



The Value of Perfect Information at SFO

Tasha R. Inniss,
Michael O. Ball, Robert Hoffman
In cooperation with Wes Wilson

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Marine Stratus Conditions

- Low cloud ceilings (uniform)
- Occurs at SFO during months of May through October
- Stratus forms over San Francisco Bay during the night and dissipates during morning hours
- Conditions do not allow dual approaches into SFO



Current GDP Planning at SFO

- Around 1300z, specialists plan GDP if demand exceeds capacity (after morning phone call)
- TRACON decides if dual (side-by-side) approaches can be done
- When weather appears to clear, ground controller asks pilot if he/she is willing to accept a visual approach
(this time is known as the “sideby time”)



Comparison of GDPs

- **Best Execution of the Best Program (BEBP):**
Executing a GDP that uses the Sideby Time as the “best” end time
- **Best Execution of the Actual Program (BEAP):**
Executing the original planned GDP with the inclusion of the actual cancellation time (CNXtime)
- **Actual Execution of the Actual Program (AEAP):**
Executing the original planned GDP with the inclusion of all dynamic changes such as flight cancellations



BEBP, BEAP, AEAP Delays

- **Delay_BEBP**- Delay that results from knowing the exact time of burnoff of marine stratus conditions (sideby time)
- **Delay_BEAP**- Delay that results from canceling a planned, “best-executed” GDP (including delay of those flights subsequently canceled)
- **Delay_AEAP**- Delay that actually occurs in a planned GDP



Value of Perfect Information (VPI)

$$\text{VPI ("Preventable" Delay)} = \text{Delay_BEAP} - \text{Delay_BEBP}$$

Delay_BEAP and Delay_BEBP sums delay for all flights such that

$$\text{GDP_Start} < \text{BETA}_f < \text{GDP_End}$$

$$\text{Delay_BEAP} = \text{Sum}_f (\text{Earliest Arrival Time} - \text{BETA})$$

$$\text{Delay_BEBP} = \text{Sum}_f (\text{CTA_SB} - \text{BETA})$$

Where: Earliest Arrival Time = Max (BETA, CNXtime + ETE)

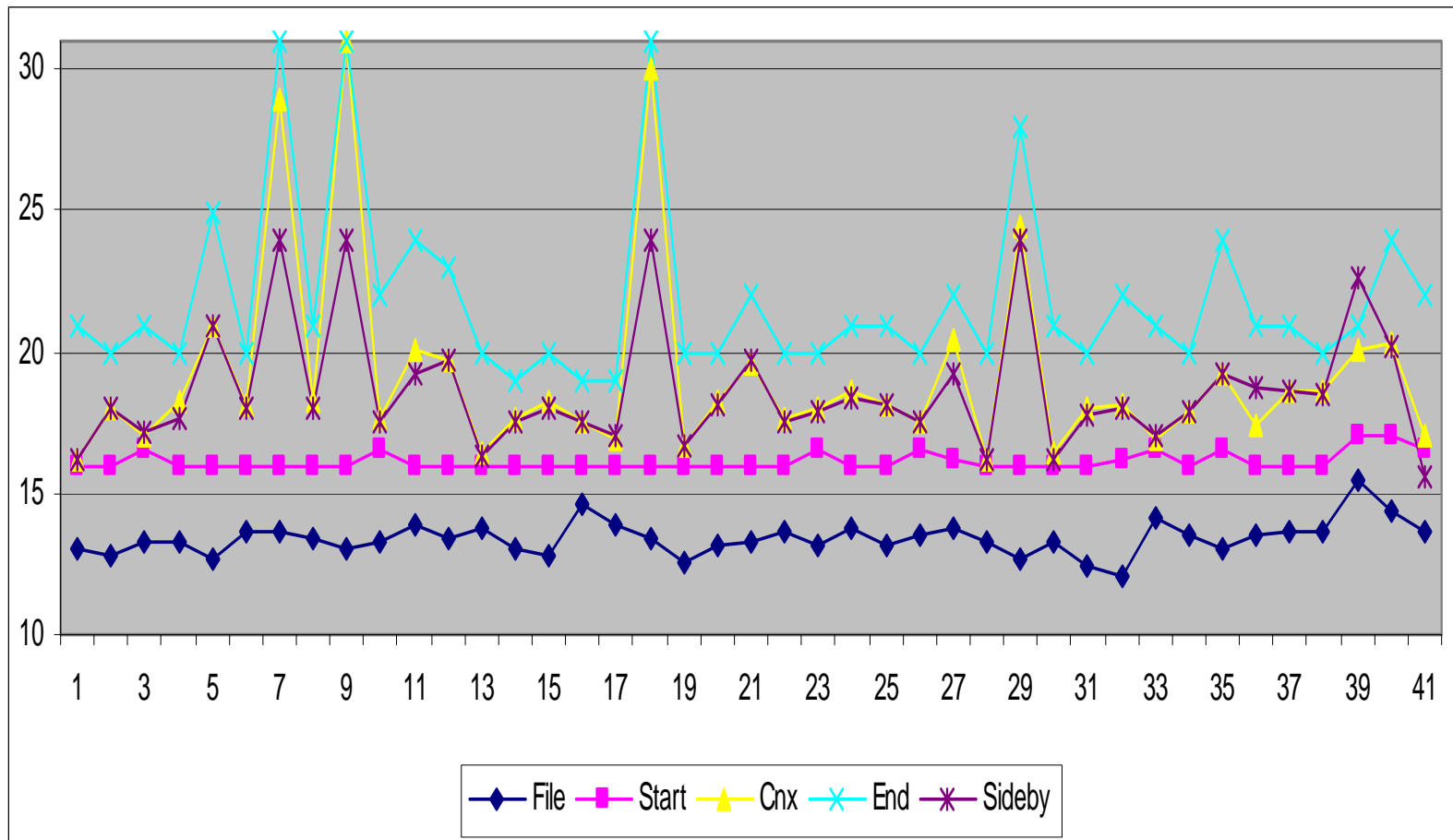
CTA_SB = "mock" CTAs given to flights based on 30 rate and 60 rate at Sideby time



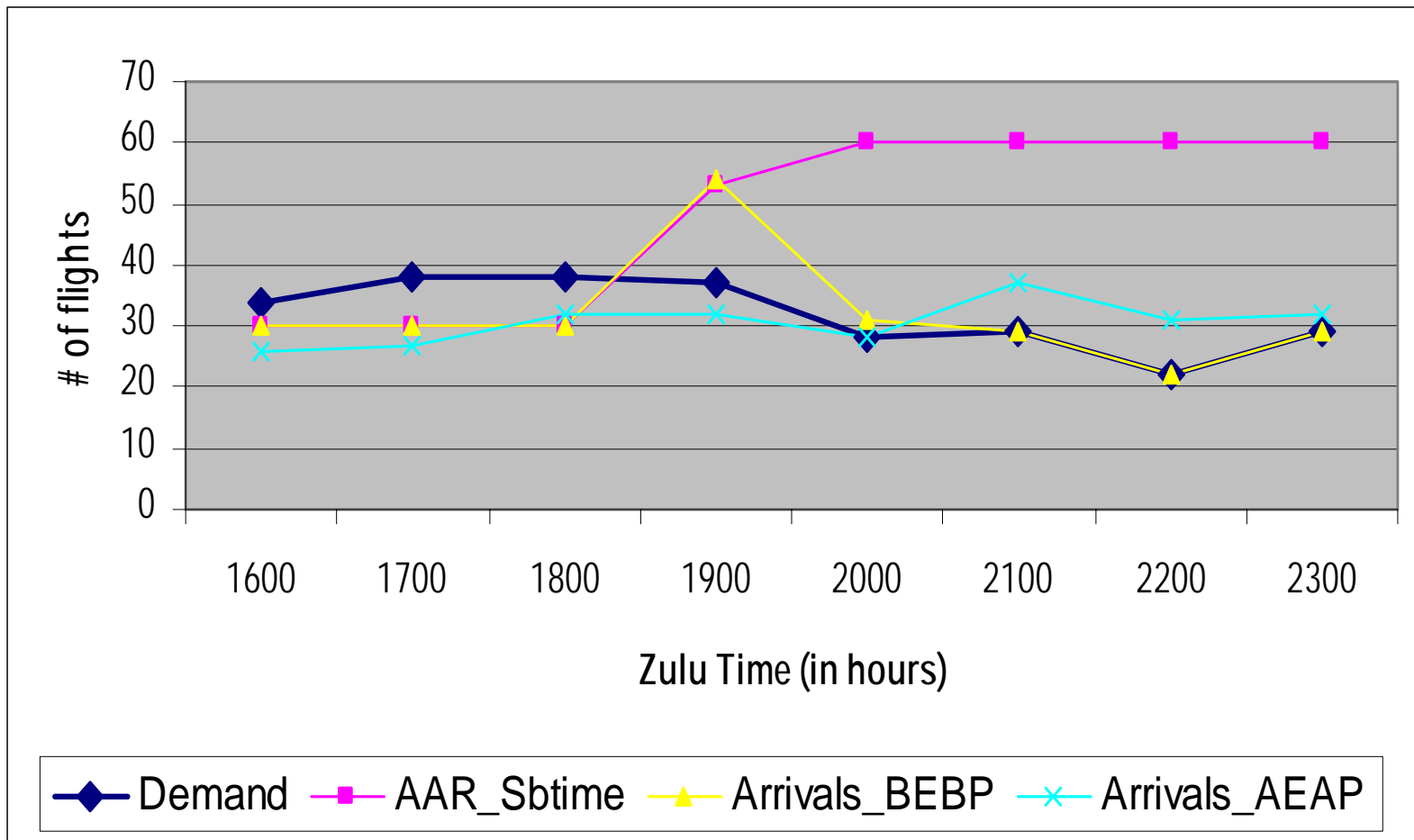
Sample GDPs at SFO in 2001

	GDP_Start	GDP_End	CNXtime	Sideby Time
6/28/2001	1600	2059	1614	1610
7/19/2001	1630	2159	1736	1728
<i>7/20/2001</i>	<i>1600</i>	<i>2359</i>	<i>2003</i>	<i>1913</i>
7/21/2001	1600	2259	1940	1943
7/22/2001	1600	1959	1625	1622
7/27/2001	1600	1859	1733	1734
7/28/2001	1600	1859	1655	1700
8/2/2001	1600	1959	1640	1643

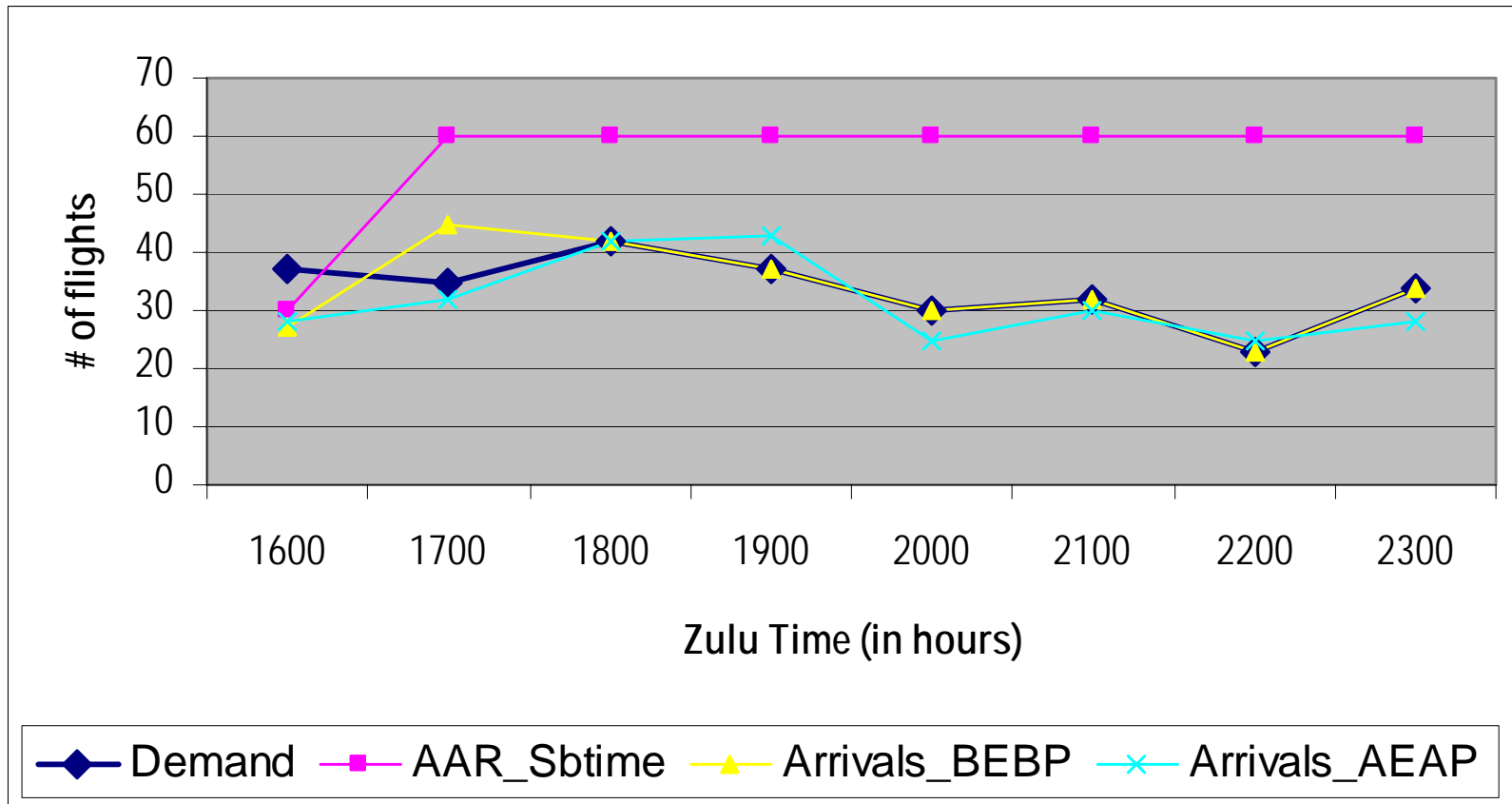
GDPs at SFO in 2001



7/20/01



7/28/01





Cumulative Delay at SFO

	Delay_BEBP	Delay_BEAP	VPI	Delay_AEAP	Add. CNXs
6/28/2001	160	6086	5926	3141	5
7/19/2001	738	5421	4683	4519	6
7/20/2001	1990	10328	8338	9977	11
7/21/2001	4066	12056	7990	8985	11
7/22/2001	165	4083	3918	946	5
7/27/2001	1098	5273	4175	1833	1
7/28/2001	607	5323	4716	1669	3
8/2/2001	268	3610	3342	2471	5



Average Delay Savings Per GDP



Days at SFO in 2001

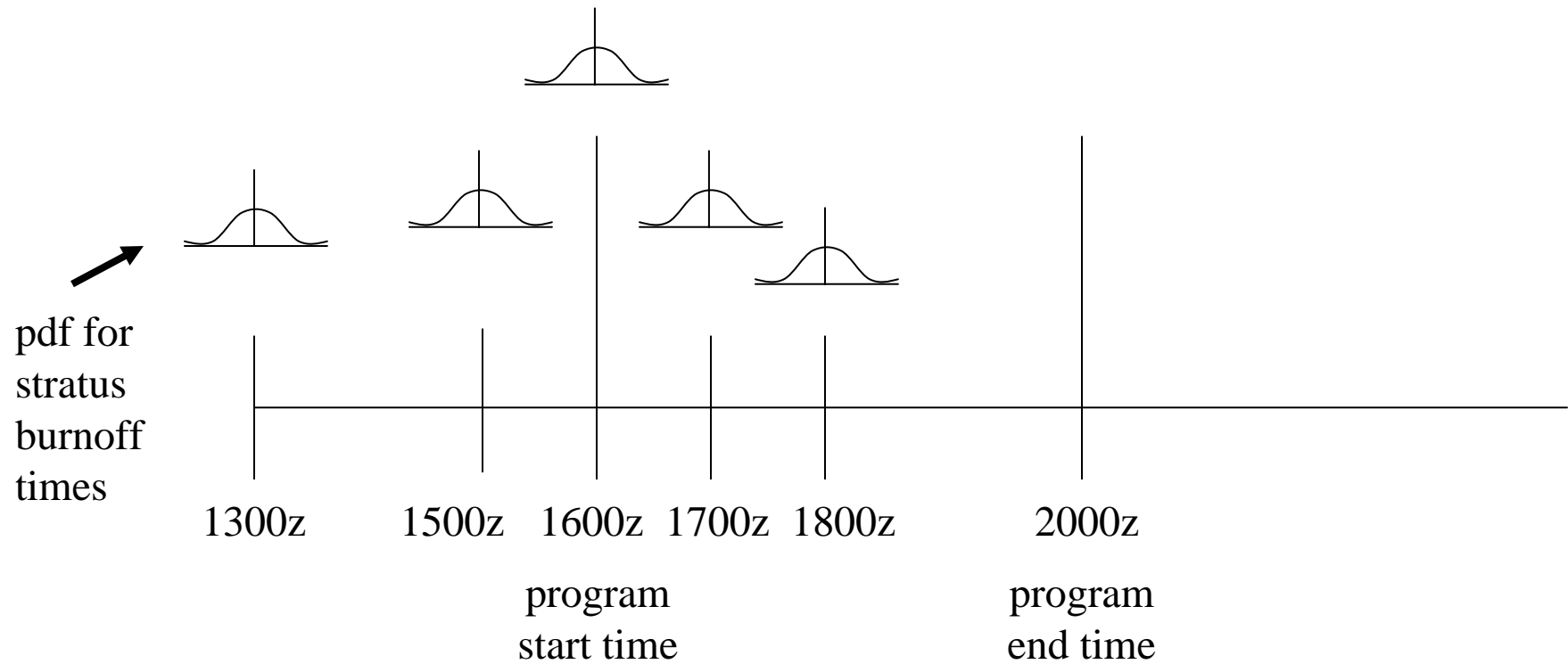
with “typical” marine stratus conditions:

Total Sum of VPI = 244741

Total Number of GDPs = 41

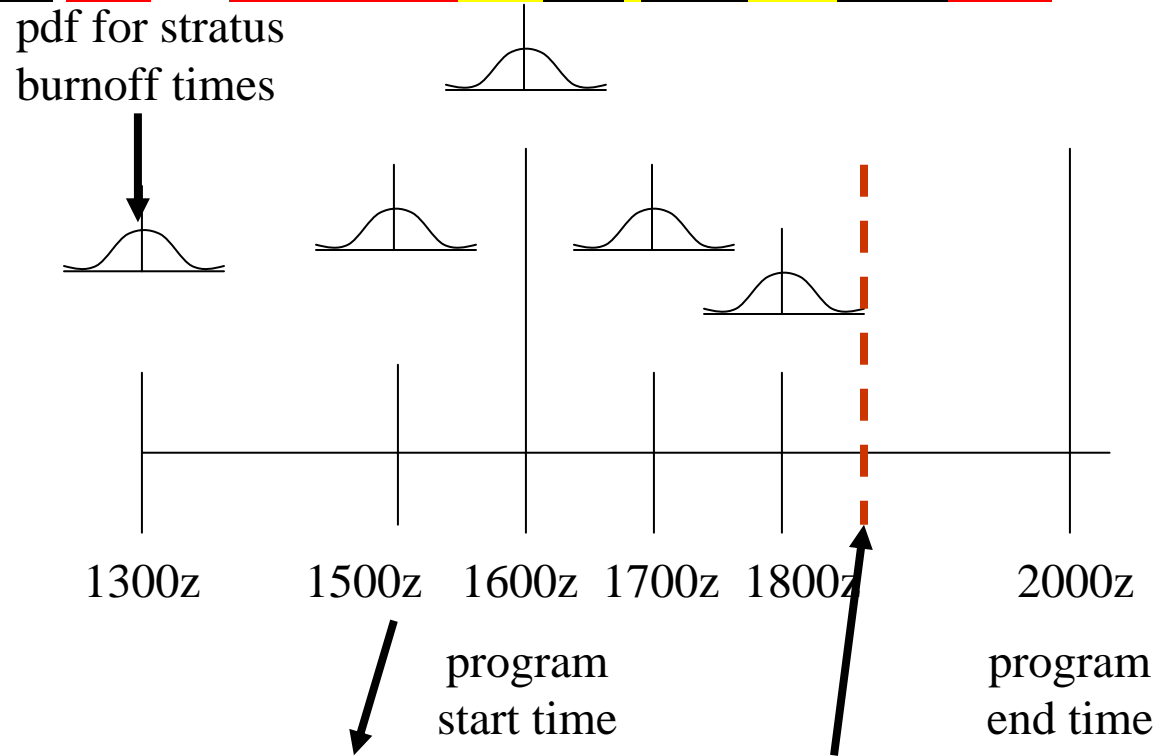
Average Delay Savings Per GDP = 5969.29

Output of Wes' Models



SAMPLE SCENARIO

- previously developed models employ risk management, i.e. tradeoff “costs” for large amounts of airborne delay on some days for less delay (and higher throughput on others);
- decision makers at SFO are very conservative (little room for airborne queues) so the risk mgmt approach may not be acceptable.
- Proposed approach: use pdf to determine when program end time can be revised with very high probability



pdf → 95% probability that stratus will burn off by 1830 → revise program (i.e. reset end time to 1830)