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AIR TRAFFIC ORGANIZATION

Airline Operational Benefits of Surface Surveillance

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June 28, 2005

Outline

- Introduction
- Memphis International Airport (MEM)
 - Taxi-out time analysis
 - Departure rate analysis
- Dallas Fort Worth International Airport (DFW)
 - Taxi-out time analysis
 - Taxi-out vs. Queue length analysis
- Summary

Introduction

Shared surface surveillance data for airlines

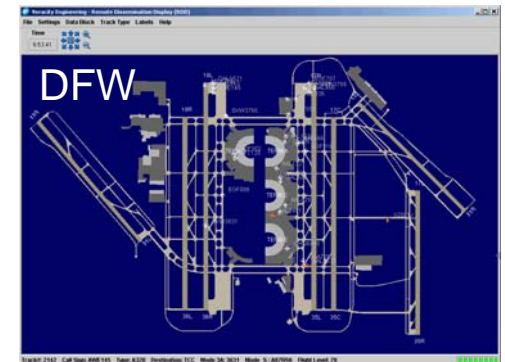
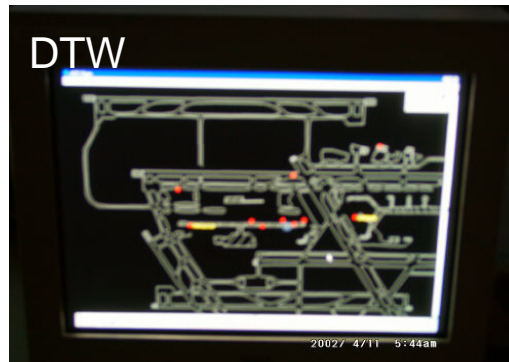
– locations of aircraft and associated call signs

Data comes from different systems at each site, but have similar impacts:

MEM – Surface Traffic Management System (STMS)

DTW – Airport Target Identification System (ATIDS)

DFW – Airport Surface Detection Equipment-Model X (ASDE-X) feed



Introduction

Users: Ramp control facility – ground controllers, surface crew dispatchers, managers

Airline Operation Center(AOC) – managers, dispatchers, analysts



Direct impacts:

1. Increased ability to monitor surface queues
2. Increased ability to estimate ETA and order of arrivals
3. Common situational view between Ramp and AOC
4. Increased awareness of mission critical flight location
5. Ability to quickly determine runway configuration and status (AOC)
6. Better archive data for use in analyses (AOC)

MEM Taxi-out Analysis (surveillance-outage data)

Performed a study of FedEx taxi times before, during, and after a loss of surface surveillance

Background: FedEx had been using surveillance data shared from ASDE-X/STMS multilateration since late March 2003. In October 2003 they suffered an 8-week loss of this surface surveillance.

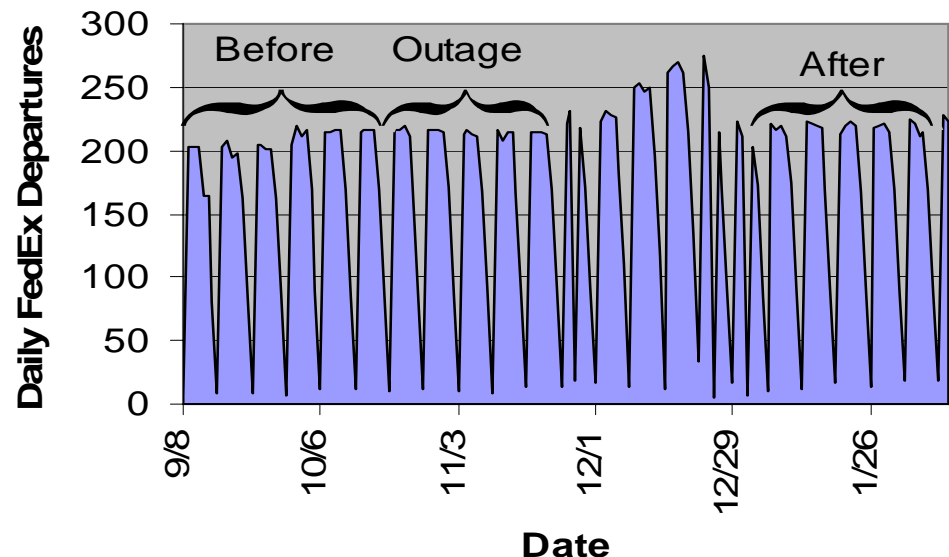
Comparison times:

Before outage: 9/8-10/26/2003

During outage: 10/27-11/24/2003

After outage: 1/6-2/11/2004

Removed holiday traffic because of large demand difference



Data source: ACARS OOOI data, runway configuration data, and weather data from ASPM. Non-ACARS taxi times directly from FedEx.

MEM Taxi-out Data

Runway configuration:

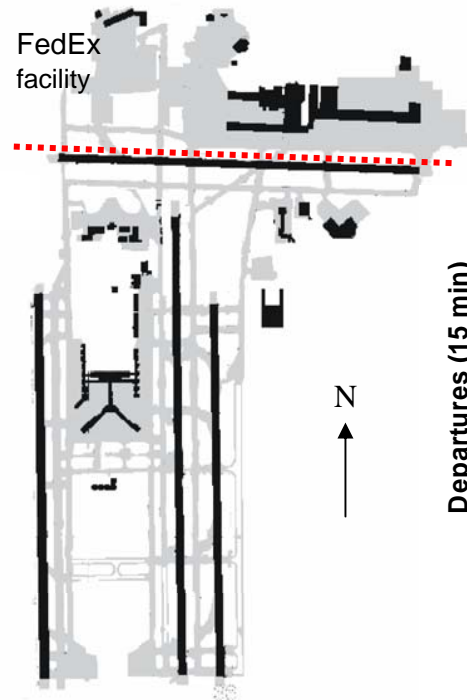
South flow 39%

North flow 61%

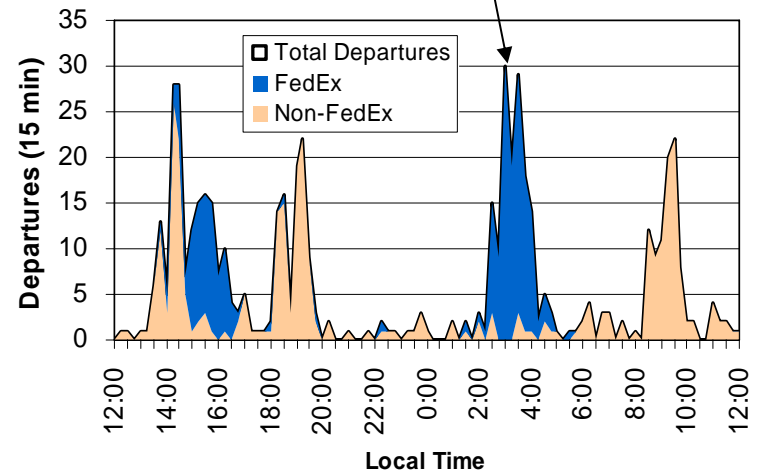
Weather:

VA conditions 75%

IA conditions 25%



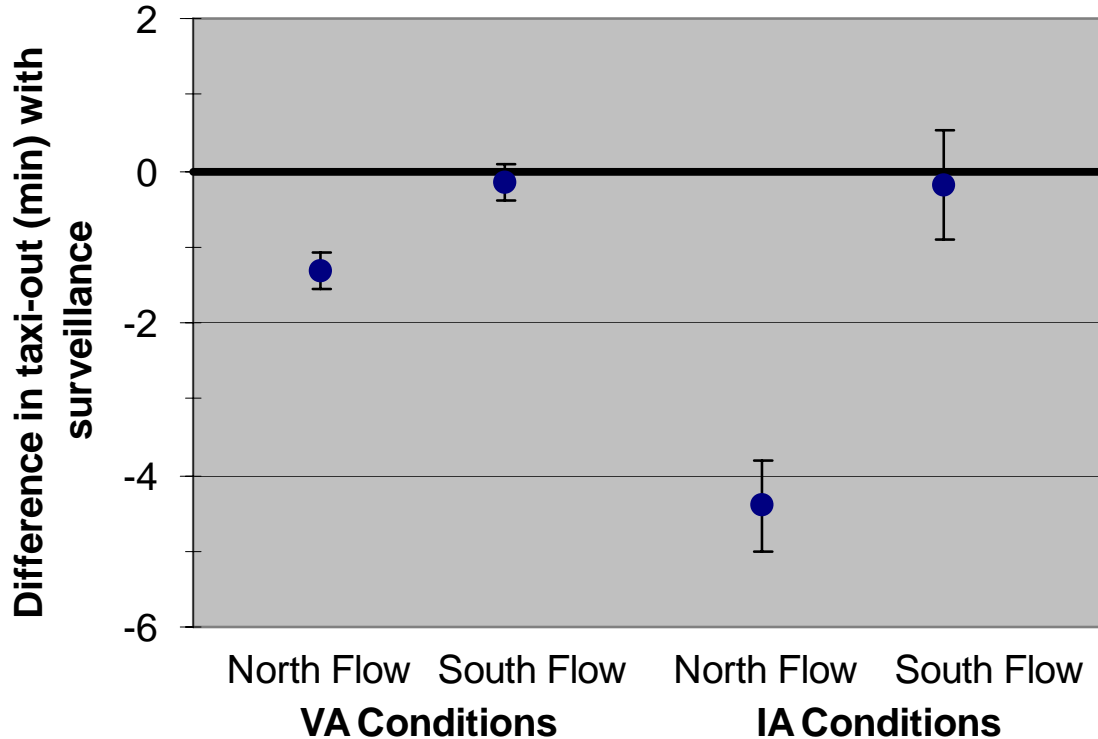
Note: There are not many GDPs or Ground Stops at night



ASPM divides weather into Instrument Approach conditions (IA) or Visual Approach conditions (VA) based on facility input. To qualify for VA conditions at MEM, the visibility must be greater than 5 miles, and the ceiling must be greater than 5000 feet.

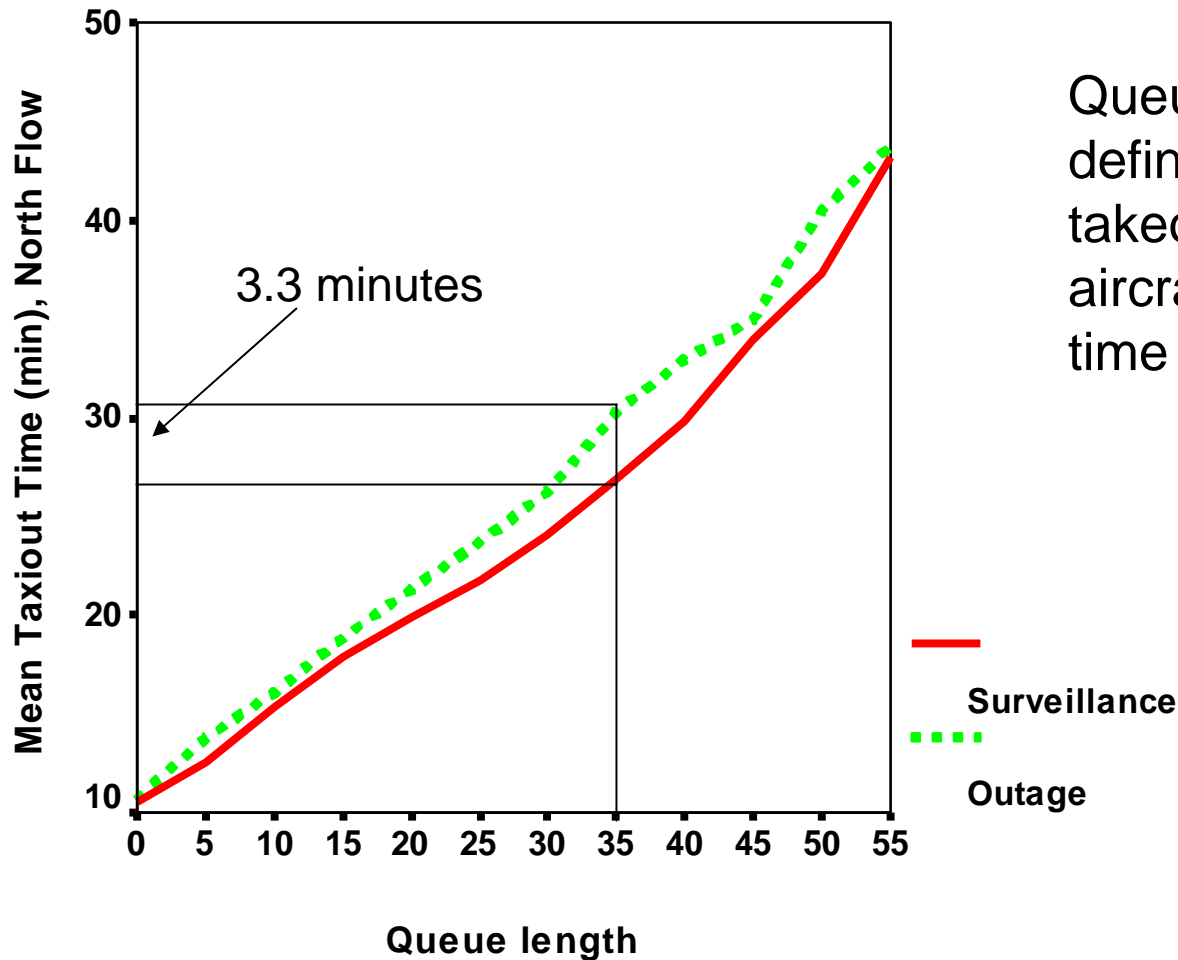
MEM Taxi-out Means (surveillance-outage data)

Results: Difference in average taxi-out time between outage period and surveillance periods. Negative value indicates a decrease in taxi-out when surveillance was available.



During the surveillance outage the North flow average taxi-out was at least 1min 20 sec longer in VA conditions and at least 4 min 20 sec longer in IA conditions.

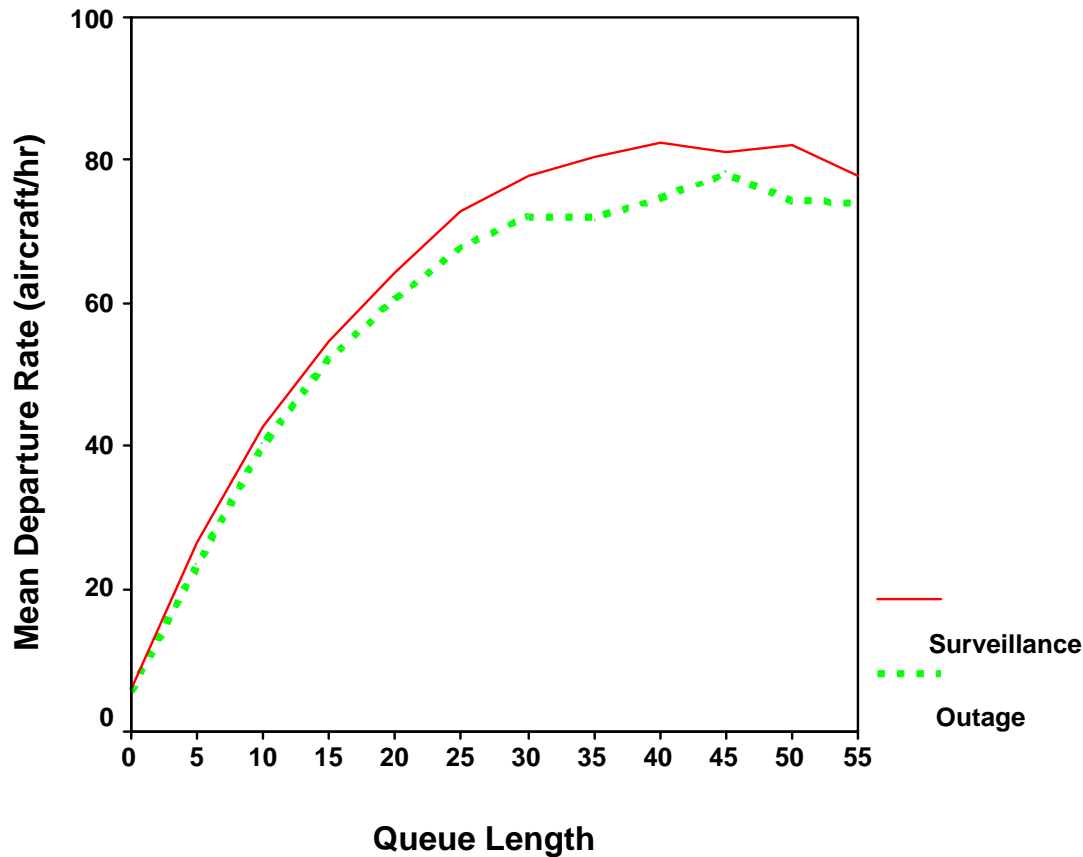
MEM Taxi-out vs. Queue Length (surveillance-outage data)



Queue Length defined as # of takeoffs between an aircraft's pushback time and takeoff time

MEM Departure Rate vs. Queue Length (surveillance-outage data)

Departure Rate vs. Q for North Flow

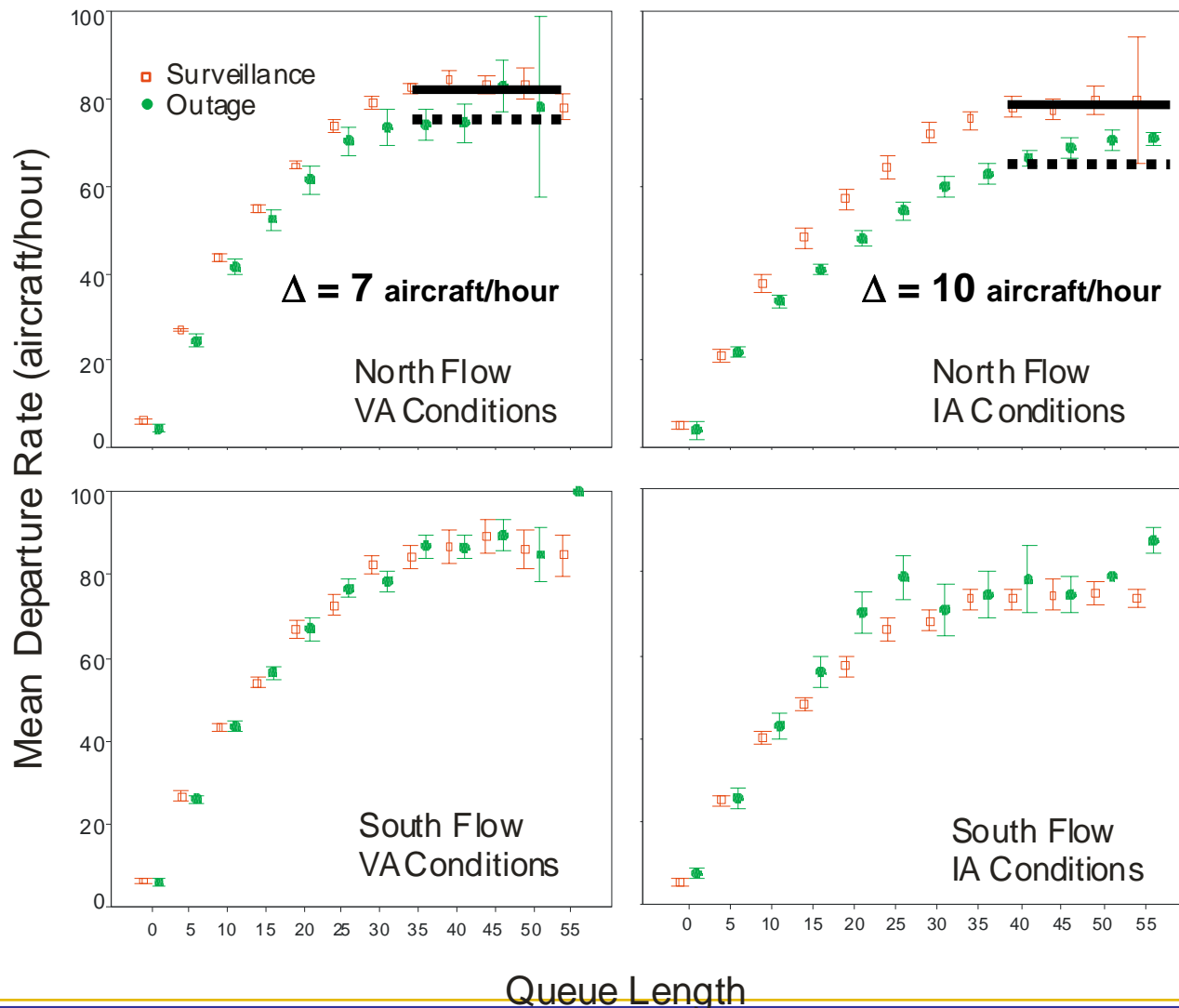


Average increase over all Q lengths: ~3 aircraft/hour

FedEx believes result is due to their ability to precondition the demand (timing and runway balancing) so that ATC can easily optimize surface flow and increase departure rate.

MEM Departure Rate vs. Queue Length (surveillance-outage data)

Recently decided to examine departure rate saturation to examine changes in departure capacity.



MEM Taxi-out Means (year over year data)

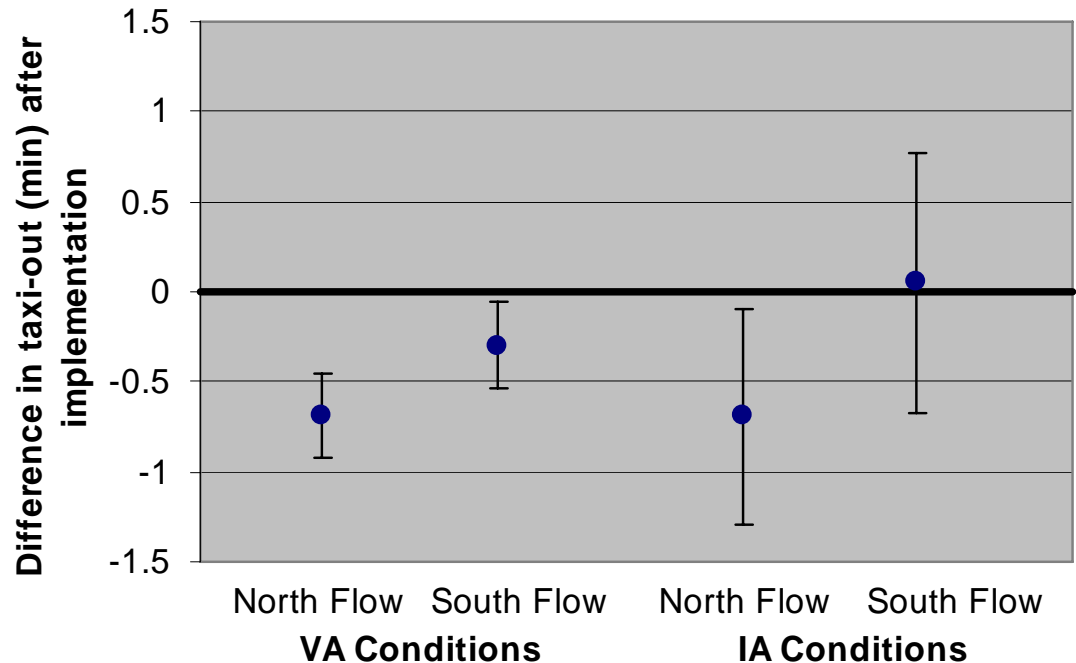
Surveillance-outage results seemed a little too good, decided to examine year over year data

ACARS only data
(65% of flights)

Baseline:
April '02 – March '03

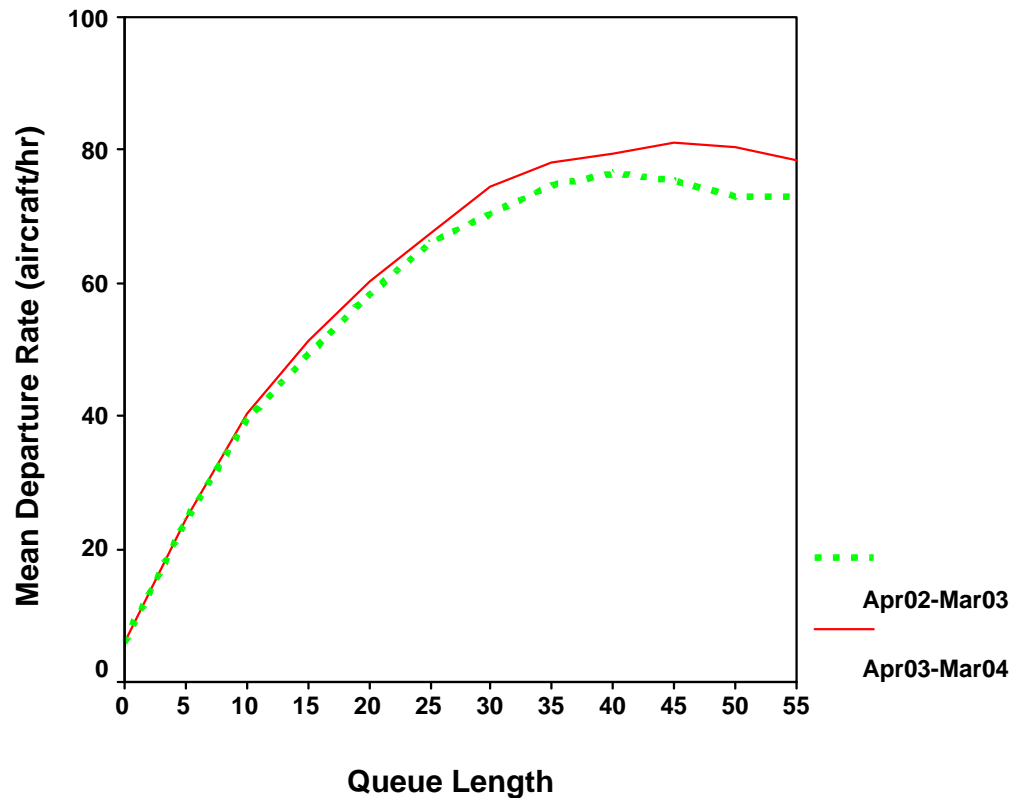
Post-implementation:
April '03 – March '04

Removed November and December from both sets to remove outage time.



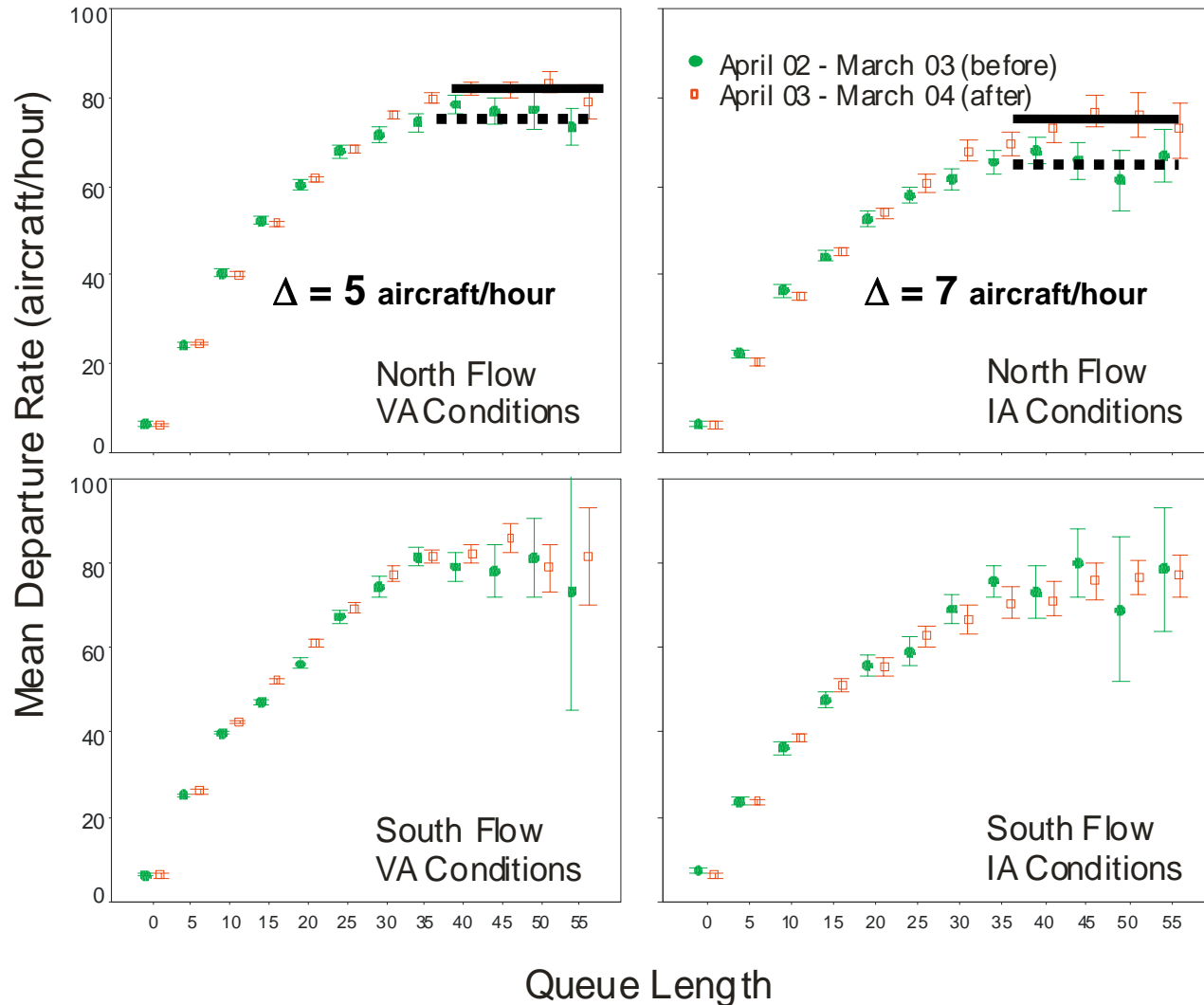
MEM Departure rate vs. Queue Length (year over year data)

Dep Rate vs. Q for North Flow



Average increase over all
Q lengths: ~3 aircraft/hour
Very similar to surveillance-
outage result.

MEM Departure rate vs. Queue Length (year over year data)



DFW Taxi-out Analysis

Performed a study of taxi times for Delta Air Lines after implementation of surface surveillance

Background: Surface surveillance feed in Delta ramp tower starts April 2003. The system made stable for consistent use by November 2003.

Comparison times: Baseline: 12/1/2002 - 9/30/2003,
Post-implementation: 12/1/2003 - 9/30/2004

Chose to only examine times after American Airlines depeaking in November 2002.

Data source: ACARS OOOI data, runway configuration data, and weather data from ASPM. Interested in all the flights controlled by the Delta ramp tower (Terminal E flights except NWA), only have consistent ACARS data from Delta flights.

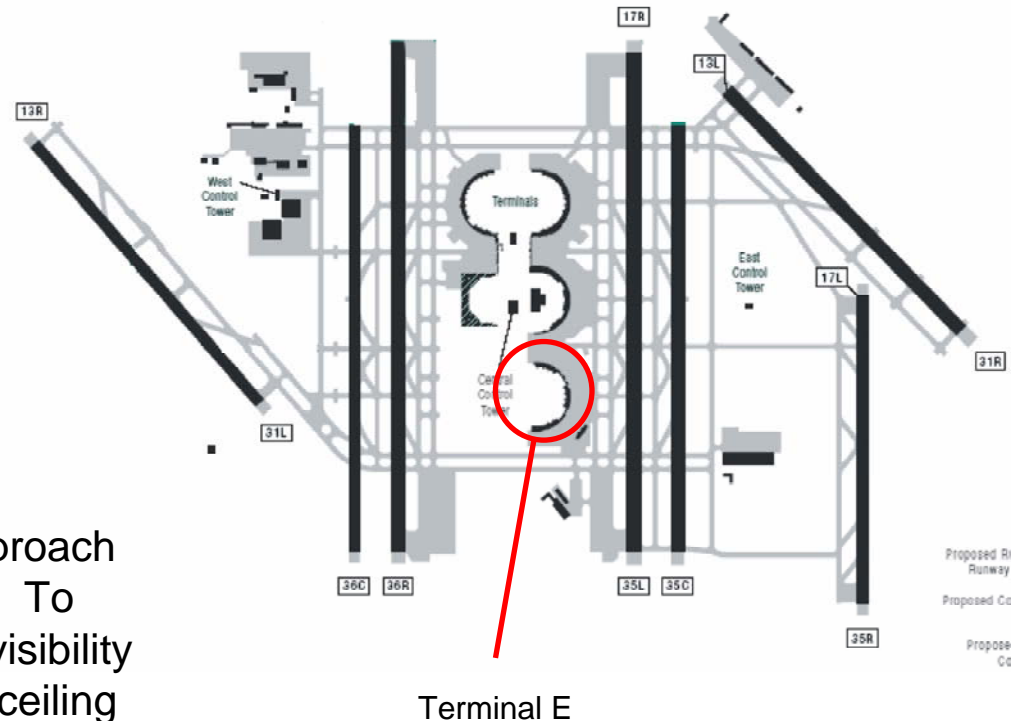
DFW Taxi-out Data

Runway configuration:

South flow 68.6%
North flow 31.4%

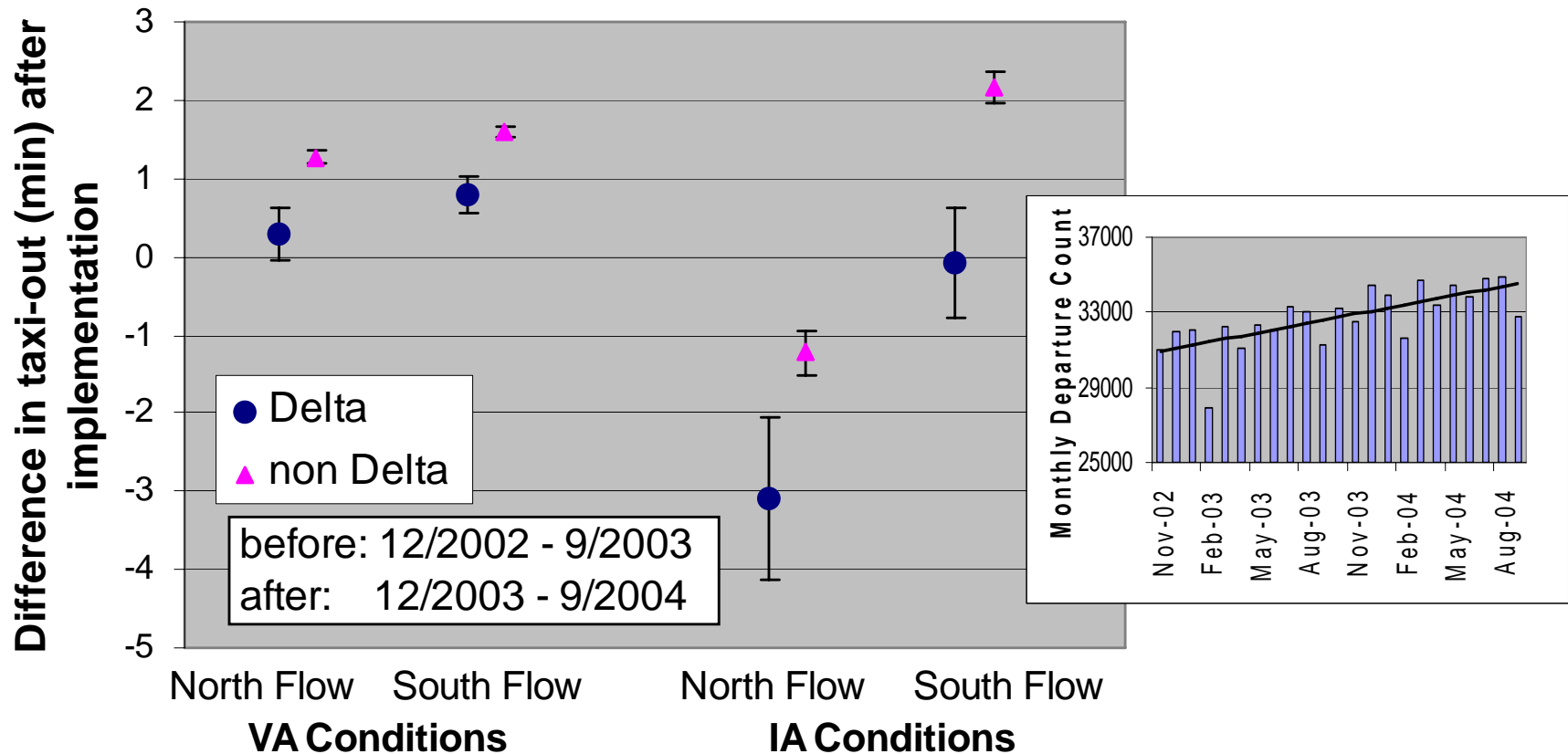
Weather: VA conditions 81.5%
IA conditions 17.5%

ASPM divides weather into Instrument Approach conditions (IA) or Visual Approach conditions (VA) based on facility input. To qualify for VA conditions at DFW, the visibility must be greater than 5 miles, and the ceiling must be greater than 3500 feet.



DFW Taxi-out Means

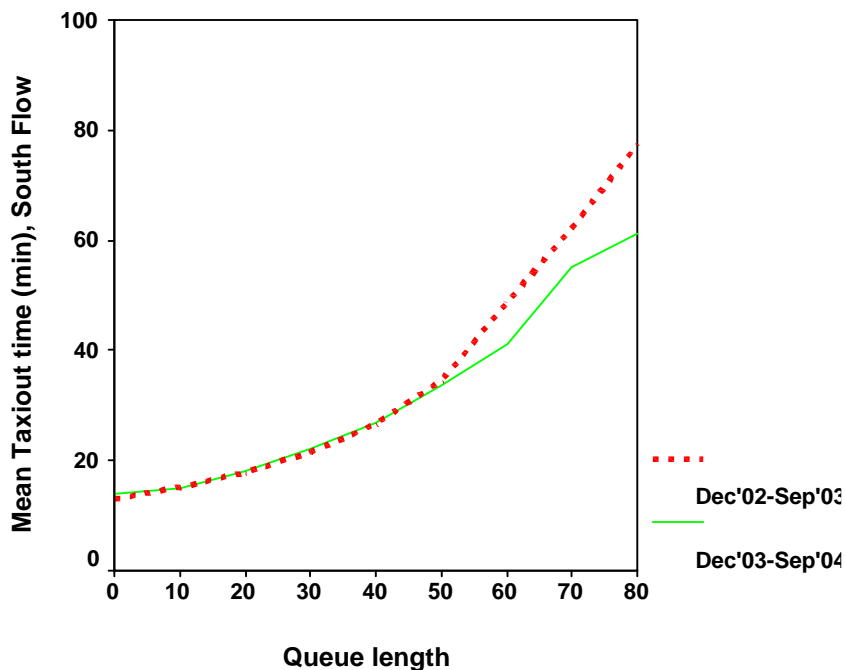
Results: Difference in average taxi-out time after tool implementation. Negative value indicates a decrease in taxi-out from the year before. In each case Delta difference is less than rest of airport. Assume general increase in taxi times due to increase in traffic load 7% increase comparing first 9 months of 2004 to 2005.



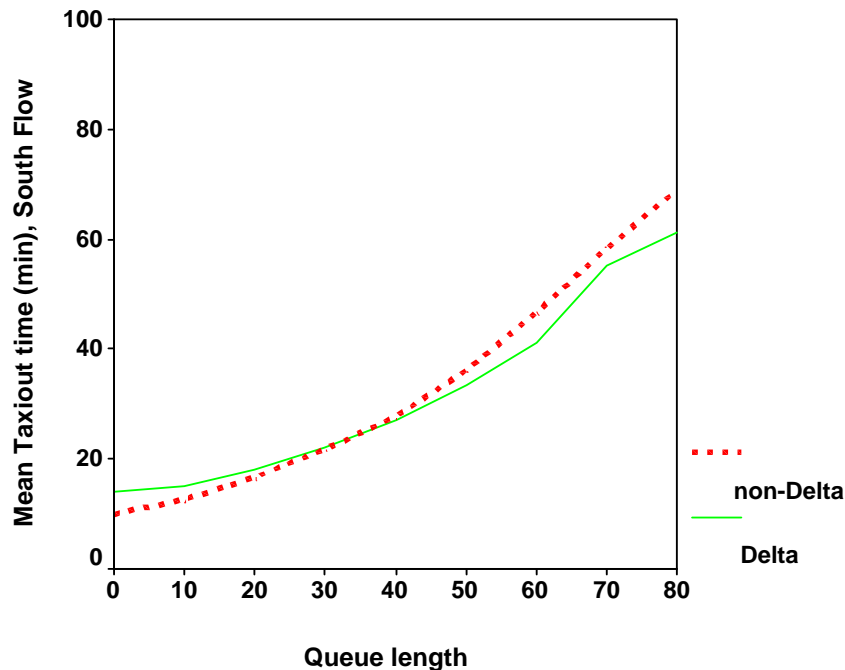
DFW Taxi-out vs. Queue Length

Taxi-out vs. Queue – Departure rate vs. Queue results did not change significantly because Delta was only small fraction of DFW departure traffic.

Delta before vs. after implementation



Delta vs. non-Delta for same period



Summary and future work

- Airlines can optimize surface operations using real-time surface surveillance
- As surface systems (ASDE-X, STMS) are installed in FAA towers, opportunities to optimize taxi time and cooperate will increase
- The FAA will continue to measure surface efficiency benefits for these locations and others.

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