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Airline Responses to NAS Capacity Constraints

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National Airspace System Resource Allocation: Economics and Equity

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Objectives

- Quantify the magnitude of the demand-capacity shortfall
- Assess the effectiveness and feasibility of possible solutions
- Estimate the true industry economic losses at stake if we fail to increase airport capacity

Analysis Approach

- Compare baseline travel demand forecast to one that directly includes airport capacity constraints
  - Quantify the "performance gap" between the constrained and unconstrained forecasts
- Focus on system performance on good weather days at the top 64 airports
- Assess the impacts of alternative policies on delay, throughput, costs, and fares

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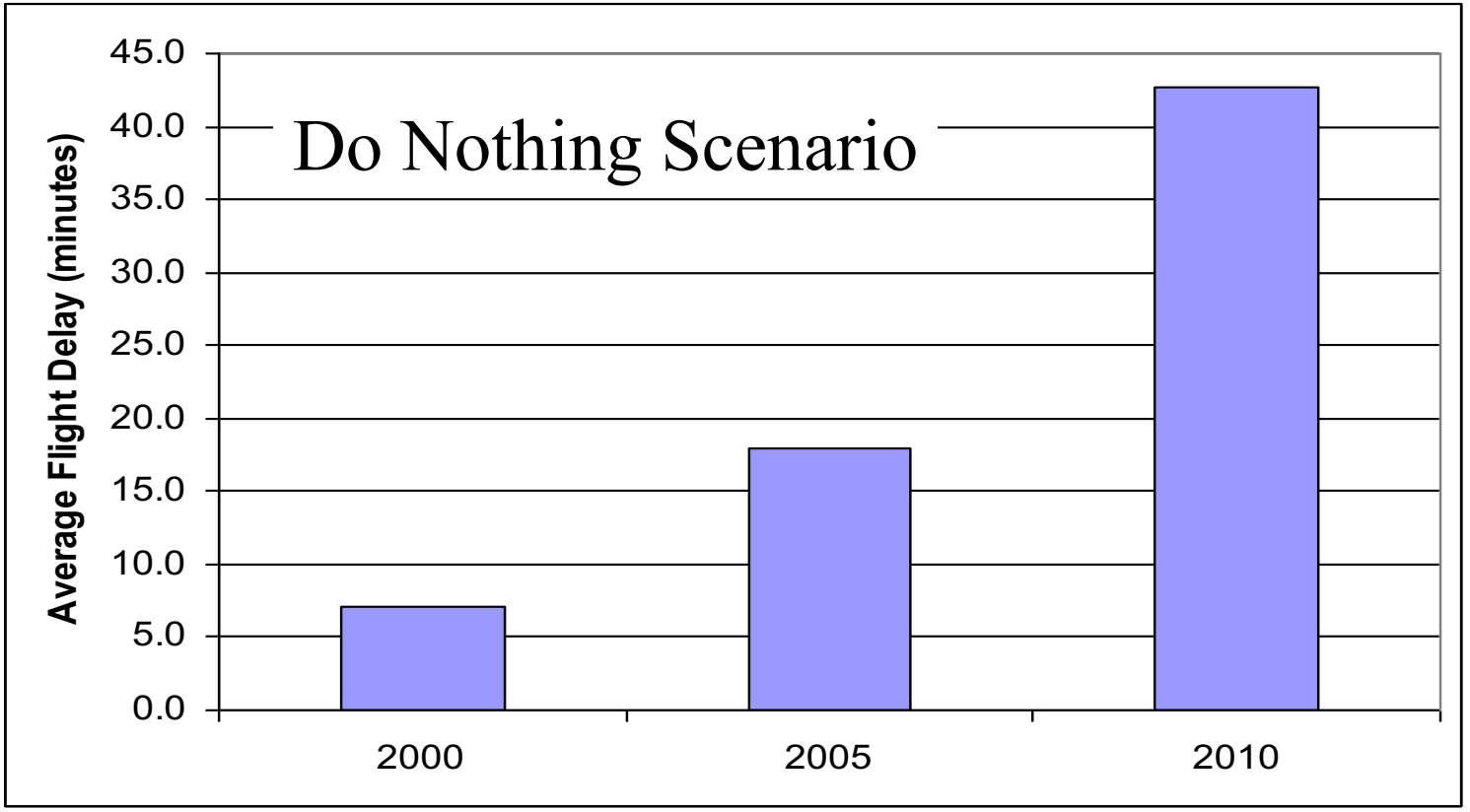
Problem: Future Demand Exceeds Capacity



Average airport delay per flight at the top 64 airports. Estimates do not include downstream delay effects.

Possible Responses

- Reduce or Reallocate Demand
  - Higher fares
  - Schedule smoothing
  - More direct (point-to-point) service
  - Night-time operations
  - New hub airports
  - Slot-limit airports (by lottery, mandate, etc.)
- Increase Capacity
  - Build more runways
  - Use larger aircraft
  - Introduce new ATM technologies

Who Can Affect What

Airlines

- Higher fares
- Schedule smoothing
- More direct (point-to-point) service
- Night-time operations
- New hub airports
- Use larger aircraft
- Introduce new ATM technologies

Airports / Gov't.

- Schedule smoothing
- More direct (point-to-point) service
- Night-time operations
- New hub airports
- Slot-limit airports (by lottery, mandate, etc.)
- Build more runways
- Use larger aircraft
- Introduce new ATM technologies

NASA/FAA

- Develop and implement new ATM technologies

Analysis Requirements

- Require a model of NAS operations that estimates delay and throughput under different capacity and demand scenarios
- Require an economic model of the airlines
  - Airline cost model
  - Air travel demand model to capture changes in demand in response to fare changes
- Connect the two models

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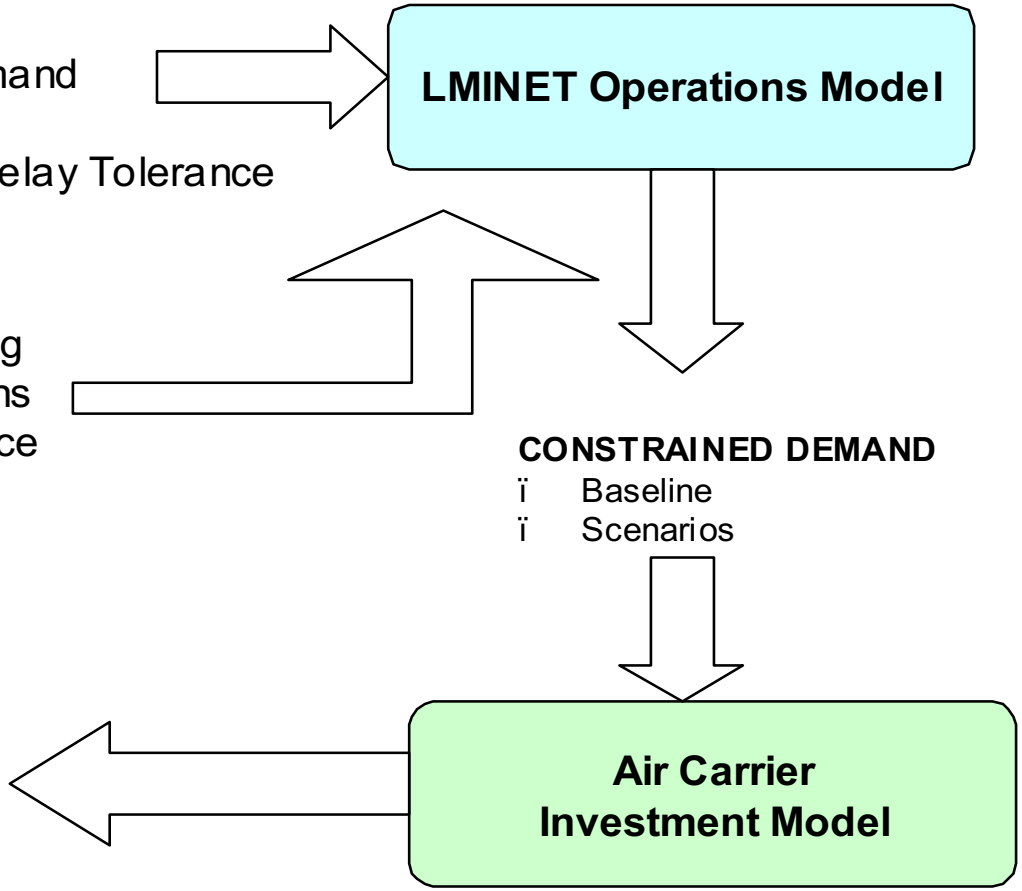
Analysis Overview

INPUTS
- Unconstrained Demand
- Airport Capacity
- Observed Airport Delay Tolerance Level

SCENARIO
- Schedule Smoothing
- Nighttime Operations
- Point to Point Service
- Larger Aircraft
- New Hubs
- New Technology

OUTPUTS
- RPMs
- Fares
- Costs
- Aircraft Fleet
- Employment



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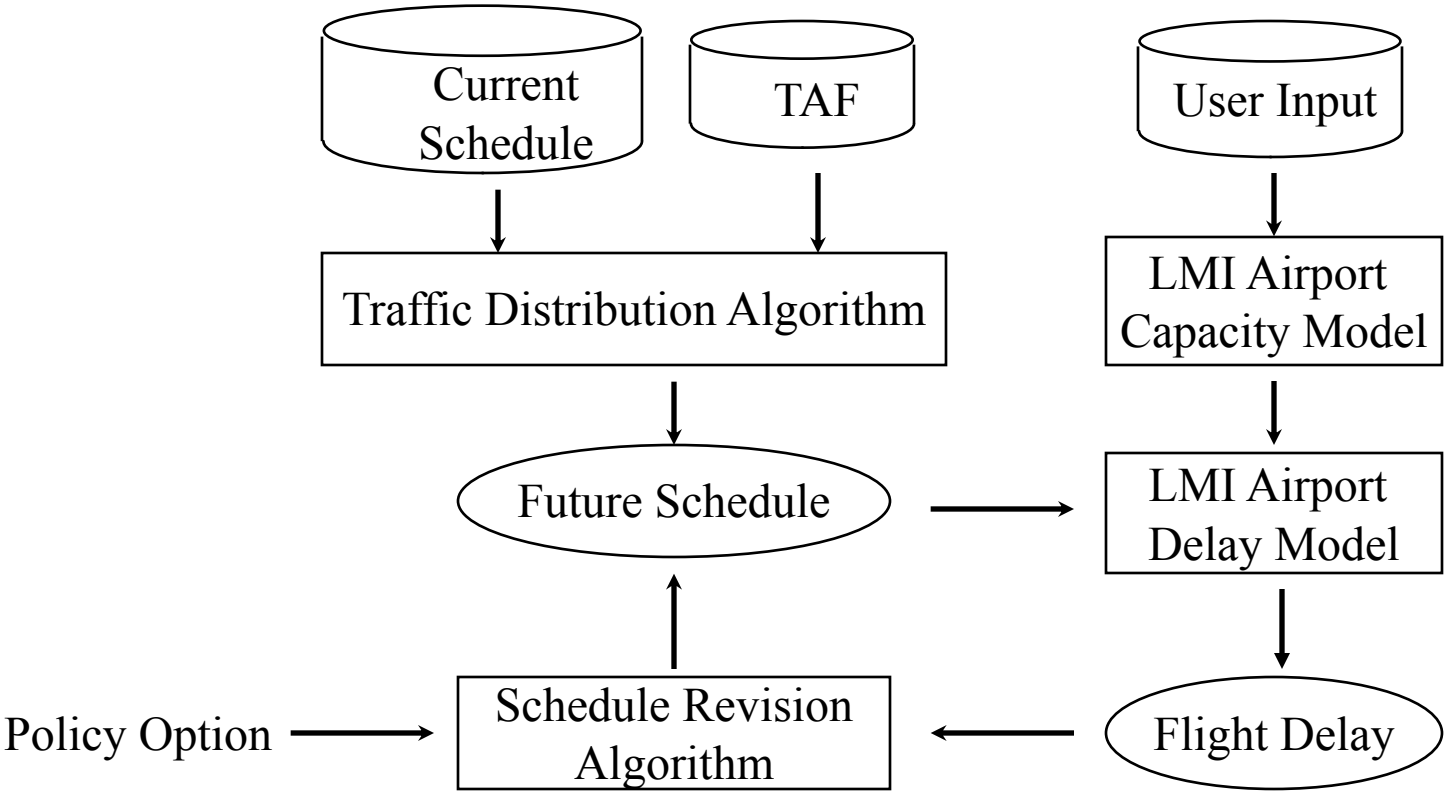
Modeling the National Airspace System With the LMINET Operations Model



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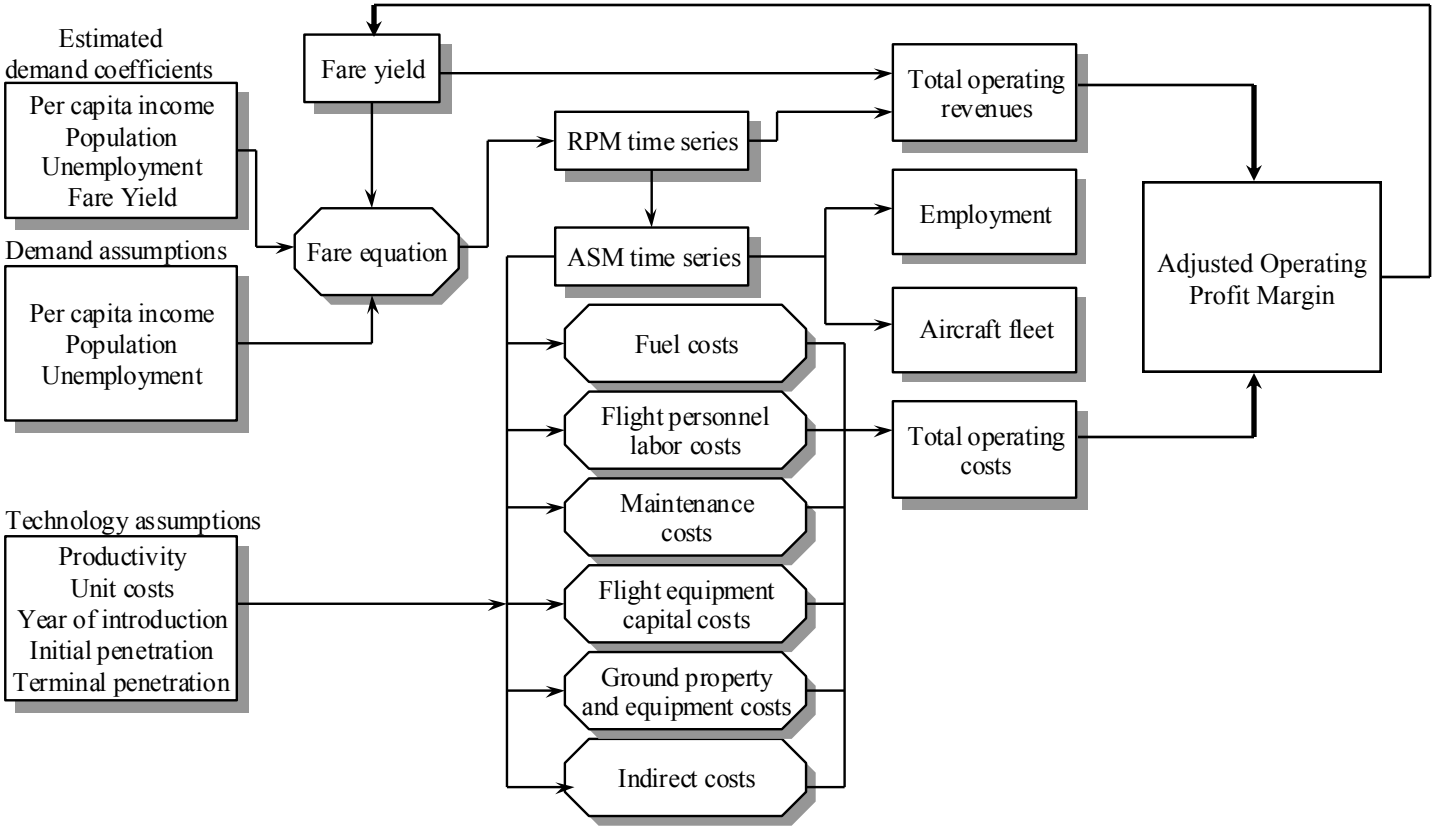
Air Carrier Investment Model- Integrating Demand With Airline Costs



Forecasts With Flight Delay Constraints

- Define limits on acceptable flight delays (increases in schedule time)
- When an airport reaches that limit, no more flights will be allowed during that hour
- Delay maximum will be set for each airport based on current operations or a system-wide average
- Estimate system throughput under the different policies
- Estimate change in fare yields to match the lower throughput

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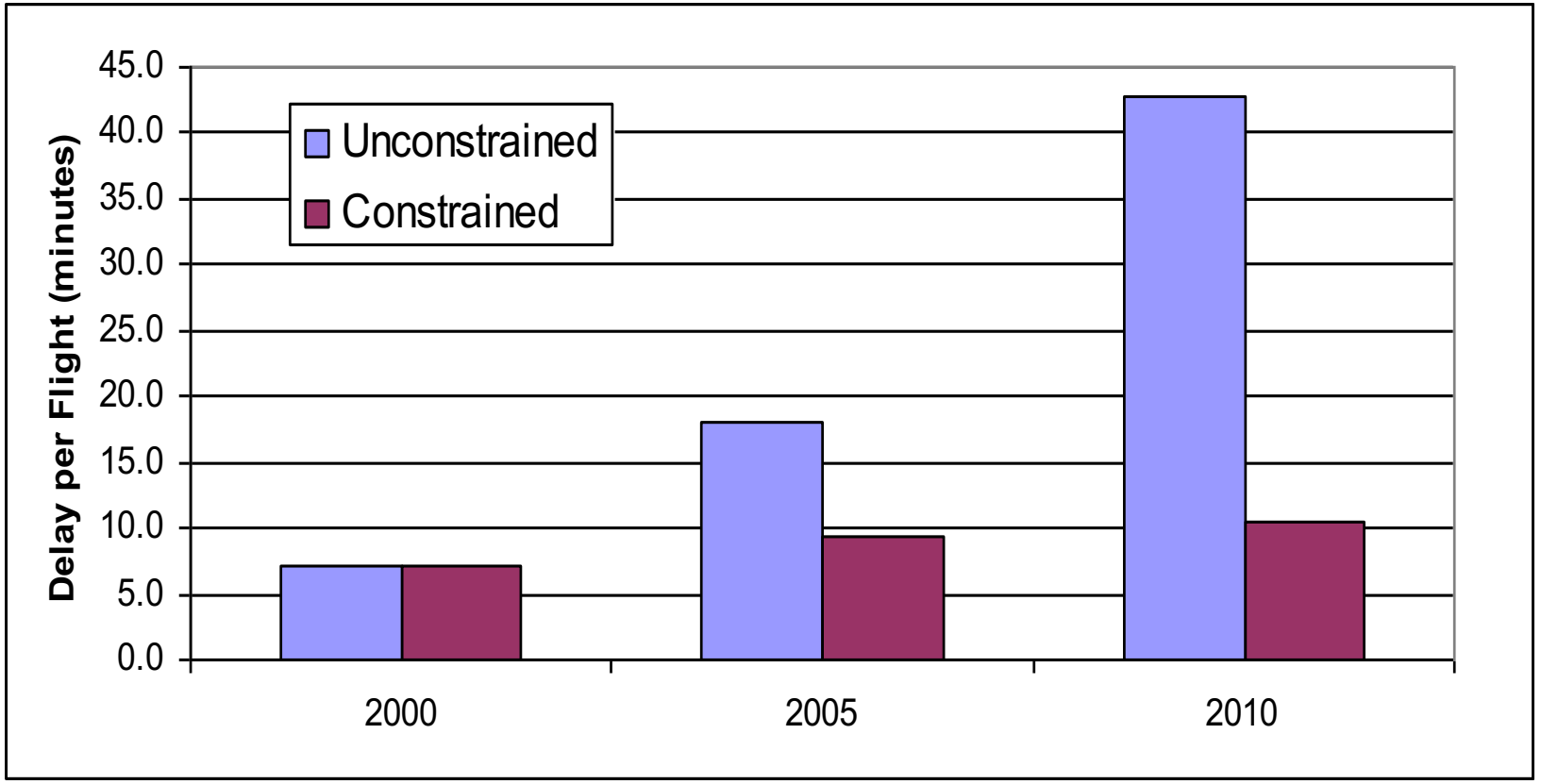
Average Delay for Constrained and Unconstrained Forecasts



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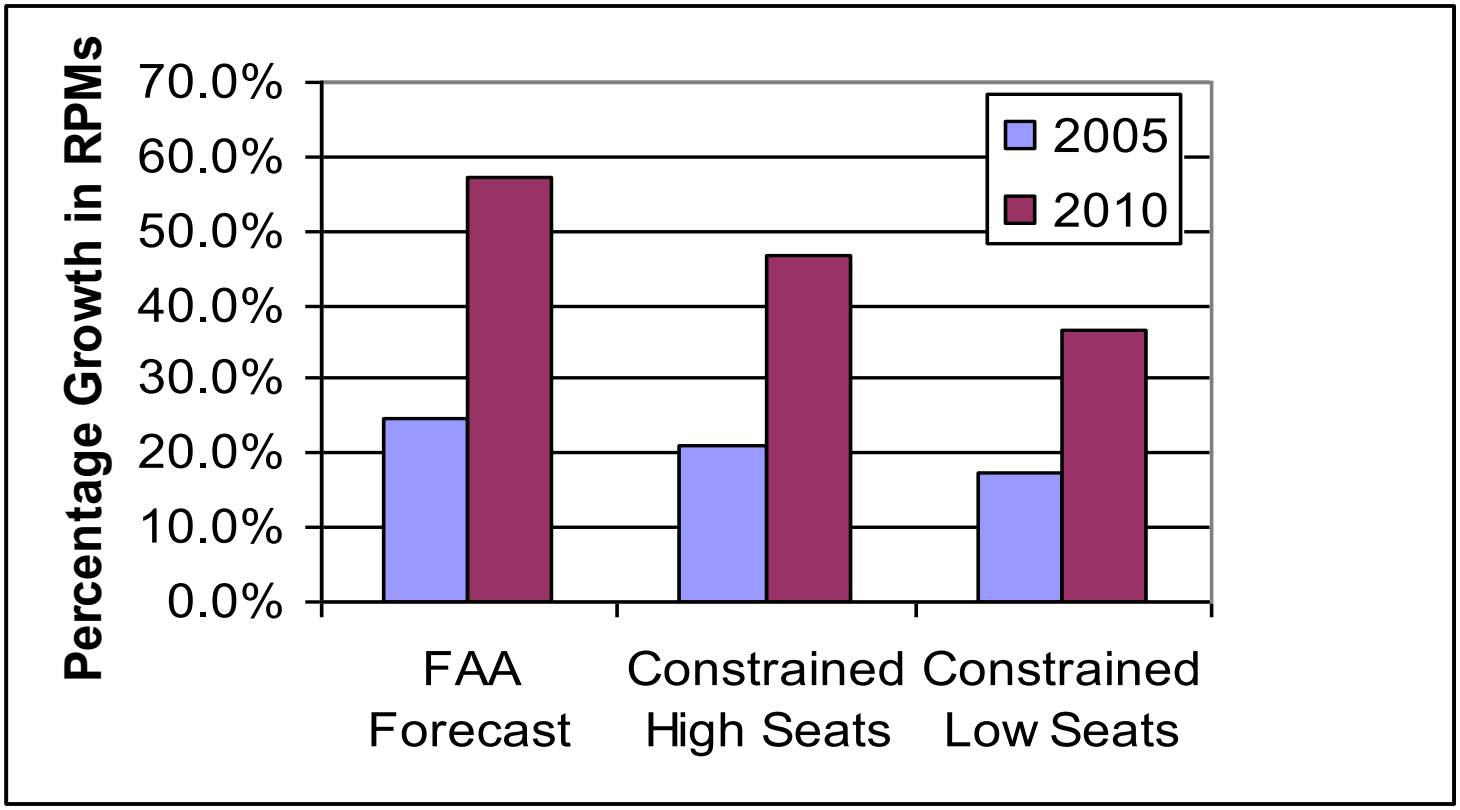
Congestion Reduces Growth From the FAA Forecast



Operational Concepts under Capacity Constraints

- Accommodate growth by increasing fares and rationing demand in the face of scarce capacity
- Smooth out the schedules
- Establish new hub airports to mitigate congestion at existing hubs
- Increase direct service to avoid congested hubs
- Increase nighttime operations
- Use larger aircraft

Schedule Smoothing

- Re-direct excessive demand to ‘less desirable’ time (smooth out the peaks and valleys associated with bank operations)
- Assumes airlines attempt to maintain their schedules as much as possible on a per-airport basis
  - Maintain current hub structure and fleets
- Flights were moved a maximum of one hour from their originally scheduled time
- Effectiveness depends upon airport’s existing demand pattern

Nighttime Operations

- We assume that airlines will only offer nighttime flights that cover their direct operating costs
- There is disutility to travelers from flying at night
- Effectiveness depends upon
  - No curfew or nighttime noise restrictions
  - Routes feasibility
  - Passenger willingness, price elasticity

Direct Service

- Redistributes demand spatially, not temporally
- Effectiveness depends upon
  - Market opportunity for point-to-point flights in non-hub airports

Larger Aircraft

- Airlines phase in larger aircraft to compensate for slot shortages
- Desirable from airports' perspective (e.g., SFO)
- Not necessarily desirable from airlines' perspective because freed slots will be used by existing and emerging competitors
- TAF projections include small increase in average seat size; this scenario increases growth 1% beyond that

New Hubs

- Preserves current hub-and-spoke strategy
- Select candidate airports based on current status and potential for additional transfer traffic
- No additional infrastructure investments assumed

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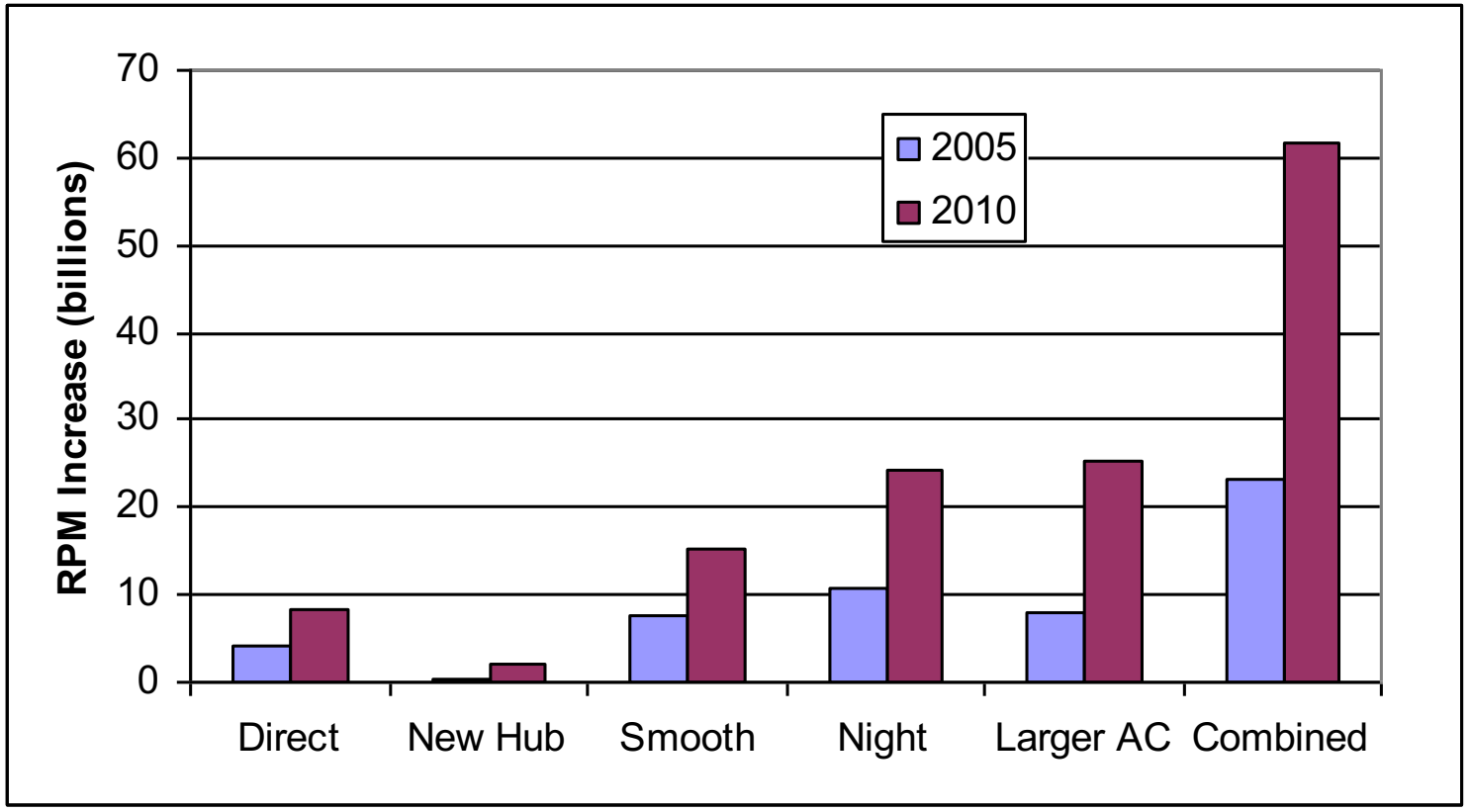
Increase in RPMs Over Constrained Forecast



FAA assumptions for growth in seats per departure.

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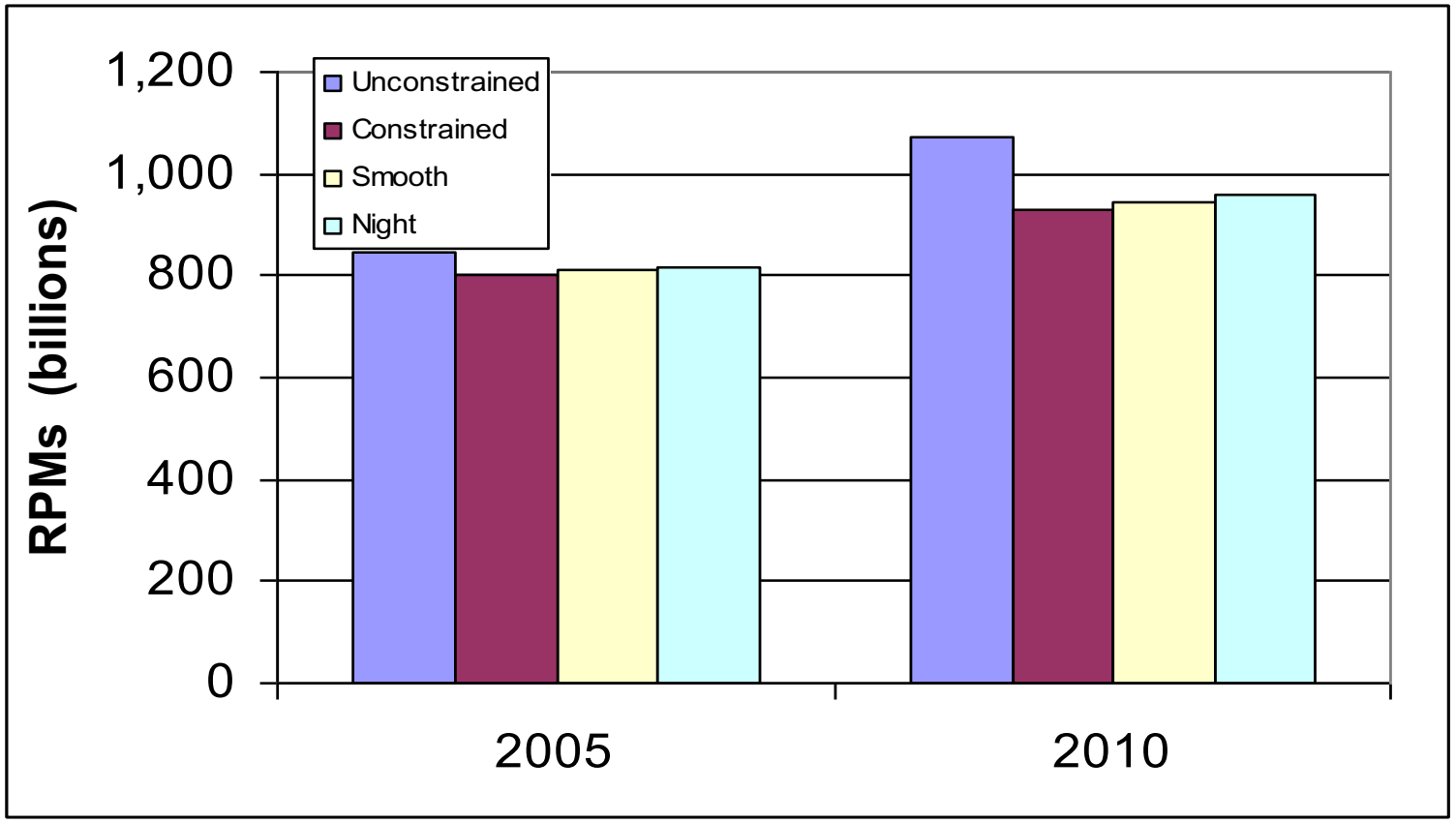
RPM Forecast With Schedule Changes



No growth in aircraft seats per departure

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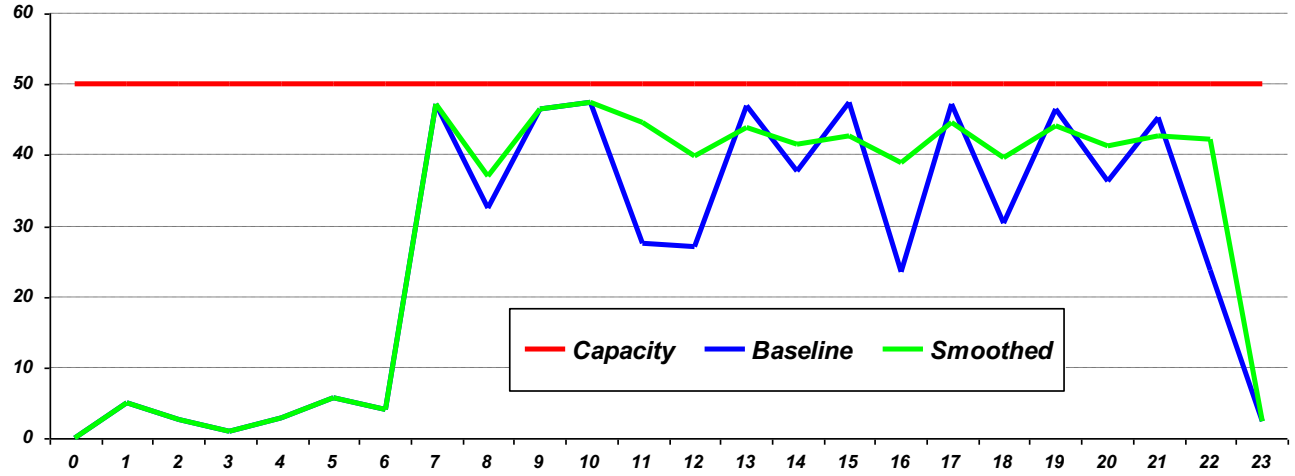
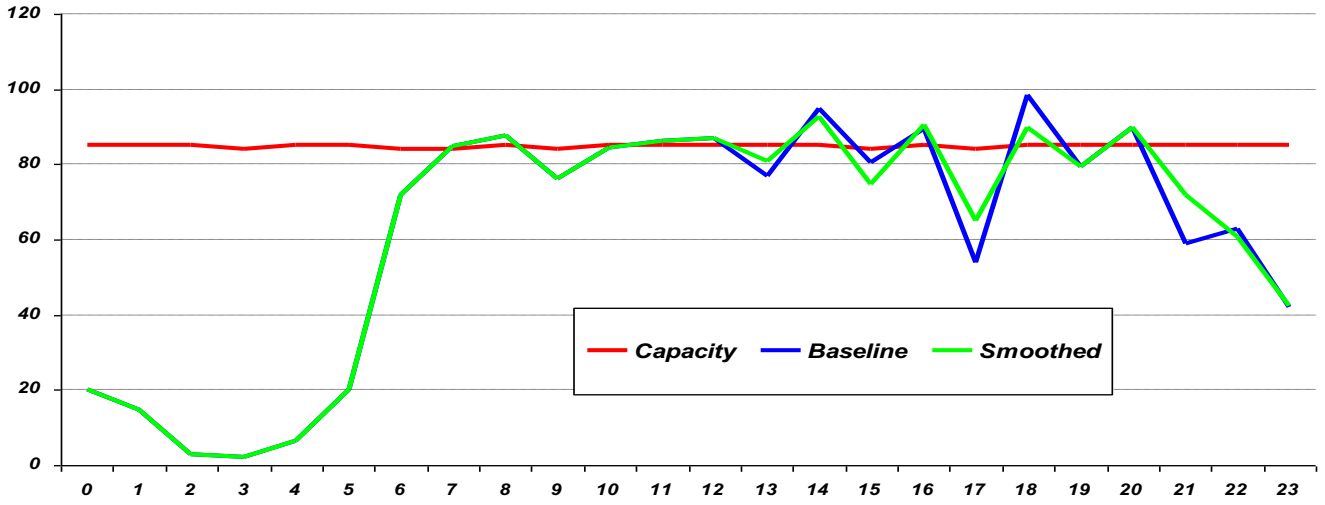
Schedule Smoothing Effectiveness

Effective
At SLC



Ineffective
At EWR



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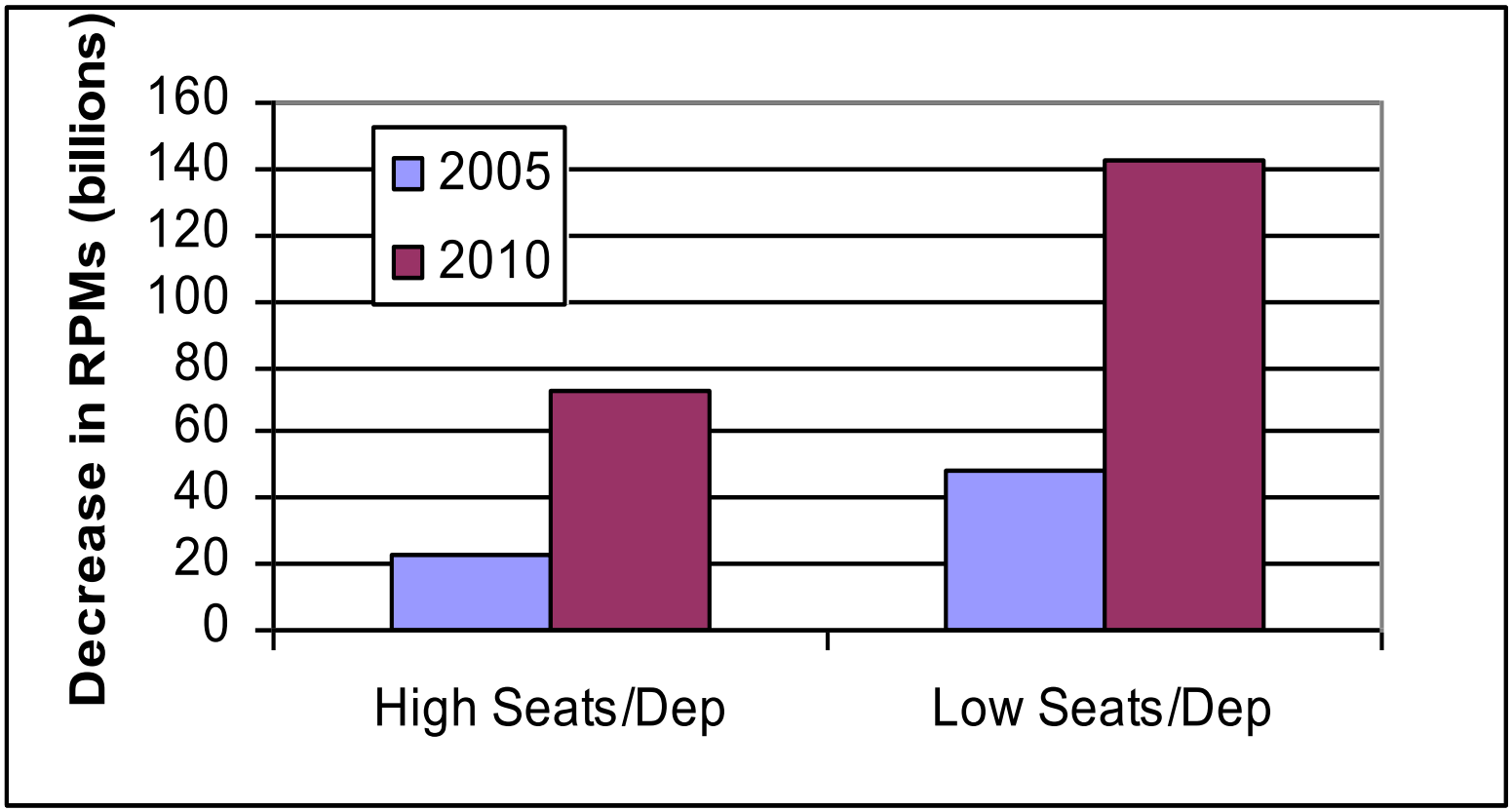
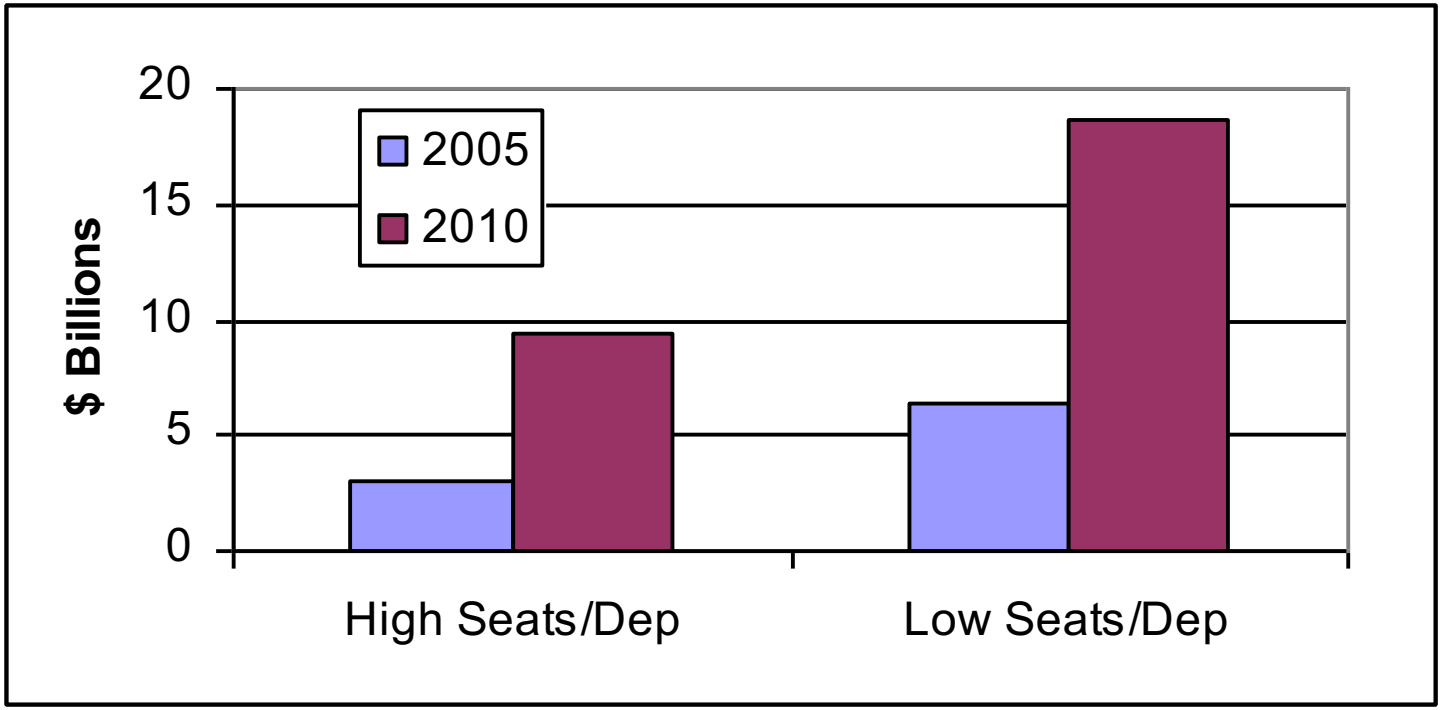
Lost Industry Output



Value of Lost RPMs

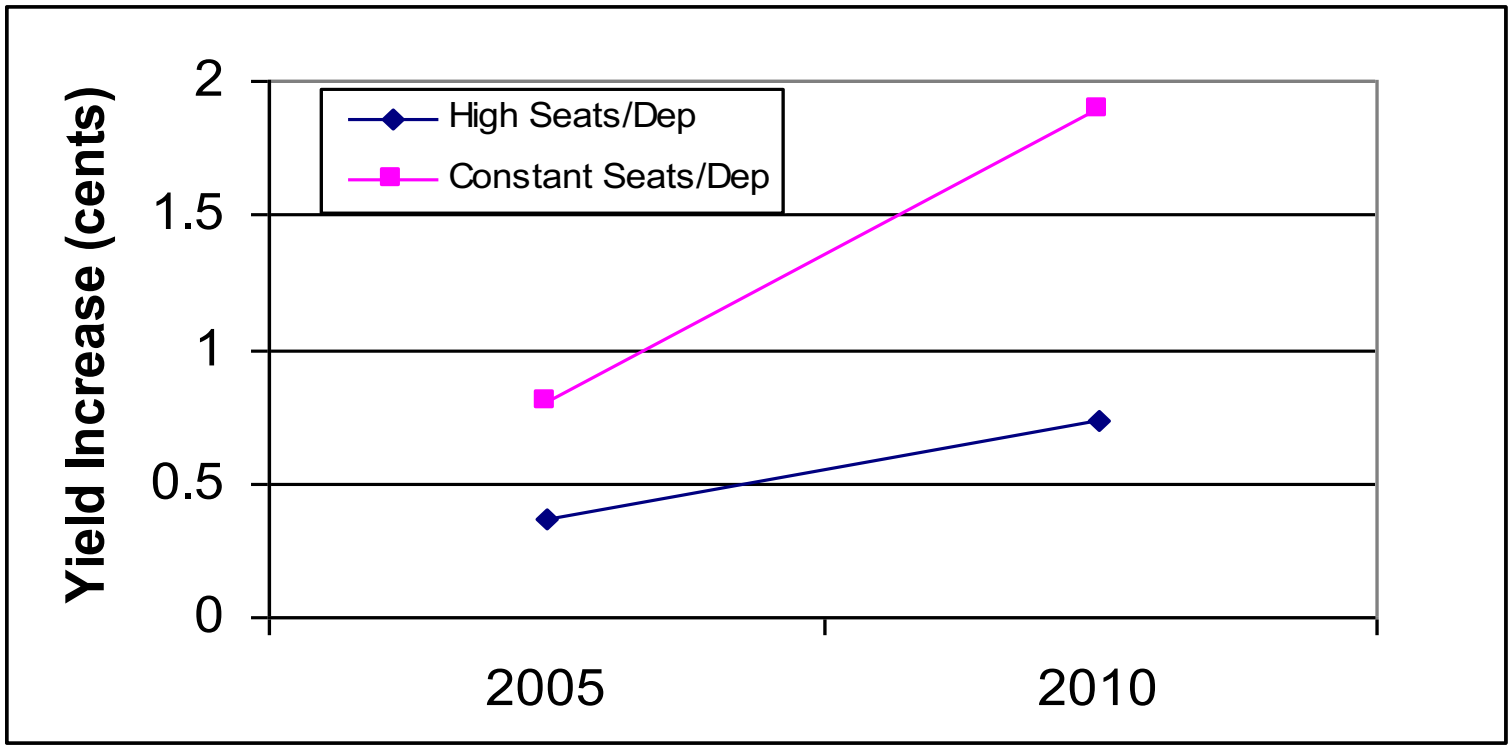


Does not include the cost of decreased utilization from increased schedule time.

Comments

- Benefits of the policies examined are limited
  - Results are conservative since they do not include the costs of the strategies
- Flight delays continue to increase under all of the policies
  - Rise to 10-11 minutes per flight in 2010
- Can any of these strategies be implemented?
  - Passenger acceptance
  - Airline operations impacts

Congestion Impact on Fare Yields



Compared to Unconstrained Forecast

Additional Economic Impacts

- Airline operating costs will rise significantly
  - But fares will increase even faster
- Airlines will not need to buy as many new aircraft
  - By 2010, US airlines will require about 600 fewer aircraft
- Airlines will not need as many new employees
  - 84,000 fewer workers in 2010

Conclusions

- Current capacity enhancement plans are inadequate
- Airline strategies make limited impact but have significant issues and obstacles to implementation
- Airline strategies do not keep air transportation on an active growth path
- Aggressive technology development required to enable growth

Knowledge That We Need

- Estimates of how much of the capacity shortfall is attributable to:
  - Misallocated resources such as runway slots
  - Systemic shortage of infrastructure
- Better understanding of what an air transportation system that can accommodate 2X growth would look like
- New look at how air transportation investments are financed
  - Who pays for what part?
  - Balance among concrete, technology, aircraft operations