Simulation Analysis of the Future NAS: Overview of JPDO’s Evaluation & Analysis Division

Dan Goldner (Ventana)
NEXTOR NAS Performance Workshop
Asilomar, March 2006
Major Dimensions of the Air Transportation System

A. Pax/Cargo Demand
1) Current (1X)
2) TAF & TSAM Growth to 2014 & 2025 (1.2X, 1.4X)
3) 2X TAF/TSAM Based Constrained Growth
4) 3X TAF/TSAM

B. Fleet Mix/Aircraft Types
1) Current Scaled
2) More Regional Jets
3) New & Modified Vehicles
   - Microjets
   - UAVs
   - E-STOL/RIA
   - SST
   - Cleaner/ Quieter

C. Business Model/Schedule
1) Current (mostly Hub & Spoke)
2) More Point to Point + Regional Airports
3) Massive Small Airport Utilization

D. NAS Capability
1) Current
2) 2014 OEP
3) Increased Capacity of:
   - Landside
   - Surface
   - Runways
   - Terminal
   - En route
4) Systemic:
   - CNS
   - SWIM
   - Wx Prediction

E. Disruptions/Weather
1) Good Weather (Wx)
2) Bad Weather
   - Airport IFR
   - En route
   - 7 Wx days
3) Disruption
   - Sudden Shutdown of an airport or region
Future Demand on the NAS

- **Biz shift**
  - 2% shift to micro jets

- **Continue existing Biz shift**
  - Smaller aircraft, more airports

- **Significant Alternate Shift**
  - Increase passengers per flight
  - A380, reverse RJ trend

- Boeing Forecast 3X
- TAF yields passenger growth of 1.8-2.4X in 2025

Note: Not to scale

Time:
- 2004
- 2014
- 2025
- 20??

2014 and later Baseline analysis will use OEP & FACT Capacities
Combined Itinerant Aircraft Operations at Airports with FAA and Contract Traffic Control Service
(Air Carrier + Air Taxi + General Aviation + Military, in thousands)
Future Capacity Shortfall by Airport Type

Baseline Hub-and-spoke Scenario

<table>
<thead>
<tr>
<th>Demand Level (relative to 2004)</th>
<th>Flights Feasible</th>
<th>Flights Lost</th>
<th>OEP Flights Feasible</th>
<th>OEP Flights Lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2X</td>
<td>61,846</td>
<td>2,493</td>
<td>1,656</td>
<td>24,669</td>
</tr>
<tr>
<td>1.4X</td>
<td>70,553</td>
<td>8,053</td>
<td>28,303</td>
<td>5,551</td>
</tr>
<tr>
<td>2X</td>
<td>89,870</td>
<td>21,745</td>
<td>34,959</td>
<td>15,590</td>
</tr>
<tr>
<td>3X</td>
<td>107,821</td>
<td>59,829</td>
<td>37,703</td>
<td>42,382</td>
</tr>
</tbody>
</table>

Number of Flights
Environmental Modeling Process

Flow

ACES OUTPUTS FOR SCENARIOS A, B, C, D

PRE-PROCESSOR

OPTYPE CITIPAIR ACTYPE

TERMINAL ROUTING MODIFICATIONS

DEP/ARR TIMES

TRAJECTORY RUNWAYS

AIRCRAFT STATE GENERATOR (NIRS)

THRUST AND SPEED

(ALL EVENTS, ALL SEGMENTS)

FLEET/AIRCRAFT MODIFICATIONS

COMPARE & MODIFY

ETMS

CAEP

POPULATION DISTRIBUTION

ELEVATION DATA

EMISSIONS ENGINE

(NOISE ENGINE (NIRS)

TDMS DATABASE)

DNL DISTRIBUTION

A. B. C. D

HC, CO, NOx, SOx

DISTRIBUTION

A. B. C. D

GOAL-ATTAINMENT GAP ANALYSIS

DNL, HC, CO, NOx, SOx

COMPARISON (A/B, A/C, A/D)

FEEDBACK TO IPTs

SCENARIO COMPARISON
Modeling the Uncertainty

Uncertainty of weather and traffic grows with time horizon
Spatial distribution of VLJ demand
Other EAD work by Asilomar participants

- Superdensity airport operations (M. Alcabin, Boeing)
- New airspace concepts (H. Swenson, NASA)
- Economic & policy analysis (R. Golaszewski with D. Ballard, GRA)