NAS Performance and Passenger Delay

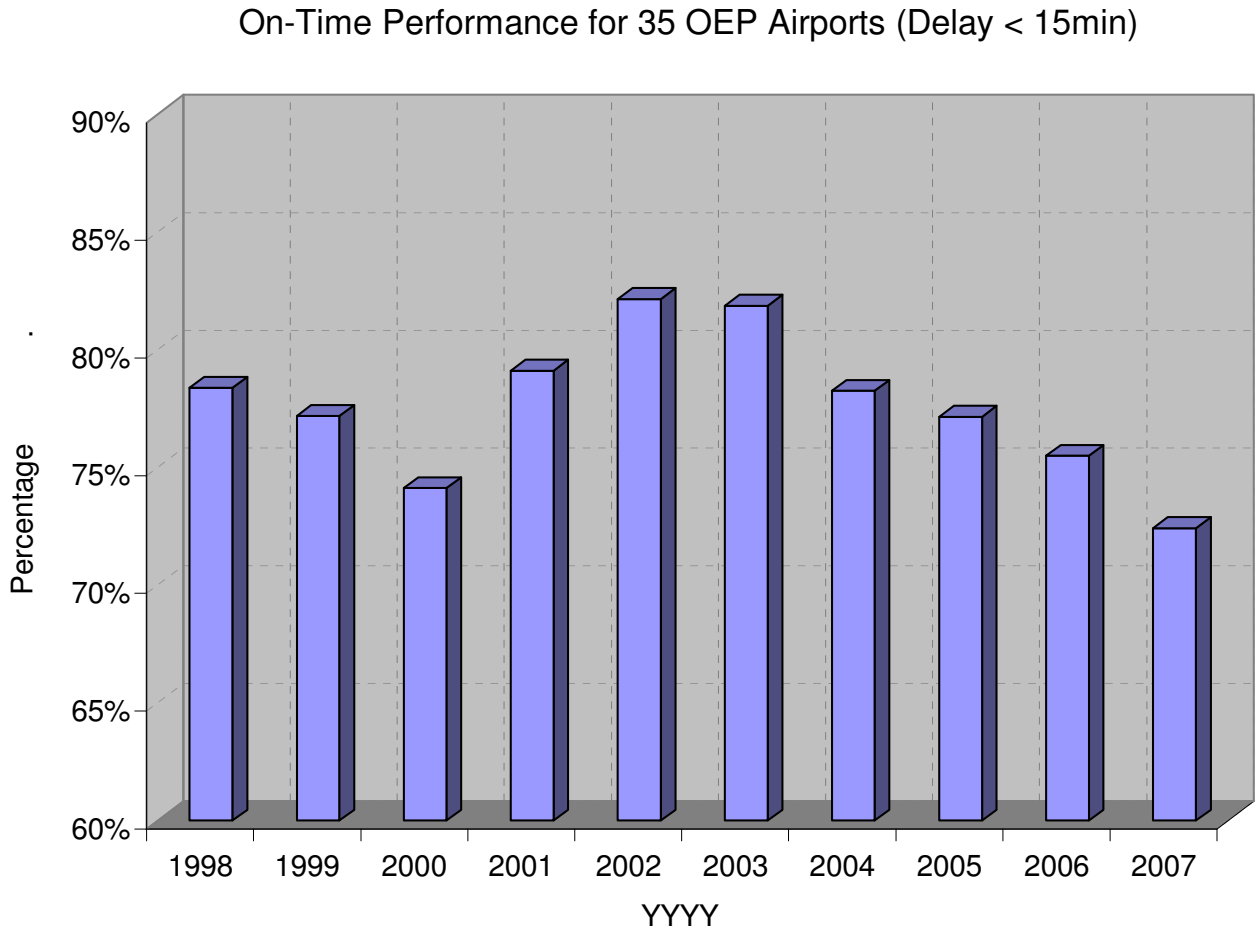
Michael Ball

NEXTOR

University of California, Berkeley & University of Maryland

Coauthors: Andy Churchill, Bargava Subramanian, Alex Tien

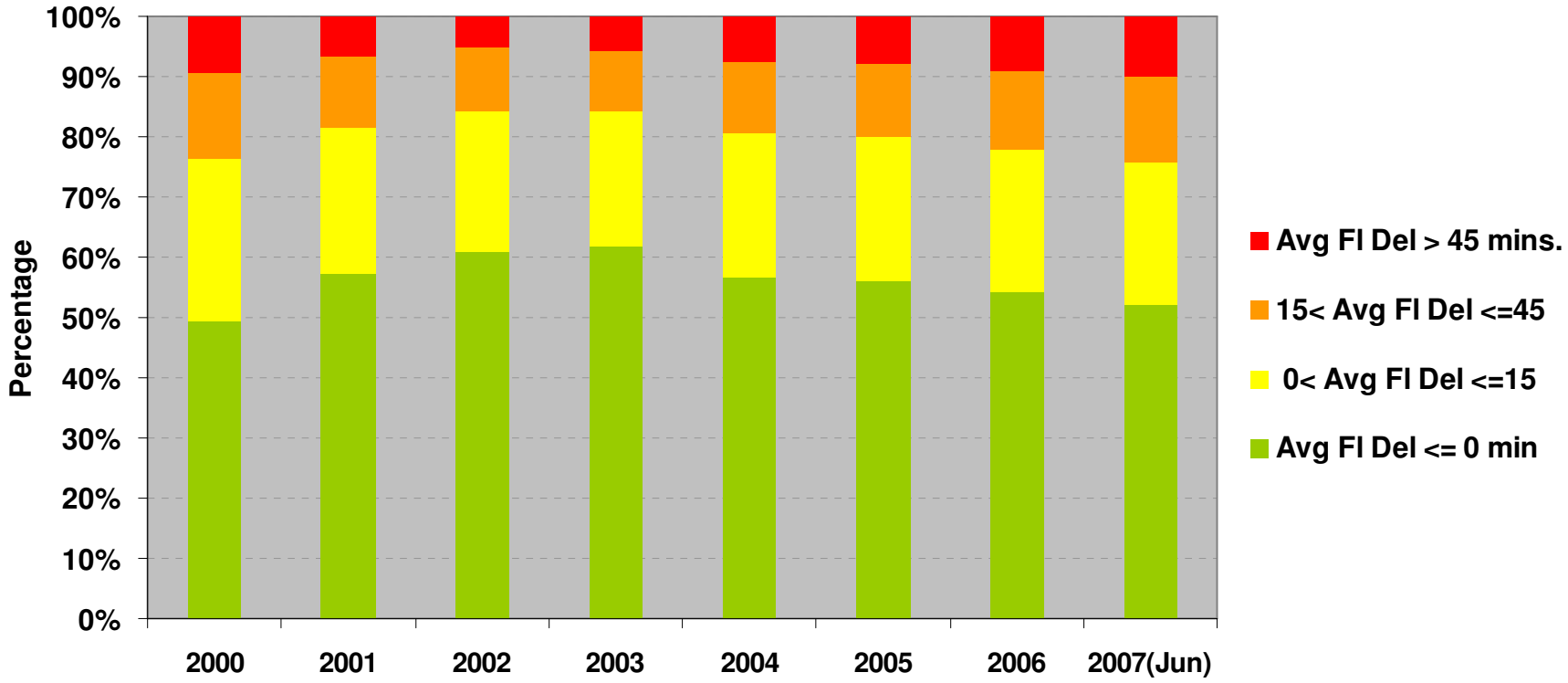
On-Time Performance



On-time percentage is decreasing.

Data Source: ASPM Analysis Database

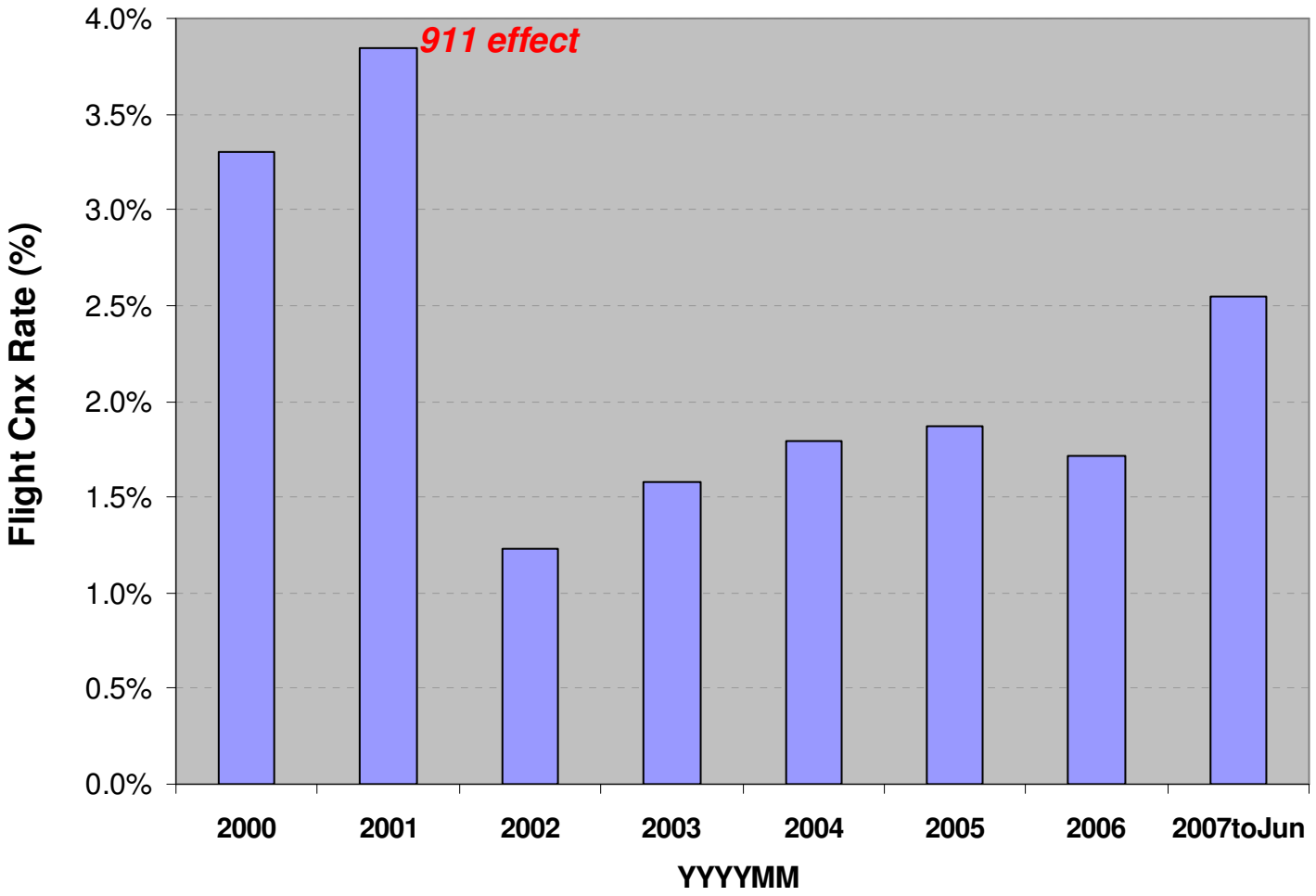
Flight Delay Trend



Percentage of flights with early arrival and delay less than 15 min is decreasing.
Percentage of flights with long delay is increasing.

Data Source: BTS On-Time Performance Database

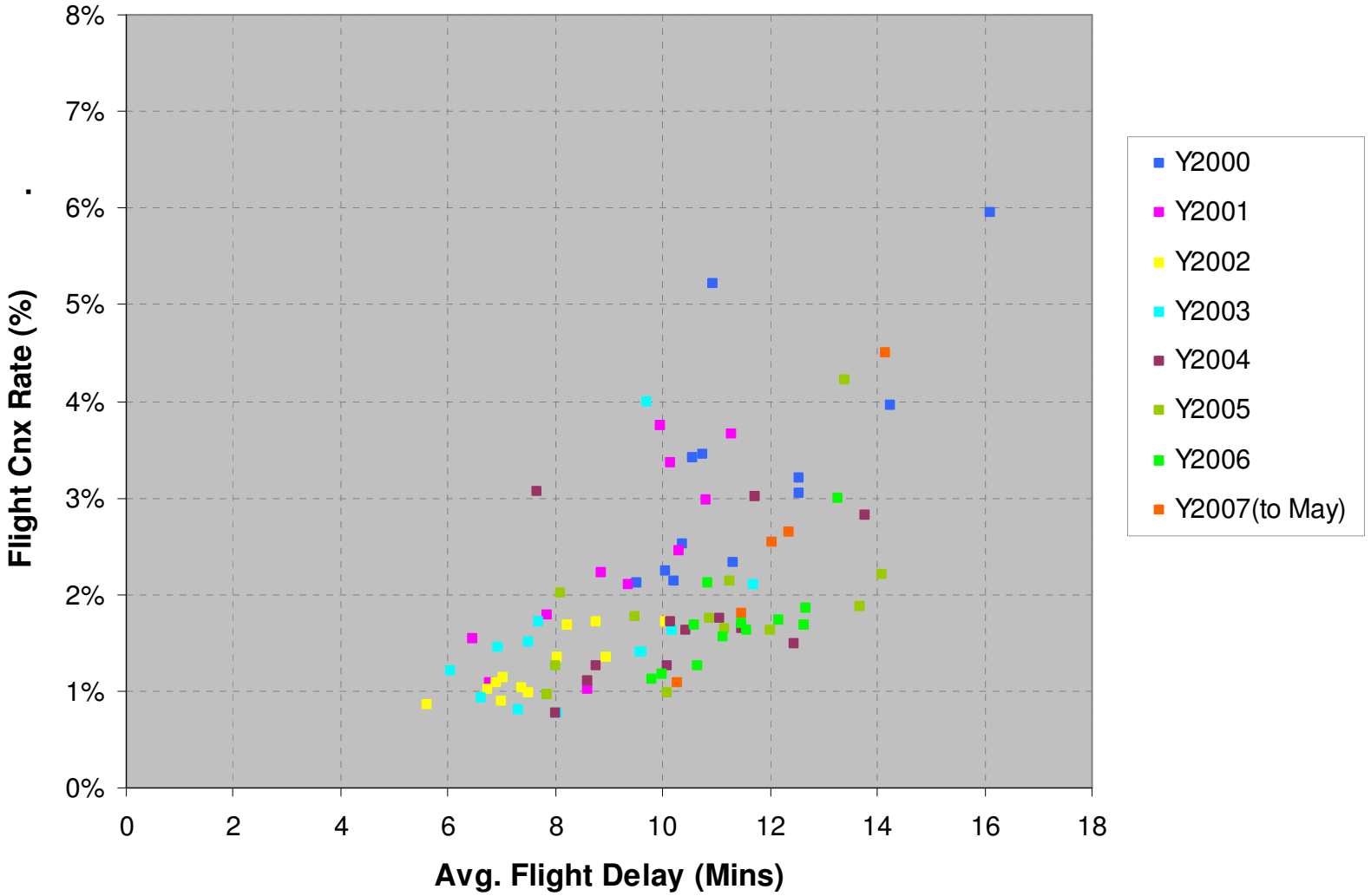
Flight Cancellation Trend



Cancellation rate decreased in 2006 but has jumped up in 2007.

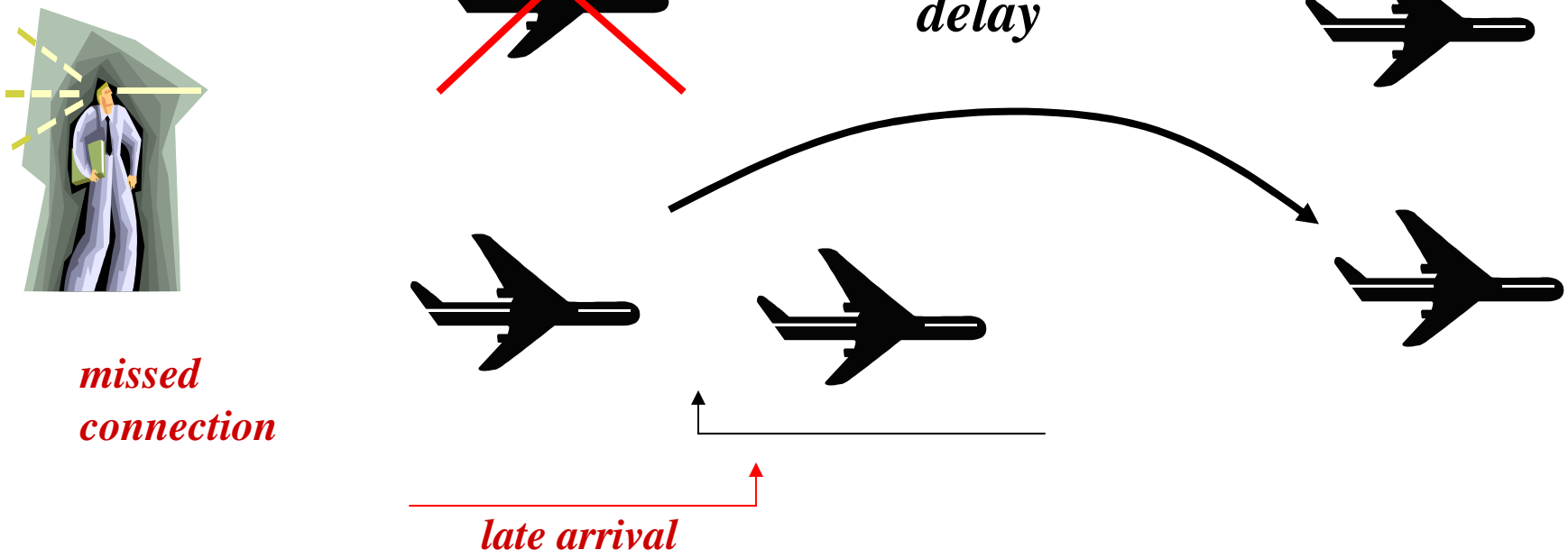
Data Source: BTS On-Time Performance Database

Cnx Rate vs Ave Delay



Delay Statistics and Passenger "Pain"

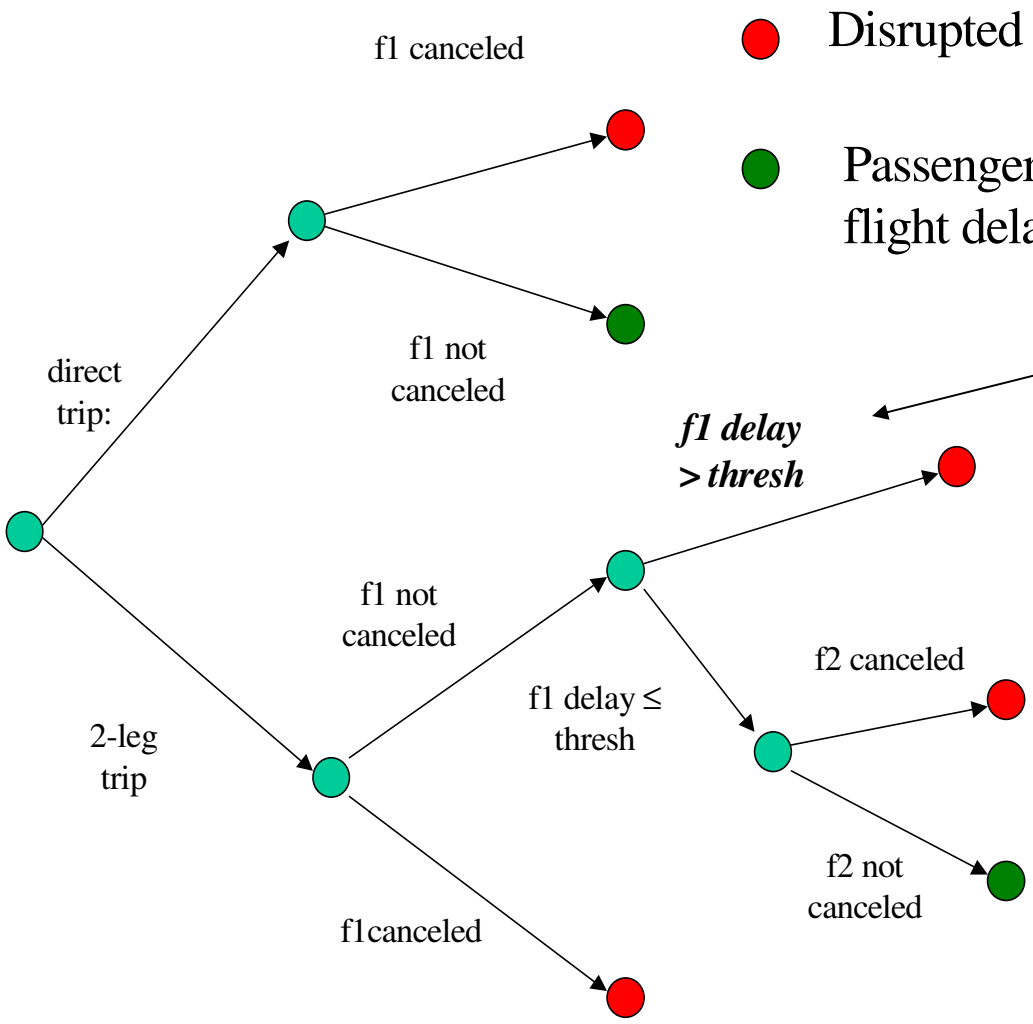
The most widely quoted performance statistic is ***on-time performance***. Yet, customer dissatisfaction is principally driven by the occurrence of very large delays. These are most often associated with the: ***disrupted passenger***



A disrupted passenger is a customer who must use a flight other than the one on which the customer was originally scheduled due to a missed connection or flight cancellation.

- *The average delay for a disrupted passenger has been estimated to be 7 hours.*
- *Cancelled flights are not accounted for in delay statistics nor is the true delay associated with passengers who miss a connection.*

Passenger Delay Model



Disrupted passenger

Passenger delay = flight delay

Requires distribution of flight delays conditioned on delay > 15 min

Parameters:
% Direct: from coupon data.
Cancel Prob: flight cancel prob.
Disrupted Pax Delay: from MIT simulations (7 hrs).
Prob Miss. Connect: complex appx model.

Another View

Average passenger delay =

A_1 (average flight delay)

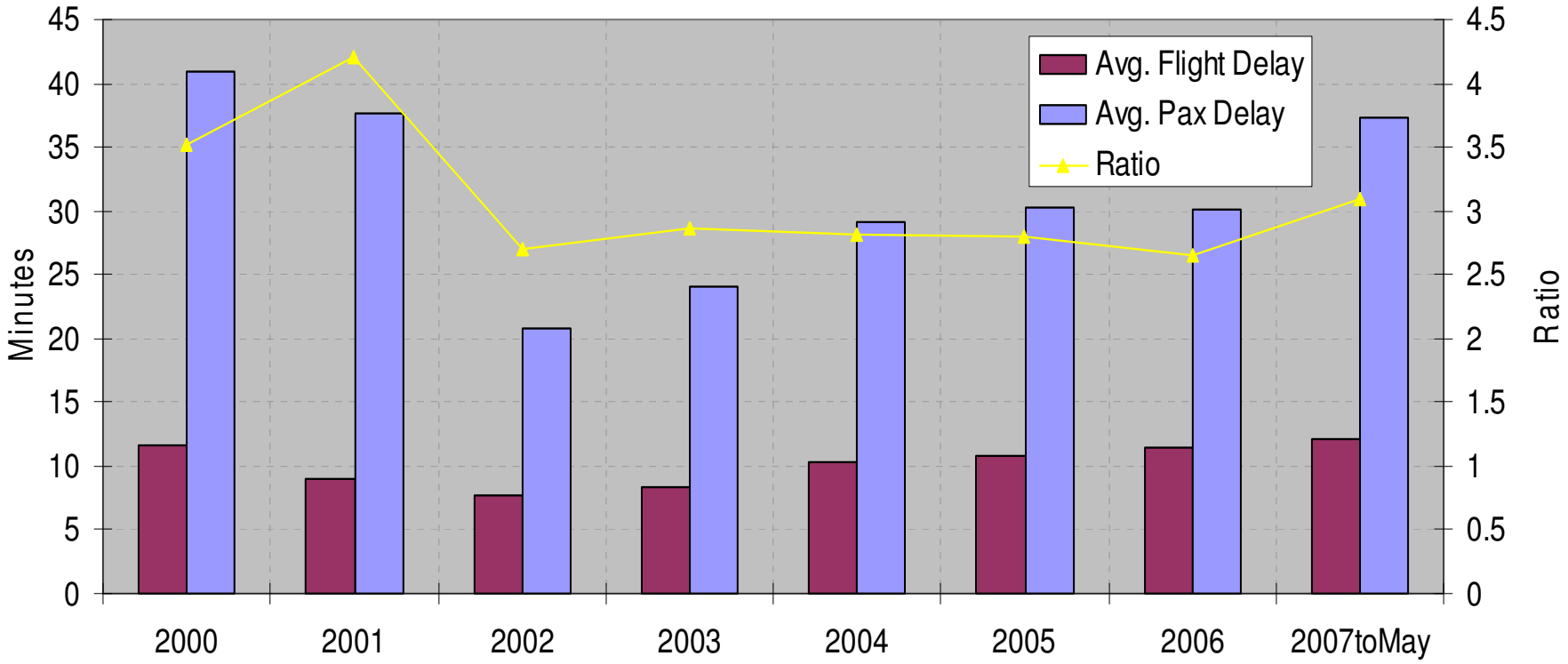
+ A_2 (average flight delay)$^{(1 + e)}$

+ A_3 (flight cancellation probability)

+ *f (load factor)*

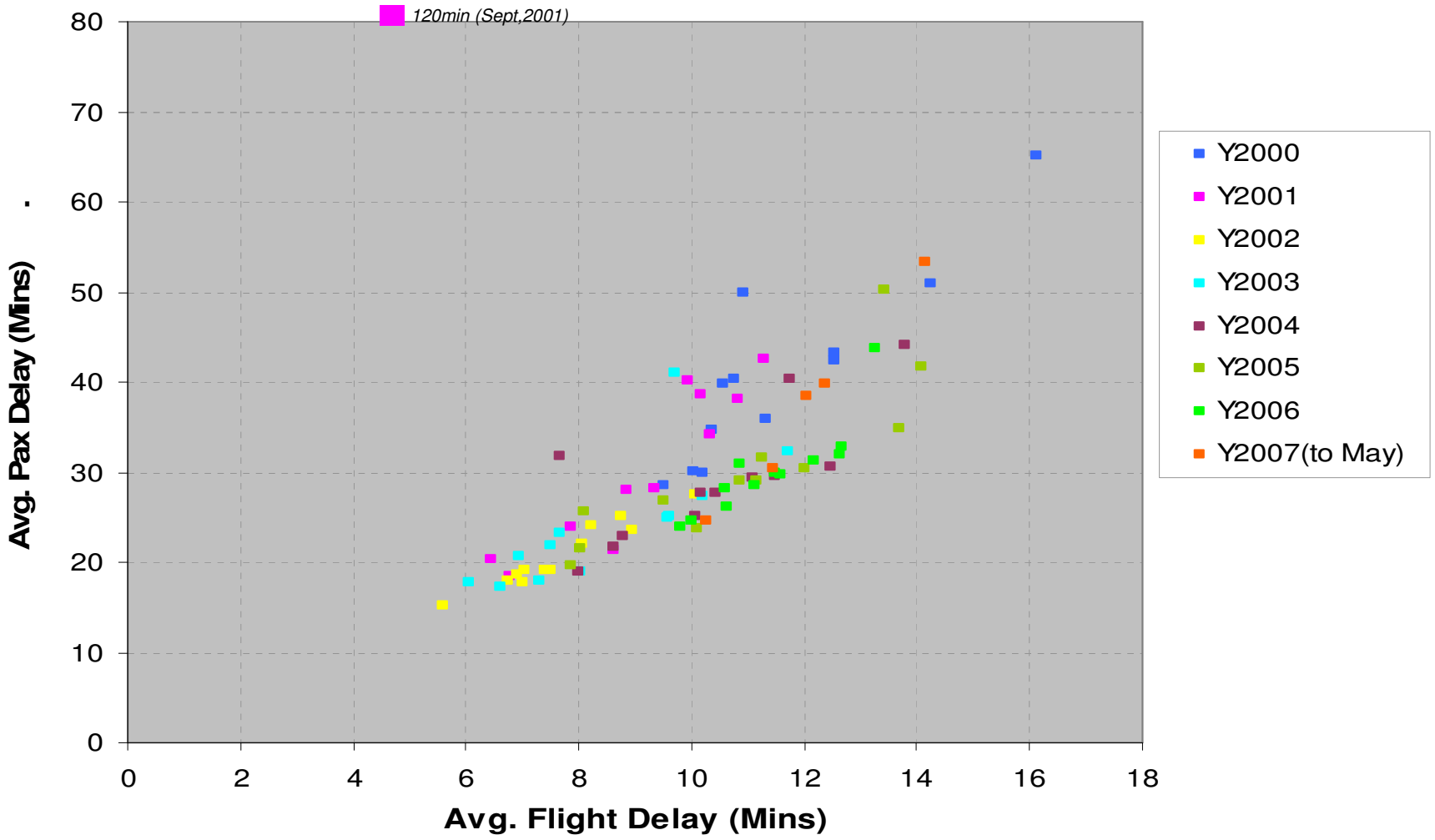
[future improvement]

Flight Delay vs. Passenger Delay (I)

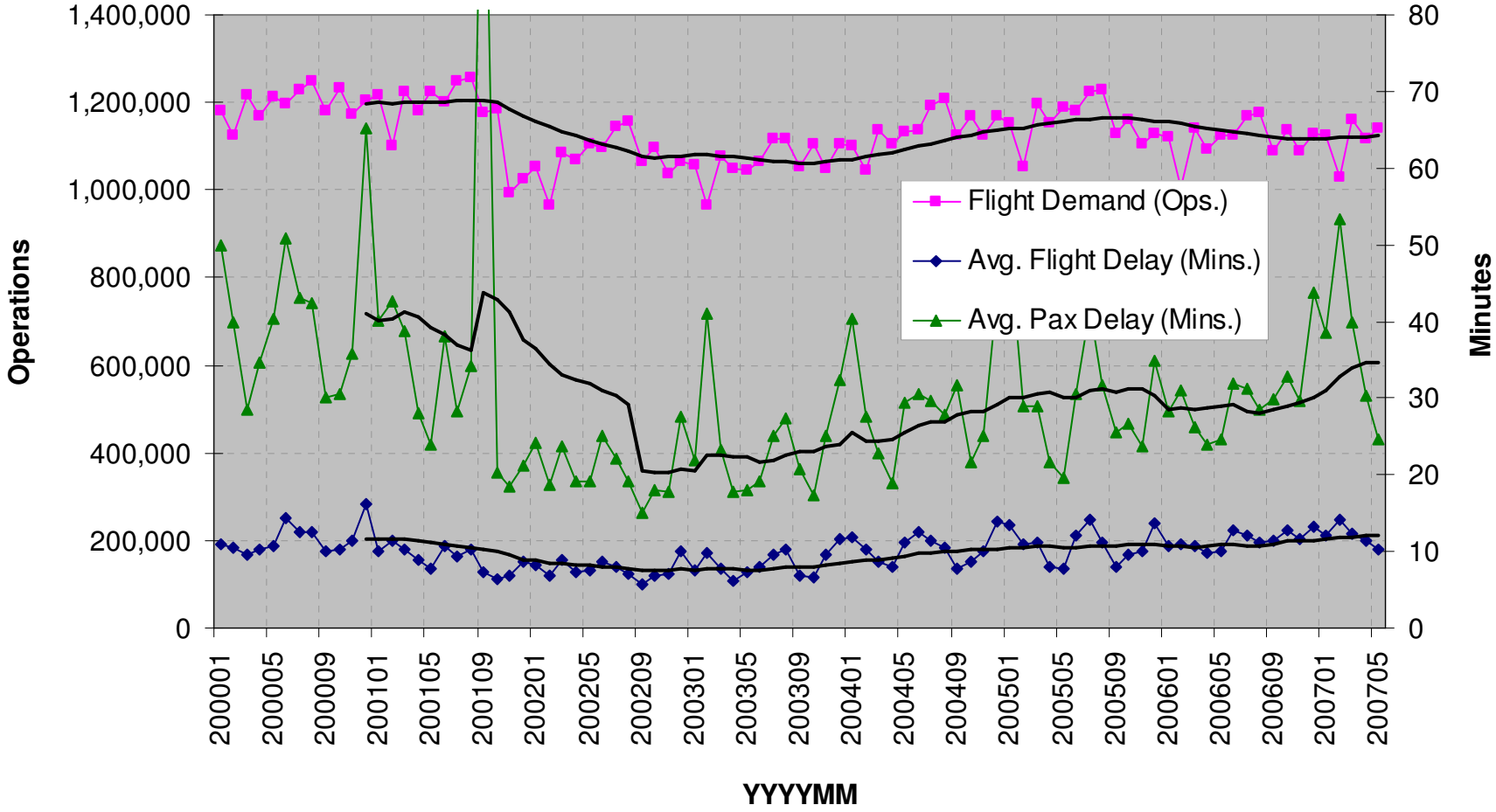


Avg. pax delay is almost three times of avg. flight delay.

Flight Delay vs. Passenger Delay (II)

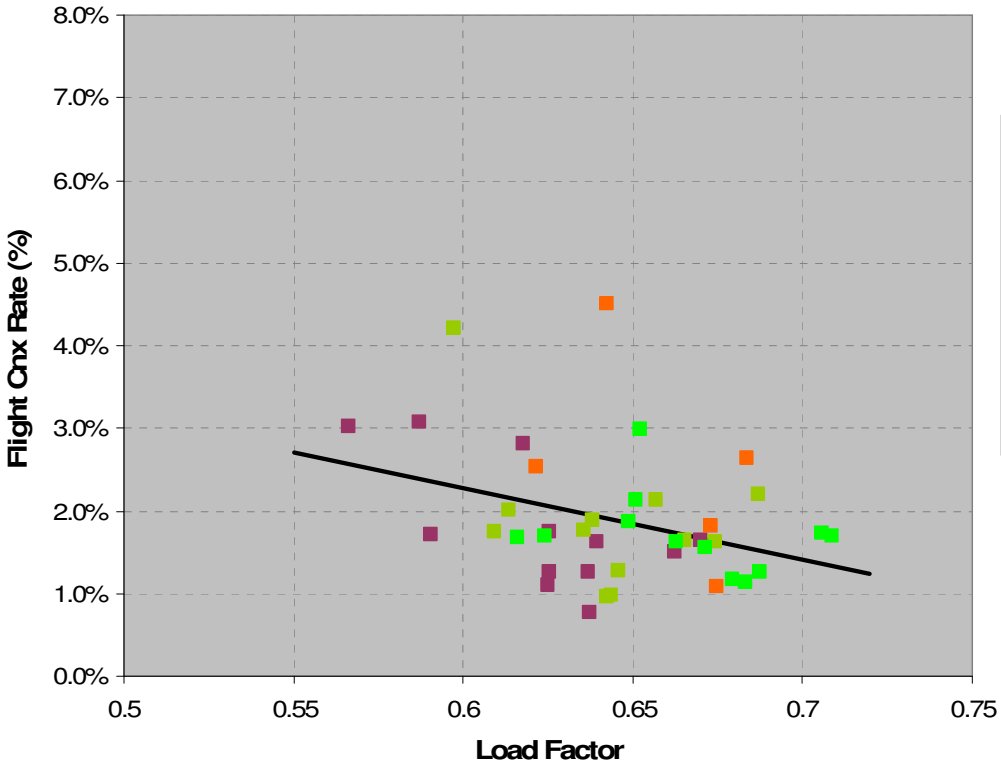


Demand vs. Delay
(35 OEP Airports)



The fluctuation of pax delay is more significant than that of flight delay.

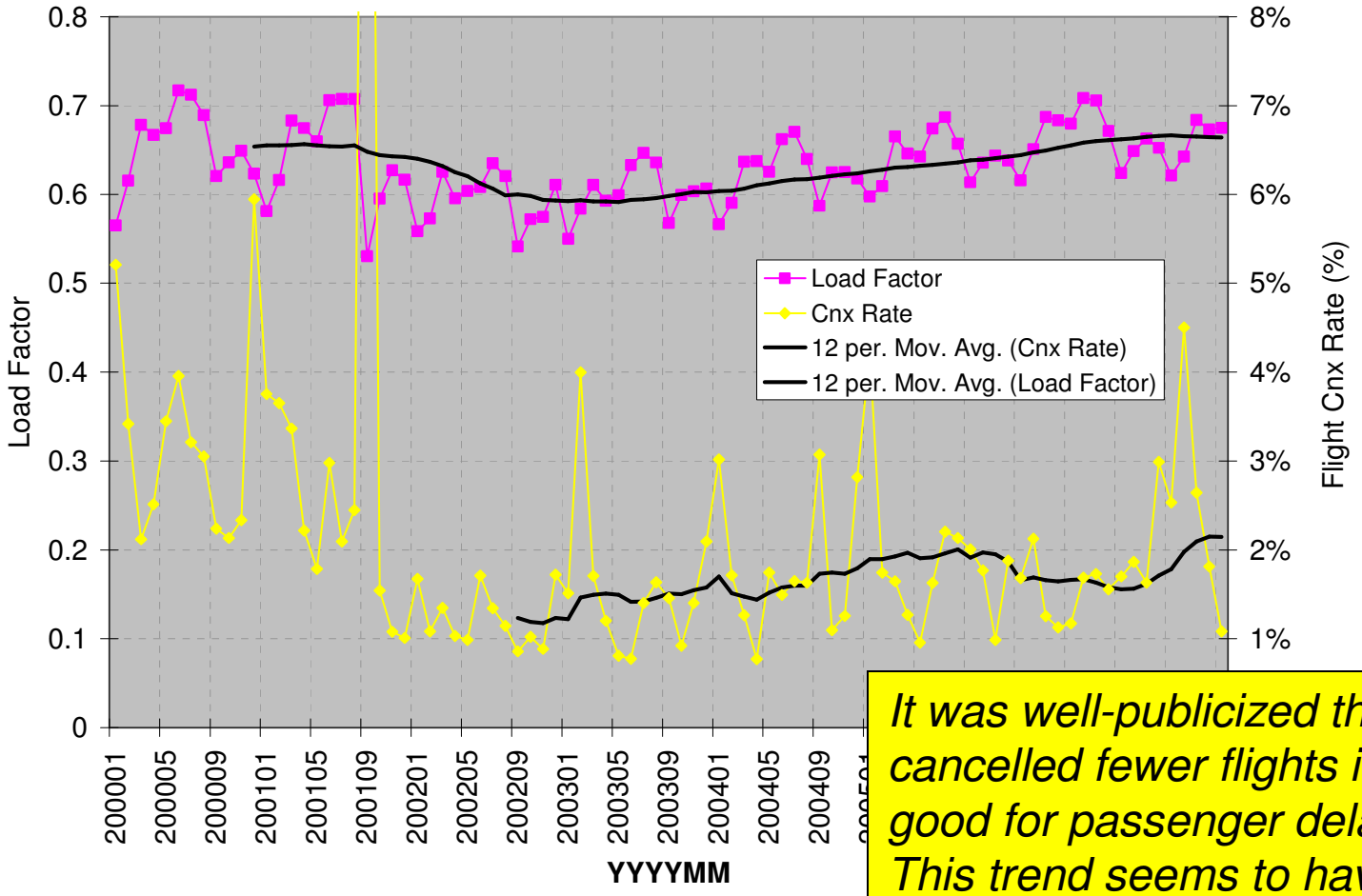
Load Factor vs. Cancellation Rate



Cnx% = 0.0741 – 0.0856*LoadFactor

Generally, there is a negative correlation between load factor and cancellation rate: ***airlines are reluctant to cancel flights when there are fewer options for accommodating disrupted passengers.***

Trend of Load Factor vs. Flight Cancellation Rate



It was well-publicized that the airlines cancelled fewer flights in 2006 (this is good for passenger delay)
This trend seems to have been reversed in 2007

Data Source: BTS On-Time Performance Database

Some Final Thoughts

High load factors ➔ greater delays when disruptions do occur

- Future analysis will replace constant disruption delay with delay function that depends on load factor and possibly other factors – most likely will use George Mason models.

High load factor + high cancellation rates is a particularly disturbing trend

- ***Question: are airlines thinking strategically about what an "ideal" load factor should be??***

Question: should on-time performance metric be replaced with more passenger oriented metric??