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ATM Performance Metrics

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Technology Assessment

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Overview

- We use performance metrics for various reasons
  - evaluate investment decisions
  - measure operational effectiveness
- LMI work focuses on the first category - analyzing investment alternatives
- Relevant measures may differ for users and service providers
  - airlines (financial, efficiency, on-time performance)
  - FAA (capacity, throughput, delay)

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Desired Metric Characteristics

- Measurable
- Time and cost to measure
- Relevance to users and the ATM service provider
- Availability of baseline data

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ATM Service Metrics

- Airport and sector capacity
  - per period of time under different weather conditions and procedures
- Aircraft delay
  - versus nominal times (e.g., for taxi times) or through queuing methods
- Cost of delay
  - per minute by aircraft type
  - by phase of flight (gate, taxi, depart, arrival, cruise)

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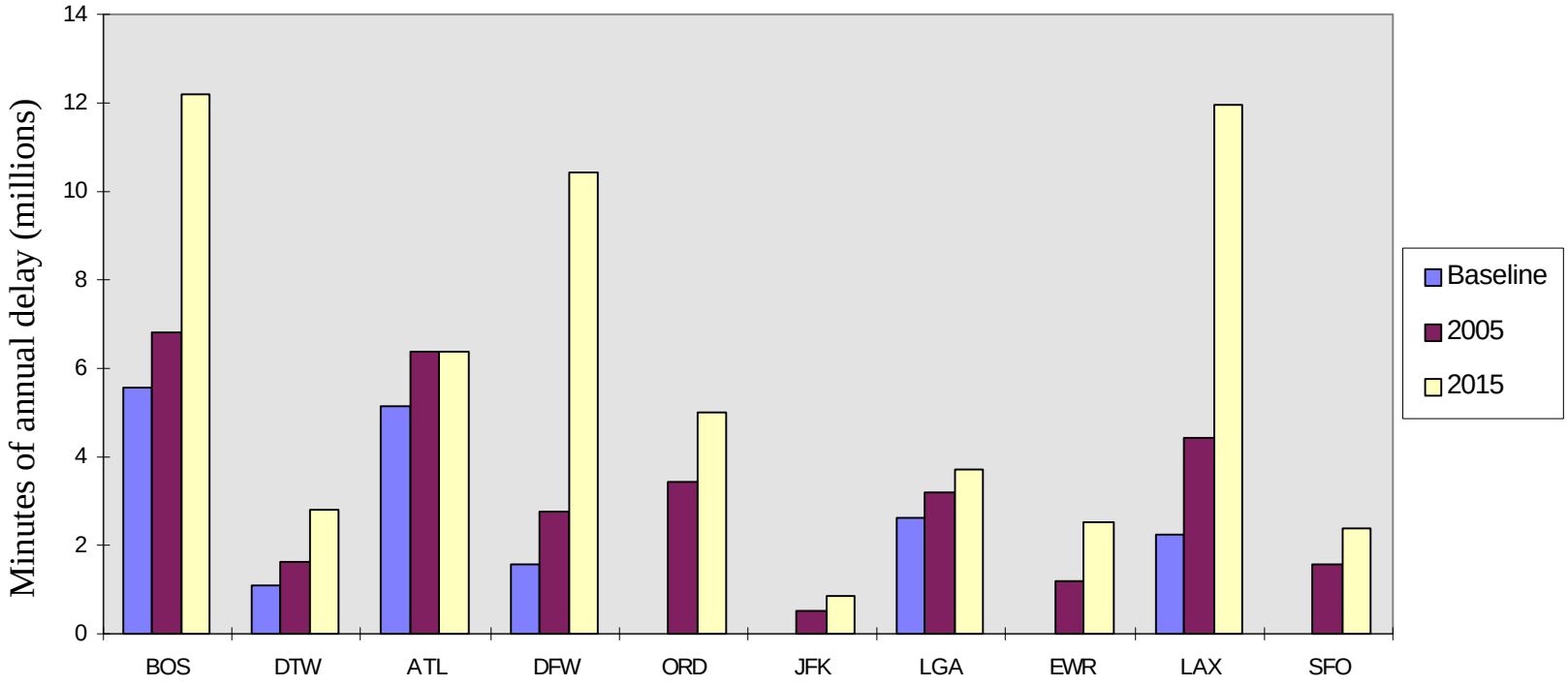
Airport Delays
Do Nothing Scenario



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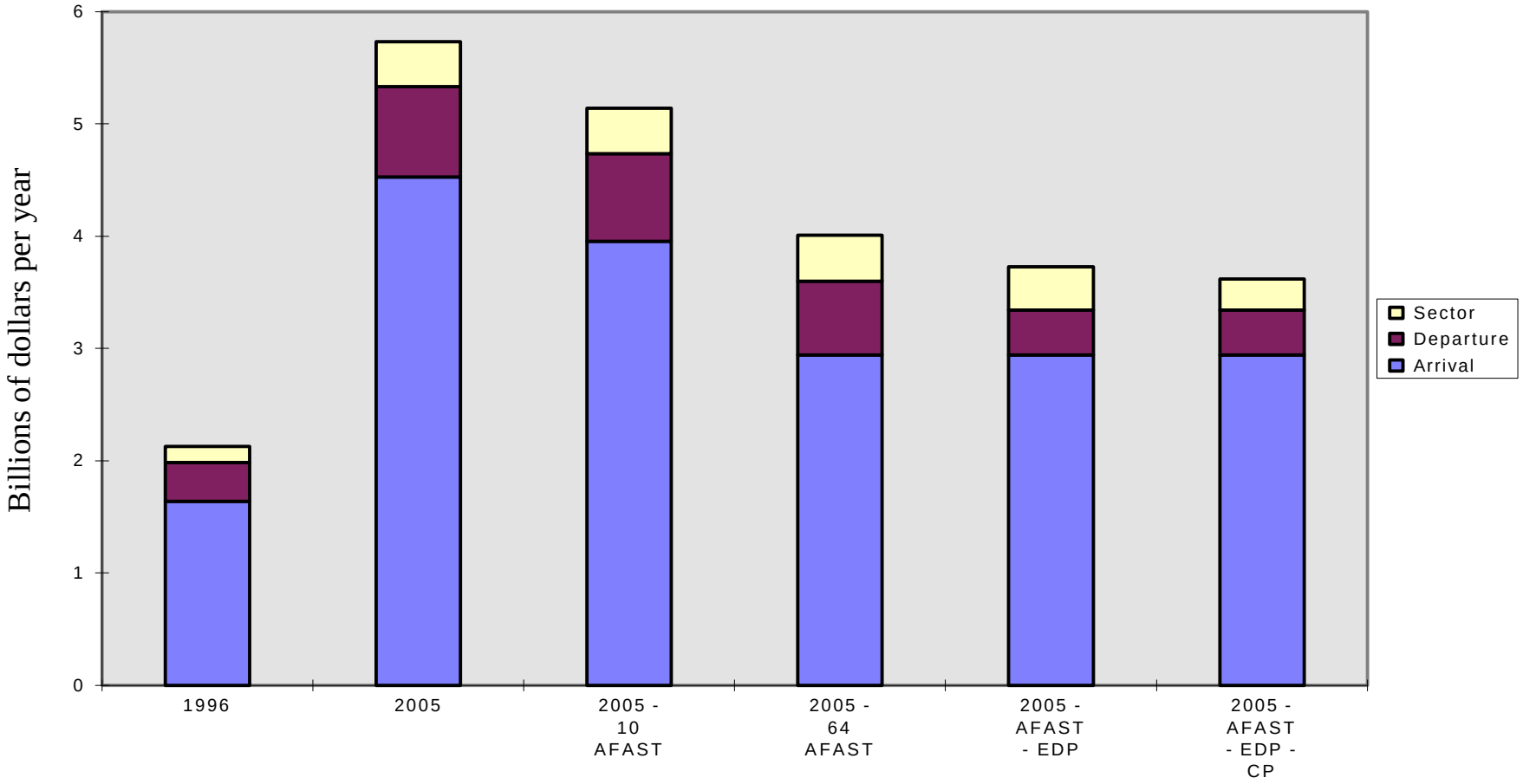
NAS Delay Costs



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Metrics for Government Programs

- Block time and block fuel
  - AATT objective is a 2-3.5 percent reduction
- Airport Peak Capacity
  - AATT objective is an increase of 30-40 percent
- En Route Sector Capacity
  - AATT objective is an increase of 10-20 percent
- Measure performance of programs through modeling and field testing

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Comments

- Delays attributed to its cause, not where it occurs
  - easier to do when modeling than with operational data
- Current analyses focusing on block times in addition to delay
  - average times and variability, to address on-time performance

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Airline Metrics for Cost-Benefit Analysis

- Most work to date focused on DOC per minute
  - mostly fuel and crew cost
- Developing a cost-benefit model that incorporates 6 functional cost categories within an activity-based-costing approach
  - hope to get into more detail in the cost categories: suggestions welcome!

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Calculating Operating Costs

$$\text{Fuel costs} = \text{ASM} \times \left(\frac{\text{fuel price / gallon}}{(\text{ASM / block hour}) / (\text{gallons / block hour})} \right)$$

$$\text{Flight personnel costs} = \text{ASM} \times \left(\frac{\text{flight personnel labor rate / block hour}}{\text{ASM / block hour}} \right)$$

$$\text{Maintenance costs} = \text{ASM} \times \left(\frac{(\text{maint. labor} + \text{maint. mat.}) / \text{block hour}}{\text{ASM / block hour}} \right)$$

$$\text{Flight equipment capital costs} = \text{ASM} \times \left(\frac{\text{capital costs / aircraft day}}{(\text{ASM / block hour})(\text{block hours / aircraft day})} \right)$$

$$\text{Ground property and equipment costs} = \text{ASM} \times \left(\frac{\text{GP\&E costs}}{\text{ASM}} \right)$$

$$\text{Indirect costs} = \text{ASM} \times \left(\frac{\text{indirect costs}}{\text{ASM}} \right)$$

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Summary Measures

- Financial Outcomes
  - net present value
  - rate of return
  - cash flow
  - capacity and revenue impacts
- Schedule predictability
- Risk probabilities