the VOLPE center

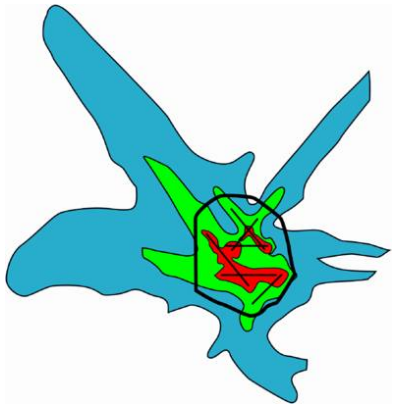
Aviation Environmental Modeling and Management

U.S. Department of Transportation
Research and Innovative Technology Administration

Airports Authority of India
16 Jan 08

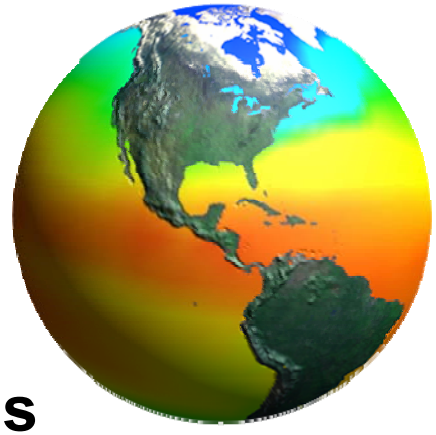
Andrew Hansen
RTV-4F
US DOT Volpe Center

Aviation Environmental Issues



Community Noise Levels

Curtailing significant aircraft noise impacts around airports



Global Climate

Understanding and addressing the impact of aviation on Earth's climate

Water Quality

Limiting or reducing impact of aviation on water quality

Air Quality

Limiting or reducing impact of aviation on local air quality

Aviation Environmental Governance

United States FAA Office of Energy and Environment

- Policy and decision-making
  - ICAO CAEP—Emissions stringency, long-term goals, green house gases, influence future fleet
  - FAA JPDO—airspace redesign, efficiencies in air traffic management, energy conservation
- Regulatory compliance
  - Airport authorities—environmental impact studies, respond to public inquiries
  - Operators and airframe manufacturers—airframe design constraints, operational fleet optimization

Why Integrate Noise and Emissions?

DOT 2004 R&D Annual Review

"Ensure aviation remains a good neighbor."

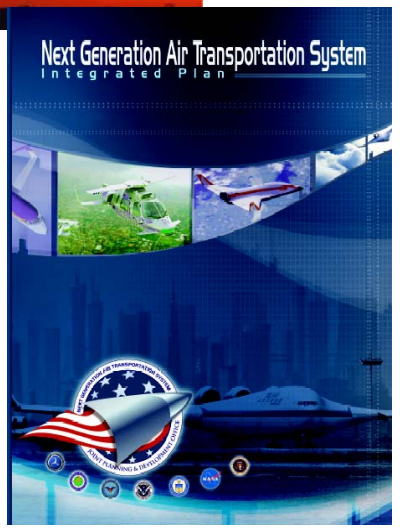
FAA 2005-2009 Flight Plan

(http://www1.faa.gov/aboutfaa/flightplan.cfm)

"Develop better technologies and analytical tools to evaluate aircraft noise and emissions."

FAA Joint Planning and Development Office—Next Generation Air Transportation System

"Create new analytical tools to understand better the relationship between noise and emissions, the different types of emissions, and the costs and benefits of different policies and actions"

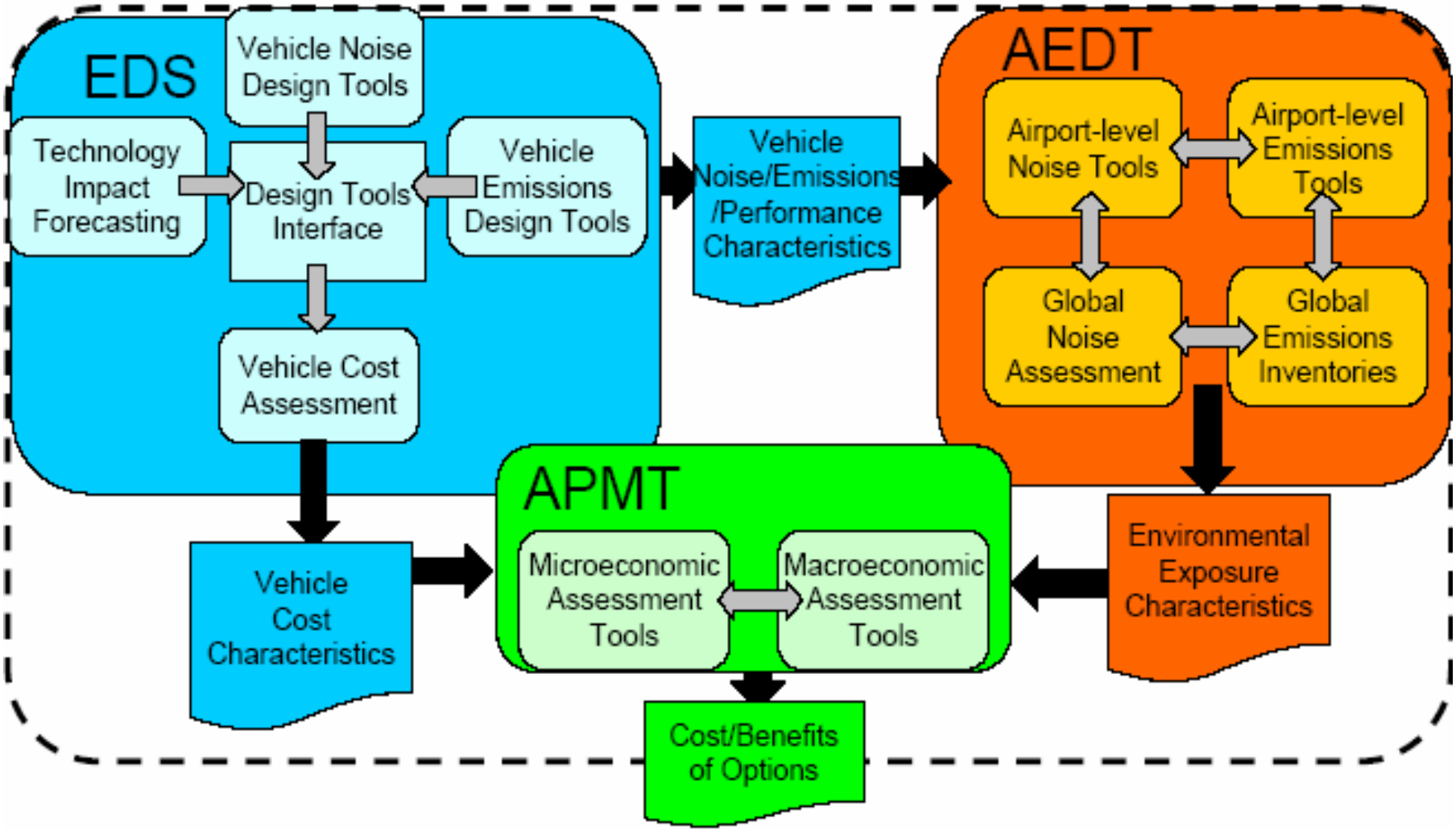


Aviation Environmental Tools Suite

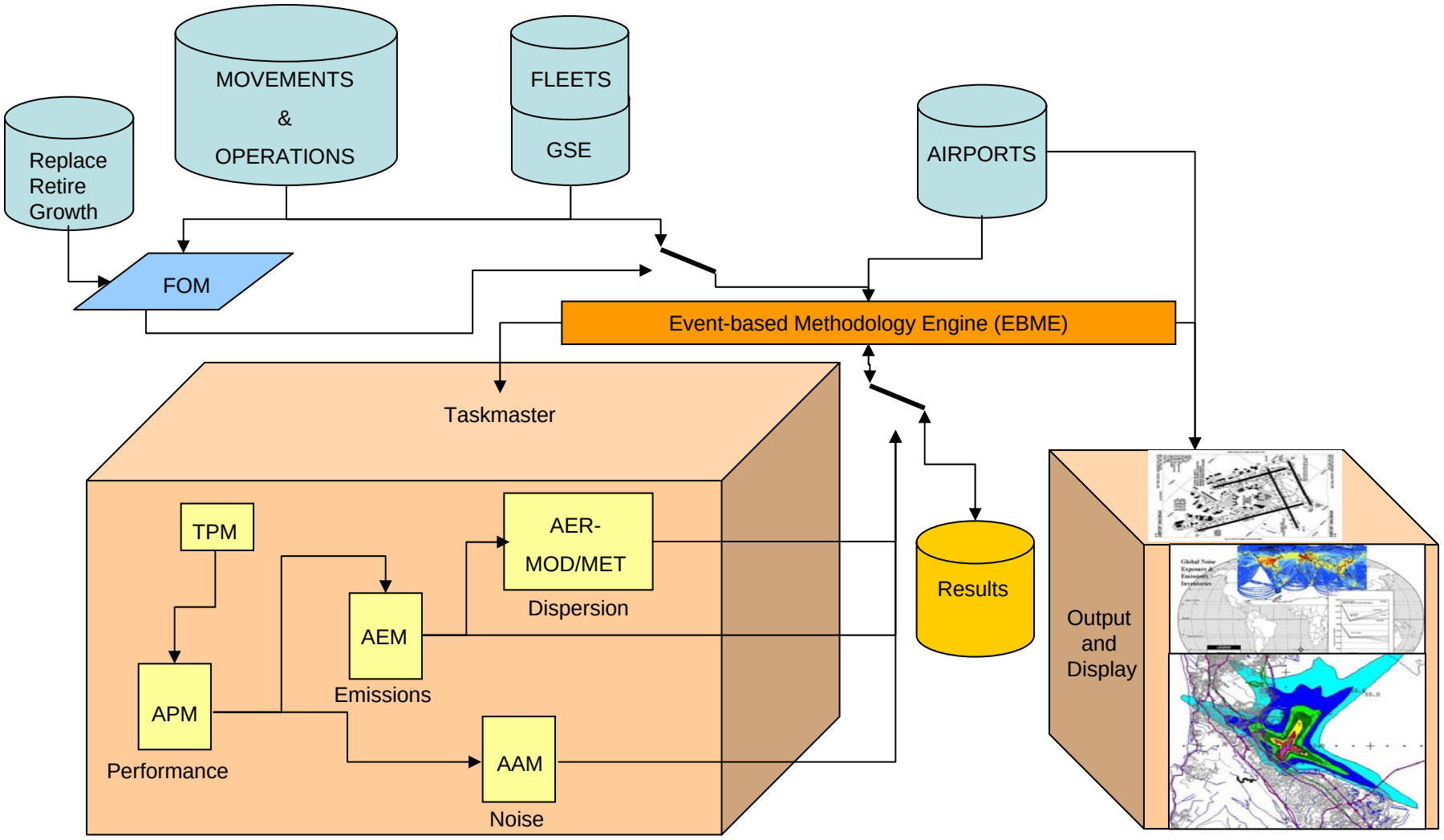
FAA Office of Energy and Environment Effort

- Environmental Design Space (EDS)—future fleets
- Aviation Environmental Design Tool (AEDT)—aircraft performance, emissions, and acoustics
- Aviation Environmental Portfolio Management Tool (APMT)—environmental and economic evaluations, benefit/cost
- Standardized Aviation Databases
  - Fleet—industry and government (Campbell Hill, BACK, BADA, ANP)
  - Airport—government (NFDC, DAFIF, AVN)
  - Movements—schedule and radar (ETMS, ETFMS, OAG, others)

Aviation Environmental Tools Suite

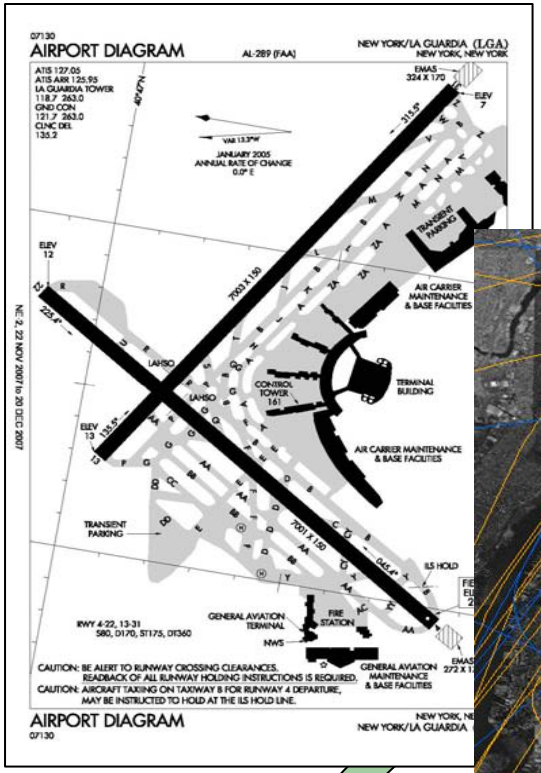


AEDT Functional Schematic

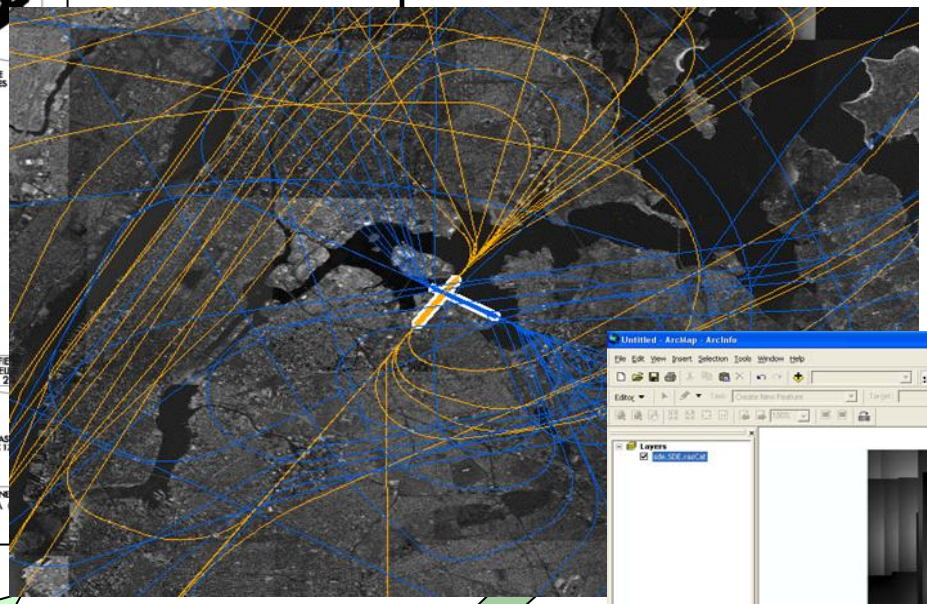


AEDT Scenario/Study Construction

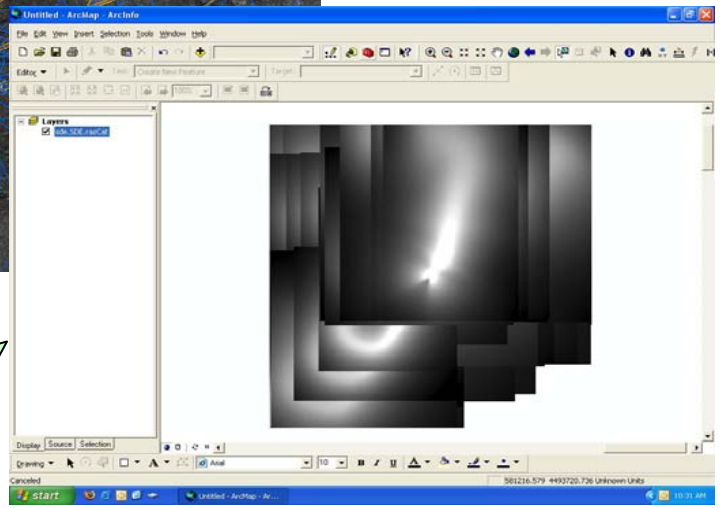
Airport layouts



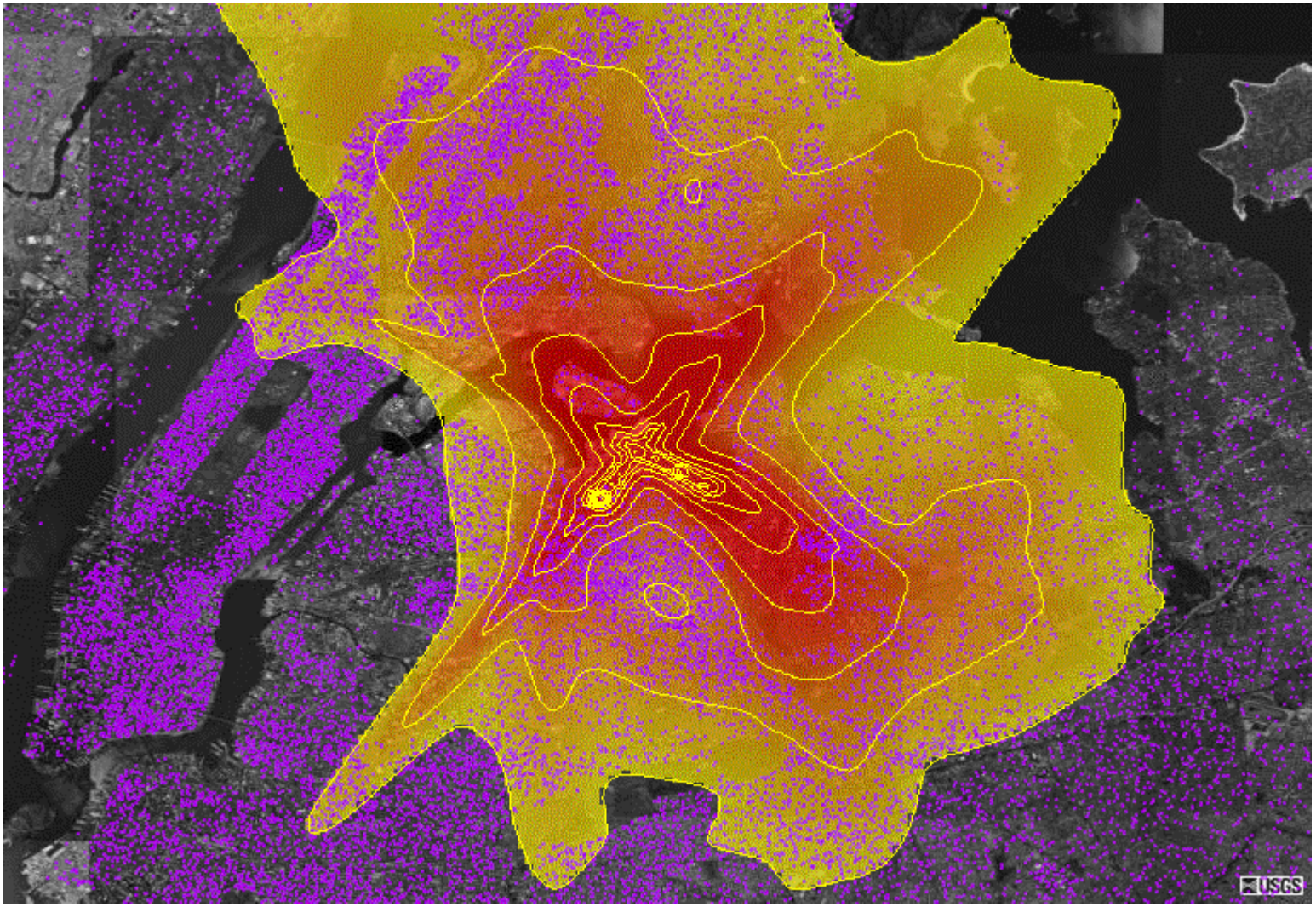
Operations visualization



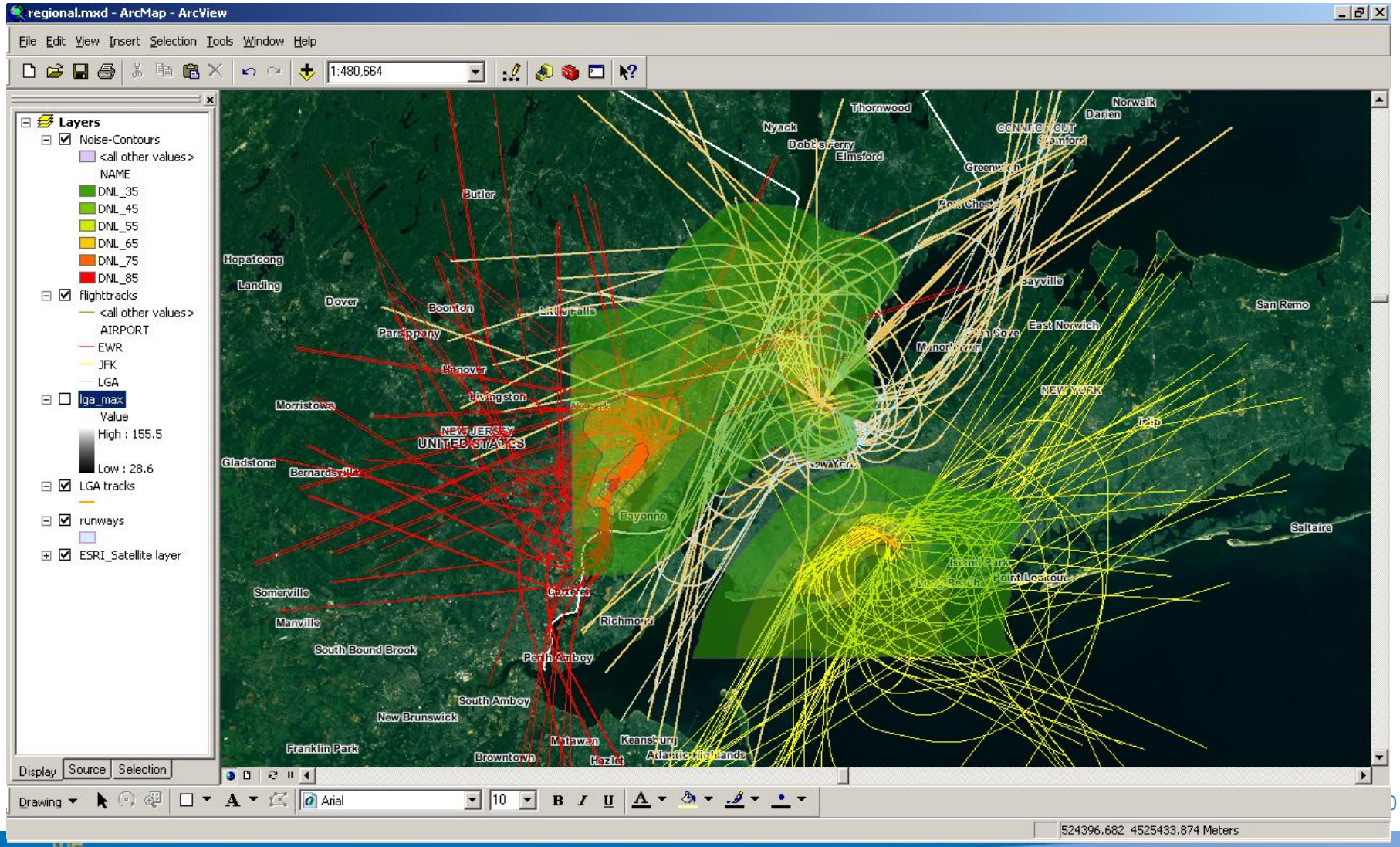
Event Archive



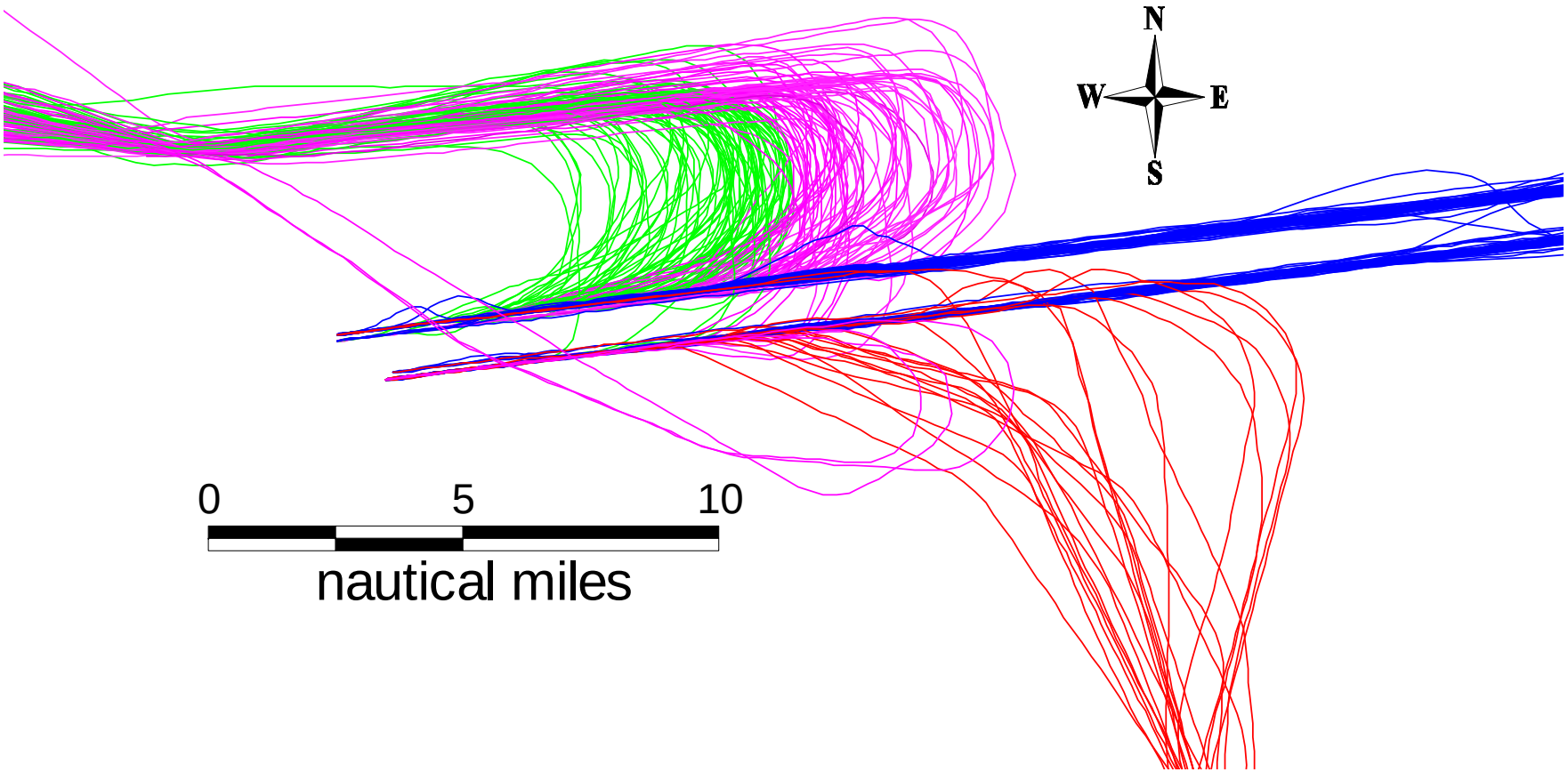
Example Analysis of Noise Exposure



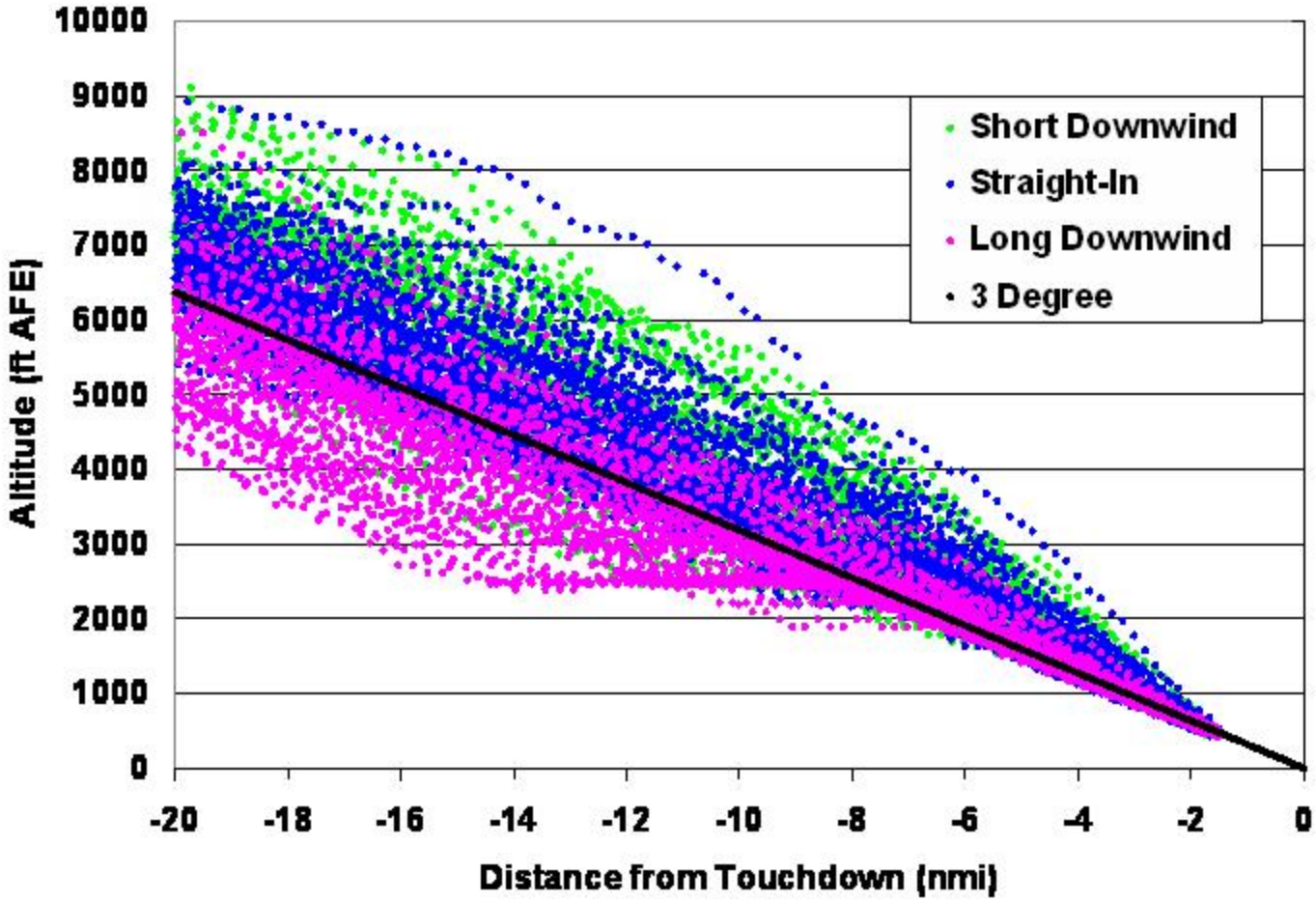
Example of Regional Airspace Design



Continuous Descent Approach (CDA)



CDA Vertical Approach Profiles

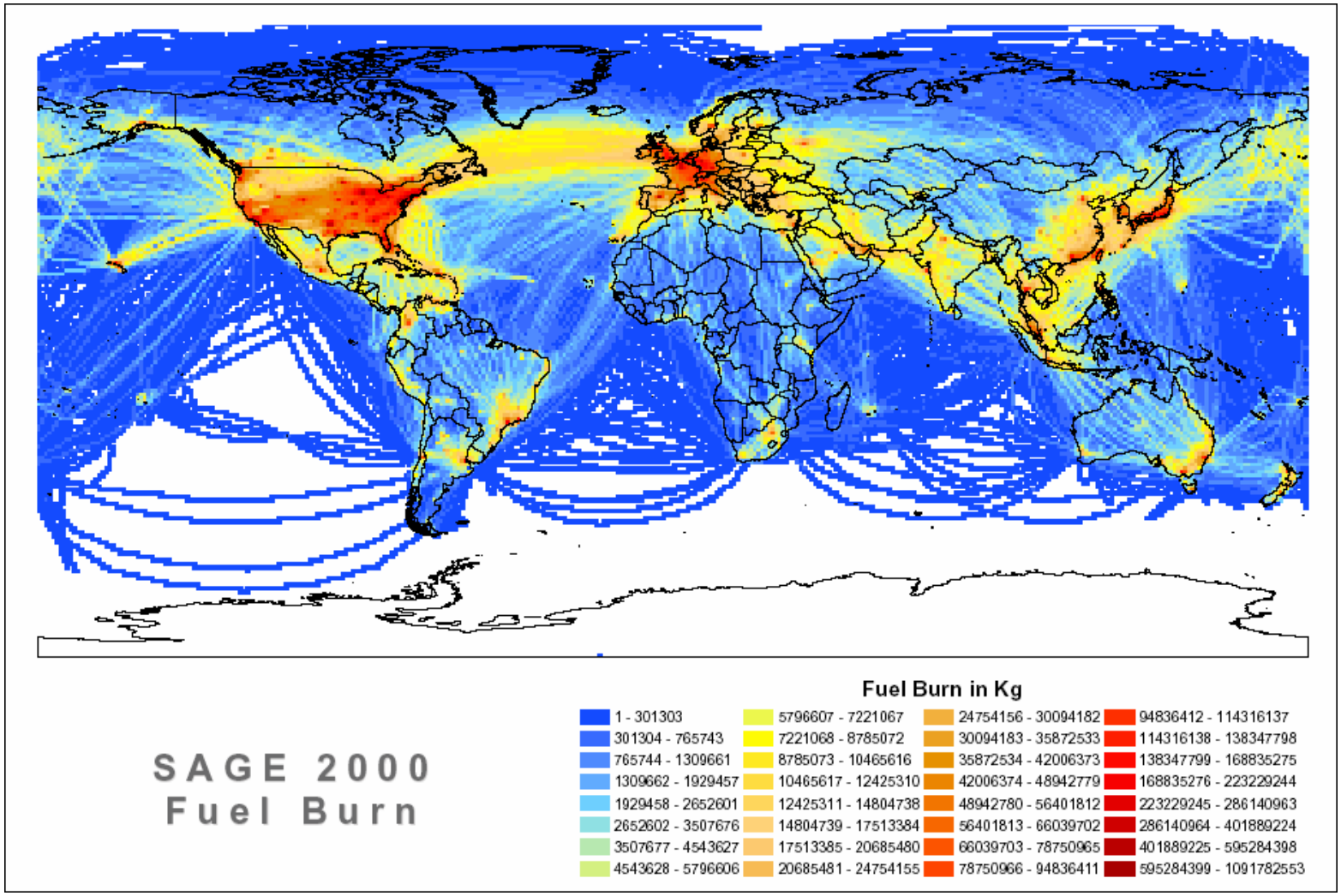


Example Improvements from CDA

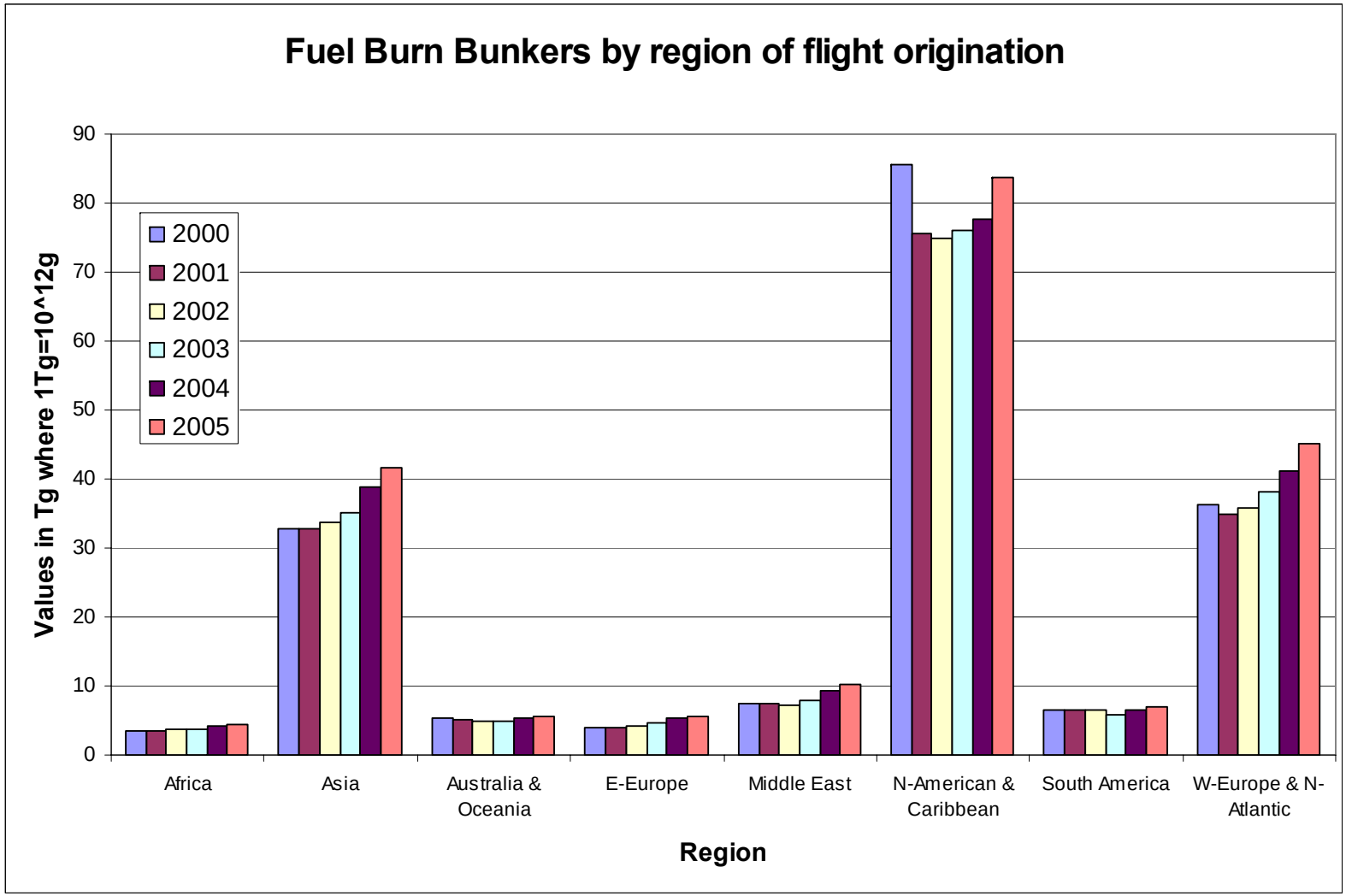
10,000 ft AFE to Touchdown

Emiss	% Change Relative to Baseline		
	Straight-In	Downwind	Southern
CO	-8.7	-13.8	-26.7
THC	-8.8	-11.0	-23.9
NMHC	-8.8	-11.0	-23.9
VOC	-8.8	-11.0	-23.9
NOx	-18.1	-32.3	-51.8
SOx	-14.7	-26.9	-46.1
CO_2	-14.7	-26.9	-46.1
H_2O	-14.7	-26.9	-46.1
Fuel	-14.7	-26.9	-46.1

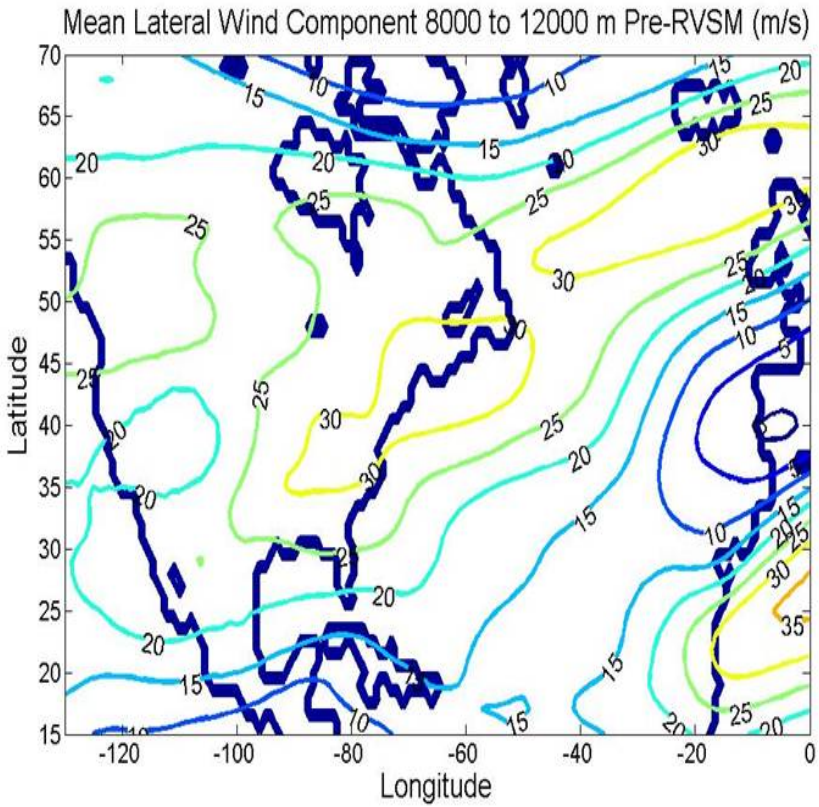
Example Assessment of Fuel Burn



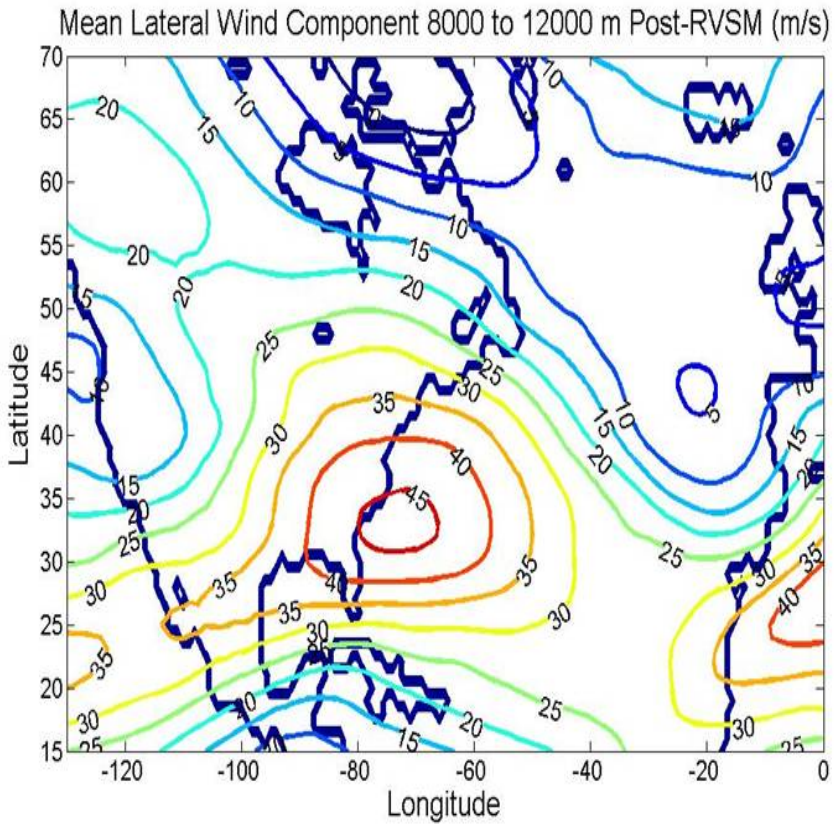
Annual Fuel-burn Estimates by Region



Airways Design—RVSM Efficiency



Pre-RVSM



Post-RVSM

RVSM Fuel-burn Benefit Prediction