TURKISH AVIATION ACADEMY

İTÜ

From Planning to Operations
Dr. Peter Belobaba

Istanbul Technical University

Air Transportation Management

M.Sc. Program

Network, Fleet and Schedule

Strategic Planning

Module 16 :   13 March 2014

Lecture Outline

- **Airline Operations Control**
  - System Operations Control Center Overview
  - Roles and Responsibilities

- **Irregular Operations**
  - Causes and Recovery Considerations
  - Example: Schedule Disruption

- **Ground Operations (Station Control)**
  - Aircraft Arrival and Departure Activities
  - Station Control Challenges at Hubs

- **Operational Variability and Delays**
  - Factors Affecting Flight Delays
 - On-time Performance and Cancellation Rates

Airline Operations Control

- **System Operations Control**
  - Real-time coordination of all operations and decisions
  - Aircraft flow management and resource (re-)allocation under irregular operating conditions.

- **Dispatch Control**
  - Flight planning, given ATC preferred routes and company constraints/policies.

- **Station Control**
  - Turnaround management of aircraft arrivals/departures on the ground.

System Operations Control (SOC)

- **Coordinates the daily operations of the airline on a dynamic basis.**

- **Objective is to ensure that all flights are operated as close to the schedule plan as possible.**

- **Subject to additional goals and constraints:**
  - Safety of passengers, crew and aircraft
  - On time performance measures
  - Most economical routings and procedures
  - Provide aircraft for "swaps", extra sections and charter operations

Systems Operations Control Structure

Figure 12-5 The SOC Center of an Efficient Airline.
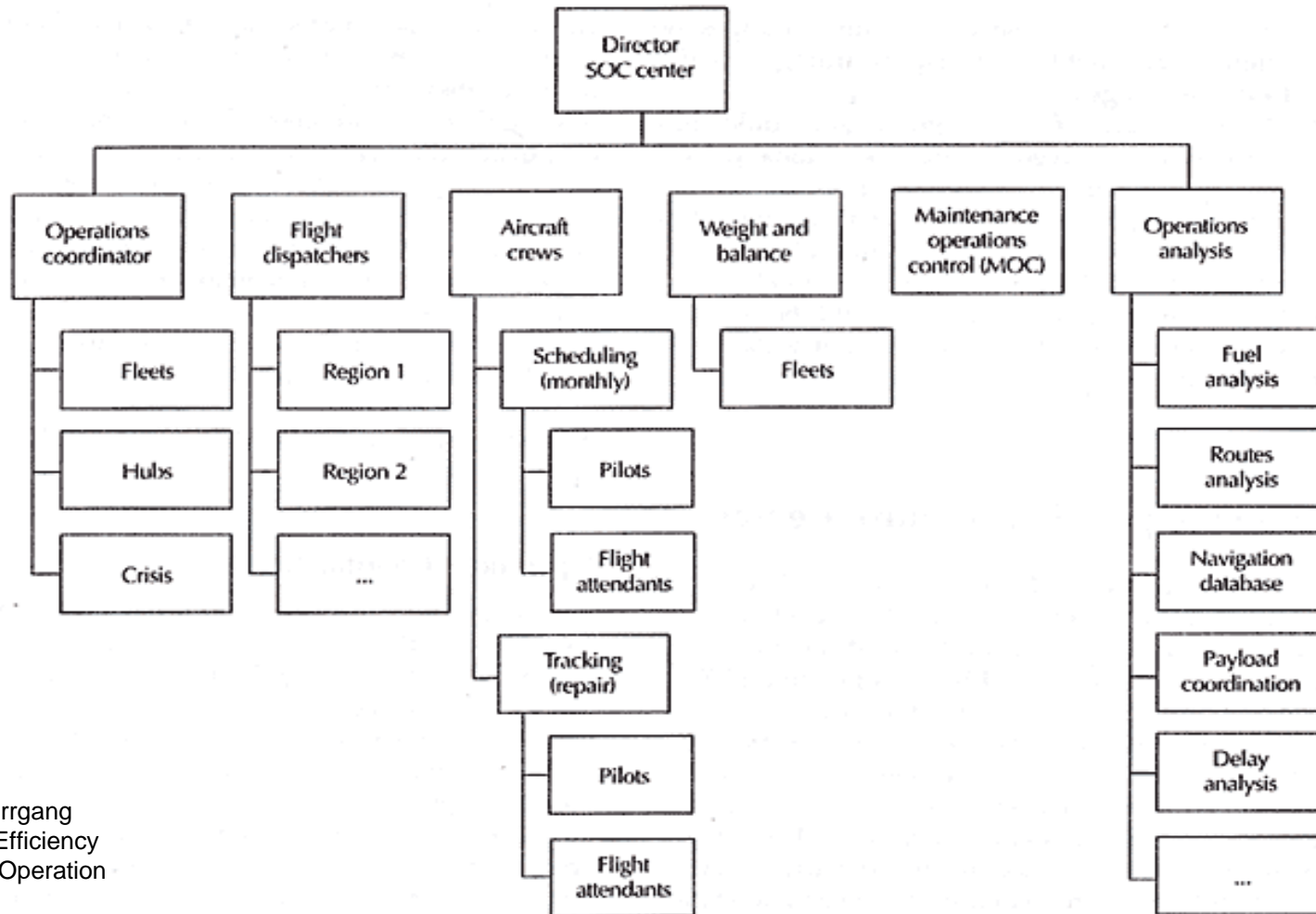
Source: Michael Irrgang
Airline Operational Efficiency
Handbook of Airline Operation

Typical Airline SOCC Goals

- Ensure a safe, on-time and efficient operation

- Monitor weather conditions worldwide; issue weather alerts

- Implement Severe Weather Action Plan (SWAP) as necessary

- Monitor flight irregularities, implement recovery plans

- Quickly return the schedule to on-time after major disruptions

- Communicate effectively with all entities

- Make notifications to senior management and others in a timely manner

- Use Voice Mail System to broadcast routine operational updates

Irregular Operations – Causes

- **Weather/ATC/maintenance delays**

- **Diversions – weather/mechanical/medical**

- **Weight restrictions**

- **Planned/unplanned fuel stops**

- **Civil unrest/strikes**

- **Fuel shortages/facilities problems**

- **Capacity constraints/airport configurations**

SOC Recovery Considerations

- Number of customers inconvenienced

- Re-protection for the customers

- Special considerations – air/sea groups, sports groups

- Down-line impact on other customers

- Complexity of balancing aircraft rotations and crew routings

- Maintenance requirements (Line and/or Base)

- Market integrity (completion factor, on-time performance)

- ATC slot protection (LGA/ORD/DCA)

- Weather considerations – Severe Weather Action Plan
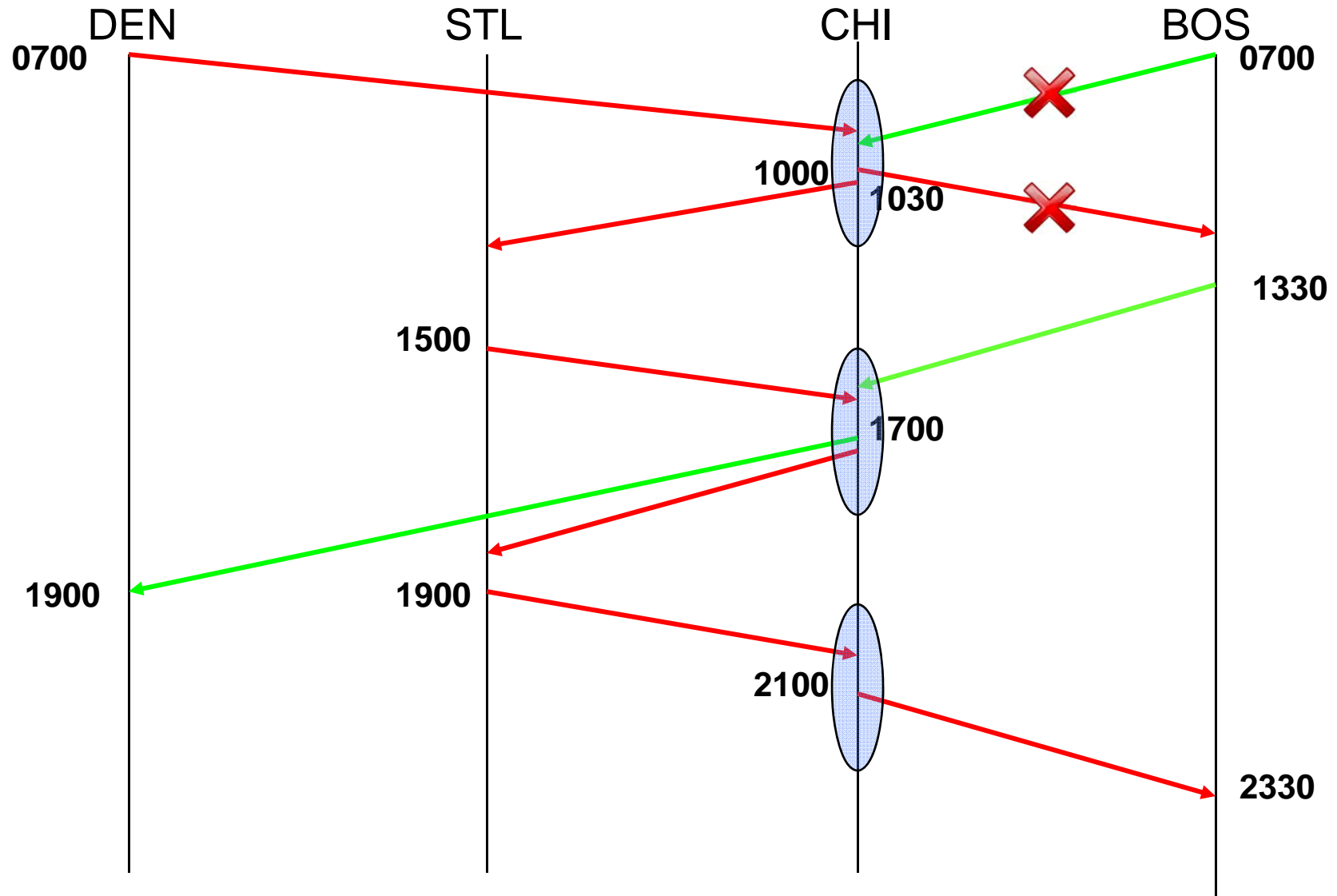
- Route profitability, all else being equal

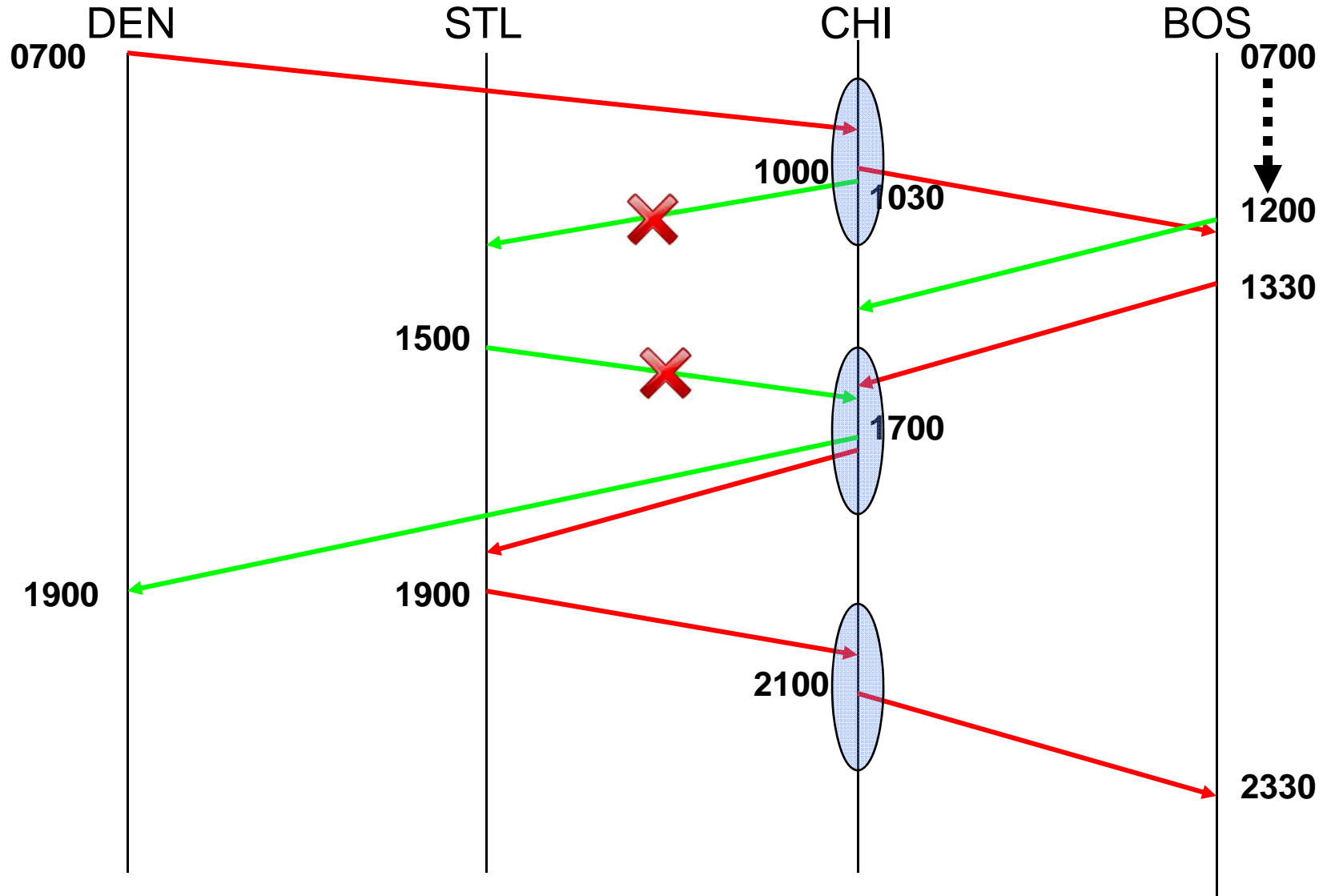# Example: Schedule Disruption
5-hour Snow Delay at BOS for 0700 Flight
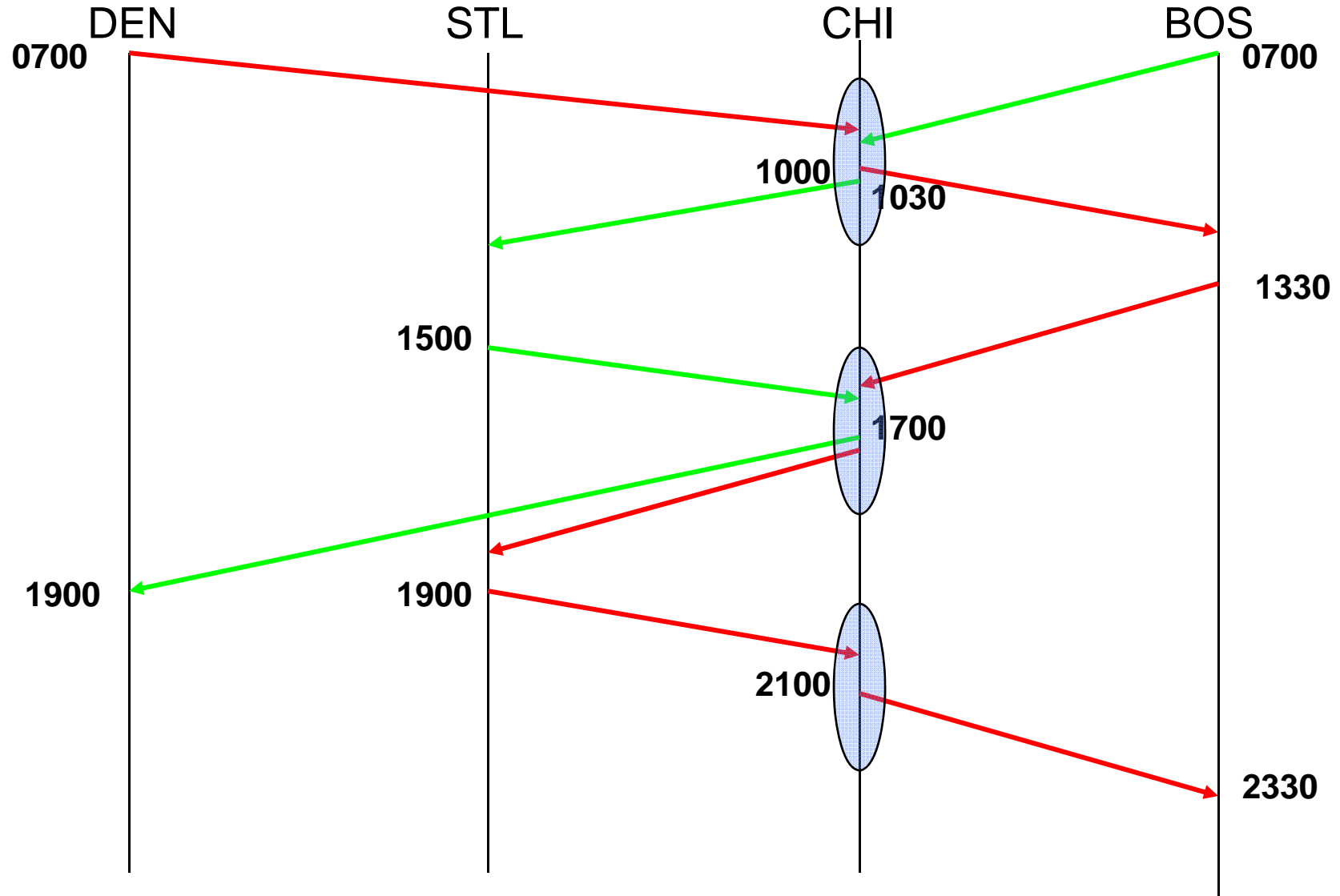
Option 1: Cancel 0700 BOS-CHI
CHI-BOS must be cancelled; aircraft re-routed

Option 2: Delay 0700 BOS-CHI to 1200
Cancel CHI-STL-CHI turn; aircraft rotations intact

Ground Operations (Station Control)

- **Overall objective is to ensure completion of schedule plan within company goals for on-time performance without compromising safety.**

- **Process passengers, baggage and cargo subject to numerous operational constraints:**
    - Limited number of gates, many with constraints on aircraft size
    - Airport flow limitations on taxiways and runways
    - Availability of airport and ground crew resources
    - Weather (both local and en route) as well as airport field conditions
    - Air traffic control (ATC) congestion and delays

Minimum Aircraft Turnaround Time

- **To achieve on-time performance, efficient turnaround of aircraft at stations is essential:**
  - "Minimum Objective Ground Time" (MOGT) sets a standard for minimum time necessary to prepare an arriving aircraft for departure on its next flight.
  - Determined with time studies by industrial engineers, and specified for each aircraft type, perhaps differently by airport.
  - Planned schedules typically exceed MOGT at least periodically to allow for additional buffer in case of unexpected delays, to preserve acceptable average on-time performance.

Aircraft Arrival Activities

- **"Above The Wings"**
  - Pre-position the jet bridge 5 minutes before planned arrival time
  - Open door and deplane passengers
  - Cabin interior cleaning

- **"Below The Wings"**
  - Ensure aircraft ramp is clear of equipment
  - Stage required ground equipment (baggage carts given aircraft load)
  - Direct aircraft to gate
  - Chock wheels
  - Position baggage conveyors and carts
  - Unload bags or containers from aircraft holds
  - Service aircraft lavatories
  - Replenish potable water

Aircraft Departure Activities

- ## "Above The Wings"

  - Check in passengers and perform required security screening
  - Cater aircraft with food and beverages
  - Process upgrade and standby requests; board passengers
  - Perform flight close-out – updates passenger records and loads

- ## "Below The Wings"

  - Load baggage or containers
  - Perform "walk-around" (visual check of entire aircraft)
  - Update load plans given final passenger count and cargo volume
  - Pushback and start aircraft engines
  - Stage ground equipment for next arrival

On Gate Departure Preparation
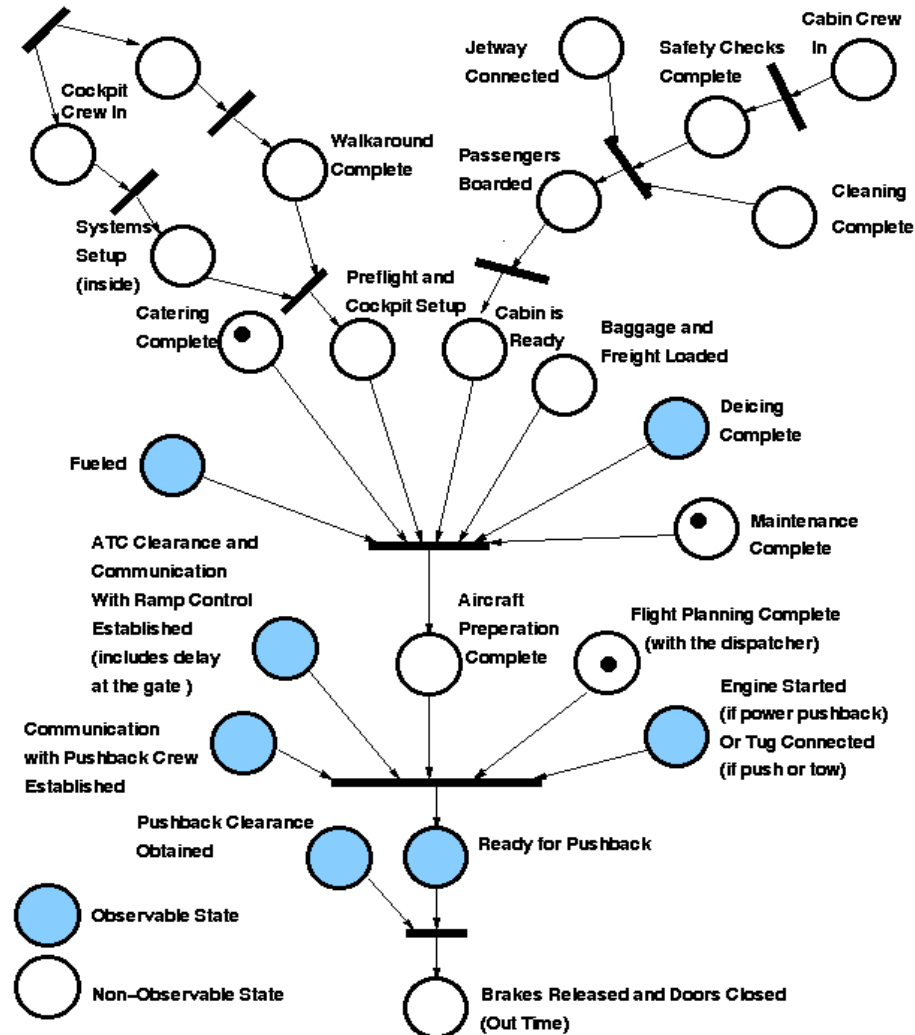
Petri Net Analysis

Source: Prof. John Hansman

# *Station Control Challenges at Hubs*

- **Ensuring that passengers and baggage make connecting flights.**

- **Decisions to hold or release flights without connecting passengers and/or bags depend on:**
  - Number of flights from hub to destination
  - Seats available on subsequent flights to destination
  - Aircraft schedule/routing for remainder of the day
  - Local hotel availability and costs for misconnects

- **Some airlines now use optimization tools to make hub operational decisions.**

Operational Variability and Flight Delays
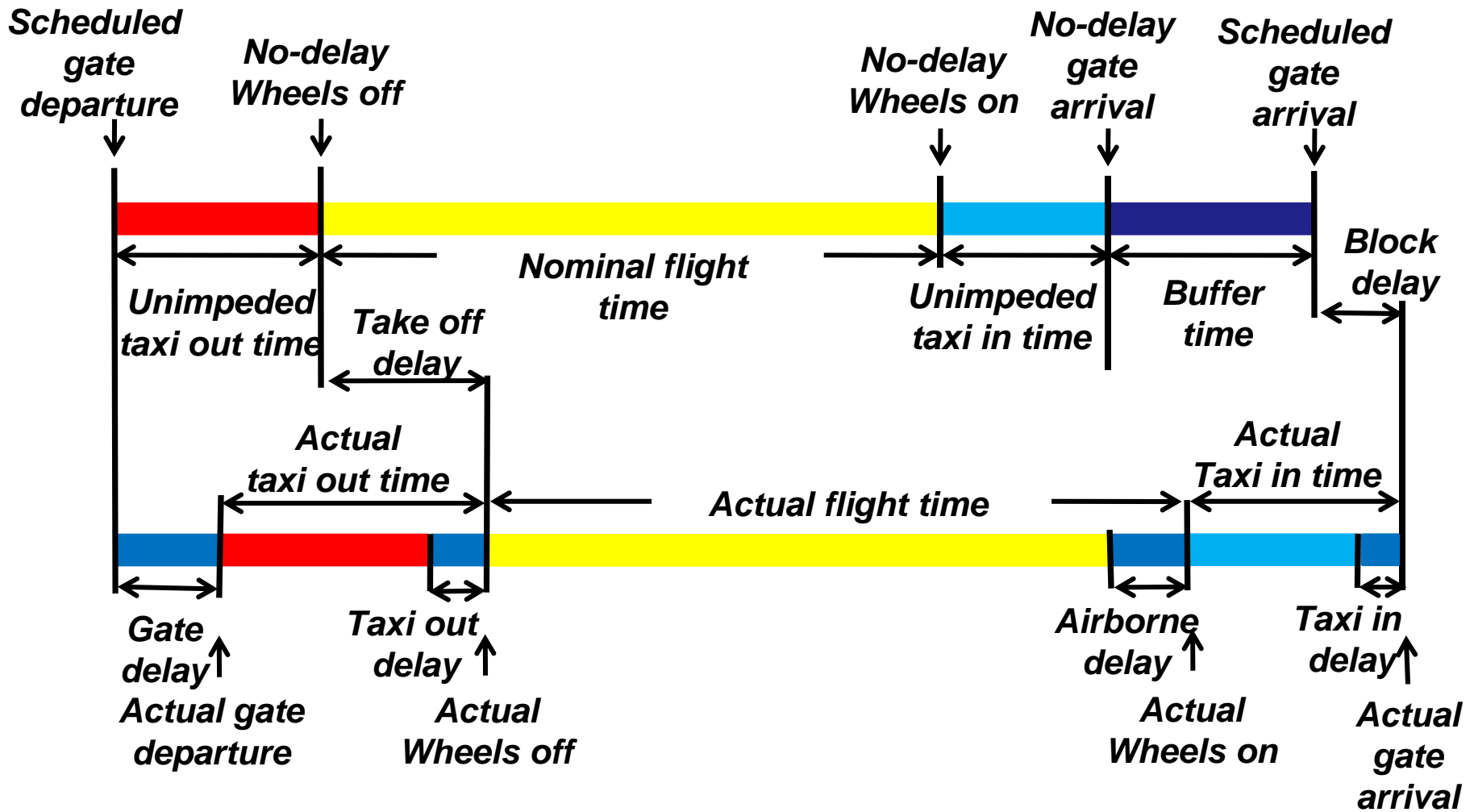
Source: Gerasimos Skaltsas

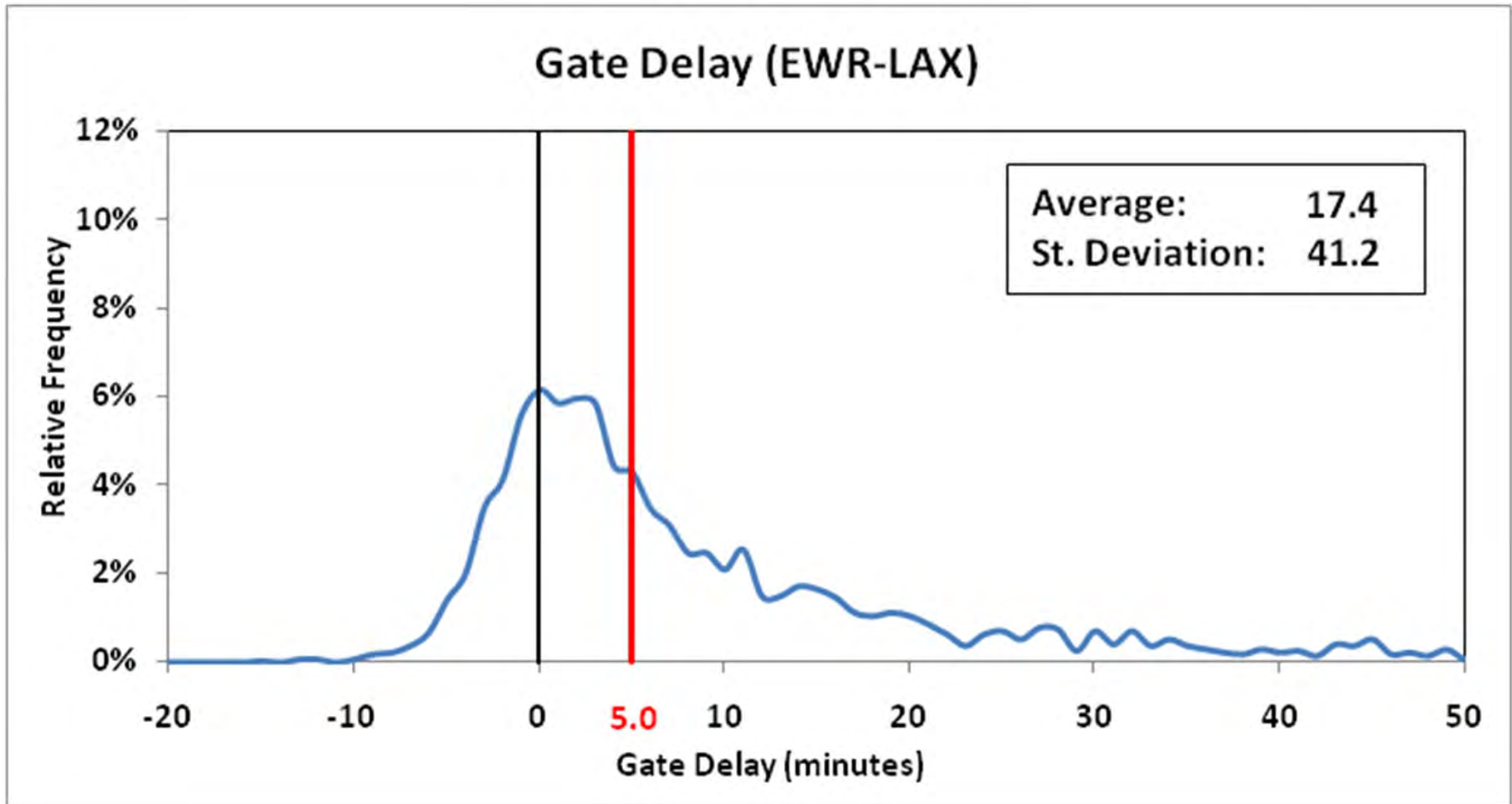# Example: Planned vs. Actual Flight Times
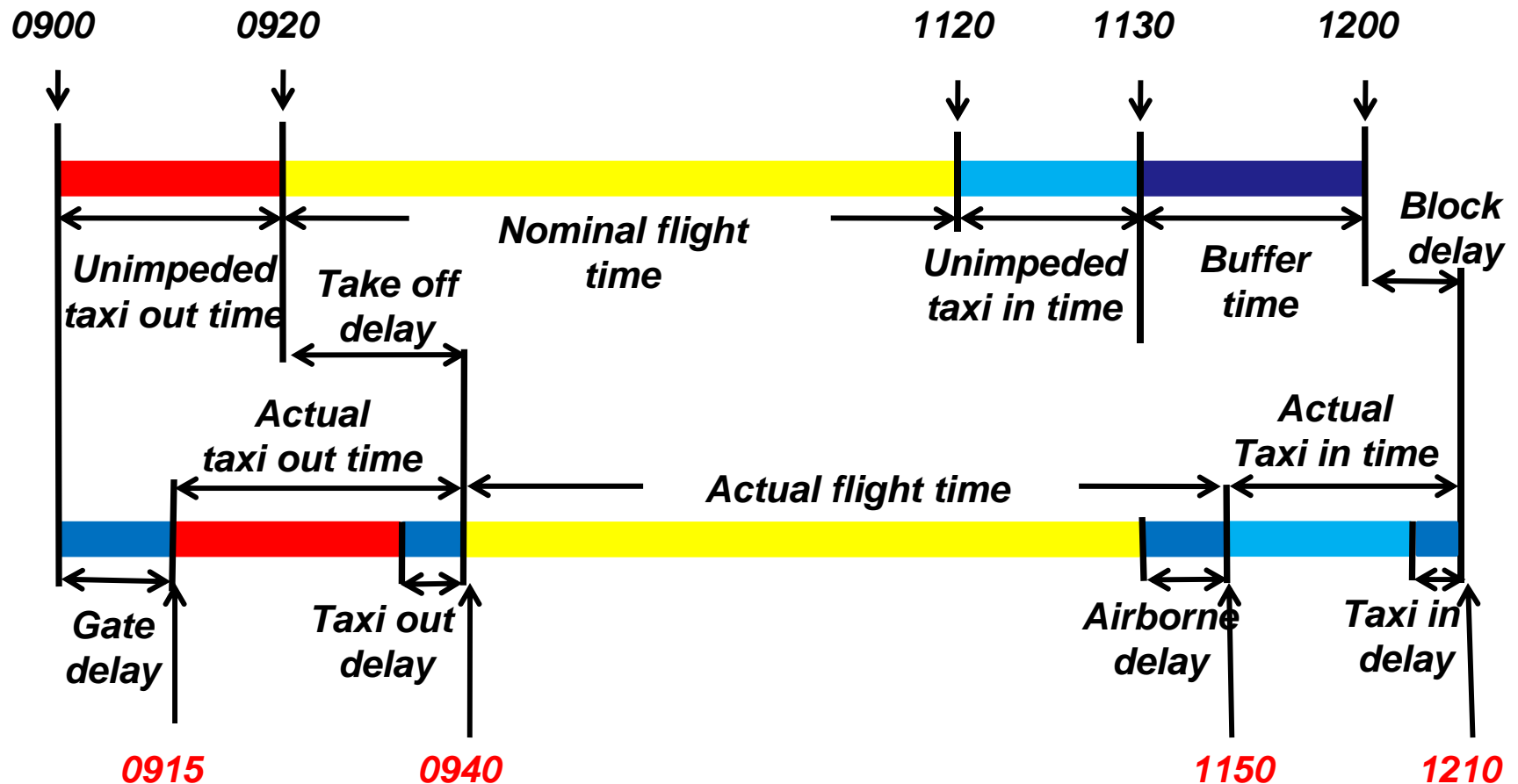
Source: Gerasimos Skaltsas

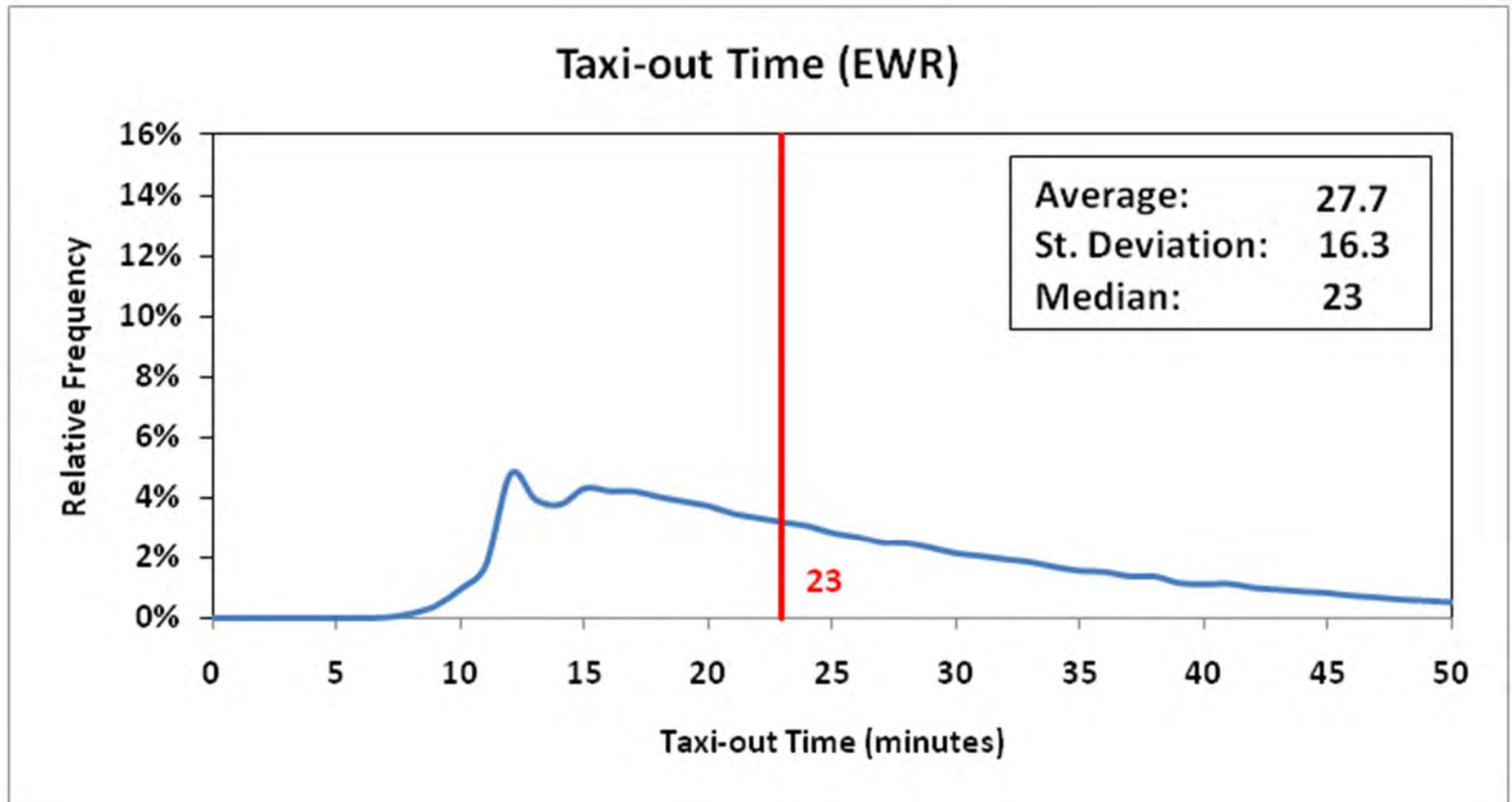# *Where and Why Delays Can Occur*

- **At the gate**
  - Unavailable aircraft
  - Unavailable crew

- **Taxi out**
  - Weather
  - Congestion
  - Ground delay program or ground hold

- **Airborne time**
  - Congestion
  - Weather

- **Taxi in**
  - Congestion
  - Weather
  - Gate blockage

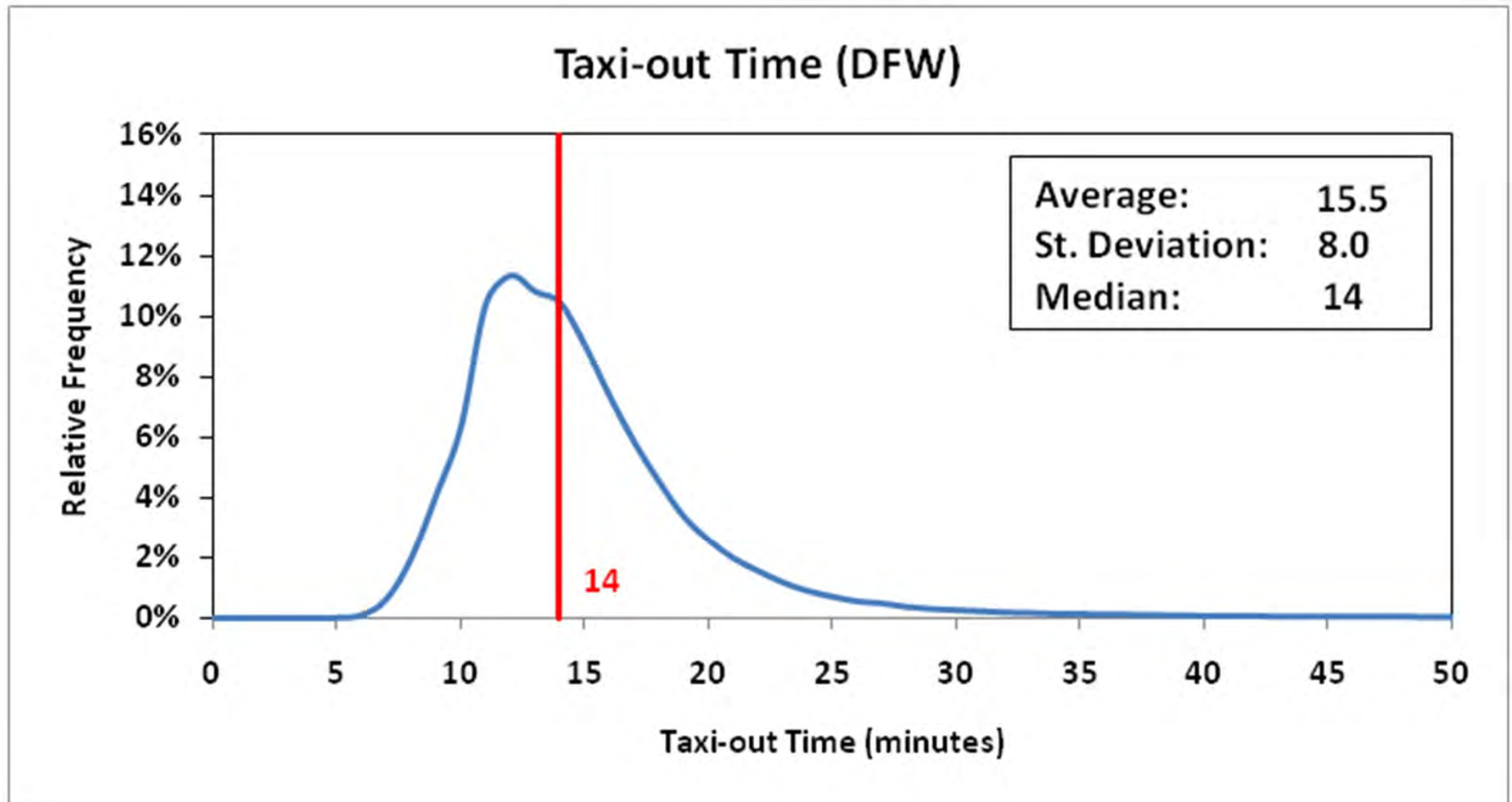# GATE DELAY = Actual Gate Departure – Scheduled Gate Departure

Source: Gerasimos Skaltsas
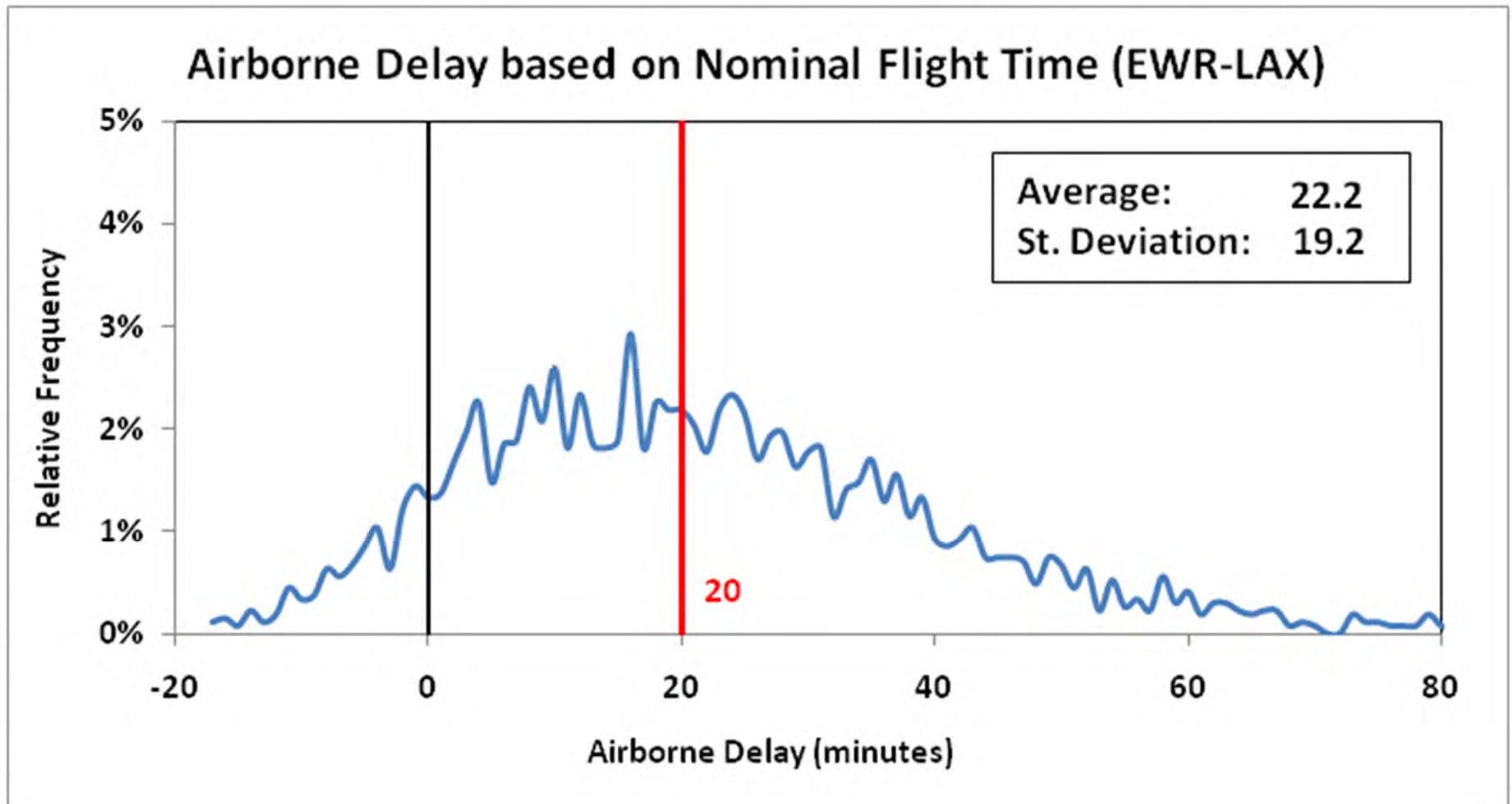
Taxi Out Time Distribution EWR

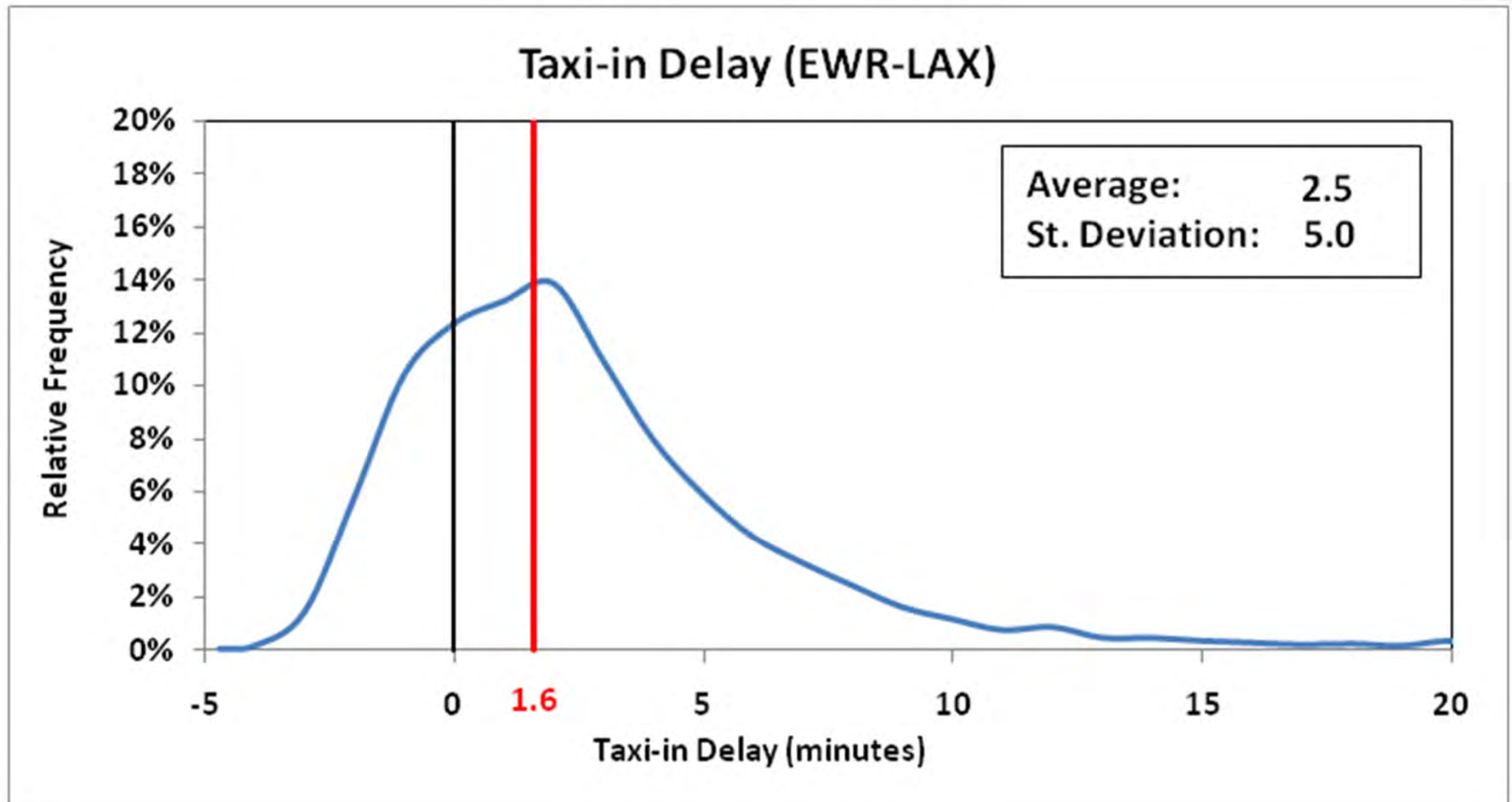Source: Gerasimos Skaltsas

Taxi Out Time Distribution DFW

Source: Gerasimos Skaltsas

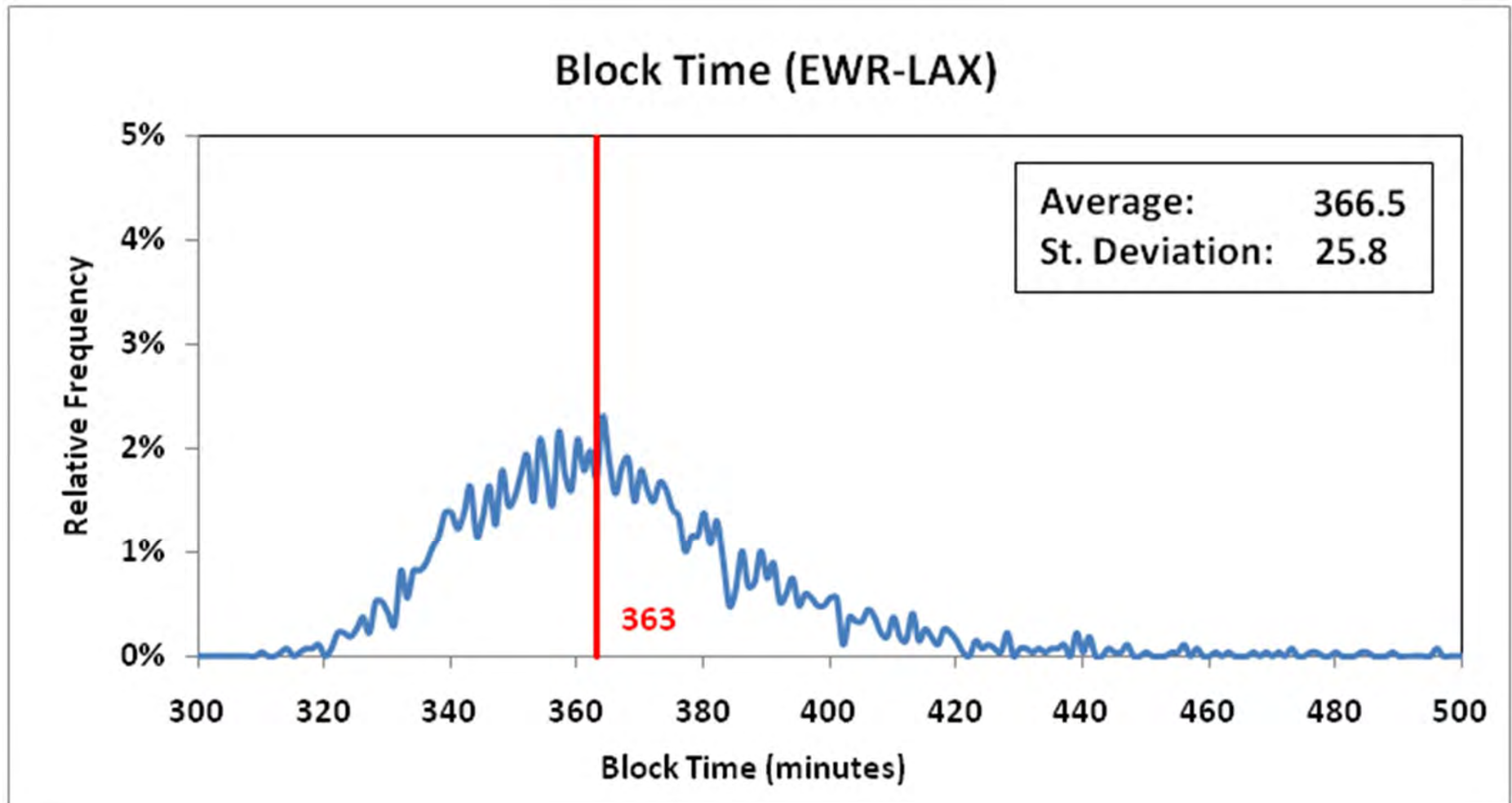# AIRBORNE DELAY = Actual Flight Time – Nominal Flight Time

Source: Gerasimos Skaltsas

TAXI IN DELAY = Actual Taxi-In Time – Nominal Taxi-In Time (Airport, Carrier)

Taxi-in Delay (EWR-LAX)

Average: 2.5
St. Deviation: 5.0

Source: Gerasimos Skaltsas
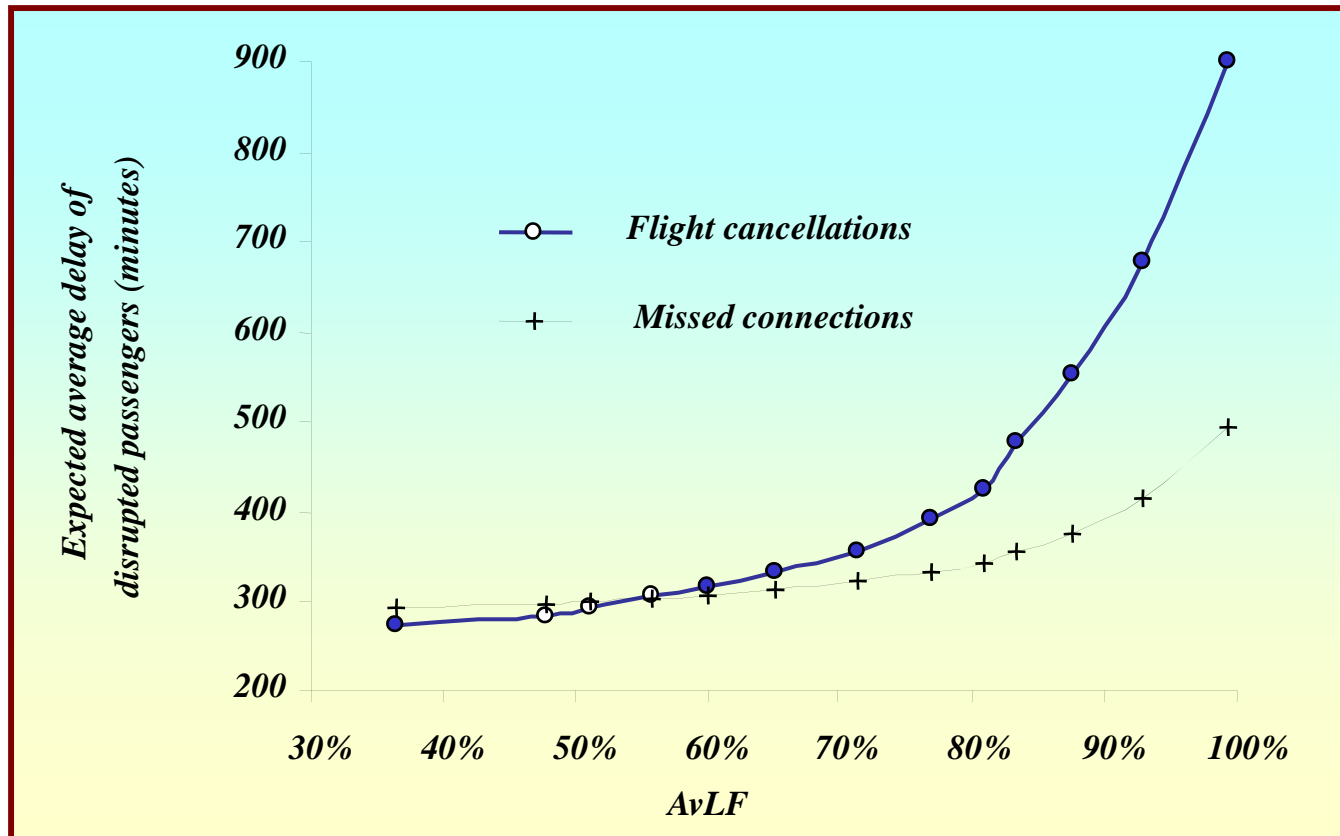
Variability in Actual Block Times

Source: Gerasimos Skaltsas

% of Flights with Arrival Delay > 15 minutes
(US Domestic Flights December 2012–November 2013)

Source: US Bureau of Transportation Statistics

Impacts on Passengers: Missed Connections and Re-accommodation

Passengers, disrupted because of a flight cancellation, become increasingly more difficult to re-accommodate as load factors increase

Source: Prof. Cynthia Barnhart