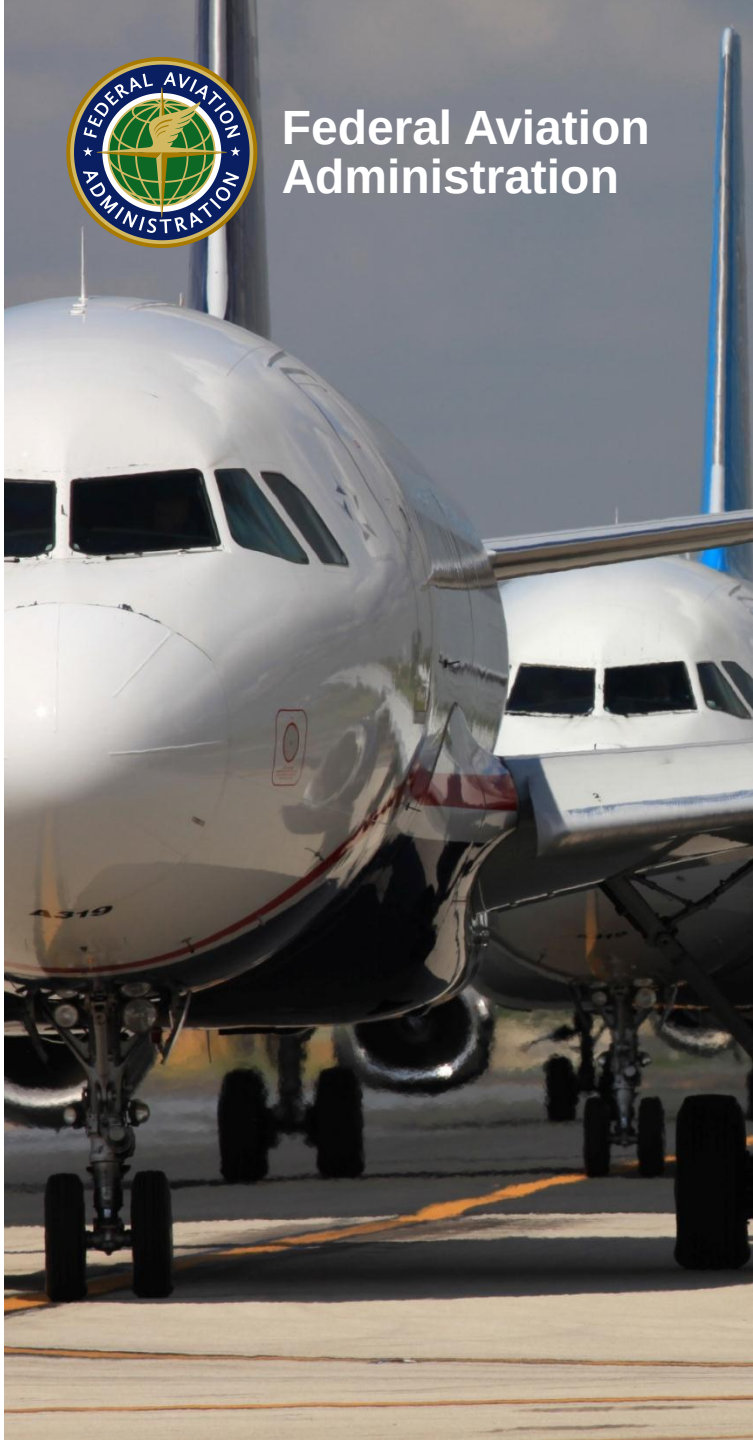
Office of Environment and Energy's (AEE) Air Traffic Management Modernization / Operations Research Program Update



Presented to: REDAC E&E Subcommittee

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Date: August 26, 2014

Air Traffic Management Modernizations (ATMM) Offer Important Potential E&E Improvements

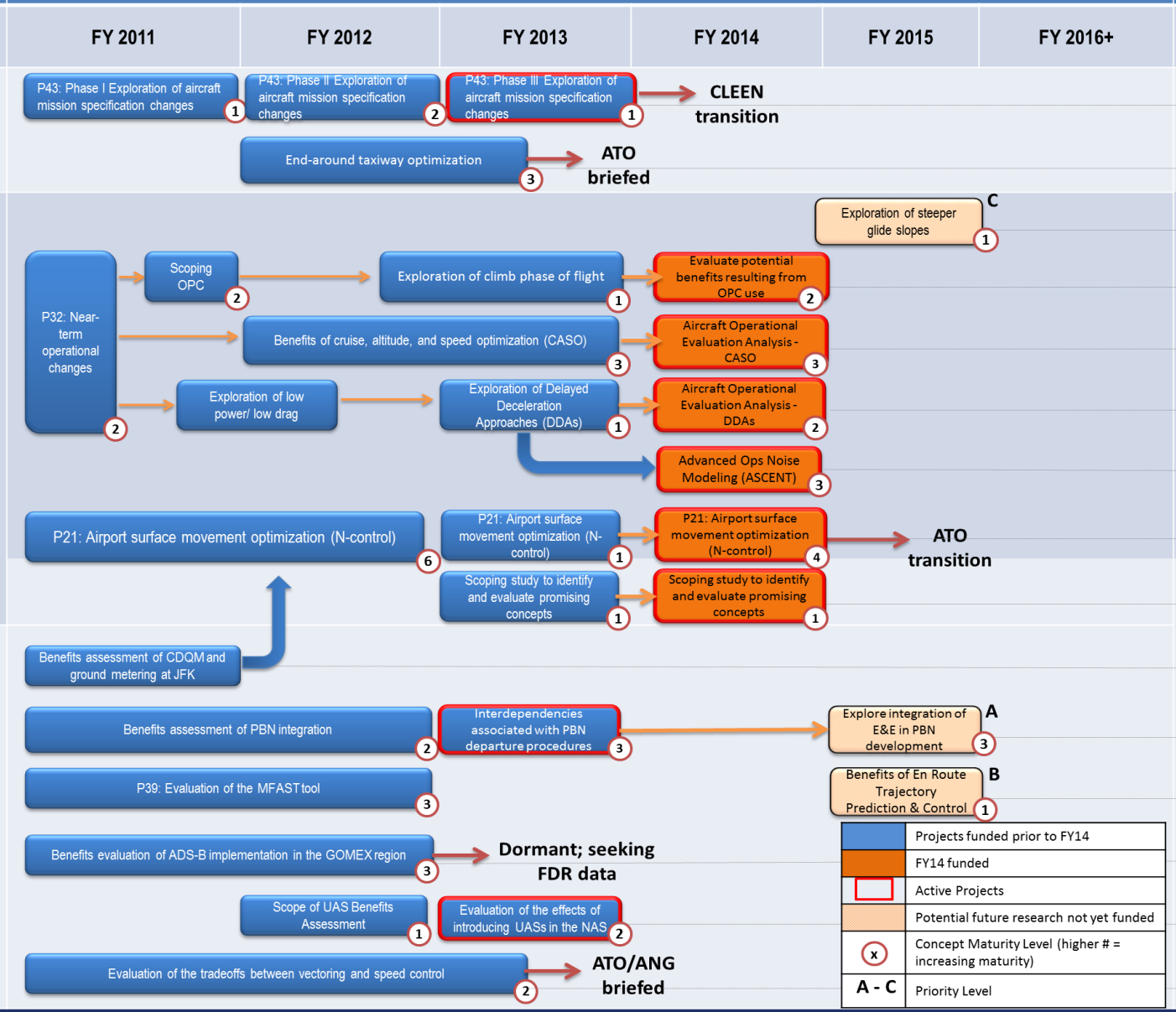
AEE E&E ATMM Research Program Goals

1. *Identify and accelerate the implementation of air traffic management concepts that will reduce aviation environmental impacts and/or improve energy efficiency*
2. *Investigate the E&E effects of operational changes implemented by the FAA.*

Core Program Elements

- *Research Process: Identifies, conducts, evaluates and transitions ATMM research for implementation*
- *Roadmap: Describes areas for ATMM Research near, medium, and long term.*
- *Portfolio Metrics: Assesses the portfolio's balance with regard to addressing E&E issues and the maturity progression of research project.*

AEE ATMM Research Roadmap



Drivers of Research

1) **Support AEE Vision and E&E goals**
2) **External pressures:**
   - ANG-2 (NextGen Chief Scientist) direction:
     - Will be difficult to fund concepts that don't have a near-term path to implementation
     - New operational concepts need to be either beneficial or neutral in terms of noise
   - General prominence of noise issues
   - Inconsistent/unpredictable funding, e.g., anticipated FY15 F&E funding cut expected to significantly reduce ops research budget

How are we aligning AEE Ops Research Program to conform to these pressures?

1) **Maturing promising near-term operational mitigations with the goal of transitioning to appropriate implementing organization (e.g., ATO, ANG)**
2) **Noise focus**
   - Noise-beneficial concepts
   - Enhancing noise analysis/modeling of operational concepts
3) **Developing improved environmental analysis capability**
   - Tools and processes
   - UAS
4) **Continuing and enhancing collaboration (within FAA and with external stakeholders)**
5) **Annual Roadmap assessment**

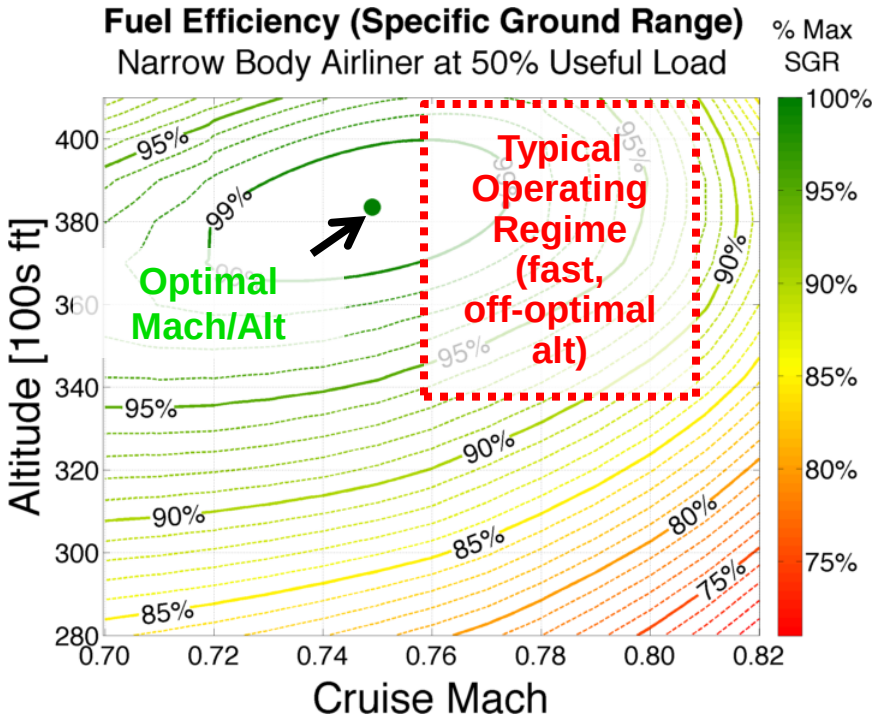
Maturing Promising Concepts

- **Advance concept maturity to demonstrate environmental/operational benefits and identify potential implementation strategy**
- **Work collaboratively with implementing organization (e.g., ATO, ANG) with the goal of integration into NAS**
- **Concepts adequately funded in FY14 to minimize dependency on FY15 funding**

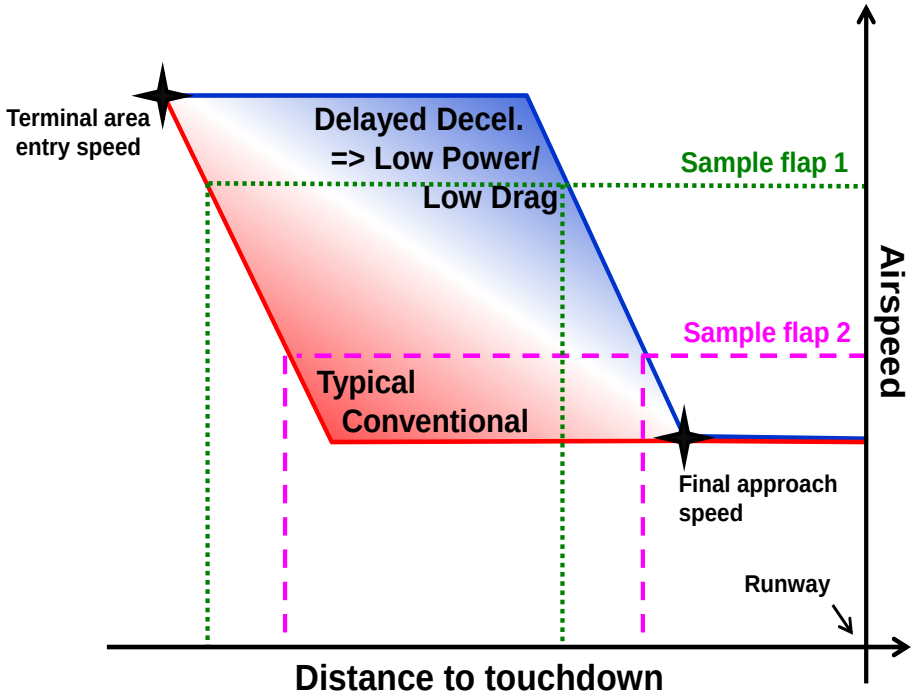
Project	FY14 Funding
Cruise Alt. and Speed Optimization (CASO) / Delayed Deceleration Approach (DDA)	$1M
N-Control	$170K
Optimized Profile Climb (OPC)	$150K

Maturing Promising Concepts

CASO



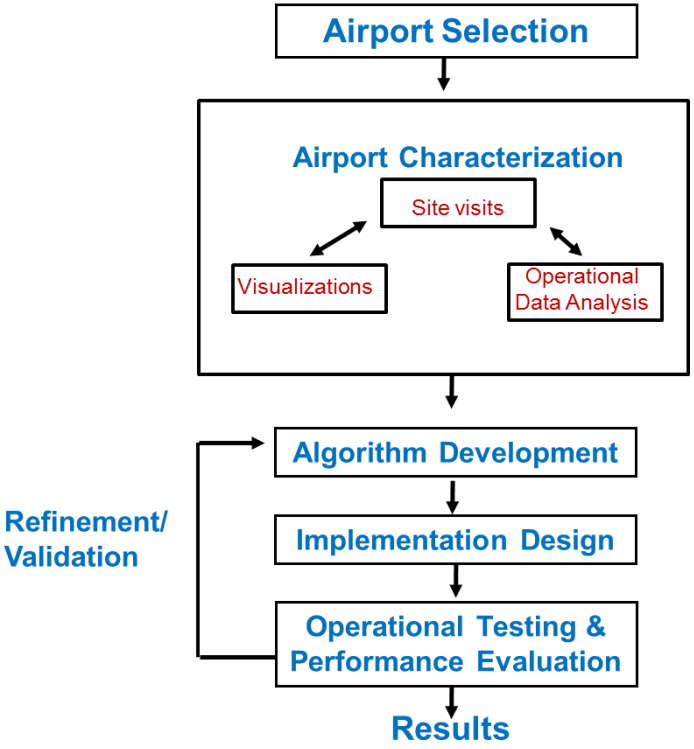
DDA



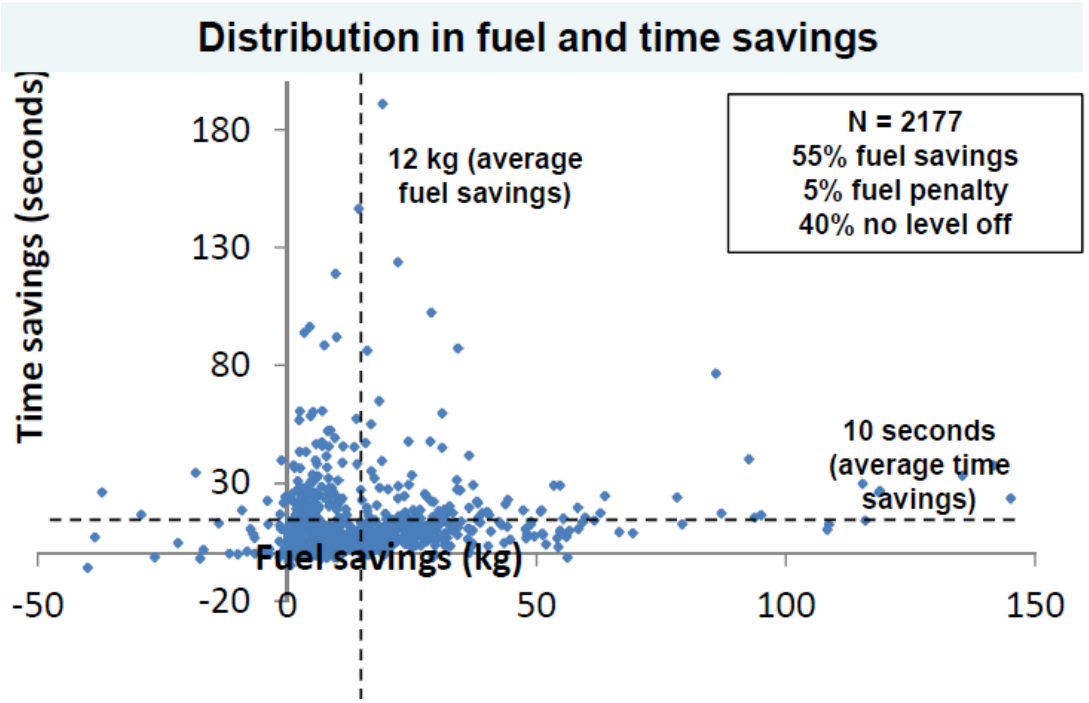
- **Benefits fairly well-understood; critical path now is stakeholder collaboration and understanding operational barriers, implementation strategy**
- **Opportunities with Delta, OSU/NetJets**
- **Integration into NextGen concepts, e.g., RNAV speed targets**

Maturing Promising Concepts

N-Control



OPC



- Focused on LGA demo and Surface Office coordination
- Complementary to NextGen Integration Working Group recommendation

- Refining benefits estimates
- Identifying barriers and targeted opportunities

Noise Focus

- **Noise-beneficial concepts:**

Project	Noise Impact	Research Approach
DDA	Potential benefit from staying in “clean” configuration	Exploring noise measurement
OPC	Potential benefit from steeper profile	Exploring alternative metrics/modeling
Steeper glide slope	Potential benefit from steeper approach profile	Possible NAS-wide analysis (not currently funded)

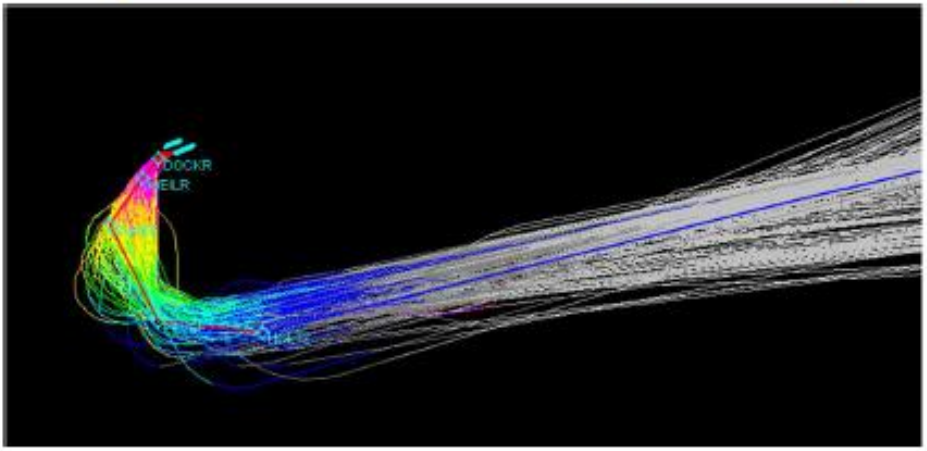
- **Enhanced analysis/modeling capabilities**
  - ASCENT project focused on quantifying noise impacts of advanced operational procedures

Improved Environmental Analysis Capability

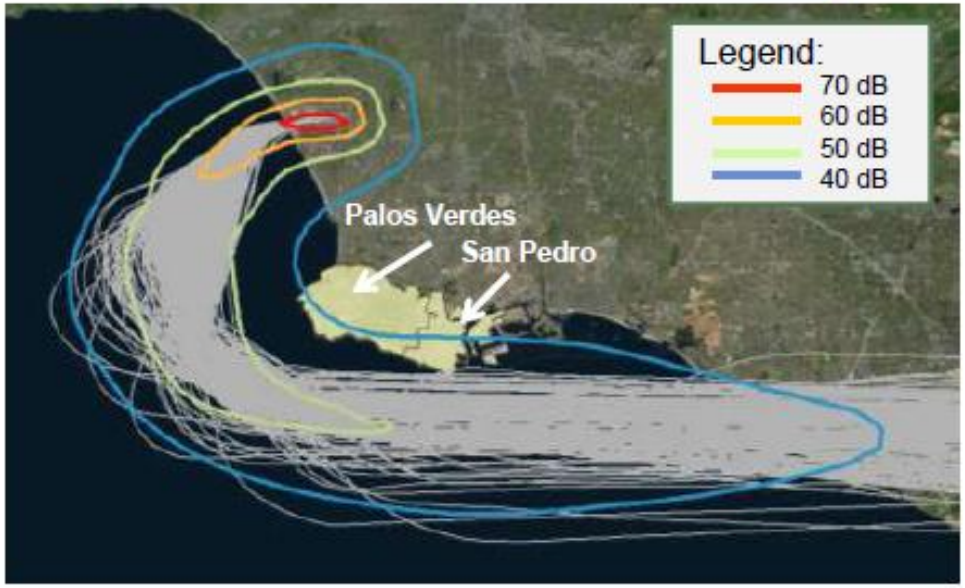
- **Goal is to perform operations analysis that informs decision-making**
- **PBN Procedures Analysis objectives:**
  - Evaluate E&E impact of PBN procedures
  - Develop generalized approach using AEDT to assess PBN procedures
  - Assess noise and emissions trade-offs associated with Noise Abatement Departure Procedures (NADPs) and explore operationally viable alternatives
- **In addition to E&E assessments, analysis has resulted in development of tools/processes for advanced operations analyses with AEDT**

Example NADP Analysis – LAX

Baseline HOLTZ9 Runway 25R



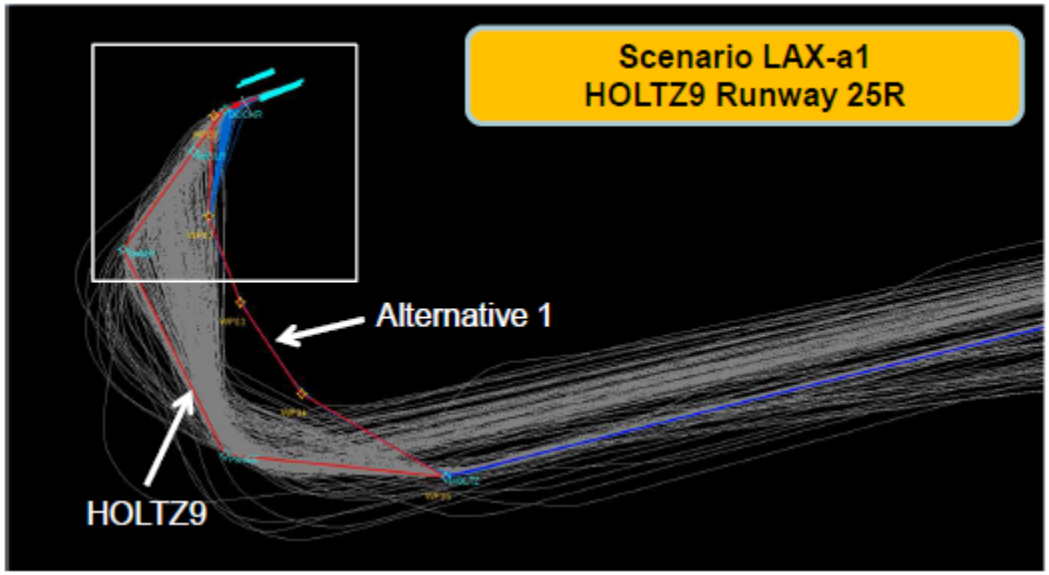
Baseline Preliminary DNL Noise Contours

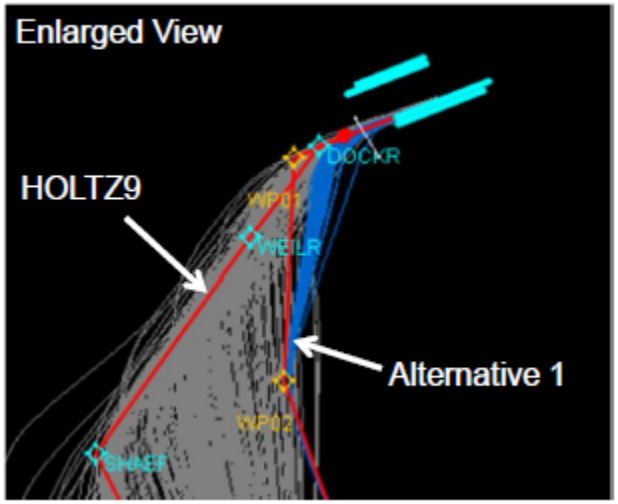


Baseline Preliminary Emissions and Noise Exposure Results

Event	# of Flights	Fuel (kg)	Distance (km)	Duration (min : sec)	CO (kg)	NO_x (kg)	$PM_{2.5}$ (kg)	DNL Contour Area (sq. km)			
								40 dB	50 dB	60 dB	70 dB
Baseline*	693**	2,035	255	23:02	2.3	42	1.9	806	185	21	3

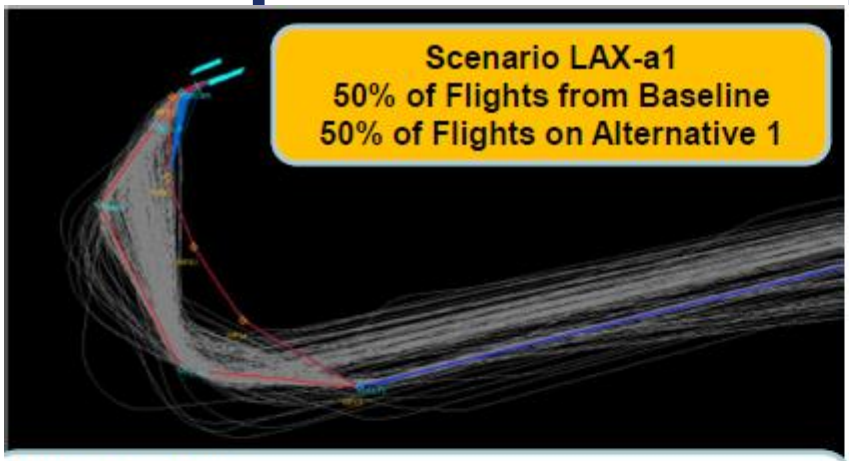
Example NADP Analysis – LAX





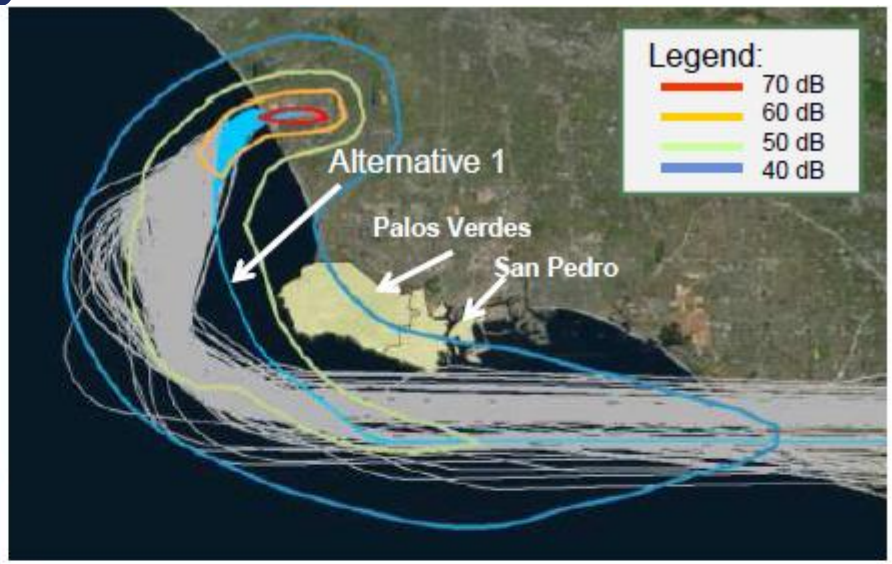
- The scenarios were created to determine the environmental impact of different utilization rates of the Alternatives
- Scenario LAX-a1 Creation:
  - 350 (50%) of the tracks from the baseline sample were used
  - 350 (50%) of the tracks from the baseline sample were 'tagged' onto Alternative 1
    - In TARGETS, control line was drawn across tracks to 'tag' to a procedure
  - Scenario LAX-a1 assumes the same percentages of Day/Evening/Night flights as the Baseline
    - Baseline Day: 231 (38% of total flights) Alternative 1 Day: 231 (38% of total flights)
    - Baseline Evening: 36 (5% of total flights) Alternative 1 Evening: 36 (5% of total flights)
    - Baseline Night: 83 (12% of total flights) Alternative 1 Night:83 (12% of total flights)
    - Scenario LAX-a1 Total: Day – 462 (66%), Evening – 72 (10%), Night – 166 (24%)

Example NADP Analysis – LAX



Key Take-Aways:

- Scenario LAX-a1 results in reductions in fuel, distance, duration, and emissions when compared to the baseline
- The CNEL 60 dB contour areas increased in size, the 50 dB contour area decreased, and 70 dB contour area remained the same.



Scenario LAX-a1 Preliminary CNEL Noise Contours

Scenario LAX-a1 Preliminary Emissions and Noise Exposure Results

Event	# of Flights	Fuel (kg)	Distance (km)	Duration (min : sec)	CO (kg)	NO_x (kg)	$PM_{2.5}$ (kg)	CENL Contour Area (sq. km)		
								50 dB	60 dB	70 dB
Baseline*	693	2,035	255	23:02	2.3	42	1.9	185	21	3
Scenario LAX-a1** Δ	642	-53 (-2.6%)	-4.7 (-1.9%)	-0:35 (-2.5%)	-0.13 (-5.8%)	-1.43 (-3.4%)	-0.04 (-2.3%)	-38 (-20%)	+7 (+33%)	No change

Preliminary results; do not cite or quote

Improved Environmental Analysis Capability

Modeling Potential E&E Benefits/Impacts of UAS in the NAS

- On-going coordination with:
  - FAA UAS Integration Office
  - Volpe
  - TRB/ACRP
  - NASA
  - DoD
- Preliminary Findings on UAS Customization and Substitution in AEDT

Level of Difficulty	Description of Customization	Data Needs	Data Availability	Updates to AEDT
0	Model UAS conversions as actual AEDT aircraft (e.g. G550 Conversion as a GV in AEDT)	☑	☑	☒
1	Model UAS with a substitute aircraft currently in AEDT	☑	☑	☒
2	Select an airframe, engine alternative in AEDT	☑	☑	☒
3	Select an airframe engine alternative with different BADA fuel specifications			
4	Select an airframe engine alternative with a different NPD curve			
5	Obtain new performance data for UAS vehicles and integrate into AEDT (Fuel Burn)	☒	☒	☑
6	Obtain new performance data for UAS vehicles and integrate into AEDT (Noise)	☒	☒	☑

Preliminary results; do not cite or quote

Summary

- **AEE Ops Research program is positioned to respond to external pressures now and in the future:**
  1) Maturing promising mitigations
     - CASO, DDA, N-Control, OPC
  2) Addressing noise impacts
     - Noise-mitigating concepts
     - Enhanced noise modeling/analysis of operational concepts
  3) Improved environmental analysis capability
     - Procedure assessment
     - UAS
  4) Collaboration
  5) Annual Roadmap assessment