Data Requirements for Effective Fuel Conservation

By Michael E. Irrgang

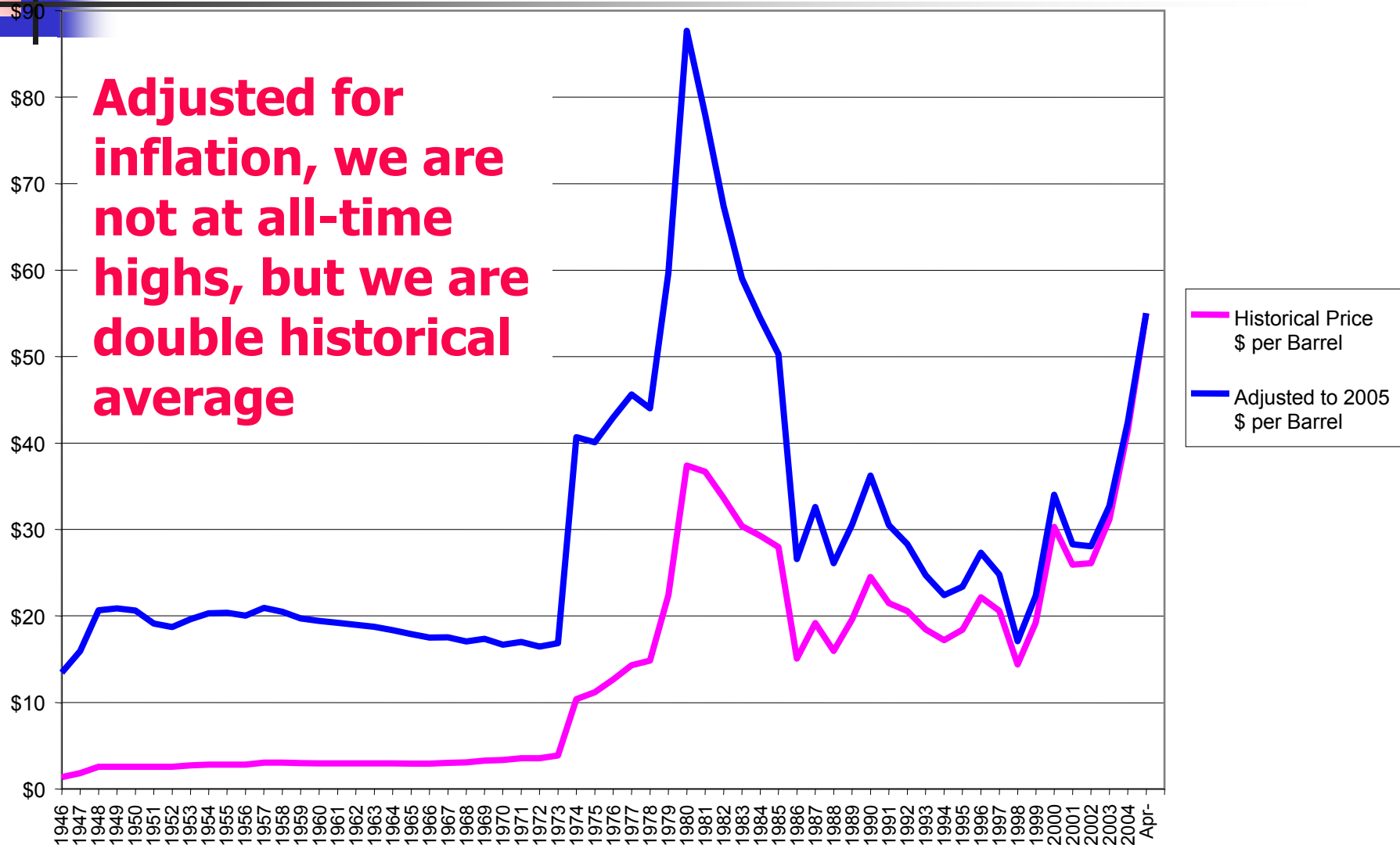http://www.airlineoperationsolutions.com/
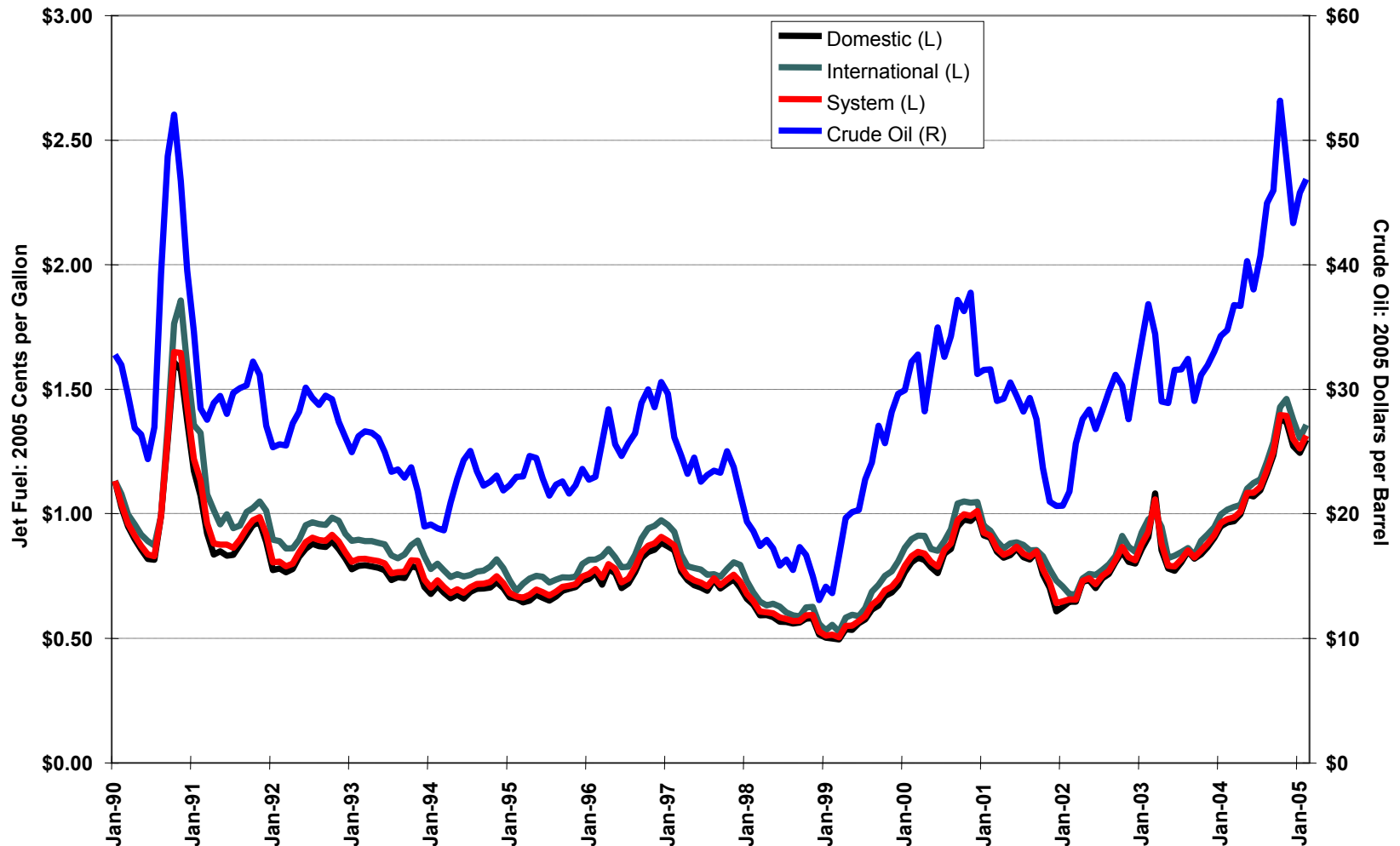
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The Problem With Fuel Costs

- At over $50 per barrel, crude prices have driven jet fuel prices to over $1 per gallon for all of 2004 in the U.S., and above $2 for many non-U.S. carriers

- Prices are expected to remain high for most of 2005

- With fuel now nearly a fifth of most airlines' budgets, conservation becomes critical
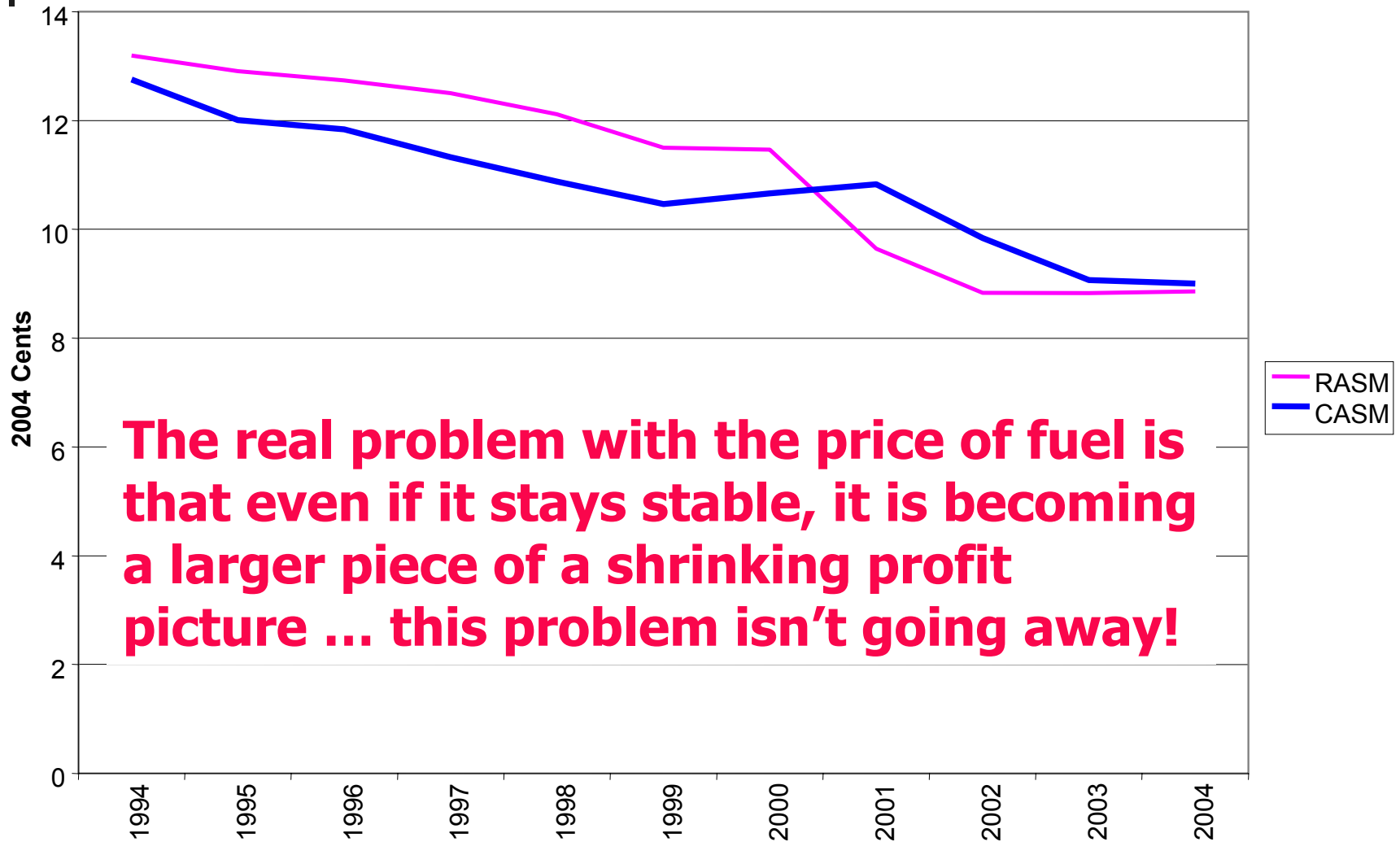
60 Years of Crude Oil Price

Adjusted for inflation, we are not at all-time highs, but we are double historical average

Legend:
— Historical Price $ per Barrel
— Adjusted to 2005 $ per Barrel

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Jet Fuel and Crude Oil Price Since 1990 Inflation Adjusted (U.S. Carriers (ATA))

Annual RASM & CASM - U.S. Carriers

The real problem with the price of fuel is that even if it stays stable, it is becoming a larger piece of a shrinking profit picture ... this problem isn't going away!

Basic Issues in Fuel Conservation

- There is too much weight on an aircraft
- The airline does not accurately calculate the weight of the aircraft
- People waste fuel on the ground
- Pilots fly inefficient or inappropriate procedures
- The airplane is flown too fast
- Fuel is purchased in the wrong place for too much
- The airplane generally lands with too much fuel
  - A special case of the airplane being too heavy
- There is something wrong with the aircraft that leads to excess fuel consumption
- **Proper Data Modeling identifies and often leads to the correction of ALL of these problems!**

Key Systems
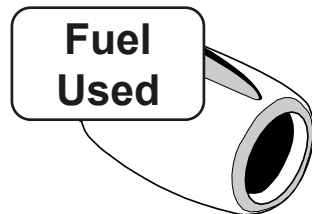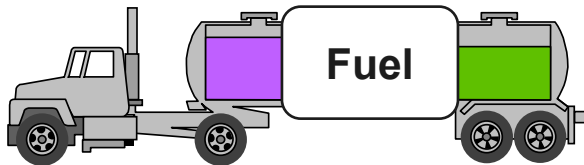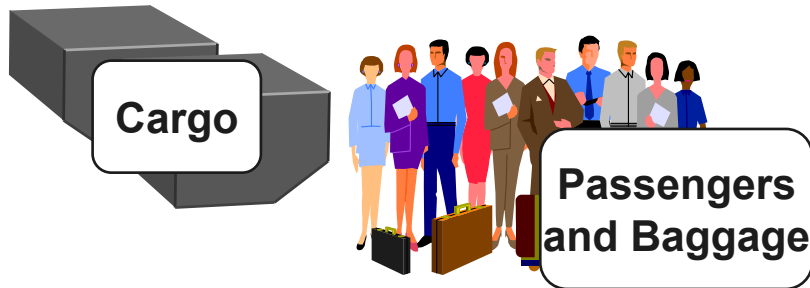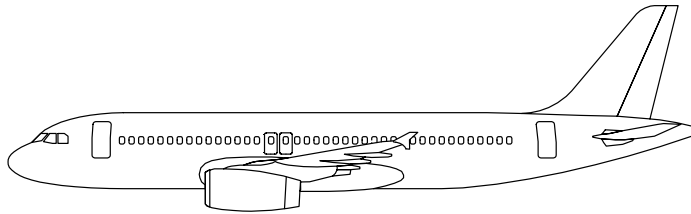
- DCS / Weight & Balance system
  - Planned vs. actual pax & cargo loads
- Flight planning system
  - Planned vs. actual weight & fuel load
  - Scheduled vs. planned vs. actual times
  - Record extra fuel & reason
  - Record significant weather
  - Fuel tankering
  - Planned altitudes
- ACARS
  - OUT(+fuel)/OFF/ON/IN(+fuel)
  - OFF fuel, altitudes if available
  - Performance monitoring (if available)
- FOQA (if available)
  - Monitor altitudes, compare to Flt. Plan
  - Monitor descent & arrival process
  - Monitor single engine taxi

Other Data

- Fuel prices
  - Needs to be updated weekly to properly calculate tankering for every flight plan where appropriate
- Passenger weight, carry-on weight, luggage weight
  - The weight of the aircraft needs to be accurate, or the altitudes flown will be inaccurate, resulting in major additional fuel burn
- MEL database
  - Aircraft defects affecting fuel consumption. E.g. pack inop, anti-ice inop
- APU usage
  - Usually requires manual data entry system, from pilot / ramp staff / Maintenance
- Maintenance & Crew Cost data
  - For proper calculation of the Cost Index, which trades off time-related cost vs. fuel cost
- Cargo pricing
  - Need to ensure proper cost vs. revenue analysis on routes that may involve tankering or from high-fuel cost airports
- FMS (aircraft Flight Management System)
  - Ensure loaded with Performance Factor, Cost Index, and (for each flight plan) current forecast winds

Planned vs. Actual: Why Is It So Important?

- Most airlines monitor consumption, but not how it compares to the original plans
- Without comparing actual consumption to plans, it is much more difficult to isolate & monitor these issues:
  - Excess loading of fuel by fueler
  - Excess APU fuel usage
  - Trends in excess arrival fuel
  - Non-weather-related excess fuel burn
  - Altitude issues
  - Aircraft performance issues
  - Incorrect block, taxi & air times
  - Weight issues
  - Excess Maintenance taxi (vs. tow)
  - Any type of variance & trends
- Not having detailed trend analysis will cause assumptions that add to arrival fuel & inability to identify underlying problems

Example of Arrival Fuel Analysis

- Key cause of major fuel wastage (>1%)
  - Carrying excess fuel costs 3-5% of excess fuel to carry fuel
- Better data would permit targeting actual key flights

2001 - 2003 Arrival Fuel (Minutes of Cruise Burn)

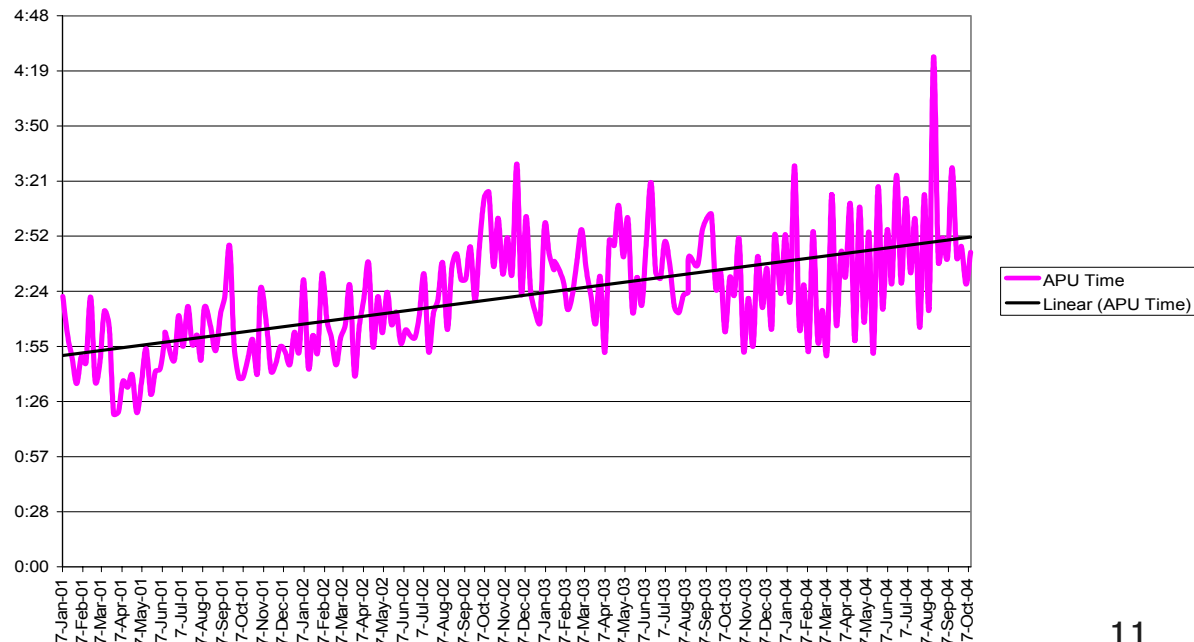**Good Trend**

Tankering Program
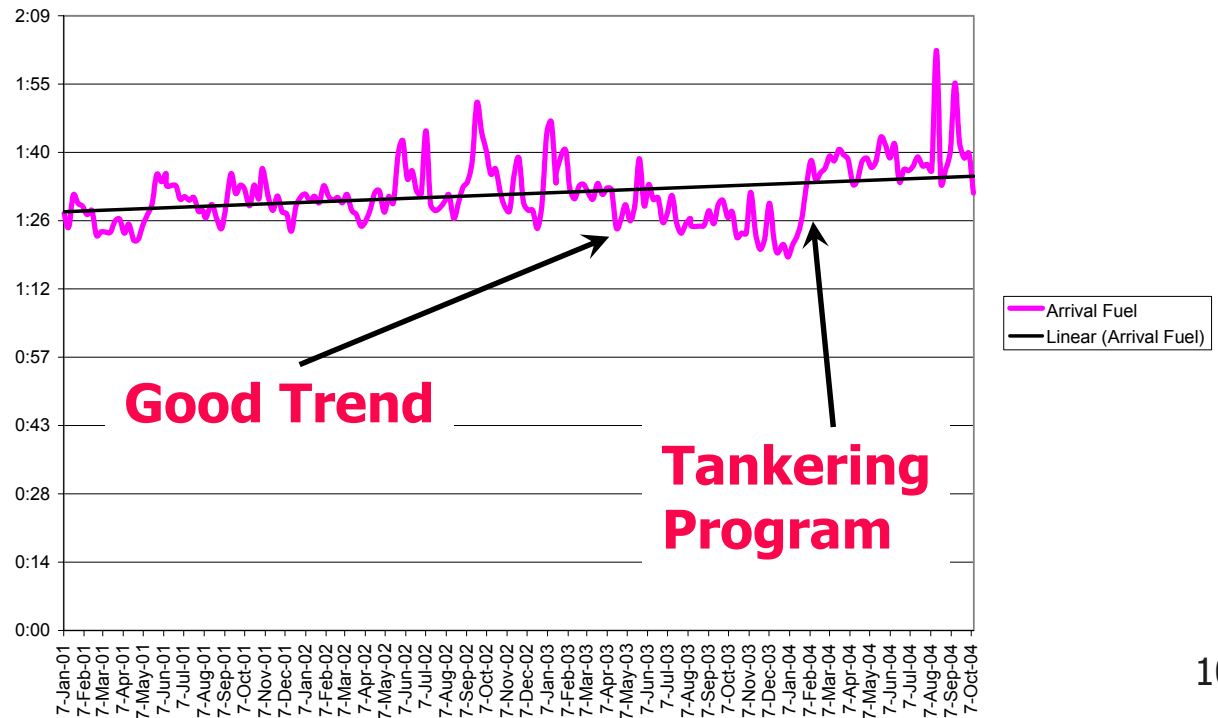
Example of APU Utilization

- Best way is to record actual usage
- The attached graph from comparing IN fuel to OUT fuel (adjusted by fuel loaded)

Use GPU or Gate Power, instead of APU

2001 - 2003 Long Stay (>2 hr. turn) APU Time


Legend: APU Time, Linear (APU Time)

Example of Aircraft Deterioration

- Analyzed by comparing **air** burn on **similar** flights with **similar** payload
  - Any other approach meaningless. Mistake often made is to compare raw burn per block hour on different aircraft
  - Same approach often erroneously made to compare pilot burn performance. Result is to penalize pilots on short trips or high load factor flights
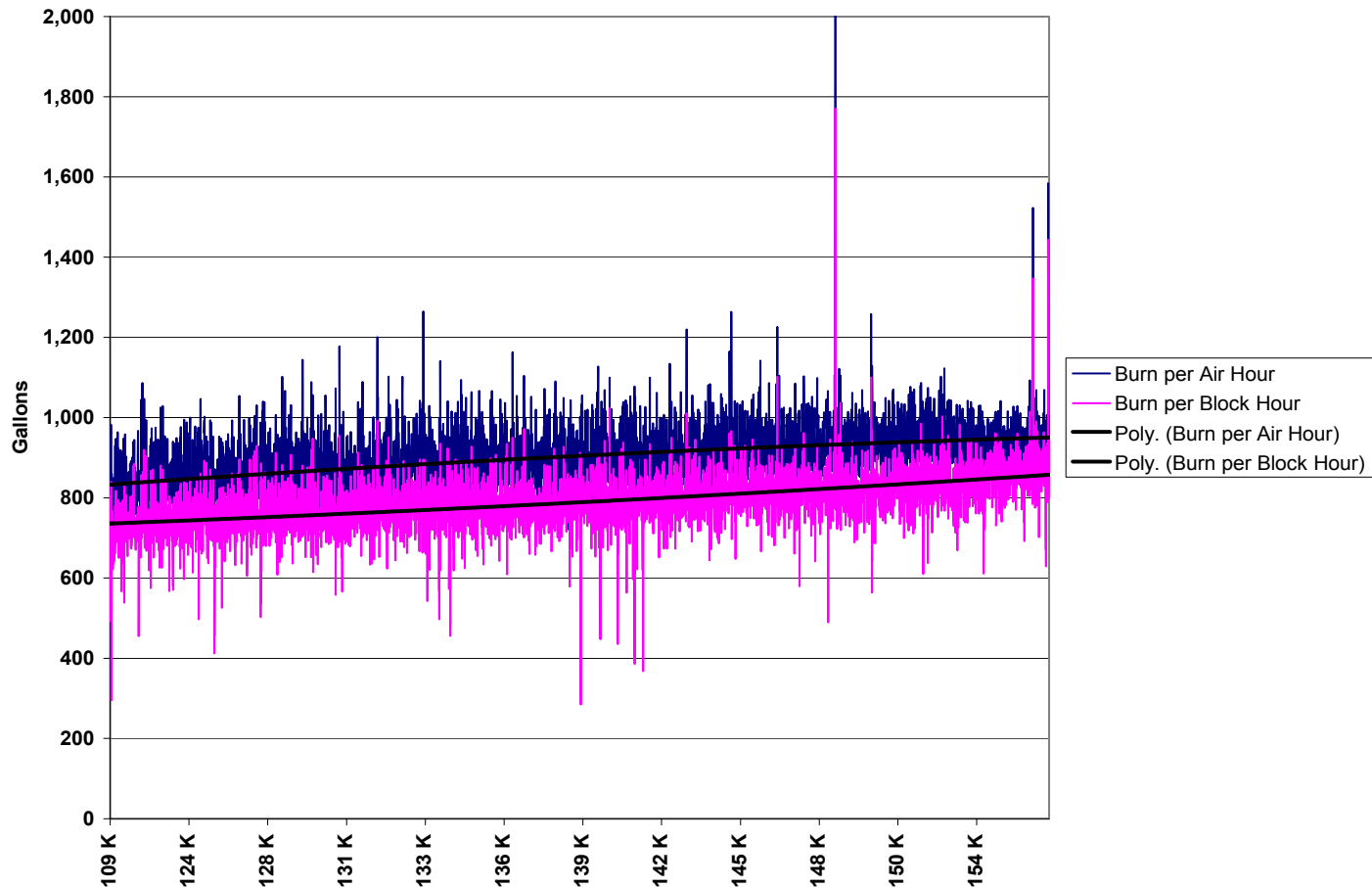- Better approach would be to use Aircraft Performance Monitoring data

Normalized A320/1 Deterioration
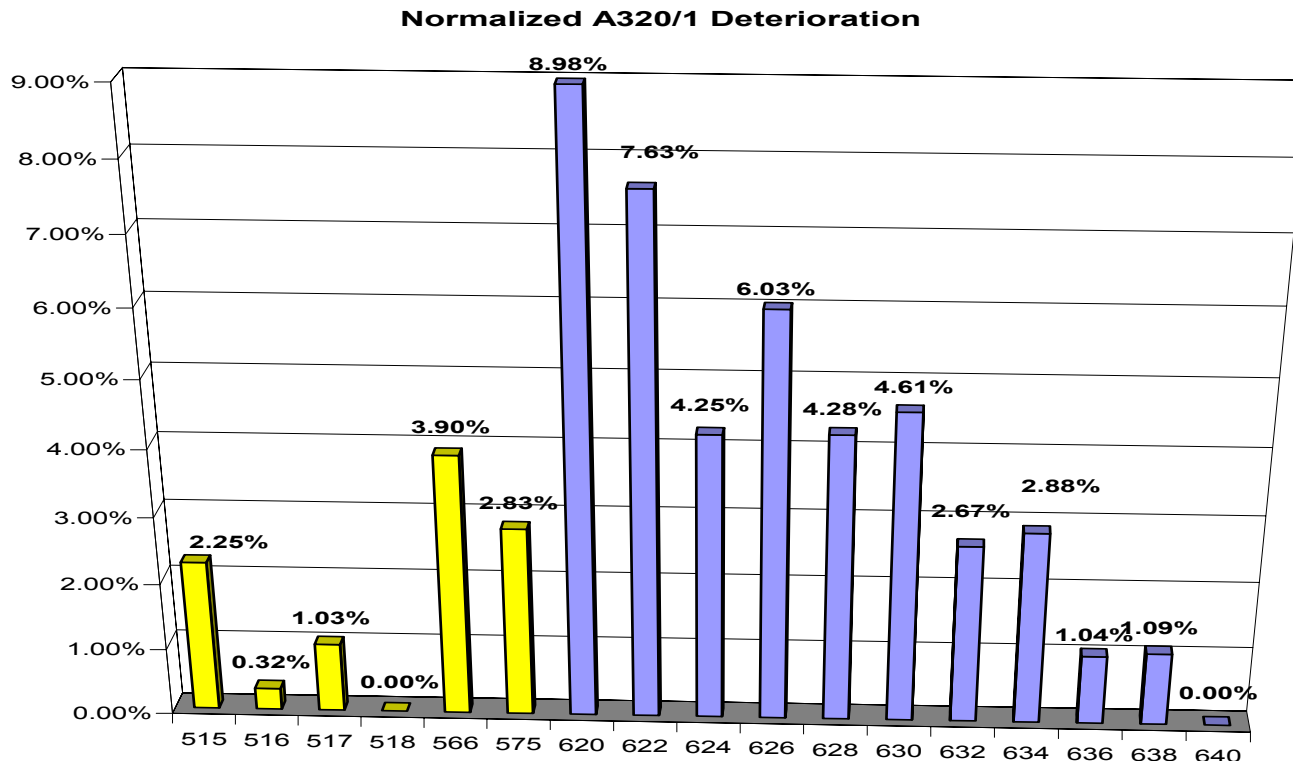
Effect of Weight on Burn

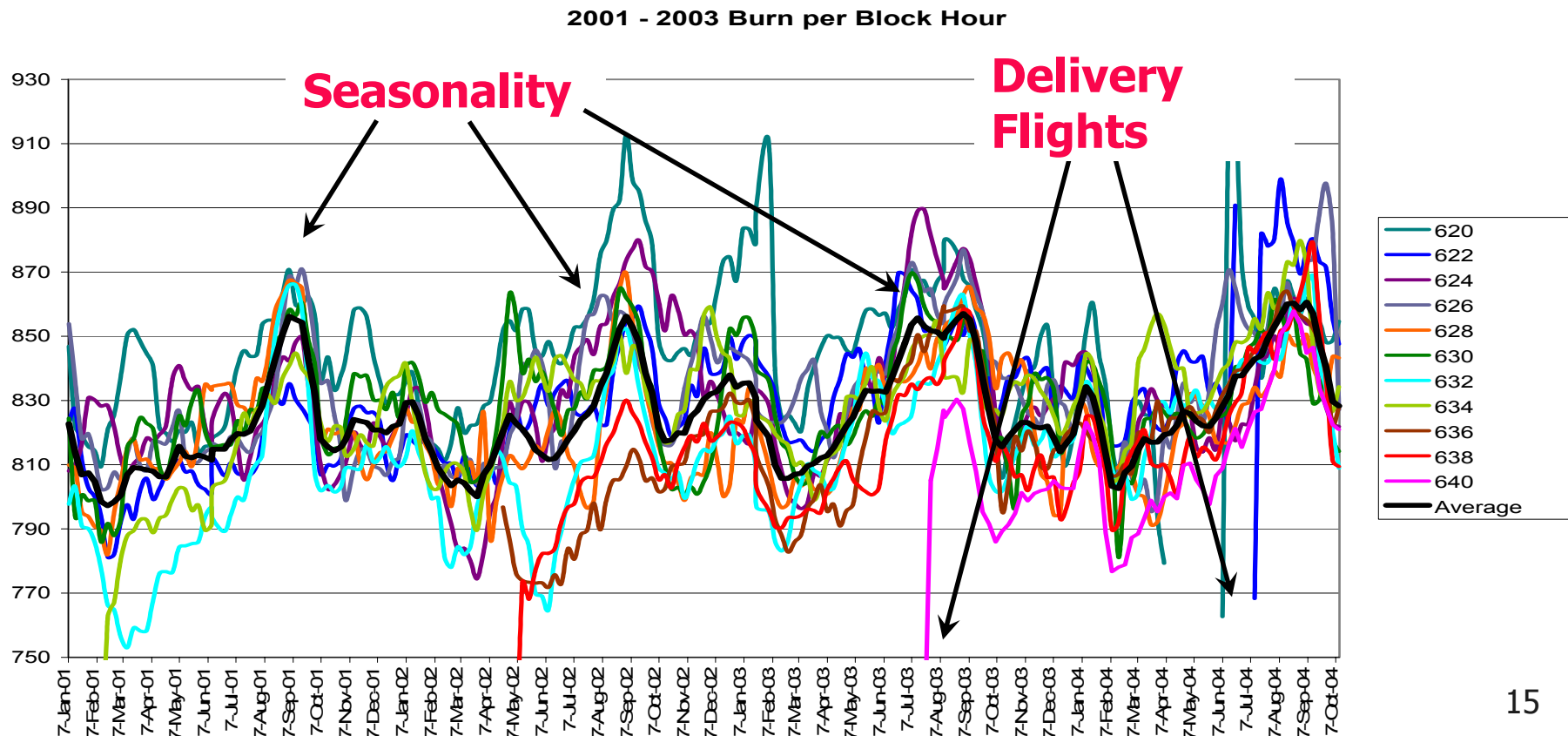- But, the graphs are far too noisy to tell very much …
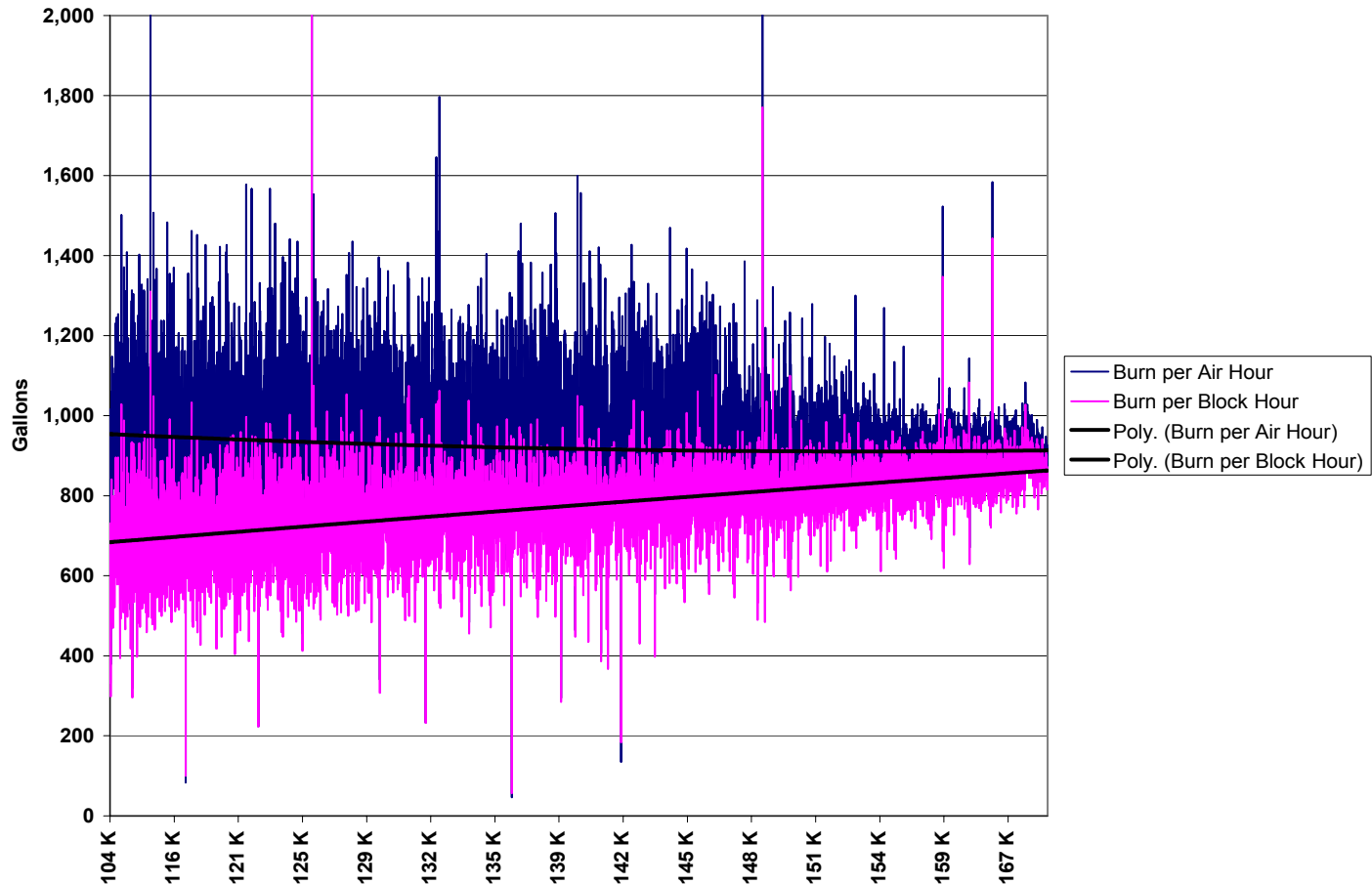
The Same Chart, With More Similarity in Flights (1- 3 hrs. only)

- Much tighter, could be used to highlight problems

Raw Burn per Block Hour of a Fleet

■ The extreme variations in this graph illustrate the possible pitfalls in many common analyses

2001 - 2003 Burn per Block Hour

Fuel Conservation: Who? Where?

- Usually, viewed as primarily an issue for Flight Operations
- But, every organization in the airline affects fuel conservation in some way …
  - Finance
  - Fuel Purchasing
  - Fuel Hedge
  - Purchasing
  - Airport Customer Service
  - Airport Station Ops
  - Ramp Operations
  - Flight Operations
  - Maintenance
  - Spare Parts
  - Marketing & Sales
  - Revenue Management
  - Scheduling
  - Catering
  - System Operations Control
  - Dispatch / Weight & Balance

- **All organizations require the right data to identify & correct their contribution to fuel wastage**