



VAMS TIM

Breakout Session #2

Scenarios and Metrics

Group 1

Joseph Del Balzo, Facilitator

May 23, 2002



Scenarios and Metrics Breakout Group #1



- 1. What should we consider our baseline scenarios and metrics?**
- 2. What are the special considerations for real-time and non-real-time scenarios?**
- 3. What are the special considerations for real-time and non-real-time metrics?**
- 4. What mixes of aircraft capability need to be represented in the scenarios?**
- 5. What CNS capabilities need to be represented in the scenarios?**



1. *What should we consider our baseline scenarios and metrics?*



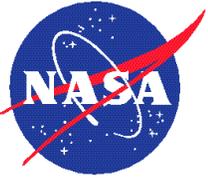
- ✓ **Same as baseline year for 2x and 3x goals (1997)**
 - OEP 2010?
- ✓ **Kind of metrics (high level)**
 - Cargo passengers and operations
 - Passenger miles per unit of time
 - Number of operations
 - Average delay
 - Economic value (more value in direct flight, quality)
 - Operational costs (Fuel burn 20% of costs)
 - Safety
 - Environment
 - Noise print
 - Pollution
 - Trip time
 - Gate-to-gate
 - Door-to-door
 - Activity metrics



2. What are the special considerations for real-time and non-real-time scenarios?



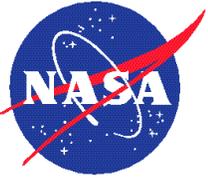
- ✓ **Depends on the question you are trying to answer**
 - What are the set of questions VAMS needs to answer?
- ✓ **Is there a difference in the scenarios?**
 - Different scale
 - Different objectives
 - Different set of inputs
 - Sometimes yes, sometimes no
 - Real-time – human performance
 - Non-real-time – overall performance
- ✓ **Do we need different scenarios?**
 - Fast-time can be more abstract
 - Different level of detail
 - Different fidelity
 - Different granularity
- ✓ **When real-time when non-real-time?**
- ✓ **Real-time is not necessarily human-in-loop**
 - Shadow mode testing



3. What are the special considerations for real-time and non-real-time metrics?



- ✓ **Why are the metrics different?**
 - Two kinds of simulations measuring different quantities
 - Depends on question, objectives, level-of-detail and scope
 - Some can't be measured in both
 - Instruments used to make measurements are different
 - Cost and availability of resources (time)
 - Repeatability
- ✓ **Examples of real-time metrics**
 - Response time
 - Workload
 - User acceptance
 - Aircraft separation
- ✓ **Examples of non-real-time metrics**
 - Same as real-time except for what can not be measured
 - High level system parameters
 - Operational costs
 - Flow capacity



4. What mixes of aircraft capability need to be represented in the scenarios?



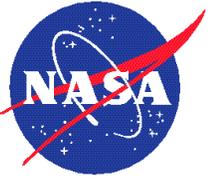
- ✓ **Yes, all concepts need to address all aircraft relevant to that domain over a range of capabilities**
 - General and specific
- ✓ **Aircraft capability**
 - Performance
 - Aircraft characteristics
 - Equipage
 - 4D
- ✓ **Equipage capability**
 - TCAS
- ✓ **Depends on the question and is defined by the scenario**
 - Wake vortex
- ✓ **Concepts cover all aircraft**
 - Runway independent (Tilt rotor)
 - Large capacity aircraft (797)
 - UAV
- ✓ **Emphasis on IFR**



5. What CNS capabilities need to be represented in the scenarios?



- ✓ **Yes, all concepts need to address all CNS relevant to that domain over a range of capabilities**
- ✓ **How you represent them depends on the question**
- ✓ **Concept specific**
- ✓ **NAS architecture expected by 2020**
- ✓ **Primary/backup**
 - **GPS failure**
- ✓ **Ground**
 - **Weather**
- ✓ **Air**
 - **Weather**
 - **Flight deck capabilities are a subset of the last question**
- ✓ **Space**
- ✓ **4D intent?**



~~Three~~ Two Most Important Points



- ✓ **Choice of scenarios and metrics depends on the question**
- ✓ **Clearly define the questions for VAMS (individual concepts)**
 - **Needs to be done before development of scenario and definition of metrics**
 - **Choice of simulation**
 - **Objectives**
 - **Scope**
 - **Fidelity**



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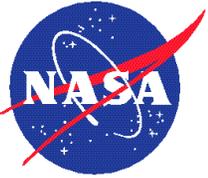
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Group 2 -- SEA Breakout Report

Kevin Corker, Facilitator

May 23, 2002



SEA Break Out Report Out: Mindful of a Distinction Between Non-real and Real time Simulation Requirements



- ✓ **Human Variability, NAS Scale response**
 - **Concept maturity, Equipment Specificity**
- ✓ **Q1 # of A/C in sim & Q2 # of A/C for Metrics**
- ✓ **Traffic Demand Model depends on OPCON's influence on business case (FT, RT)**
 - **Simulation Scope**
 - **Airspace**
 - **NAS**
 - **Selectable**
- ✓ **Passenger seat miles**
- ✓ **Operations**
 - through put Cargo, Business Jets, military, General Aviation**
- ✓ **Complexity factor (1x, 2x, 3x) to be considered**



Q3: How long do the scenarios need to be to reflect realism for our concepts



FT: One day (20 – 26 hours)

- ✓ Multiple days with different effects
- ✓ Day of the week
- ✓ Resolution of scenario data (milliseconds or minutes) - Depends
- ✓ Metrics by flight
- ✓ By some dependent or course time metric

RT: Scenario or OPCON dependent

- ✓ NAS wide vs Site Specific
- ✓ 10 minutes - 2 hours, 8 hours
- ✓ Fatigue studies
- ✓ Transition period
- ✓ Flight Deck
- ✓ ATM } Differential event rate for each
- ✓ AOC
- ✓ If local event, single concept – guideline is 10 minutes
- ✓ If Pulse event guideline is 2X bandwidth of pulse
- ✓ If NAS wide issues guideline is 4 - 8 hours
- ✓ (longer for fatigue and strain evaluations)



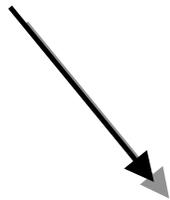
Q4:How do we try to insure buy-in from the stakeholders regarding the validity of our scenarios and metrics



- ✓ Demand Models: Airlines
- ✓ Roles and Responsibilities: Practitioners
- ✓ Who are the stakeholders? Buy in by whom?

Stakeholder community

- ✓ Current (Small incremental)



Super users

Future users

- ✓ Product introduction
- ✓ Is it worth caring?
- ✓ CADREs



Q4:What are the “challenge” events that are relevant for the scenarios



- ✓ **Weather**
- ✓ **Failure Modes**
- ✓ **System Shutdown**
- ✓ **Military Operations**
- ✓ **Security**
- ✓ **Demand Load (holiday travel)**
- ✓ **Airspace Sectional Loss**
- ✓ **Information Infrastructure**
 - ✓ **Data Integrity and Robustness**
- ✓ **Equipment dependent failures**

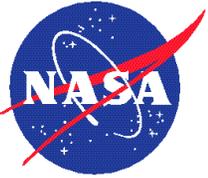
- ✓ **Collision Risk Models**
 - ✓ **Formation Flying**
 - ✓ **Tight Coupling**

- ✓ **When and how much challenge modes in OPCON test**
 - ✓ **-> Validation Plan**



Level of Scenario	Environment	Fast Time	Real Time
Baseline	NAS	Current	Current or less
	SPECIFIC	Current	Current or less
Moderate Increase	NAS		
	SPECIFIC		
High	NAS		
	SPECIFIC		

Current = 1997 levels
Moderate = (2x current)
High = (3x current)



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Group 3

Earl Van Landingham, Facilitator

May 23, 2002



Summary of Breakout 2, Group 3 Session



- ✓ **Difficulty starting in the “middle of the movie”**
- ✓ **We assumed we were addressing only capacity metrics in our answers (we know there are others)**
- ✓ **A concerted effort was made to address all 5 (nos. 11 - 15 in Sandy’s list) questions put to them**
- ✓ **A “challenge event” was interpreted to be a perturbation that has to be included in the scenarios in the execution of the simulation of the concept**
- ✓ **In question 13, technical challenges were assumed to be framework issues (not events) that need to be considered in the development of the scenarios, vs. challenges**



Summary, cont'd



- ✓ **Re: question 14, a number of specific recommendations were provided that must be considered in testing the concepts, however some open issues were also identified (e.g., Incompatible concept/system architecture issues)**
- ✓ **The consensus of the group was that its necessary to precisely define the entry and exit conditions of the domains.**



Agenda



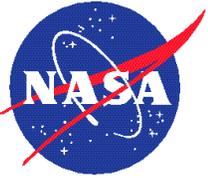
- ✓ **11. What are the “challenge” events that are relevant for the these metrics (e.g., choke points, weather)?**
- ✓ **12. What are the measures that need to be addressed in the scenarios? (These should consider economic, safety, security, environment, and human performance factors)**
- ✓ **13. What are the technical challenges in scenario development?**
- ✓ **14. How do we insure the appropriate testing of the concepts that include only one domain v. those that are gate-to-gate?**
- ✓ **15. Since we will have multiple scenarios, how to we insure some comparability between them so we can test some single domain v. gate-to-gate concepts fairly?**



Group 3, Number 11



- ✓ **What are the “challenge” events that are relevant for the capacity metrics (e.g., choke points, weather)?**
- ✓ **Important capacity metric events:**
 - **Weather**
 - **inaccurate forecasts**
 - **deicing conditions**
 - **convective**
 - **changes to ceiling/visibility**
 - **changing wind conditions, strong gusts**
 - **Schedules**
 - **demand exceeding capacity**



Group 3, Number 11, cont'd



- **Outages (scheduled and unscheduled)**
 - **facility**
 - **radars**
 - **runways**
- **Human error**
- **Terrorist events**
- **Resource loading**
- **Noise/other environmental issues**
- **Aircraft mix, unequipped aircraft**
- **SUA or other airspace closures**
- **Runways**
- **Wake Vortices**
- **Separation**
- **Labor/unions**



Group 3, Number 12



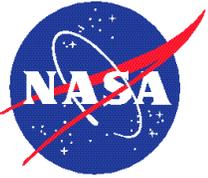
- ✓ **What are the measures that need to be addressed in the scenarios? (These should consider economic, safety, security, environment, and human performance factors)**
- ✓ **Measures**
 - **Delay (ave, peak, etc.)**
 - airborne delay
 - ground delay
 - allocation of delay
 - cancellations
 - **Passenger throughput**
 - **Aircraft throughput**
 - Ave, peak
 - **Cost and cost allocation**



Group 3, Number 12, cont'd



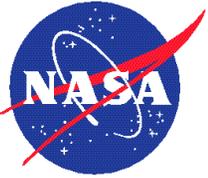
- **Equity**
- **Safety metrics**
 - **conflict, conflict alert**
 - **workload**
 - **weather exposure**
- **Access**
- **Unused capacity**
- **Cargo throughput**
- **System stability**
- **Predictability**
 - **edict compliance**



Group 3, Number 12, cont'd



- Environment
 - noise, pollution
- Passenger satisfaction
- Staffing
- Efficiency
 - workload
 - comm loading
- Political constraints, public mandates
- Sector density



Group 3, Number 13



- ✓ **What are the technical challenges in scenario development?**
- ✓ **Challenges for scenario development**
 - **schedules**
 - **demand**
 - **fleet mix**
 - **weather conditions**
 - **representative set**
 - **consensus**
 - **coverage**
 - **observability of phenomena**
 - **appropriate complexity/fidelity**



Group 3, Number 13, cont'd



- capture of variability in procedures
 - changes in roles, responsibilities
- relevance
- accurate reflection of airline's business case
- non normal operations
- human factors representation
- clear statement of scenario objective



Group 3, Number 14



- ✓ **How do we insure the appropriate testing of the concepts that include only one domain v. those that are gate-to-gate?**
- ✓ **Testing concepts**
 - allow for variability
 - arrival of common domain definition, architecture, interface definition
 - appropriate integration of concepts
 - definition of boundary conditions and constraints
 - single domain impact on gate to gate scenario
 - concept invariant metrics for comparison of different architectural premises
- ✓ **Open Issues**
 - how to handle incompatible concept/system architectural issues?
 - how do we know we've tested enough
 - how do we know we've tested the "right" things



Group 3, Number 15



- ✓ **Since we will have multiple scenarios, how do we insure some comparability between them so we can test some single domain v. gate-to-gate concepts fairly?**
- ✓ **Scenario comparability issues**
 - **Metrics need a common framework to evaluate scenarios (and concepts)**
 - **Configuration management**
 - **Information necessary to verify scenarios is required**
 - **Assume following are true**
 - **scenarios facilitate the blending process**
 - **scenarios are for validation**
 - **scenarios are for evaluation**