NIRS Screening Tool As Applied To CDA Macro-level Impact Estimation and Sensitivity Analysis

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- **CDA Impacts Via NIRS Screening Tool (NST)**

- **Relevance to JPDO Gap/Constraint Analysis**

Data Preparation: CDA Profiles

SDF CDA DATA

AVERAGE FOR EACH AIRCRAFT TYPE

REDUCTION OF NUMBER OF POINTS IN PROFILE

MERGE WITH NST/INM PROFILE DATABASE

- SDF data for CDA and non-CDA periods received from Boeing.

- CDA flight events for same aircraft used to create « average » CDA profile for 757PW, 757RR, and 767-300.

- Number of points in these CDA profile_pts files reduced to correspond to standard INM profile_pts files.

- Inserted resulting CDA profiles into NST profile database.

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Data Preparation – Radar-based Flows/Events

Radar-based data is used to create a sample day of traffic at the airport being analyzed for CDA impacts.
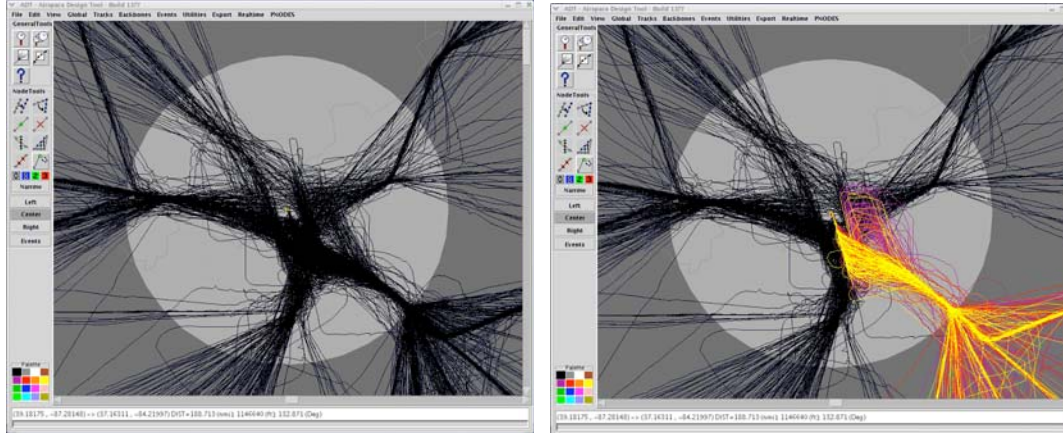
Aggregation flows (with events)
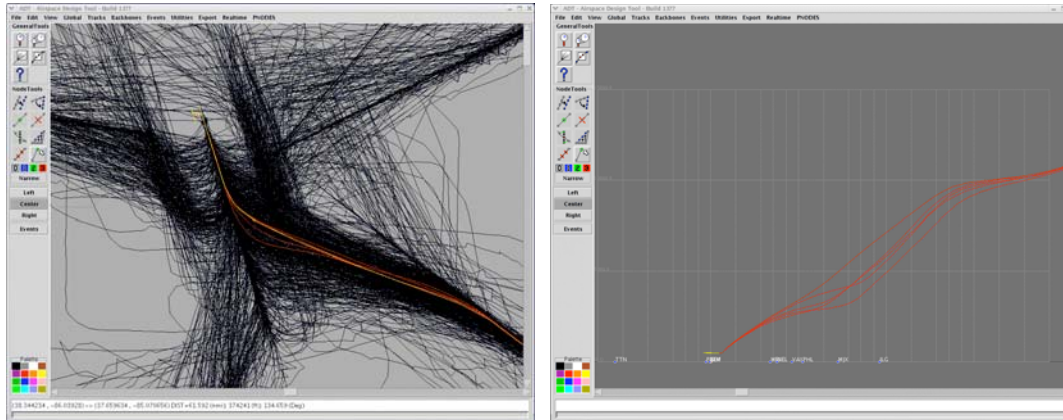
- **30 days of ETMS data used to derive representative traffic flows.**

- **ADT applies algorithms that group 3-D tracks according to similarity (location, arr/dep, actype, fix, etc.).**

- **Rapid point/click editing to polish results.**

- **Resulting flows can be as detailed (location, time, actype, etc.) as one desires.**

CDA Impact Estimation: Scenario Definition
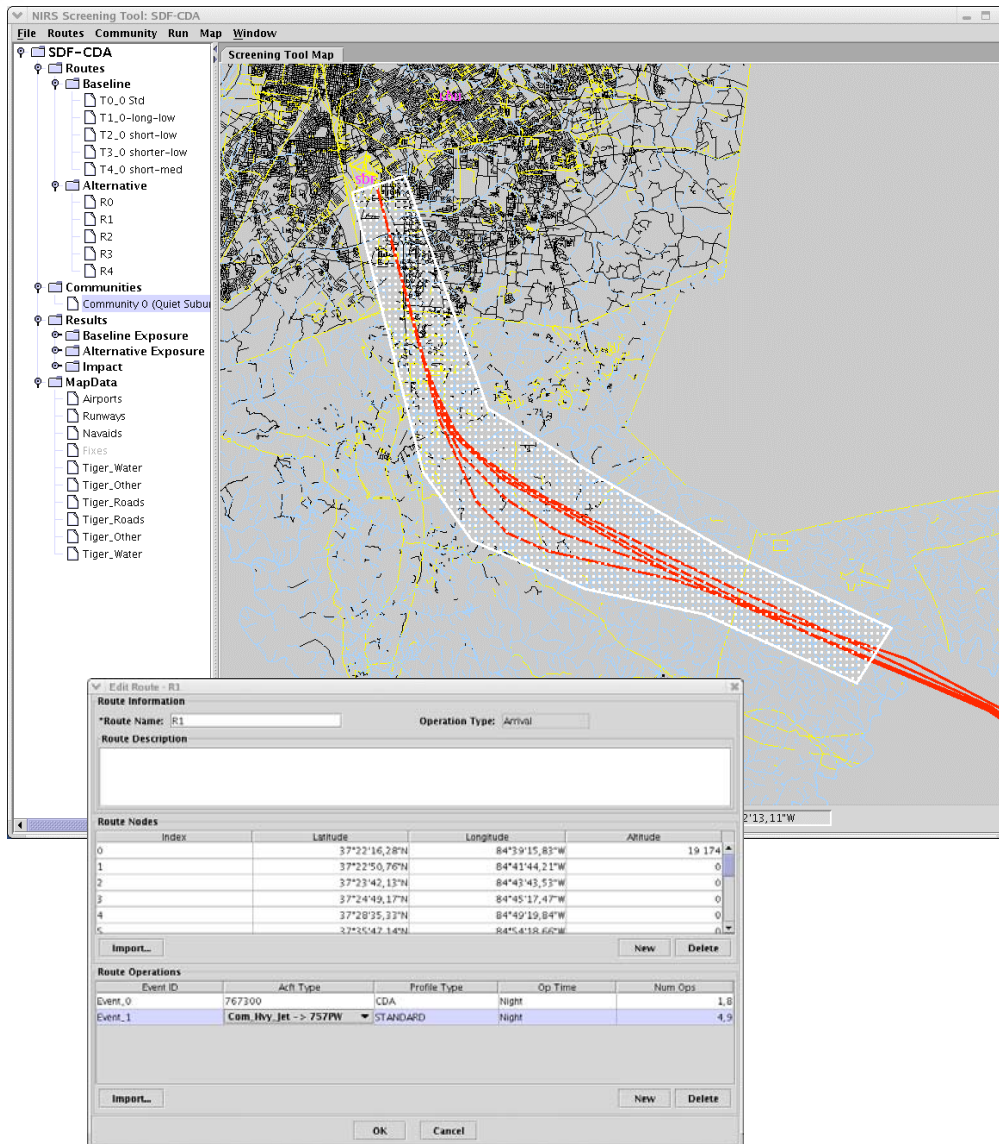
- **NST imports ETMS-based traffic flows.**

- **Events loaded with flows, or modified by NST user.**

- **TIGER data defines roads, waterways, etc.**

- **Community boundaries imported from digital files.**

- **Areas of interest drawn by NST user, and noise-sampling points defined.**

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CDA Impact Estimation – Location and Magnitude

NST calculates <u>macro-level impacts</u> of baseline (non-CDA) and alternative (CDA) cases.

BASELINE

ALTERNATIVE

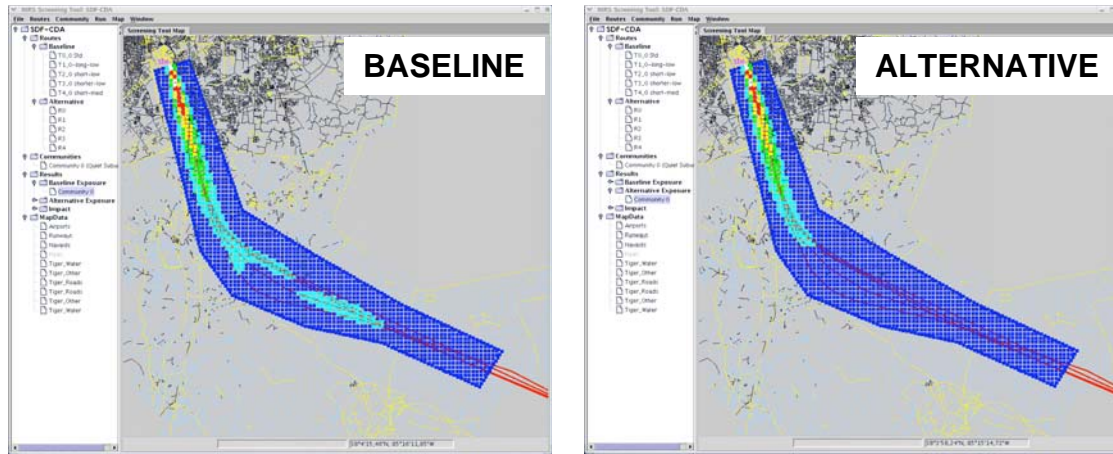- **Radar-based profiles applied to these flows to form Baseline case.**

- **Note that Baseline can also be defined based on standard INM profiles.**

- **CDA profiles for some aircraft applied to these flows to form Alternative case.**

- **Impact measured in terms of FAA guidelines.**
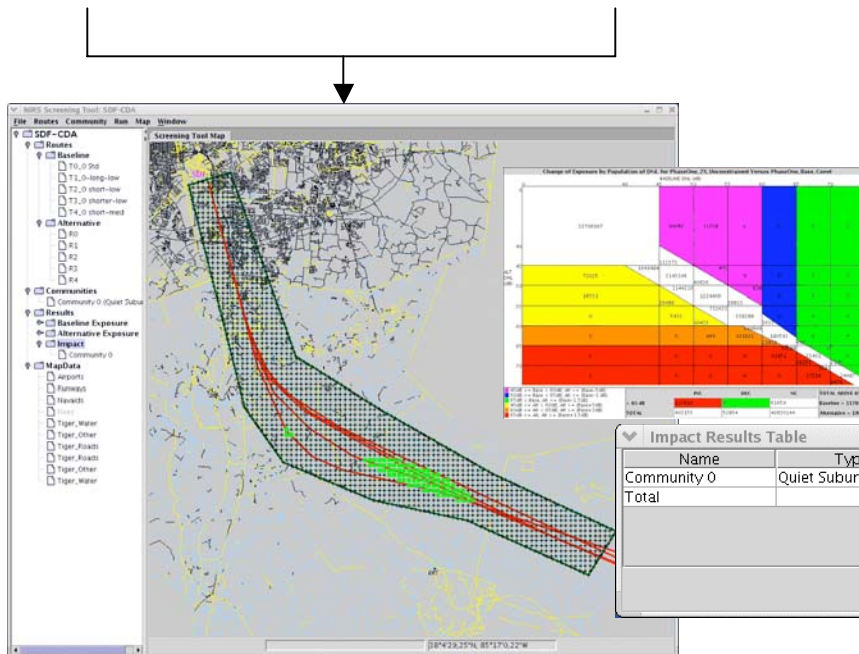
Name	Type	% Red	% Orange	% Yellow	% NoChange	% Green	% Blue	% Purple
Community 0	Quiet Suburb	0	0	0	95,2	4,7	0	0
Total		0	0	0	95,2	4,7	0	0

CDA Impact Estimation: Things We Can Do Now

- Vary assumptions about CDA usage (who, when, where), and quantify sensitivities.

- Select from multiple CDA profiles for given aircraft (given the data).

- Address any airport for which there is data.

- Re-use data from past and current projects (NYNJ, Midwest, etc.)

- Use NAS-simulator data as input.

- Model at various levels of fidelity, depending on need.

- Aggregate across sets of airports.

- Use other metrics for CDA impact.

Questions/Issues/Next Steps

- **Expansion of CDA profile database to more aircraft?**

- **Prioritization of airports for analysis of CDA benefits**

- **Extrapolation to national level under different assumptions**

- **Estimation of fuel savings in parallel with noise**

- **Should CDA benefits be based on comparison with standard INM profiles or with profiles derived from radar data?**

- **What uses of this modeling capability are relevant to the needs of workshop participants.**

Gap Analysis Background

EAD Environmental Approach

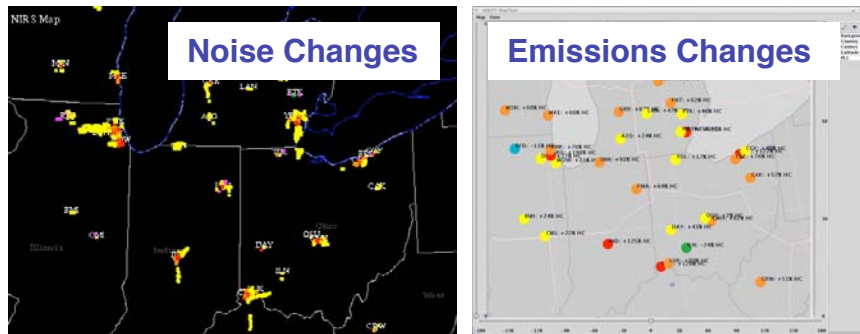*Nationwide traffic under different business assumptions over the next 20 years as simulated by ACES is evaluated for both noise and emissions impacts.*

Future Scenarios
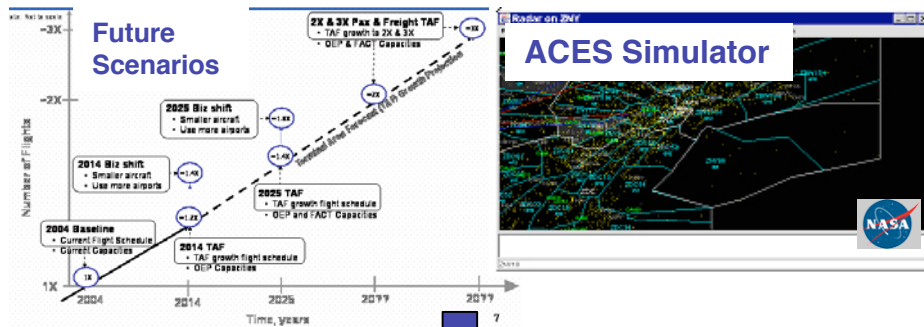
ACES Simulator

ACES NAS Simulation Outputs for Different Futures

Noise Changes

Emissions Changes

Noise and Emissions Future Projections

Feedback to the Transformation Process

- Methodology and infrastructure coupling environmental modeling to NAS-wide airspace simulation.

- Core modeling tools (NIRS/INM, EDMS) extended to meet JPDO needs.

- Key goals:

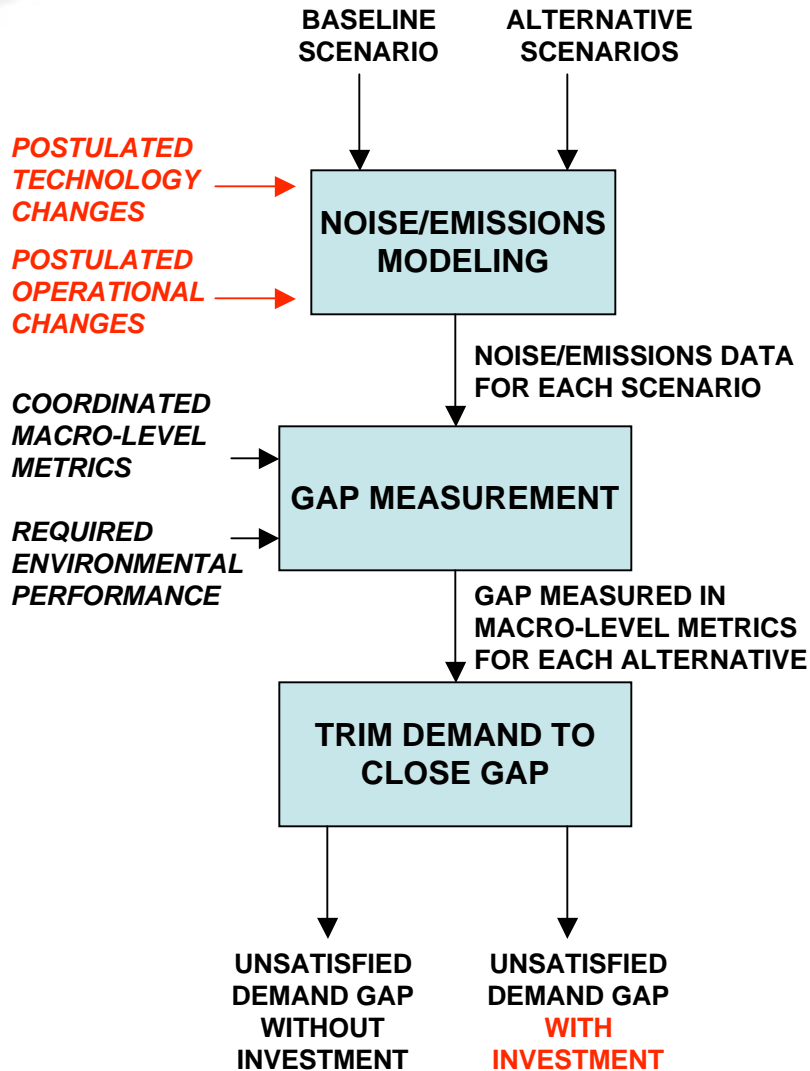 - Estimate gap between desired traffic levels and those consistent with environmental constraints.

  - Estimate impact of gap closers (vehicle technology, operations).

  - Sensitivity analysis regarding fleet, vehicle technology, operational techniques, traffic patterns, and business models.

  - Compatibility with national and international methods

Environmental Processing and Analysis Overview
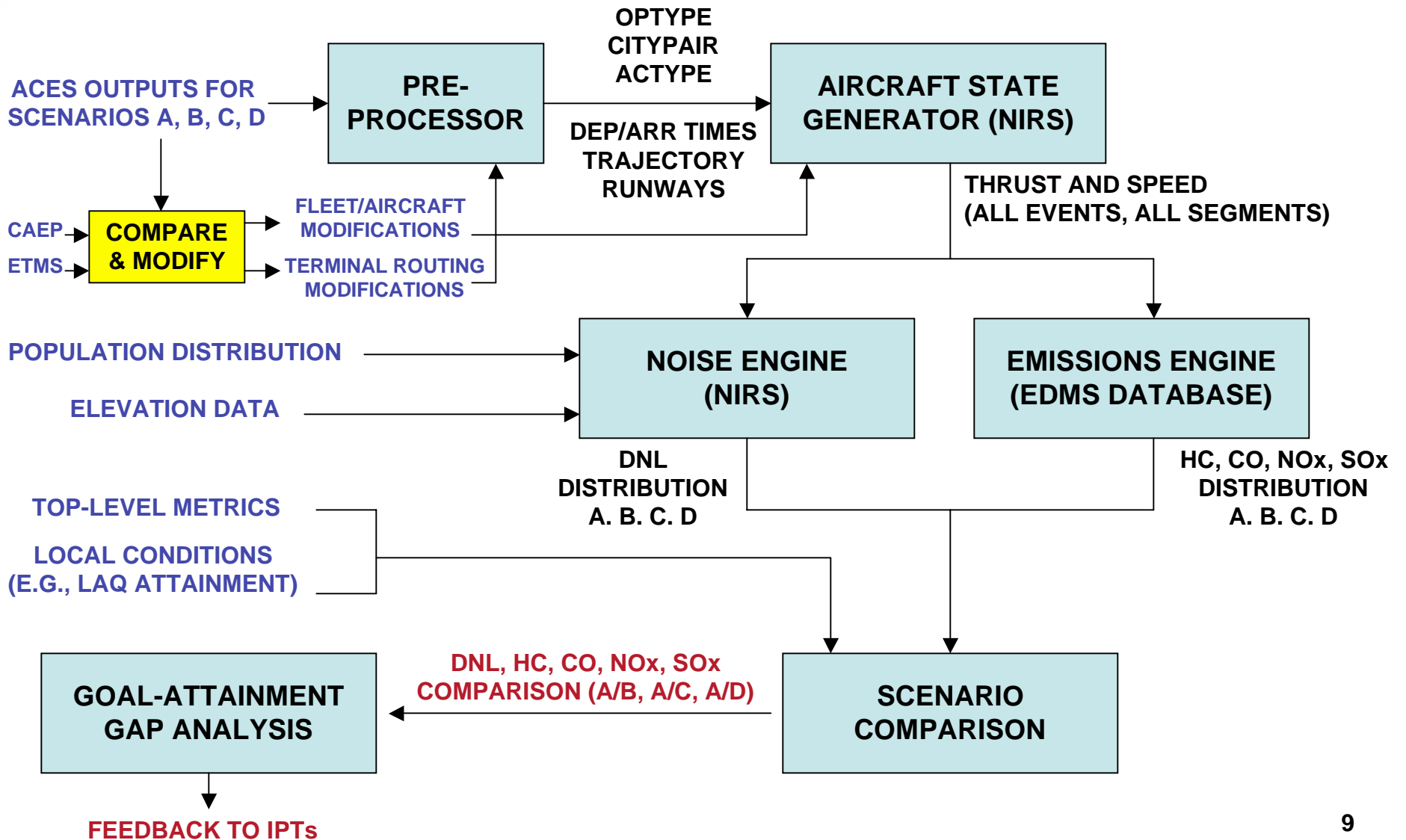
Gap Analysis – Overview

Estimate the unsatisfied demand due to environmental constraints, and estimate the improvement due to investment in vehicle technology and operational procedures.

BASELINE
SCENARIO

ALTERNATIVE
SCENARIOS

POSTULATED TECHNOLOGY CHANGES

POSTULATED OPERATIONAL CHANGES

NOISE/EMISSIONS MODELING

NOISE/EMISSIONS DATA FOR EACH SCENARIO

COORDINATED MACRO-LEVEL METRICS

REQUIRED ENVIRONMENTAL PERFORMANCE

GAP MEASUREMENT

GAP MEASURED IN MACRO-LEVEL METRICS FOR EACH ALTERNATIVE

TRIM DEMAND TO CLOSE GAP

UNSATISFIED DEMAND GAP WITHOUT INVESTMENT

UNSATISFIED DEMAND GAP WITH INVESTMENT

- **Environmental modeling is completed for a Base Case and one or more future Alternatives.**

- ***Macro-level metrics* are computed for noise and emissions for the study region as a whole and for each sub-region around major airports.**
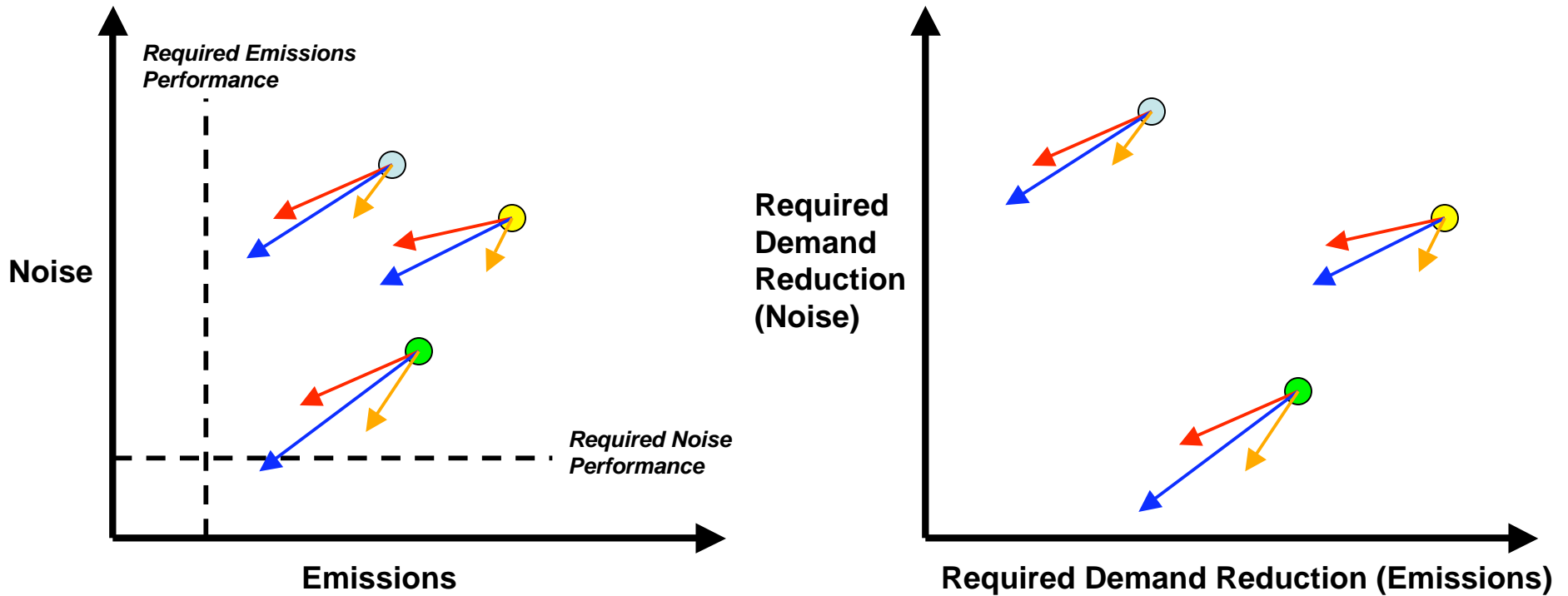
- **The Alternative is compared to the Base Case in terms of the macro-level metrics and their relationship to « *required environmental performance* ».**

- **The difference between the macro-level metrics and the required environmental performance gives the gap measured in environmental terms.**

- **The amount of demand reduction required to reduce this gap to zero measures the gap in terms of unsupplied demand.**

- **Vehicle technology enhancements and operational changes are postulated to measure the degree to which the gap can be closed by these investments.**

Gap Analysis – Envisioned Output