Status of WakeVAS Benefits Assessments

WakeNet USA

Boca Raton, Florida

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NASA Langley Research Center

WakeVAS Benefits History

- **Previous Studies Conducted for WakeVAS & VAMS**
  - **MITRE – WakeVAS Benefits: Preliminary Results & Questions**
  - **LMI – Analysis of WakeVAS Delay Reduction Using LMINET**
  - **Swales – Analysis of WakeVAS Delay Reduction Using ACES 2.03**
  - **MITRE – Analysis of WakeVAS Procedures for Potential Benefits and Development and Implementation Risks**
  - **- LMI – Business Case Analysis for NASA Wake Vortex Technology**
- **Results are Difficult to Compare Due Differences In:**
  - **Metrics Measured (Delay Reduction, Capacity Enhancement)**
  - **System Assumptions**
  - **Procedures**
  - **Airports Studied**
- **Candidate CONOPS Must Provide Positive Benefits**
- **Differences are Expected Due to Spiral Development Process**

Current Studies

- **Near-Term Concept at KSTL**
- **Mid-Term (Phase II) Wind-Dependent Concepts**
  - **3-7 Yrs to Implement**
  - **Concept Evaluation Team (CSPR & Single Runway Arrivals & Departures)**
  - **Closely Spaced Parallel Departure (FAA/CAASD)**
- **Focus on Opportunities Across the NAS**
  - **Major Airports**
  - **Runway Layouts**
  - **Prevailing Winds (Surface & Aloft)**
  - **Traffic Mix**

MITRE Wind-Based Study Parameters

- **Wake Removal by Transport Due to Crosswinds**
  - Wake Models and Windline Data Support Transport Assumptions
  - No Wake "Sink" or Wake Decay Required
- **Representative Set of 19 Airports**
  - Previous or Current Wake & Atmospheric Data Collection(s)
  - Surface Winds from Archived ASOS Data
  - Winds Aloft from Archived RUC Data (1 Hr Forecasts,20 Km Grid)
  - Aircraft Traffic Mix Captures 97% of Operations
- **Standard Wake Separations Except in Bounded Region**
  - Bounded Region is the "Alternate Separation Zone – ASZ"
  - ASZ Geometric Boundaries Defined by WakeVAS Procedure
  - ASZ Defines Extent of Wake & Traffic Surveillance
  - ASZ Height is Primary Variable but Distance is Important
- **Monte Carlo Simulations to Generate Statistics**

Peek at Results #1

Airport	ATL	BOS	CLE	CLT	DFW	DTW	EWR	IAH	JFK	LAX
Heavy	10.9%	6.5%	1.0%	1.4%	4.1%	2.5%	12.2%	4.6%	32.6%	18.5%
B757	6.8%	10.9%	1.1%	3.9%	5.6%	6.6%	9.6%	4.8%	12.0%	10.8%
Large	81.1%	74.4%	86.0%	84.1%	88.7%	90.1%	77.4%	87.1%	53.6%	59.8%
Small	1.3%	8.3%	12.0%	10.6%	1.6%	0.8%	0.9%	3.5%	1.7%	10.9%
CSPR Rwy Spacing (ft)	1050	1500	1241	NA	1200	2000	900	1000	NA	700
Min Arr Sep (nmi)	2.5	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0	2.5
OEP List [30]	*	*	*	*	*	*	*	*	*	*
OPSNET List [30]	*	*	*	*	*	*	*	*	*	*
2013 List [29]							*		*	
Eval CSPR Deps	D	D	D		D	D	D	D		D
Eval CSPR Arrs		A	A			A	A			A
Eval Single Runway	S	S		S	S		S		S	S

19 Airports &

10 Procedures

Airport	LGA	MEM	MIA	ORD	PHL	SDF	SEA	SFO	STL
Heavy	0.9%	20.9%	17.5%	6.5%	5.5%	21.7%	4.8%	16.8%	0.7%
B757	8.3%	0.8%	13.8%	5.2%	6.0%	9.8%	6.8%	14.0%	2.3%
Large	84.6%	67.3%	61.7%	87.5%	85.9%	59.6%	84.2%	58.0%	88.3%
Small	6.2%	11.0%	6.9%	0.8%	2.6%	8.9%	4.3%	11.2%	8.8%
CSPR Rwy Spacing	NA	926	800	NA	1400	NA	800	750	1300
Min Arr Sep (nmi)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.0	2.5
OEP List	*	*	*	*	*		*	*	*
OPSNET List	*	*	*	*	*		*	*	*
2013 List	*			*	*				
Eval CSPR Deps		D	D		D		D	D	D
Eval CSPR Arrs					A		A	A	A
Eval Single Runway	S			S		S			

Courtesy MITRE/CAASD

Peek at Results #2

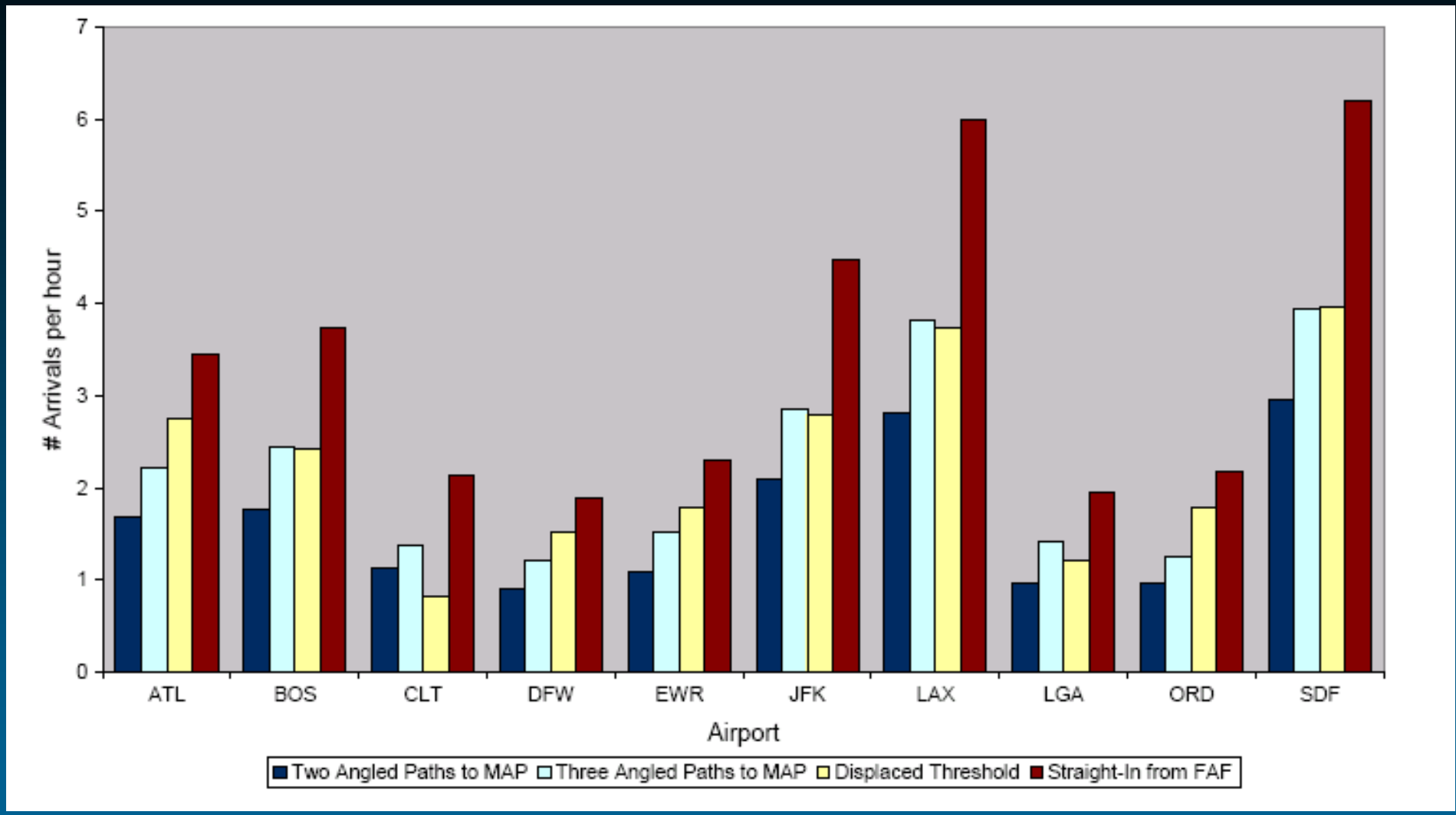
Height of ASZ

(II-A) Departures (II-B) Arrivals

	CSPR	CSPR	CSPR	CSPR	CSPR	CSPR	CSPR	CSPR
Airport	II-A-3(d)1	II-A-3(d)2	II-A-3(d)3	II-B-1(a)	II-B-1(b)	II-B-1(c)	II-B-1(d)	II-B-1(e)
ATL	3569	1169	3569	N/A	N/A	N/A	N/A	N/A
BOS	3393	993	3393	6000	841	2091	281	1708
CLE	3494	1094	3494	6000	994	2244	288	2085
DFW	3510	1110	3510	N/A	N/A	N/A	N/A	N/A
DTW	3196	796	3196	6000	546	1796	265	979
EWR	3628	1228	3628	6000	1196	2446	299	2582
IAH	3589	1189	3589	N/A	N/A	N/A	N/A	N/A
LAX	3707	1307	3707	6000	1314	2564	305	2874
MEM	3618	1218	3618	N/A	N/A	N/A	N/A	N/A
MIA	3667	1267	3667	N/A	N/A	N/A	N/A	N/A
PHL	3432	1032	3432	6000	900	2150	284	1853
SEA	3667	1267	3667	6000	1255	2505	302	2728
SFO	3687	1287	3687	6000	1284	2534	303	2801
STL	3471	1071	3471	6000	959	2209	287	1999

Courtesy MITRE/CAASD

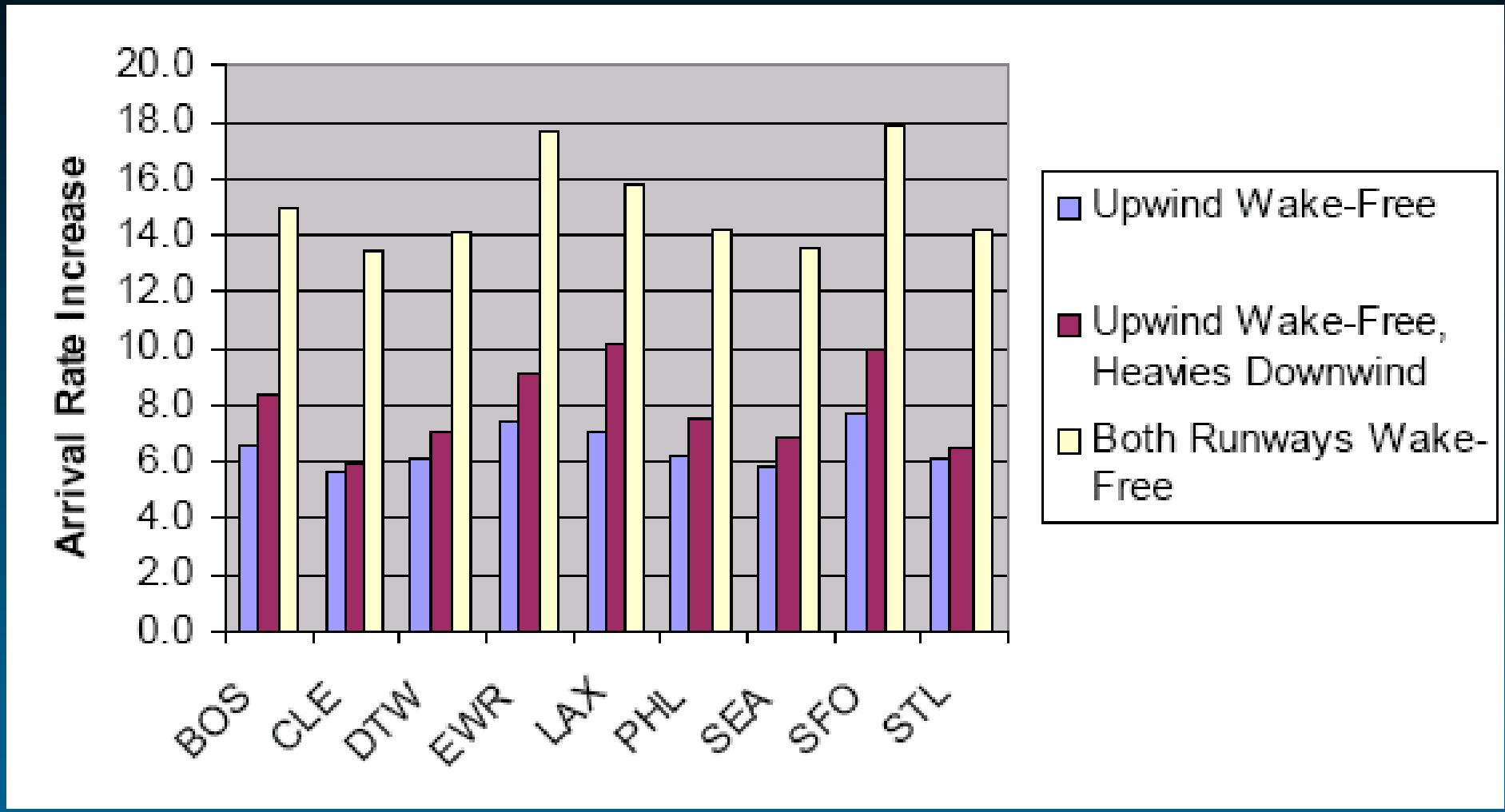
Peek at Results #3



Single Runway Arrival Capacity Increases

Courtesy MITRE/CAASD

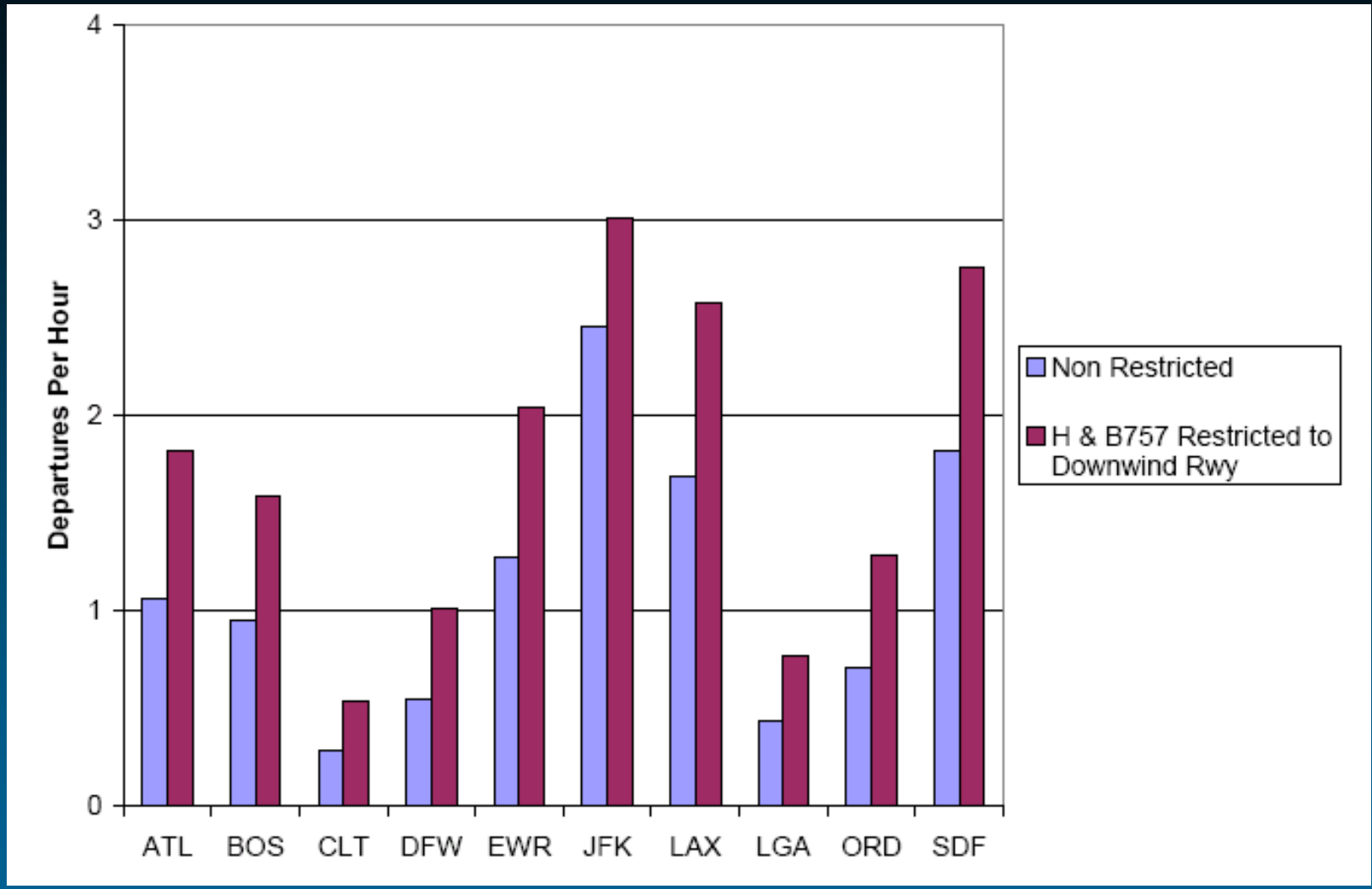
Peek at Results #4



Parallel Runway Arrival Capacity Increases

Courtesy MITRE/CAASD

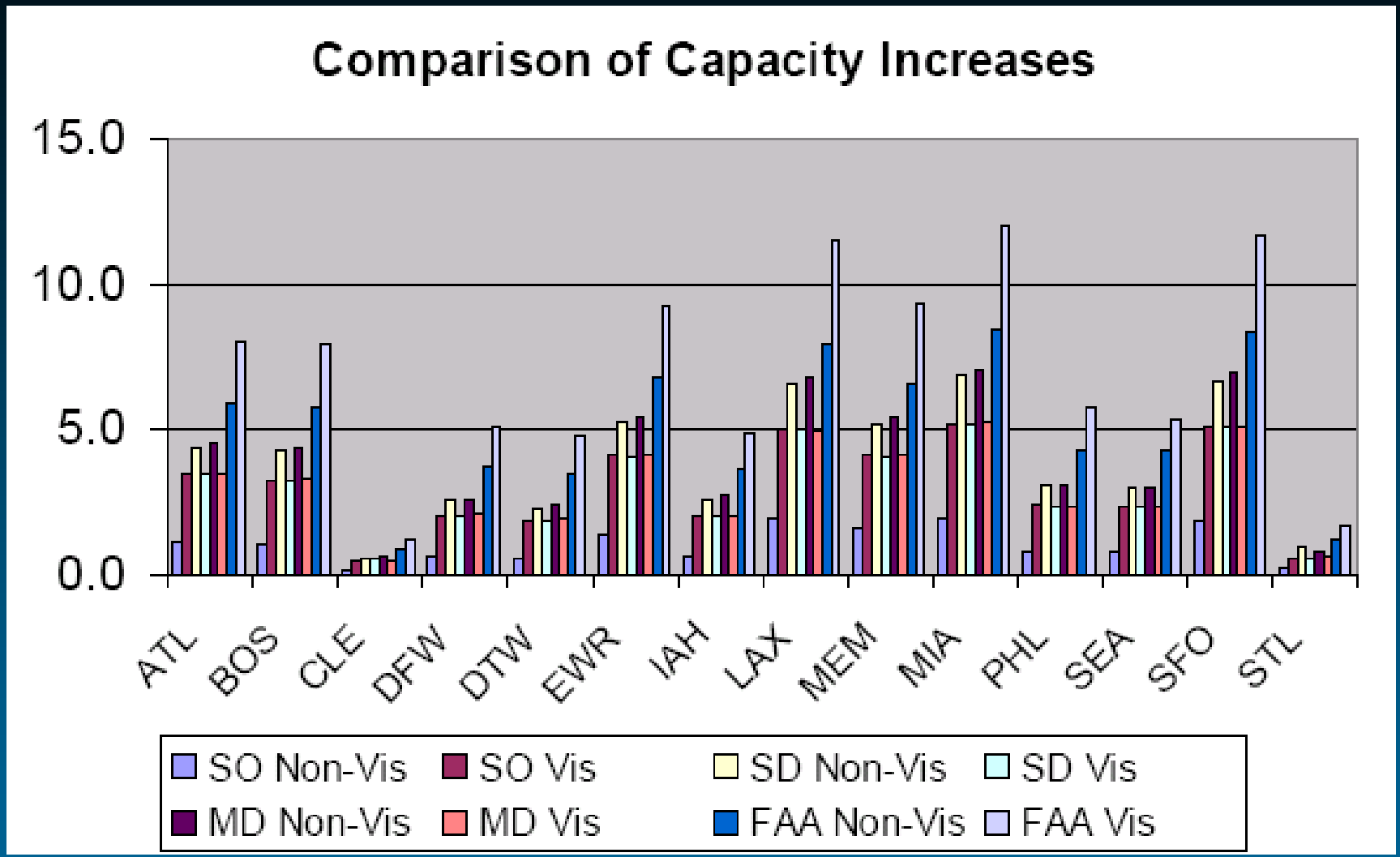
Peek at Results #5



Benefit for Single Runway Non-Visual Departures for Dual Divergent Paths

Courtesy MITRE/CAASD

Peek at Results #6



Summary of CSPR Departure Capacity Increases

Courtesy MITRE/CAASD

Peek at Resuls #7

- **All Candidate Wind-Based CONOPS Produce Favorable Benefits/Opportunities**
- **Identifying Most Favorable Arrival & Departure CONOPS**
  - **CSPR Arrivals & Departures**
  - **Single Runway Arrivals**

- **Please Attend Talk by Clark Lundsford Wed 1:45**

"Update on Benefits Assessment of Wind Dependent Departures/Approaches"

Next Steps

- **Advance Spiral Development Inward One More Band**
- **Down Select CONOPS for Detailed Development**
  - **Most Promising WakeVAS Wind-Based Procedures by Airport**
  - **Obtain Stakeholder Acceptance/Feedback & Recommendations**
- **Select Evaluation Airports**
- **Establish First Iterations of:**
  - **Functional Decomposition**
  - **Hardware Architecture**
  - **Cost Analyses**
- **Develop Required Documentation Package**
- **Adjust Program Plans**