



Effectiveness Analysis for ASDE-X in the Absence of Historical Data

NEXTOR Workshop

Moving Metrics

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Relevant Metric Questions

- What aspects of NAS performance does your work address?
 - Type A&B Runway Incursions
 - Taxi-Out delay
- What do you consider to be the appropriate metrics for that aspect of performance?
 - Type A&B Runway Incursion rate (RI/unit time vs Expected)
 - Taxi-Out delay
- What do you consider to be the most important challenges to quantifying progress in your area through metrics? (discussed later)



Overview



- Using Expert Judgment
 - Methodology
 - Incremental Safety Benefits of ASDE-3X
 - Efficiency Benefits
- The results
- Future Metrics
- Concerns



Methodology



- Often Difficult to Analyze new capabilities directly
- Group of Subject Matter Experts
- Expert on new Technology capabilities
- Questions designed to elicit approximate impact – non-quantified
- One Expert, One Vote
- Secret Vote – Avoids peer pressure



Methodology – Cont.

- Allow for discussion/questions
- Apply Statistical Techniques to results
 - Mean of results
 - Standard Deviation
 - Case-by-Case group estimates
 - Across individual panelists
 - Other measures



Expert Judgment - Safety

- Safety (Runway Incursion) Benefits of ASDE-X at ASDE-3/AMASS sites
 - Panel of 6 Air Traffic Controllers & Pilots
 - Expert on capabilities of new technology
 - Independent assessment of effectiveness
 - Secret assessment – no peer pressure
 - Implicit incremental benefit
 - ASDE-3/AMASS avoid accident?
 - If not ASDE-X capability avoid accident?



Expert Judgment - Efficiency

- Efficiency Benefits of ASDE-X
 - Panel of 10 ATC
 - Simple agreement on having benefits (yes/no)
 - Benefit Areas Identified for inclusion
 - Improved Identification of Aircraft within a Queue
 - Improved ability to perform conformance monitoring
 - Only benefits with high degree of agreement that ASDE-X would have an impact
 - Panel also provided input on frequency of occurrence



Queue Confusion – an example

- ATC mis-orders the strips for the aircraft waiting to depart
- ATC provides clearance to depart – not the A/C at the front of the queue
- Delay occurs in determining proper A/C order and A/C at front departing
- Several Scenarios

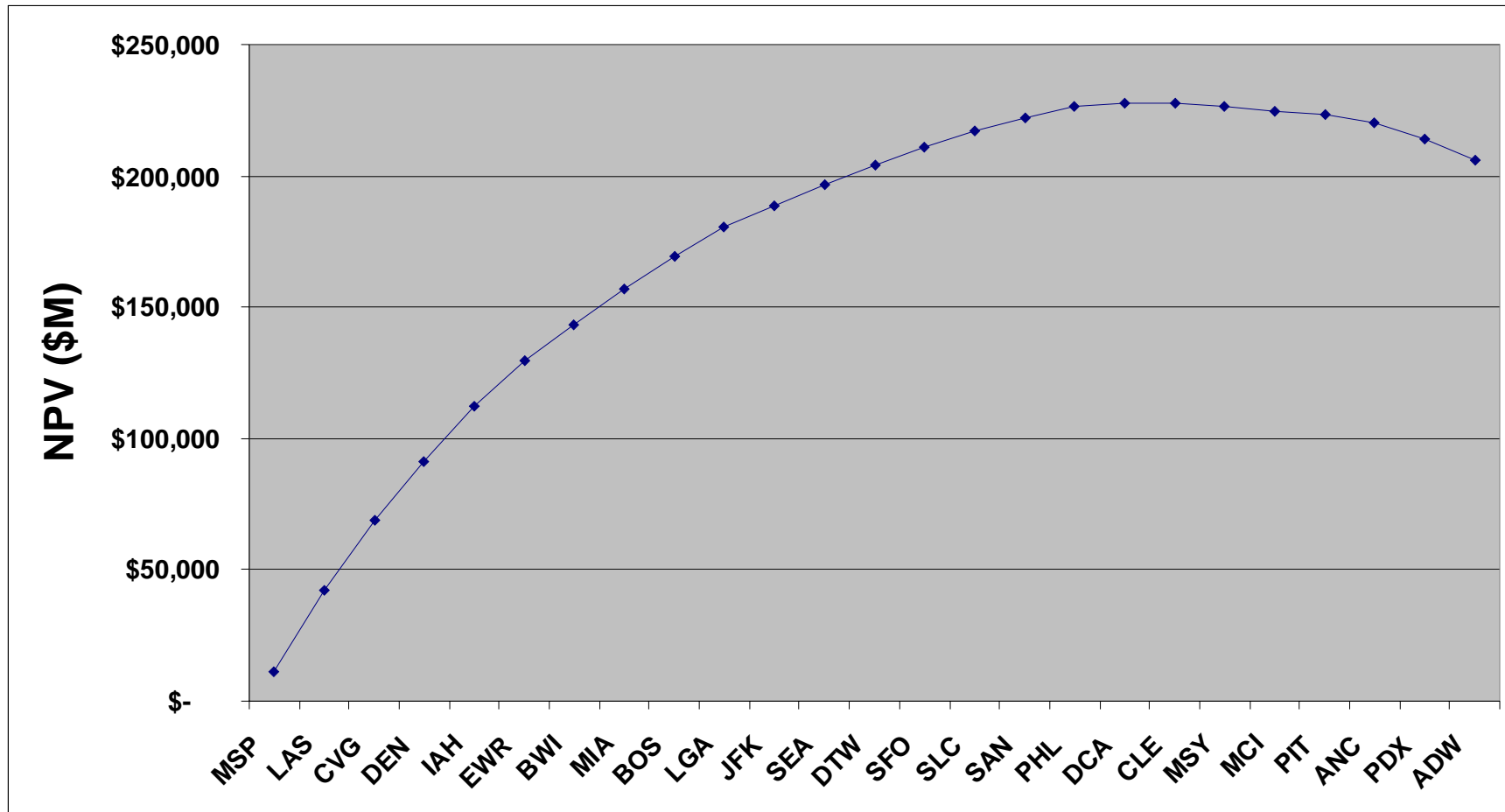


Results of the Analysis

- Safety
 - Potentially Effective in accident avoidance
 - Incremental effectiveness of 7% to 17%
 - Some post-implementation results at ASDE-X sites
- Efficiency
 - Impact on Taxi-Out times (reduced delay)
 - Highly site dependent
 - Approximately 4% reduction in Taxi-out delay



Return on Investment by Site





Future Metrics



- Difficult to Measure – always hard to separate from other impacts
 - Taxi-Out times
 - Confusion time (need controller input)
 - Both current time and post-implementation
 - Number of Runway Incursions/Accidents
 - Fatalities



Measurement Challenges

- Hard to measure accidents that don't occur
 - Can't know if the impact (or lack of impact) is due to other factors
 - Statistical in nature
- Average Queue Size – is this proper measure
 - Small queue, should have very quick correction?
- True Frequency of Queue Confusion
- Reduction in Taxi-Out delays
 - Change in Traffic
 - Change in Schedule – definition of delay