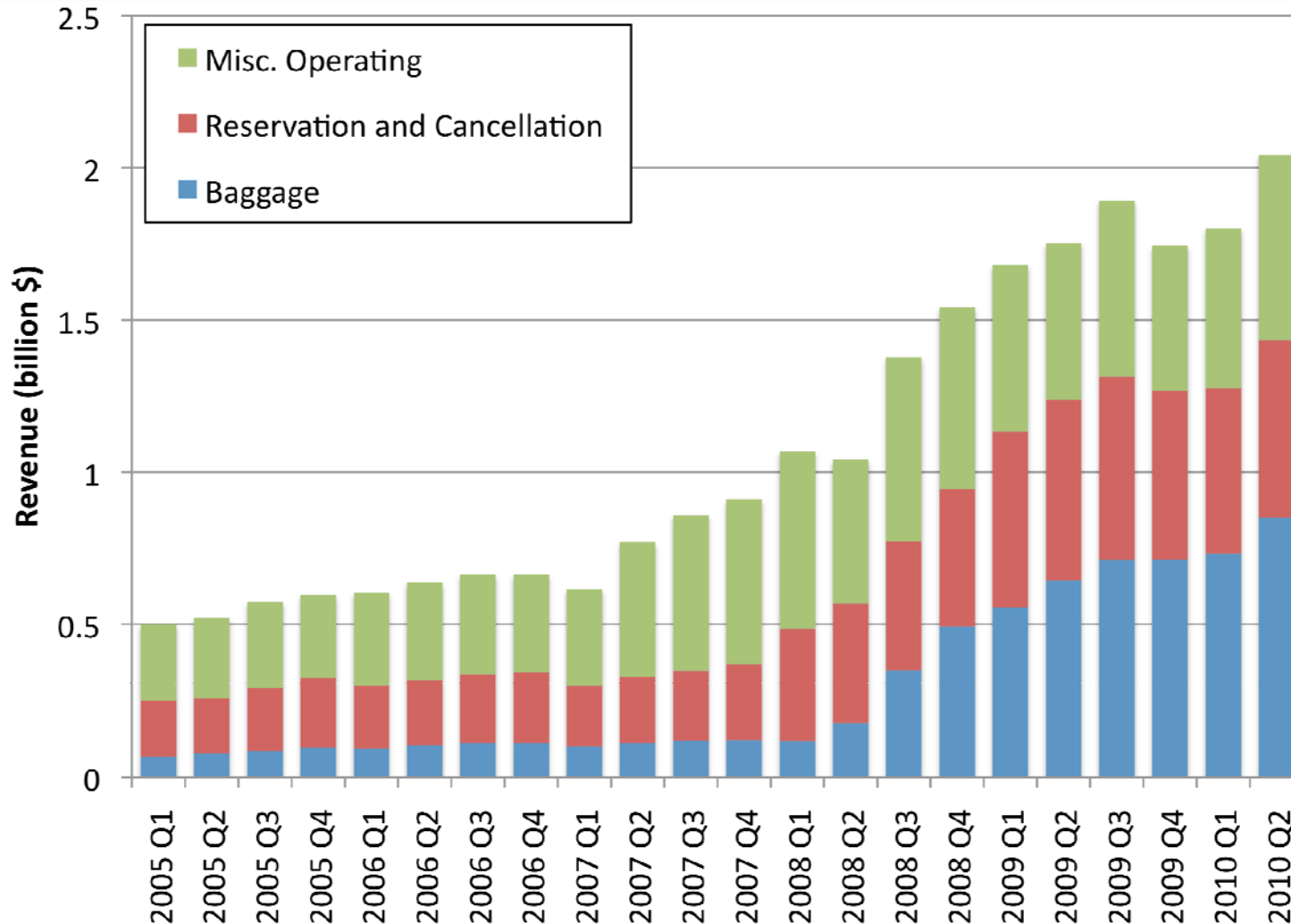
Ancillary revenue includes only: baggage fees, reservation change fees and miscellaneous operating revenue (the method used by the BTS)

Revenue from seating assignments and on-board sales of food, drink, pillows, blankets, entertainment, or any other ancillary items is NOT included





# Trends in Ancillary Revenue Breakdown (20 largest US Carriers)



Source: BTS Form 41 schedules P-12 and T-2 for the 20 largest U.S. airlines

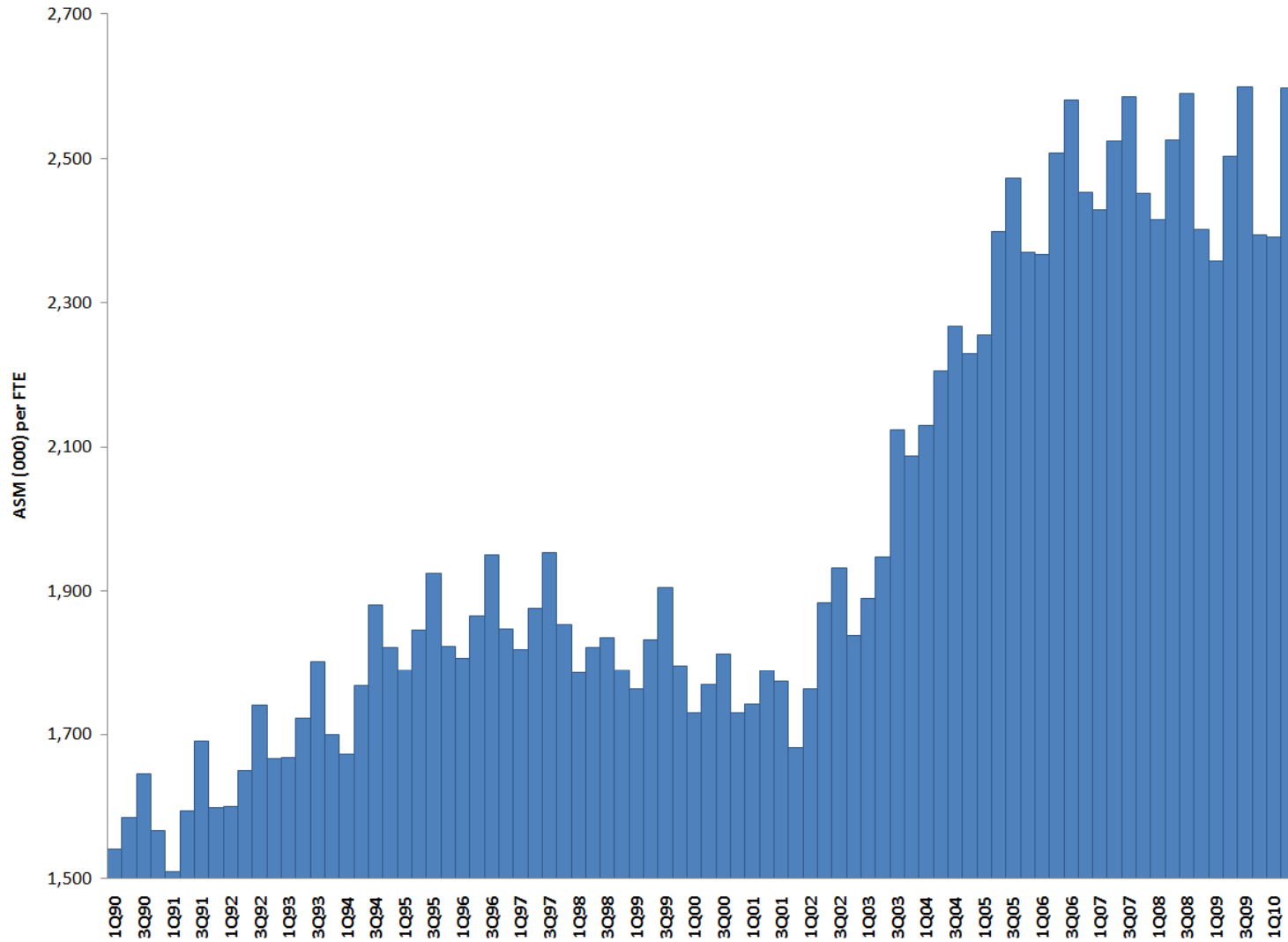
Ancillary revenue includes only: baggage fees, reservation change fees and miscellaneous operating revenue (the method used by the BTS)

Revenue from seating assignments and on-board sales of food, drink, pillows, blankets, entertainment, or any other ancillary items is NOT included



# Labor Productivity Trends

## US Data



Data Source: ATA US Airline Cost Index: Major & National Passenger Carriers, Q2 2010



# Electronic Distribution and Processing

- **Airline Tickets #1 Web Product by Value**
  - Browser 1st page effect on marketing
- **Increase in e-Tickets**
  - Cost Savings
  - Charge for Paper Tickets
  - Interlining of e-Tickets
  - Domestic 40% in 2005 to 97% in 2008
- **IATA**
  - Only e-tickets after June 1 2008
  - 94% of Intl Passengers
- **CAPPS II**





# Increased Price Transparency

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---

**Refine Search**

**Stops**

Nonstop \$429

1 Stop \$437

2+ Stops none

---

**Flight Times**

**Outbound (to SFO)**

Depart  Arrive

Depart 5:00a Tue - 7:45p

---

**Return (to BOS)**

Depart  Arrive

Depart 12:15a Thu - 12:00a Fri

---

**Airlines**

select all | clear all

AirTran \$451

Alaska Airlines \$534

**Boston, MA to San Francisco, CA** Tue Jul 13 - Thu Jul 22, 3 travelers

Results: **2421** out of 2421

Lowest Price Found | Compare Dates | Compare Airlines HIDE

**\$380 + Taxes & Fees = \$429 total** ✈ Prices include Taxes and Fees, so you'll know the real cost up front.

**Fly Nonstop**  
from **\$429**

**Best Times**  
from **\$445**

**Lowest Price**  
**\$429**

Price	Airline	Depart	Arrive	Stops	Duration
<b>\$429</b> <small>per person Tax &amp; Fees incl.</small> <a href="#">Select</a>	Multiple Airlines	BOS 9:20a → SFO 12:51p		Nonstop	6h 31m
		SFO 10:50p → BOS 7:30a (+1)		Nonstop	5h 40m
Book On: \$429 CheapOair					
<b>\$429</b> <small>per person Tax &amp; Fees incl.</small> <a href="#">Select</a>	Multiple Airlines	BOS 6:59p → SFO 10:27p		Nonstop	6h 28m
		SFO 10:50p → BOS 7:30a (+1)		Nonstop	5h 40m
Book On: \$429 CheapOair					
<b>\$429</b> <small>per person</small>	Alaska Airlines	BOS 7:40p → SFO 11:20p		Nonstop	6h 40m
		SFO 10:50p → BOS 7:30a (+1)		Nonstop	5h 40m

The lowest fares the most often

Compare prices on...

- jetBlue
- American Airlines
- priceline.com
- ORBITZ
- bookingbuddy
- cheapOair.com
- Hotwire

Select All

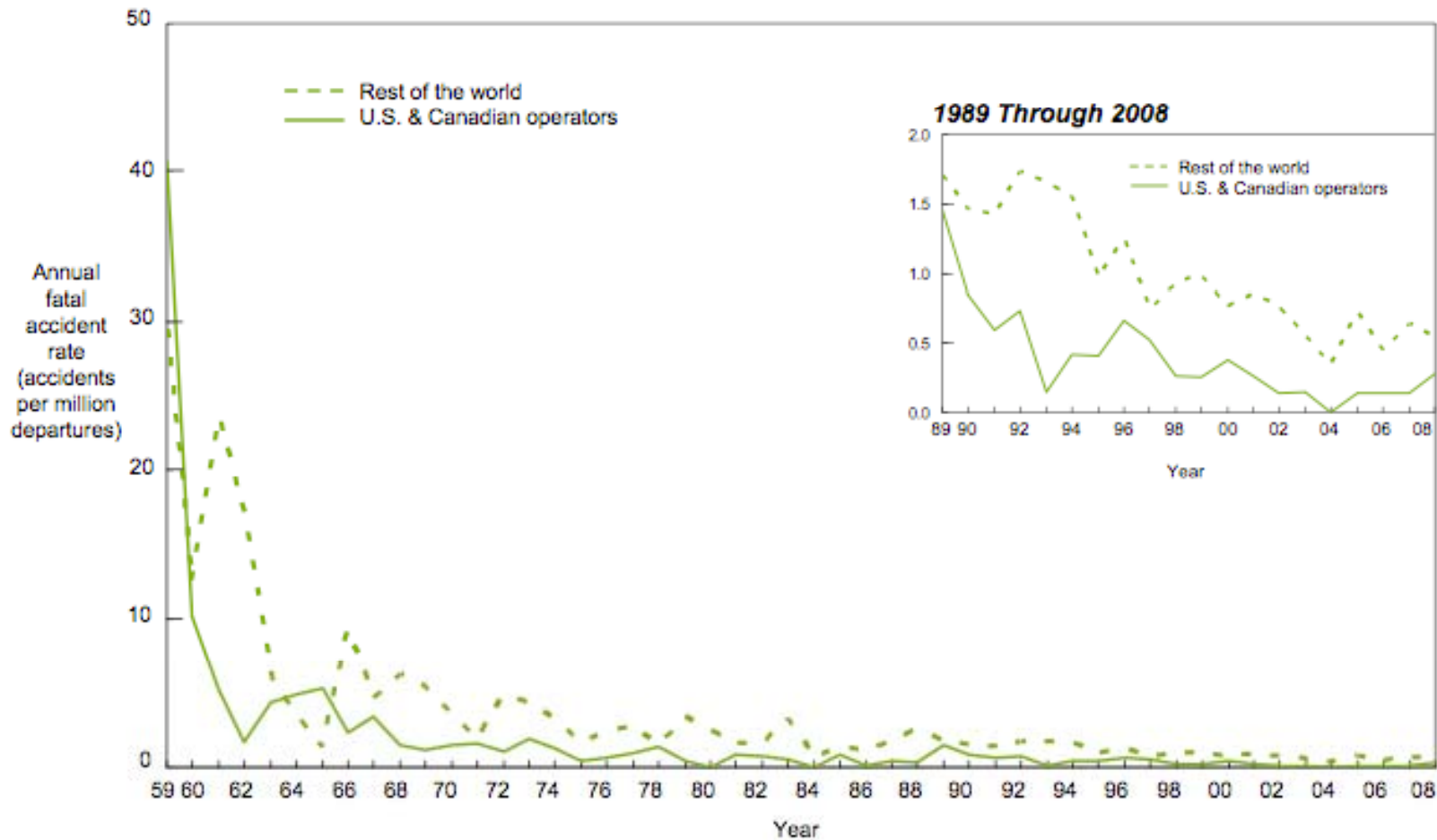
Search

A new window will open for each website selected. Please disable pop-up blockers.

✈ Flights to San Francisco, CA

# U.S. and Canadian Operators Accident Rates by Year

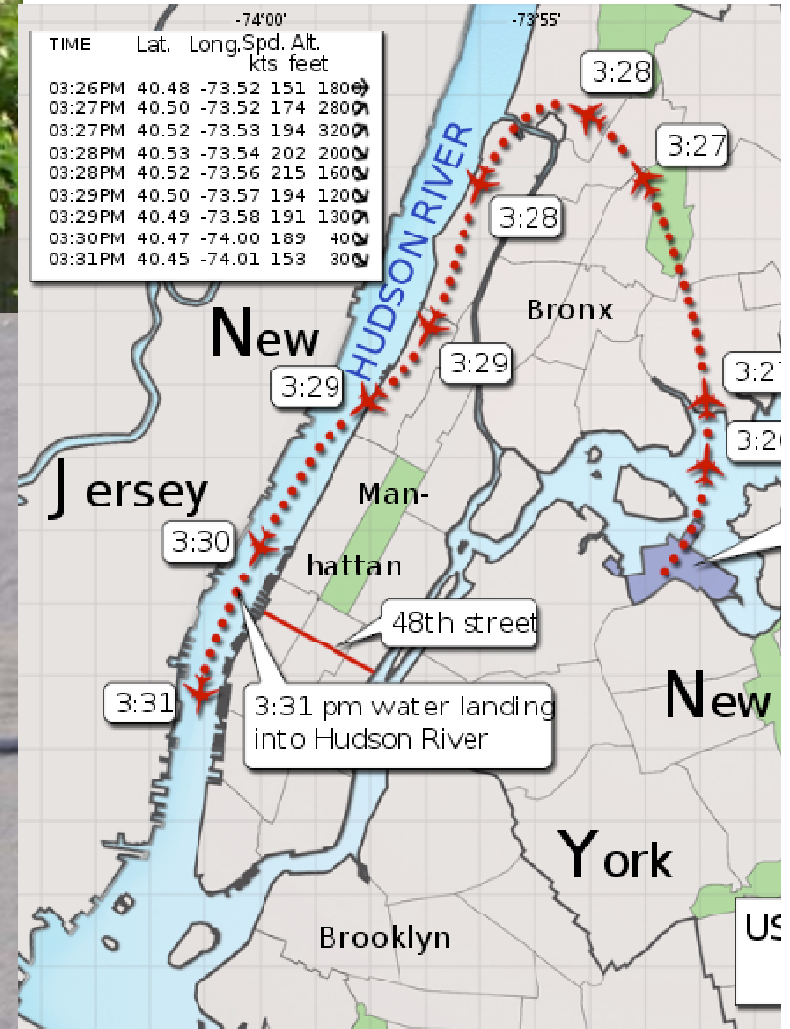
Fatal Accidents – Worldwide Commercial Jet Fleet – 1959 Through 2008





# USAir 1549

## 15 - Jan - 2009

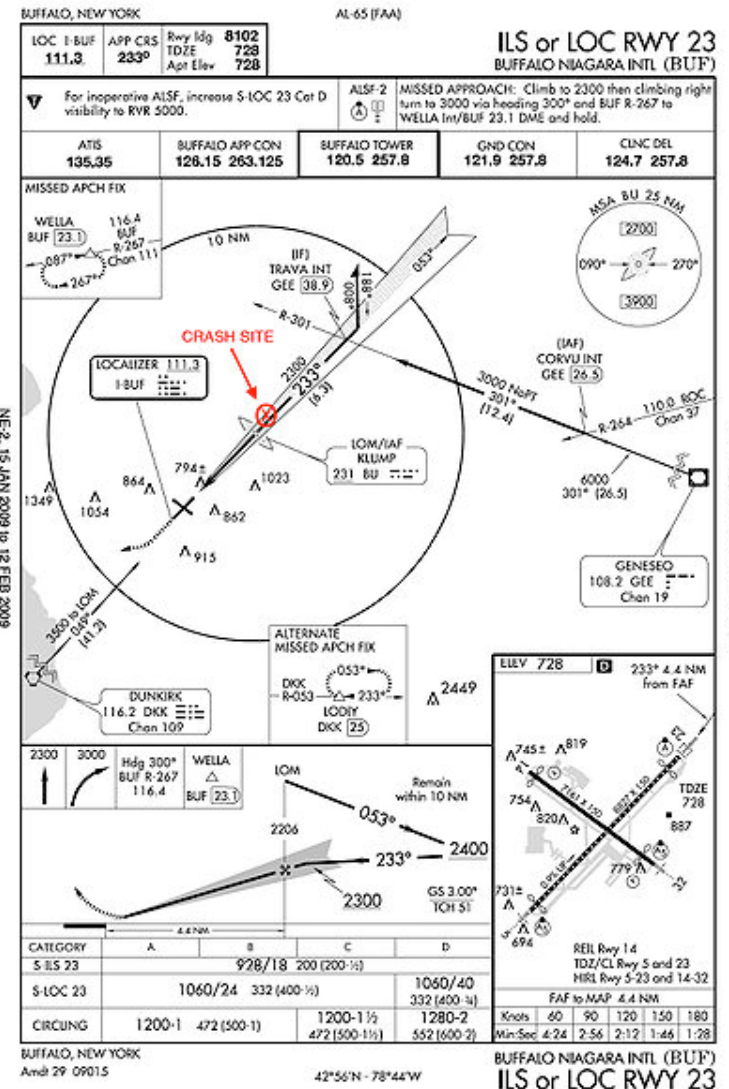




# Colgan Air 12 – Feb - 2009



- Crew Issues
- Training
- Commuting and Fatigue
- Compensation (\$16K - \$20K)
- Professionalism





# Regional Airline Trends

- **Increasing Coverage in Domestic Markets**

- **US Example**

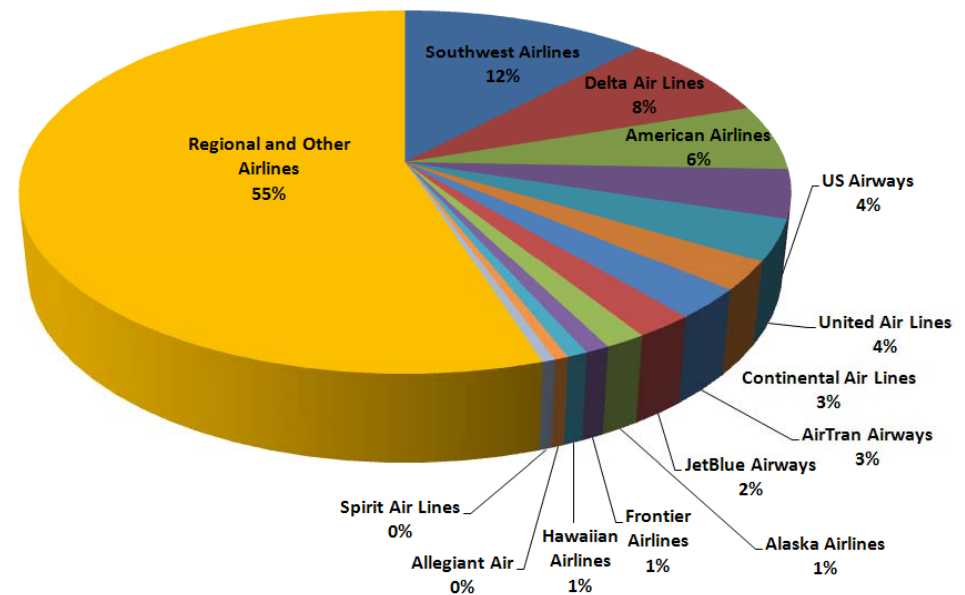
- ◆ 50% Departures
- ◆ 25% Passengers
- ◆ Sole service (400 communities)

- **Increasing Safety Scrutiny**

- NTSB Hearing (Oct 2010)
- Congressional & Media Pressure
- Training and Crew Rest Actions

- **Implications for Code Share Partners**

**US Carrier Domestic Flight Departures**  
5,370,683 Total Departures for 2010

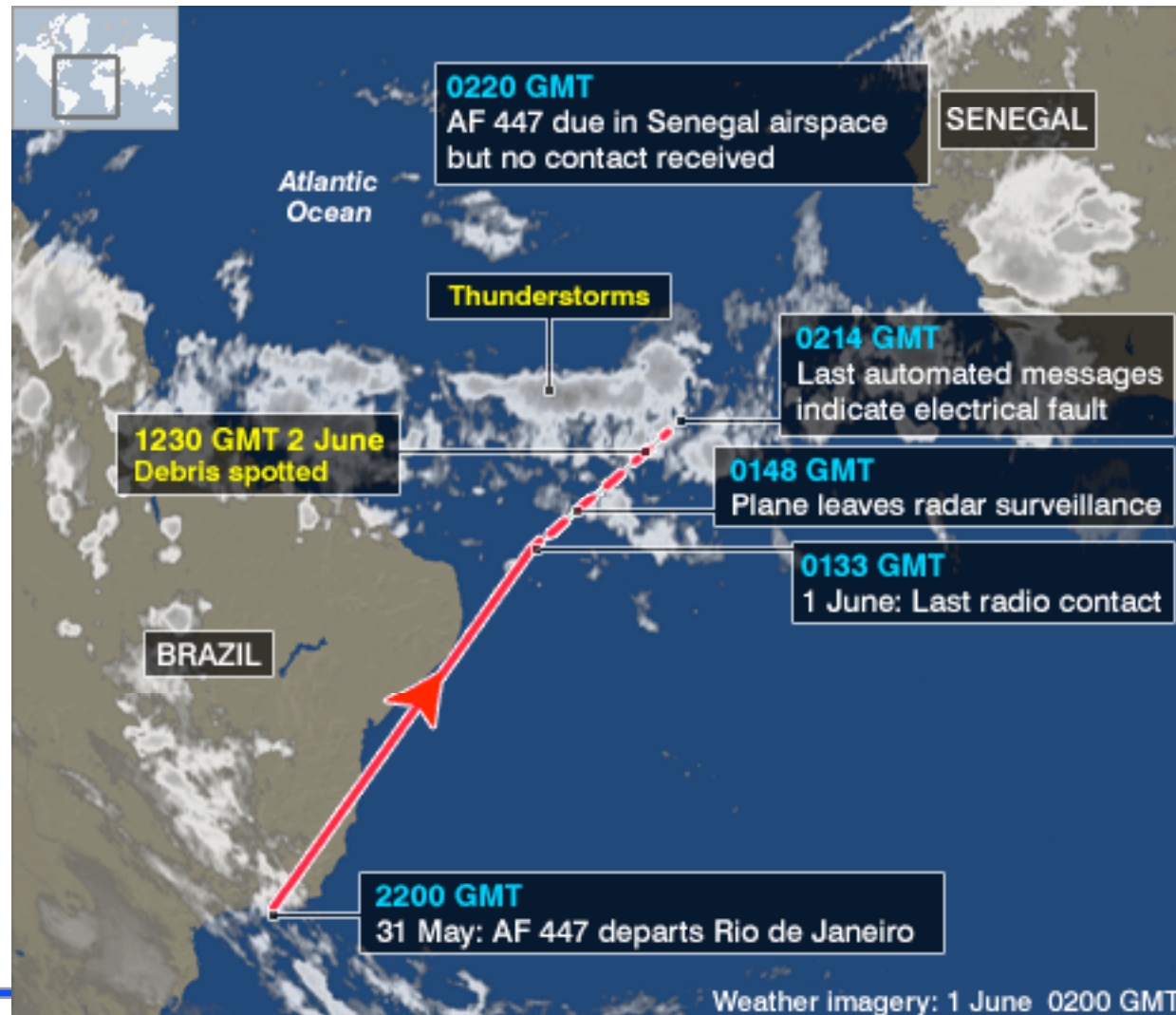






# Air France 447

## 27 - Aug - 2009

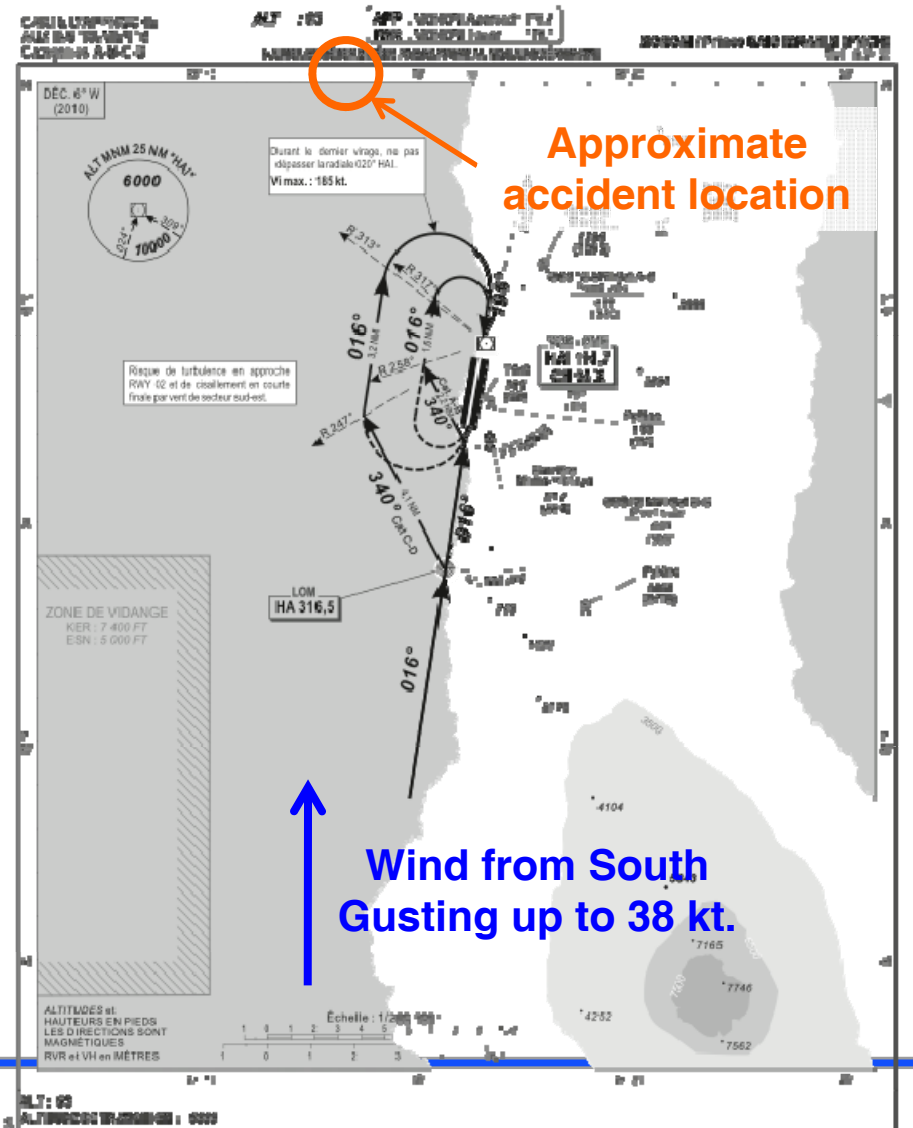


Source: BBC

# Yemenia 626

## 30 – June - 2009

- **Airbus A310-300**
  - 19 year old airframe
- **152 Fatalities, 1 Survivor**
- **Night approach to runway 20**
  - Good visibility
- **Complex “circling” approach**





# Ethiopian Airlines 409

## 25 - Jan - 2010

- **90 fatalities**
- **Boeing 737-800**
  - 8 year old airframe
- **Contact lost at 9000ft, shortly after departure from Beirut International Airport**
- **Thunderstorm activity in the area**





# Afriqiyah Airways 771

## 12 - May - 2010

- 103 fatalities, 1 survivor
- A330-200
  - Airframe < 1year old
- Crashed on approach to Tripoli international airport
- Poor visibility (dust/mist) on approach?





# Airblue 202

## 28 July, 2010

- 152 fatalities
- A-321-231
- Islamabad, Pakistan
- CFIT on circling approach





## Security (Passenger)

- Overall security processes have increased
- Some efficiency improvements
- TSA Workforce issues





# Security (Cargo)

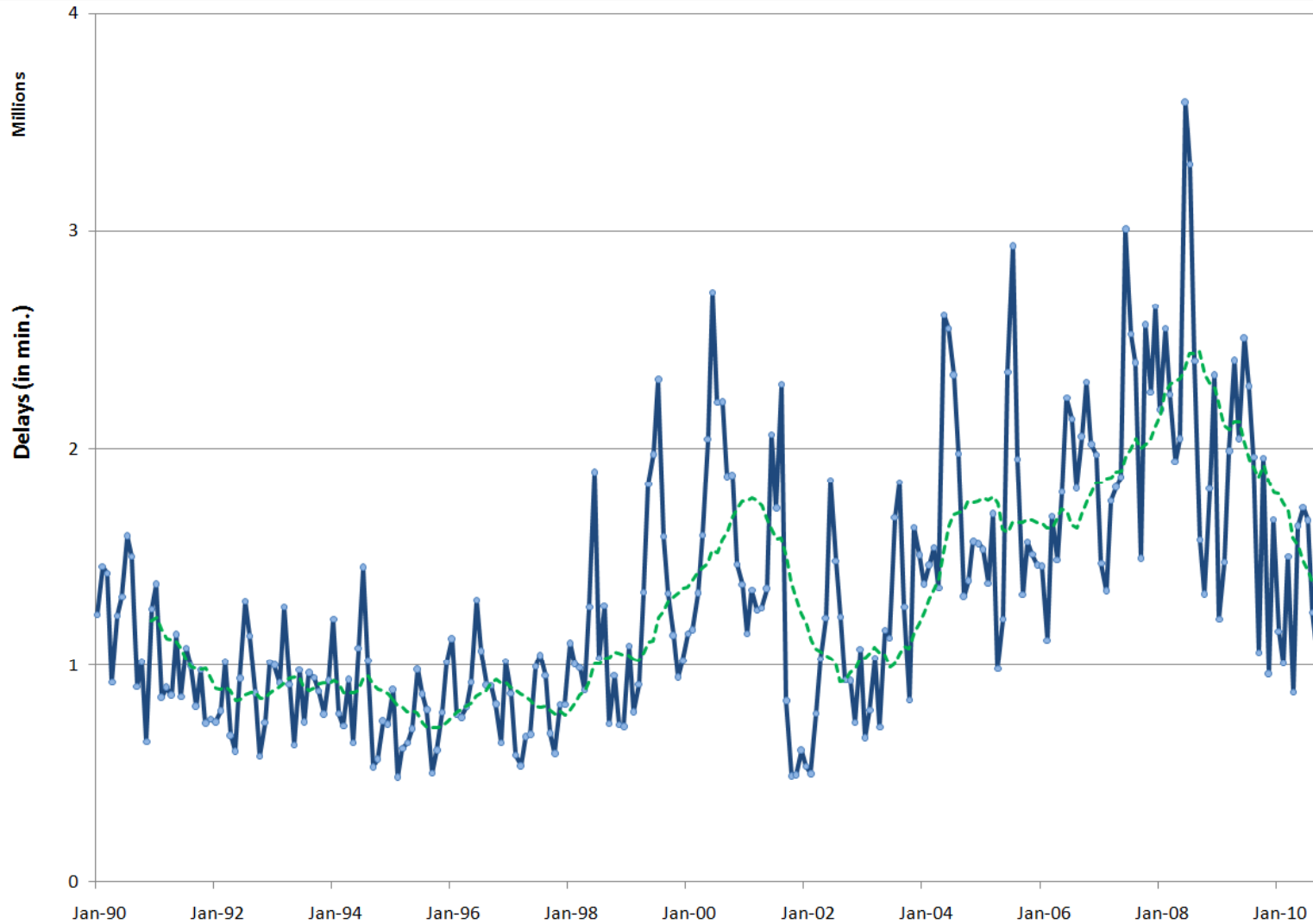
- **Yemen Bomb Plot (9/28/10)**
  - UPS (East Midlands) and FedEx (Dubai) Aircraft Involved
  - Re-evaluation of 9/3/10 UPS (Dubai) Take-off Accident
- **Implications for Air Cargo Security Requirements**
  - 100 % Belly Freight Screen (August 2010)
  - Certified Shipper Programs at Risk
  - Potential for 100% Screen Requirement
  - Lack of standard international protocols
- **Need to Balance Real vs Perceived Risk**





# Flight Delay Trends

## US Data

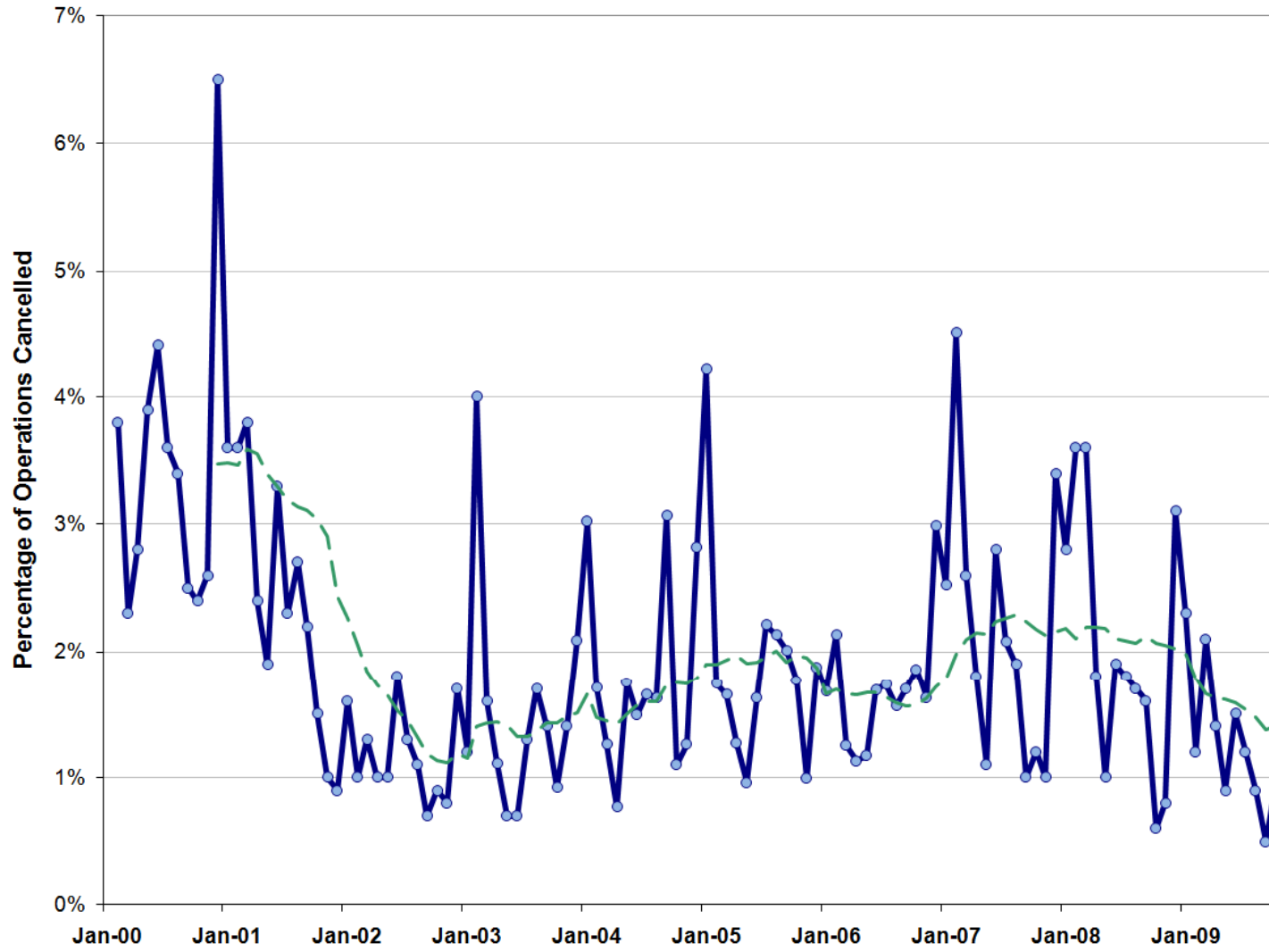


Data source: FAA Operational Network (OPSNET)

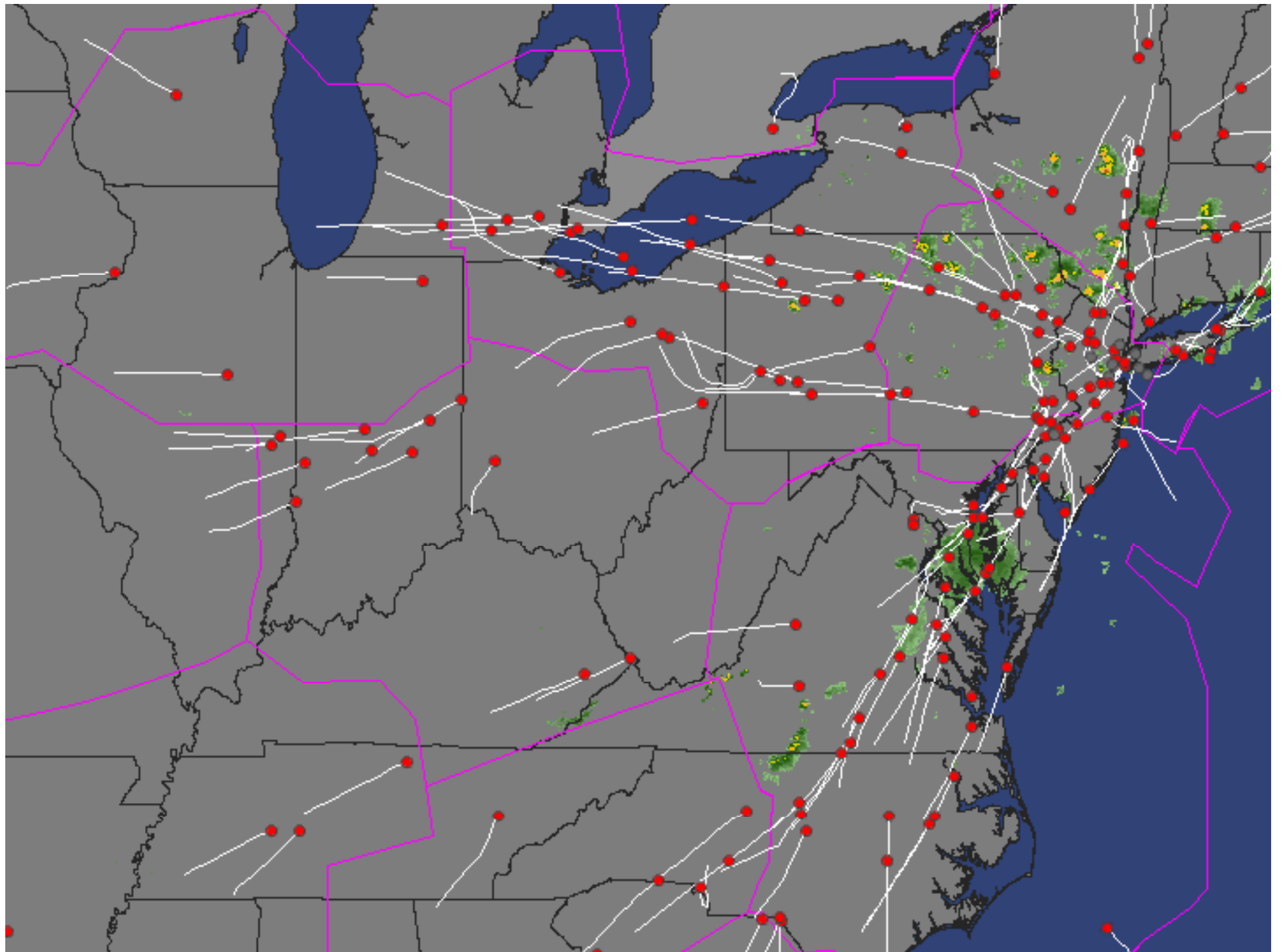




# Flight Cancellations from 2000 to 2010 (by month)



Data 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 2009)





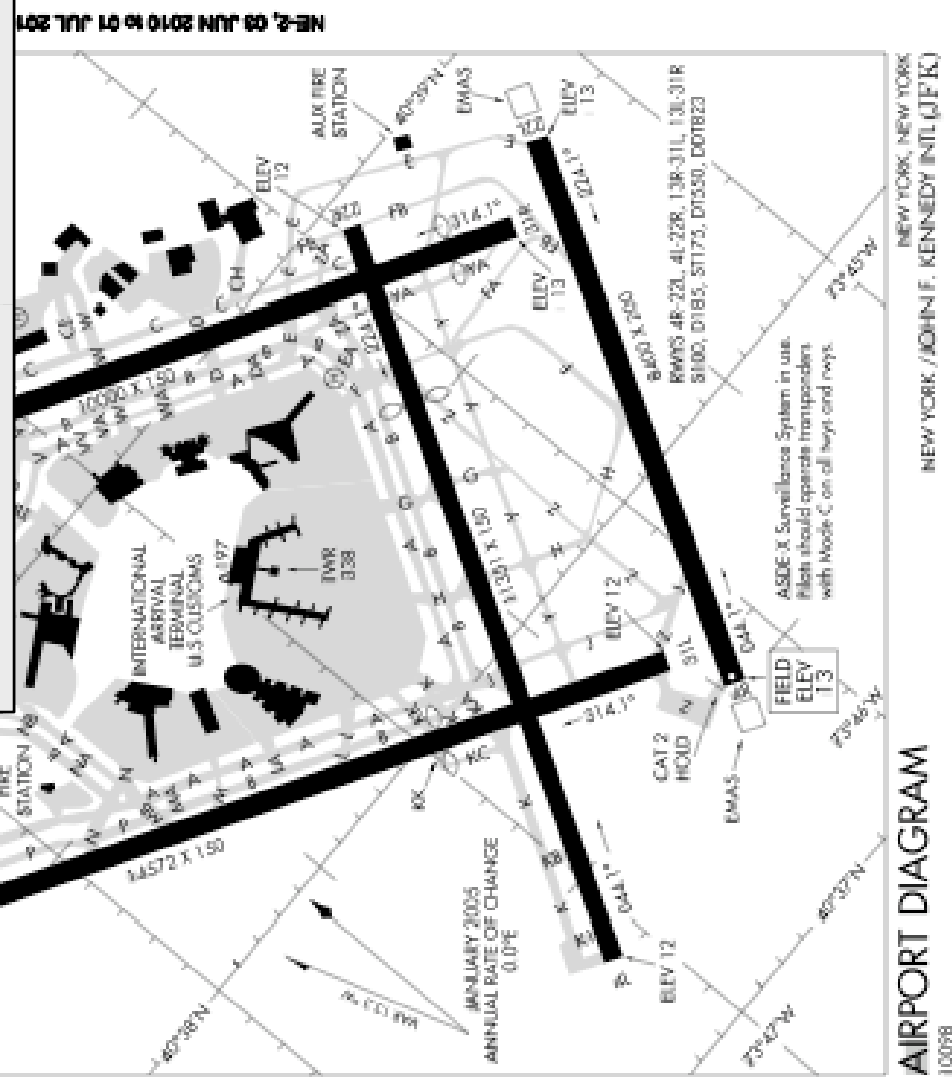
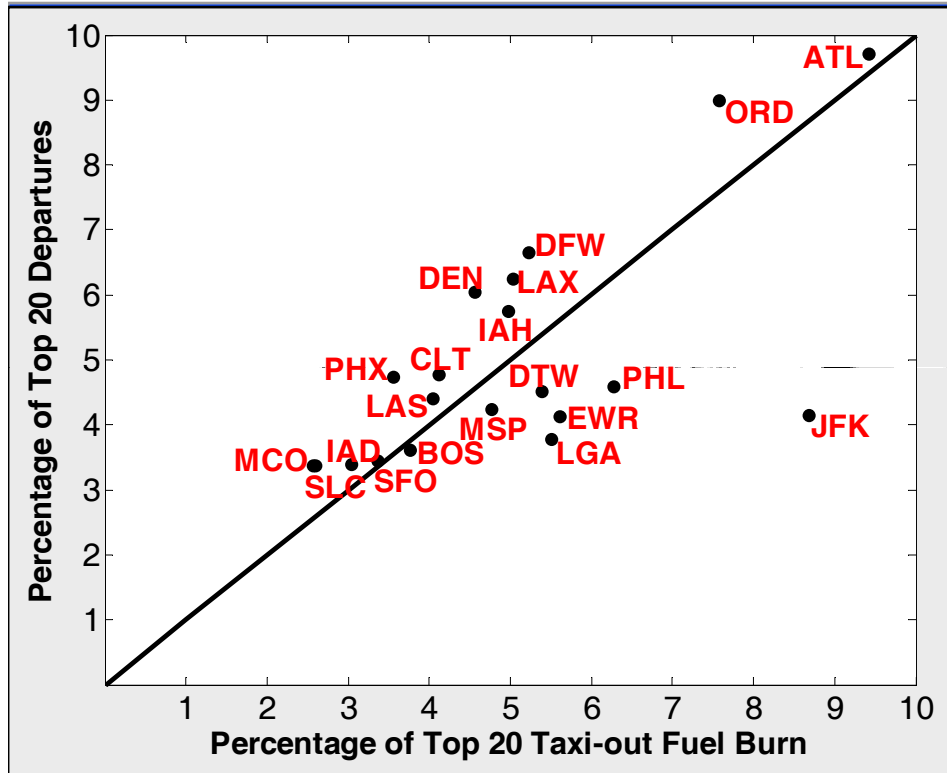
# Tarmac Delay Rule

---

- **Fine of up to \$27,000 per passenger delayed more than 3 hours**
  - **Rule effective 29<sup>th</sup> April 2010**
  - **American, Continental, Delta, JetBlue and U.S. Airways all denied exemptions from the rule at JFK**
    - Longest runway at JFK closed May-June 2010, putting strain on operations at that airport
  - **Not clear that airlines have the power to resolve the long-delay issue on their own**
    - Reducing long delays will require the cooperation of all stakeholders in the air transportation industry
-



# JFK Runway Closure



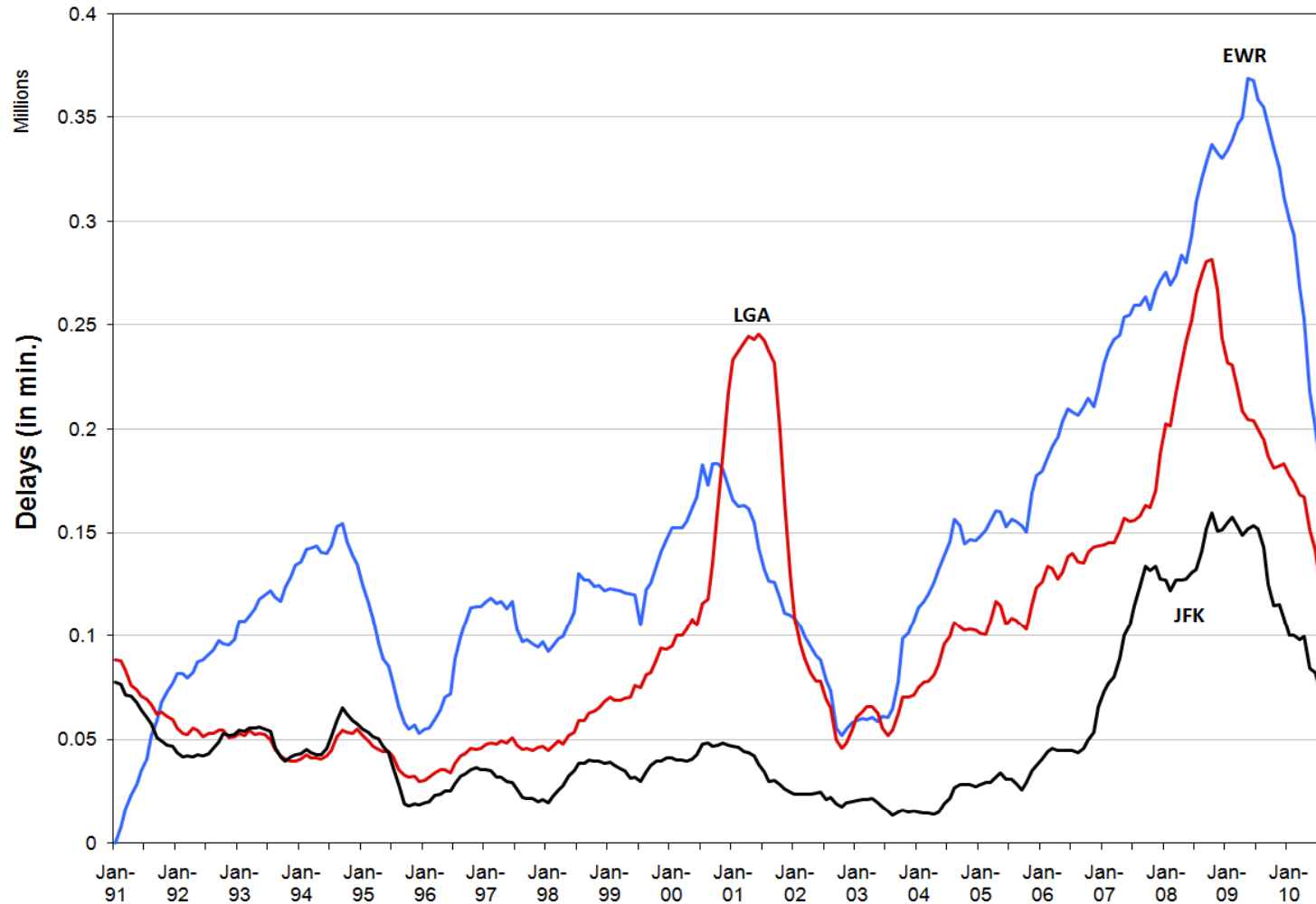
Source: H Balakrishnan

NE-2, 03 JUN 2010 to 01 JUL 2010



# New York Airport Flight Delays\* from 1995 to 2009

\* Note: 12 month moving average



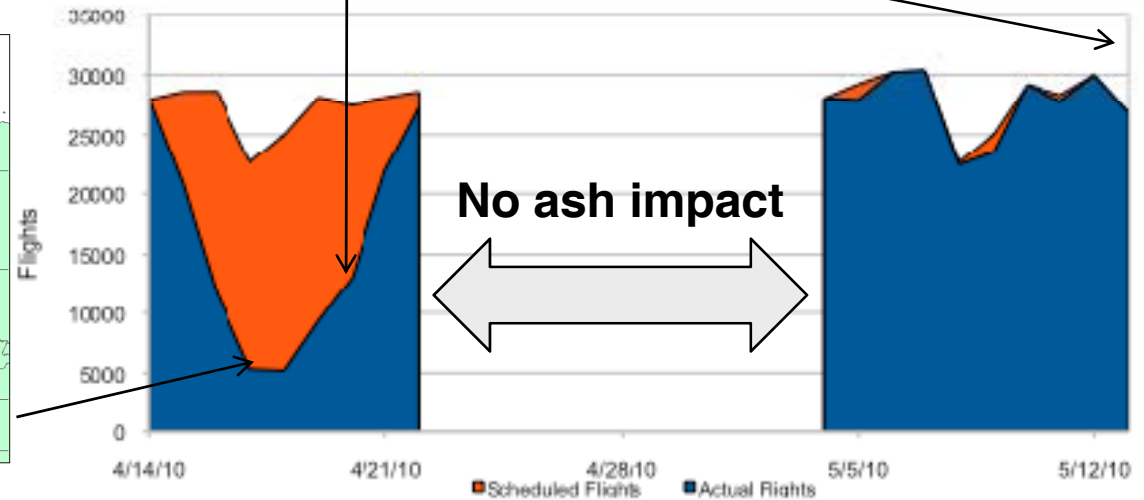
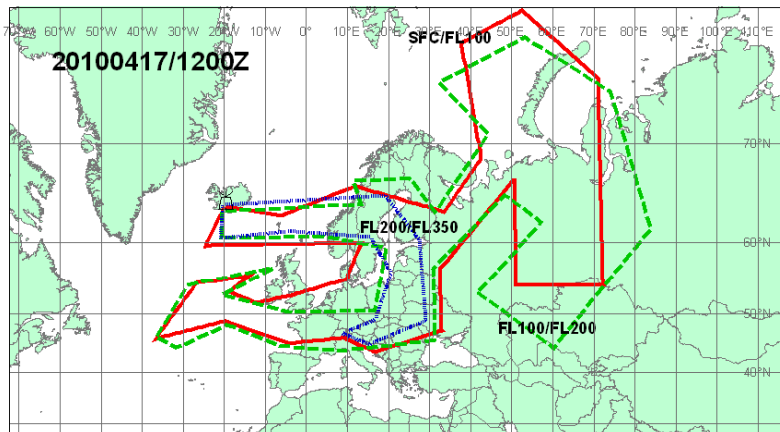
Data source: FAA Operational Network (OPSNET)

# Eyjafjallajökull Eruption



Allowable volcanic ash concentration raised from 0 to 0.002 g/m<sup>2</sup>

Ongoing refinement to procedures for operating in ash  
 • May 17<sup>th</sup> UK CAA approves 0.004 g/m<sup>2</sup> limit





# Long Term Plans for System Transformation

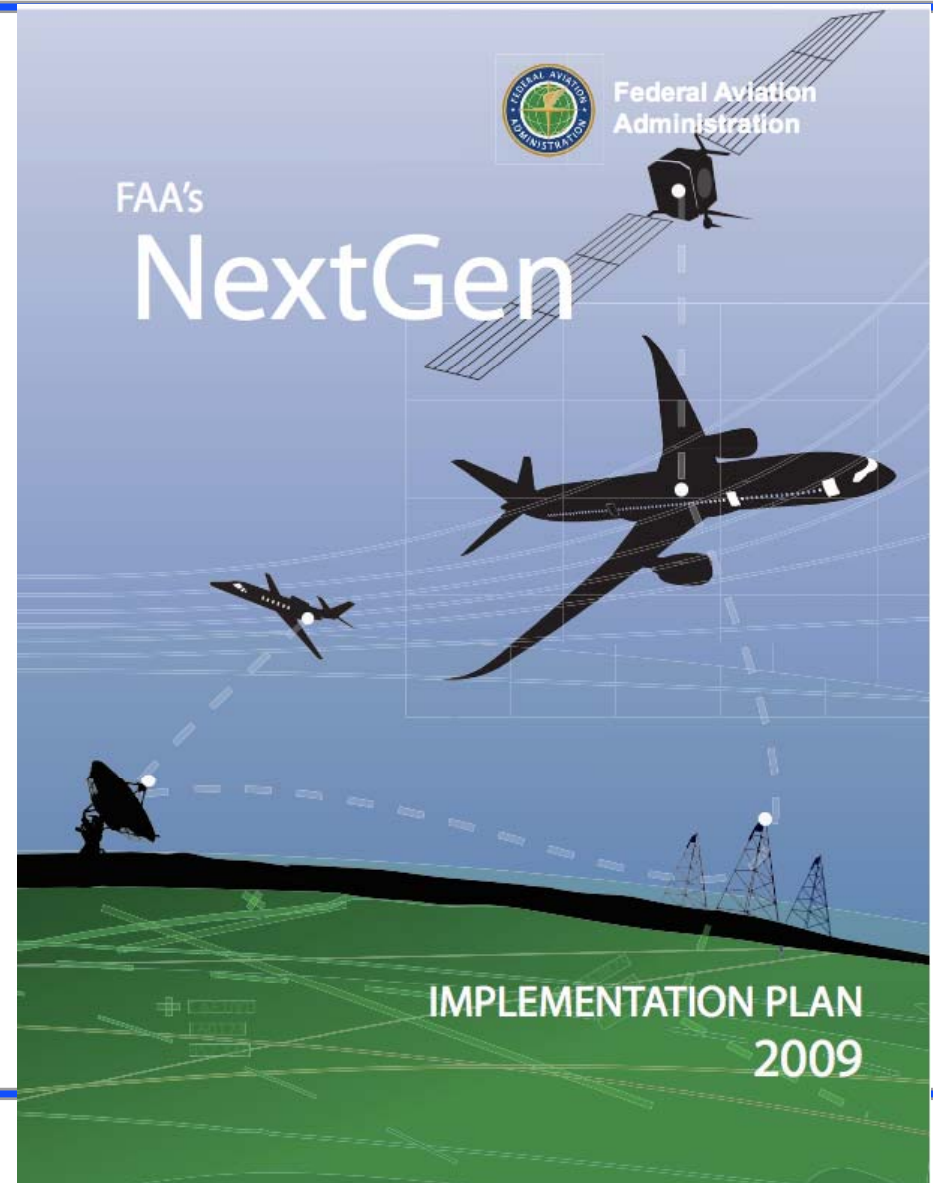
- Common recognition that existing US and European ATM systems will not scale to meet future demand
- Reflected in major long term initiatives
  - US **NextGen**
  - Europe **SESAR**





# NextGen Implementation Plan

- Focus on first phase of NextGen Transition to 2018
- 

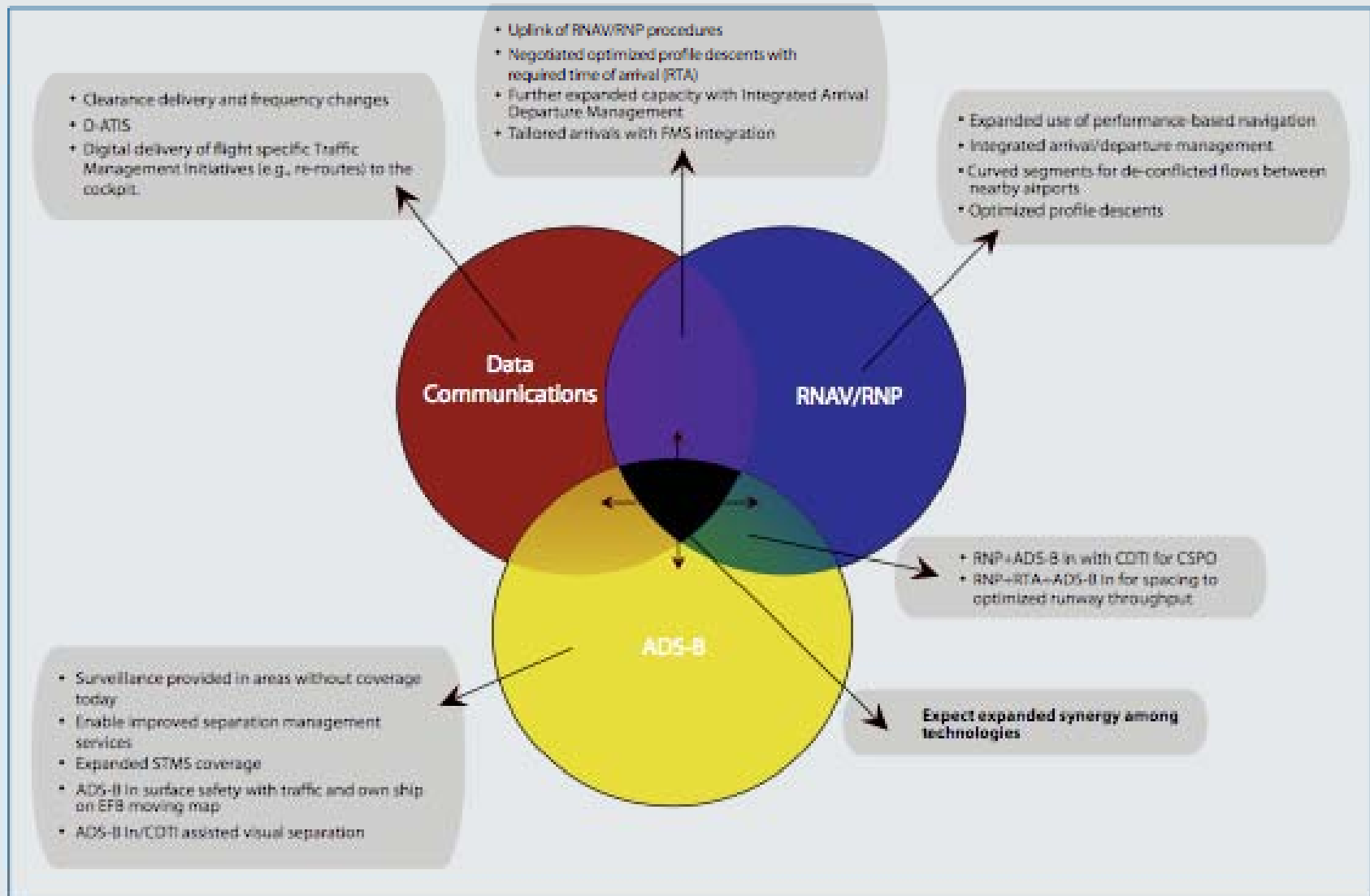






# NextGen-SESAR CNS Technologies

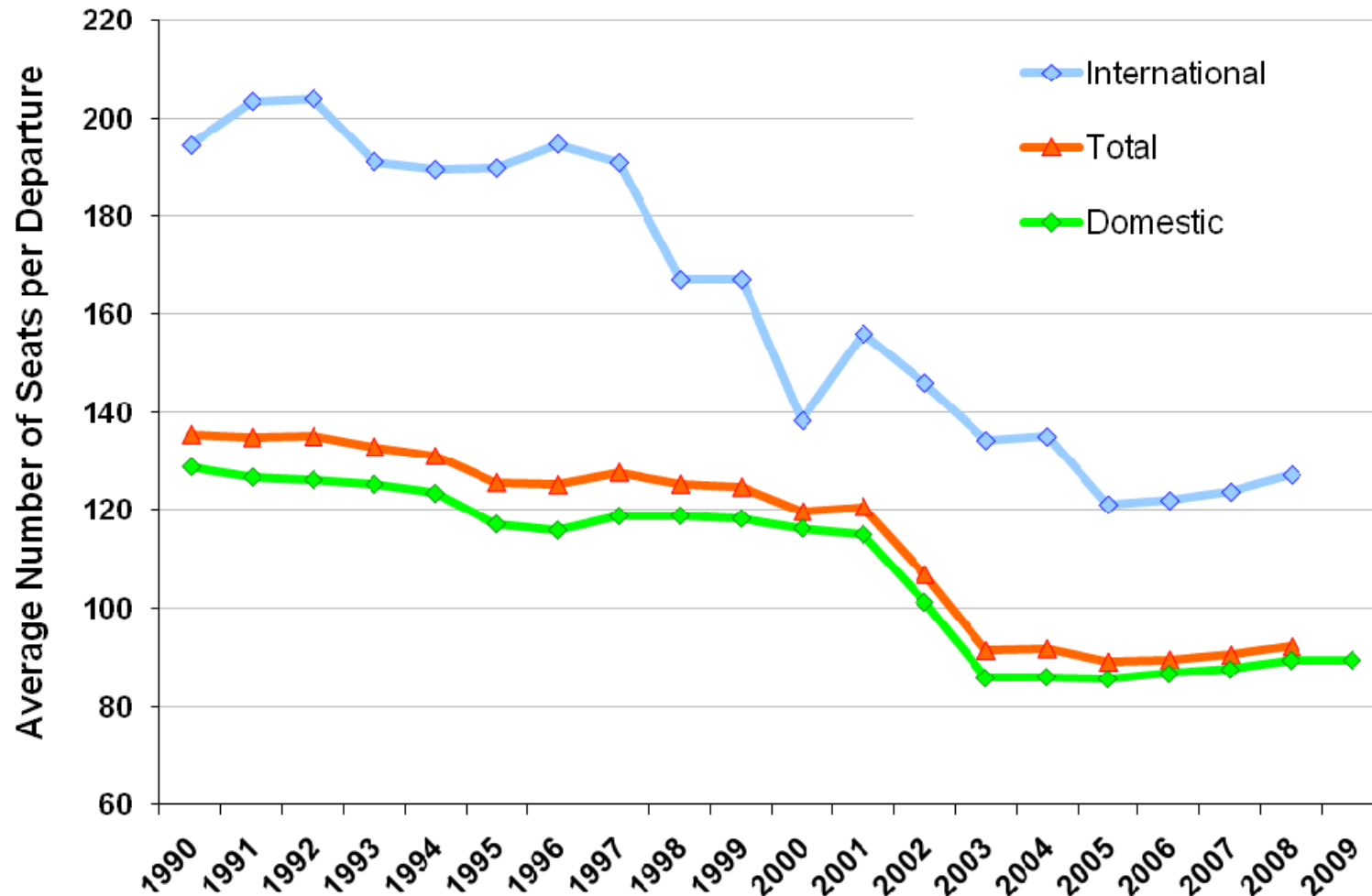
## Integrated Mid-Term Capability





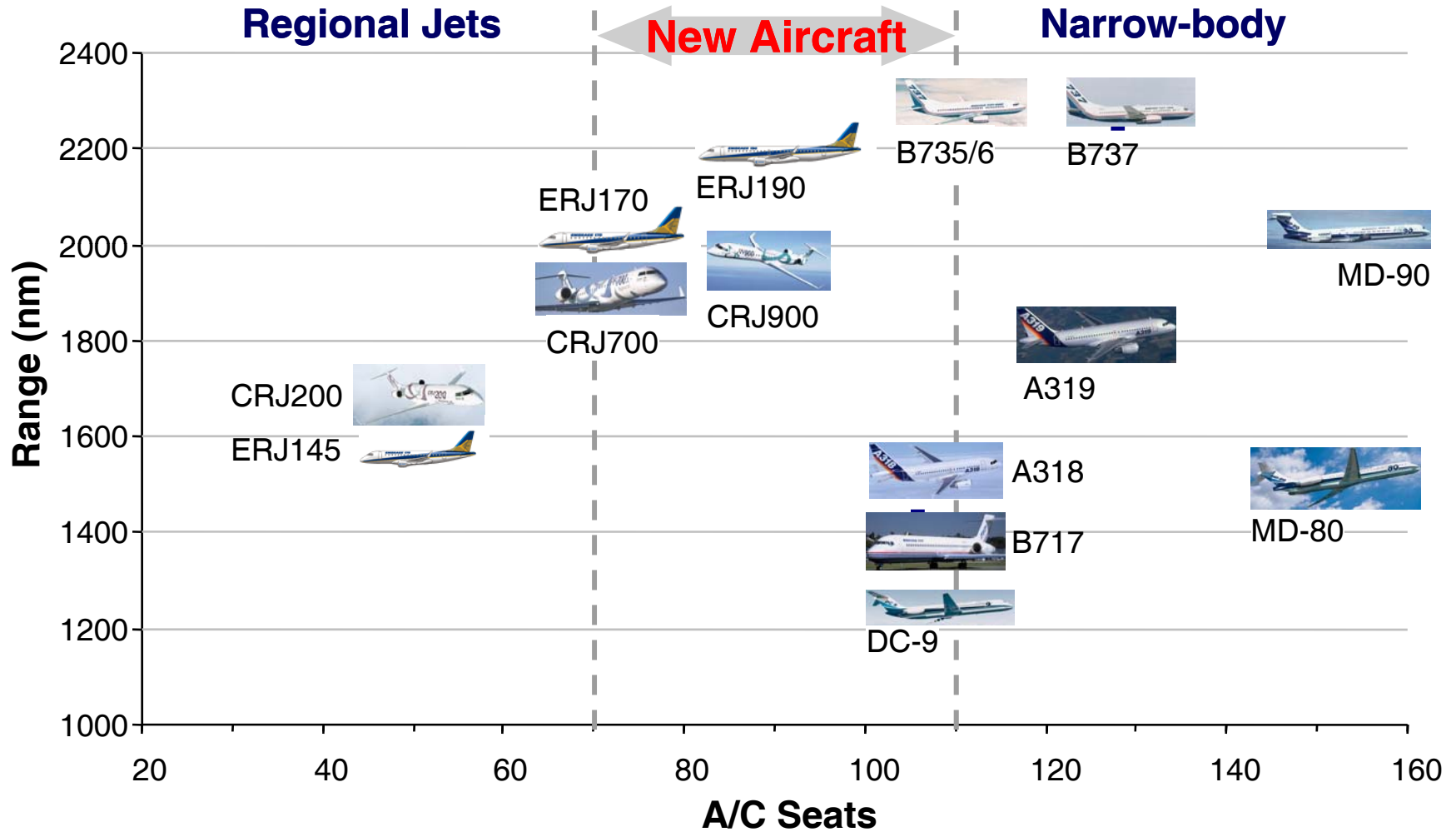
# Trends in Aircraft Size

## U.S. Airlines



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



# New Aircraft Types

---



## Embrear EMB-190

671 delivered, 215 firm, 747 options



## Boeing B-787

847 firm, 481 options



## Airbus A-380

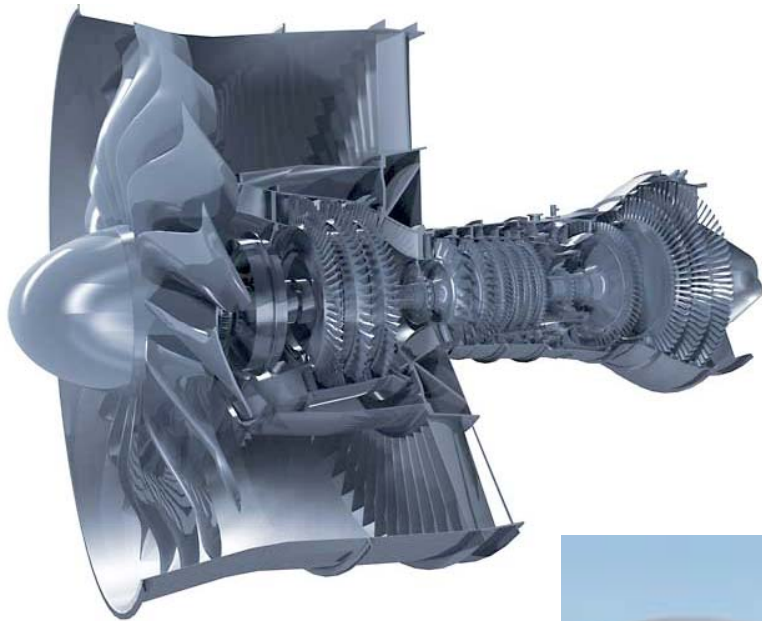
37 delivered, 234 firm, 57 options



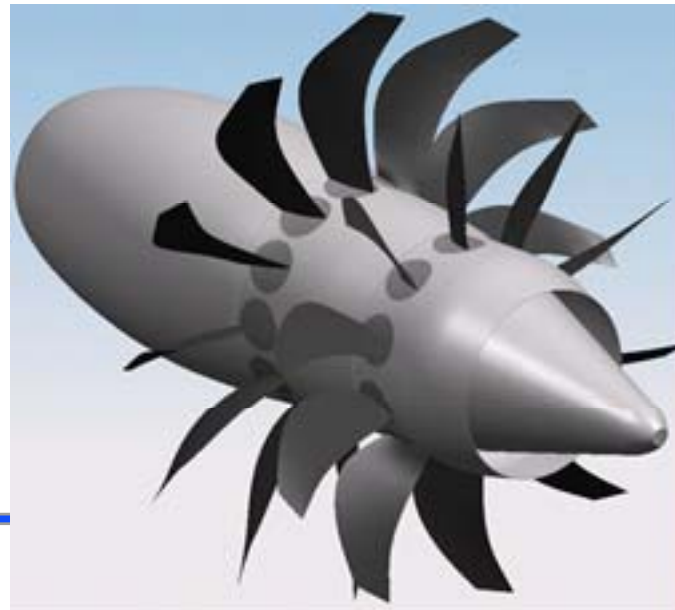
## Airbus A-350

573 firm, 200 options

# Advanced Engines



- P&W Geared Turbofan
- GE Unducted Rotor





# Next Generation Narrow Body Plans

## Bombardier C-Series

Seats: 100 - 145  
Est. Entry Into Service: 2013

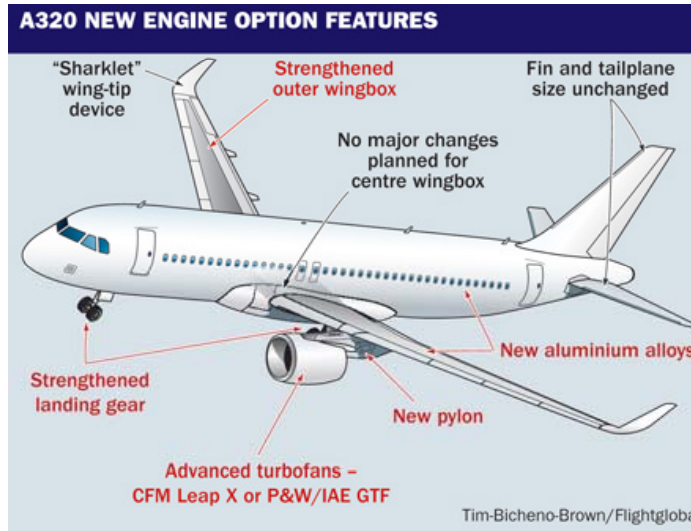
## Airbus:A320 NEO ?

A320 Seats: 107 - 220  
Est. Entry Into Service: 2015

## Boeing Y1:

B737 Seats: 108- 189  
Estimated Entry Into Service: ?

Re-engined B737?  
**New Aircraft Type?**





## Boeing 777 Replacement/Re-engine

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# NASA N+3

## MIT D8 “Double Bubble” Configuration

*50% - 70% Improvement in Fuel Burn*

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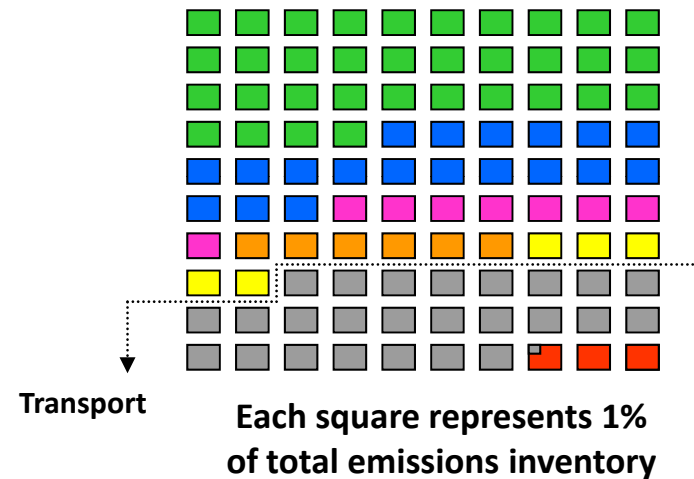


# Green House Gas Emission Restrictions



- Cap and Trade Discussions
- CO2 Efficiency Standards
- Alternative Fuel Demonstrations
- Increase in Effective Price of Fuel

## Greenhouse Gas Emissions



Non-Transport		Transport	
<span style="color: green;">■</span>	Electric Utilities	<span style="color: grey;">■</span>	Transportation
<span style="color: blue;">■</span>	Industry	<span style="color: red;">■</span>	Aviation
<span style="color: pink;">■</span>	Agriculture		
<span style="color: orange;">■</span>	Commercial		
<span style="color: yellow;">■</span>	Residential		

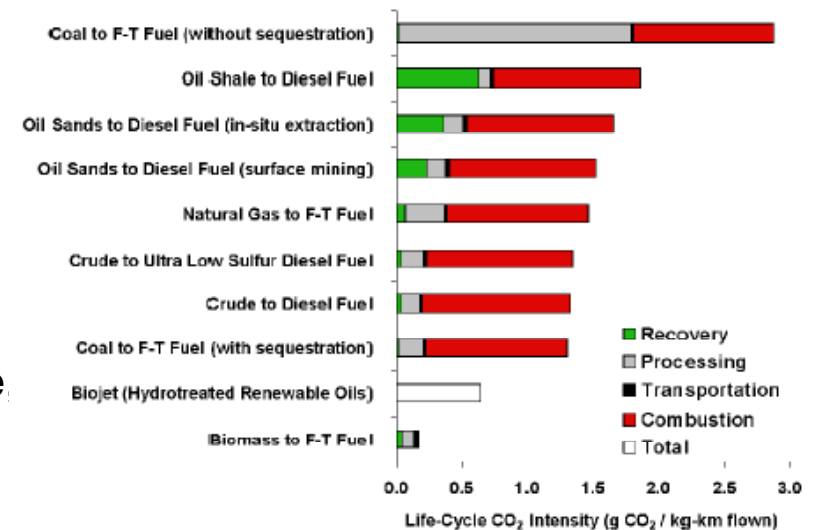
Source: US EPA data, 2005



# Alternative Fuels for Commercial Aviation

- **Traditional jet fuel:**
  - Kerosene, from crude oil, tar sands or oil shale.
- **“Drop in” fuels:**
  - Fischer Tropsch (FT) synthetic fuel:
    - Coal to Liquid (CTL)
    - Natural Gas to Liquid (GTL)
    - Biomass to Liquid (BTL)
  - Biofuels:
    - 1st generation: biomass from food crops,
    - 2nd generation: Nature byproducts/waste
    - 3rd generation: Algae, switch grass.
- **Hydrogen or Methane**
- **Challenges:**
  - Availability and production cost of alternative fuels,
  - Certification,
  - Airport infrastructure (i.e. dual distribution systems).

*Alternative jet fuel well-to-wake CO<sub>2</sub> emissions\**



\*Source: Hileman, Wong, Ortiz, Maurice, Rumizen and Brown, “The feasibility and potential environmental Benefits of alternative fuels for Commercial aviation”, ICAS, 2008.