



Your complimentary  
use period has ended.  
Thank you for using  
PDF Complete.

[Click Here to upgrade to  
Unlimited Pages and Expanded Features](#)

# Aviation and the Environment

## *Updates on Quantifying and Mitigating Aircraft Noise*

Presented to: ONCC

Presented by: Dr. Lourdes Maurice  
Executive Director  
Office of Environment and Energy

Date: May 4, 2012



**Federal Aviation  
Administration**





*Your complimentary  
use period has ended.  
Thank you for using  
PDF Complete.*

[Click Here to upgrade to  
Unlimited Pages and Expanded Features](#)

Background

FAA's Goals and Metrics

NextGen Approach

Noise Efforts

FAA Modernization and Reform Act of 2012

Assessment Framework and Summary



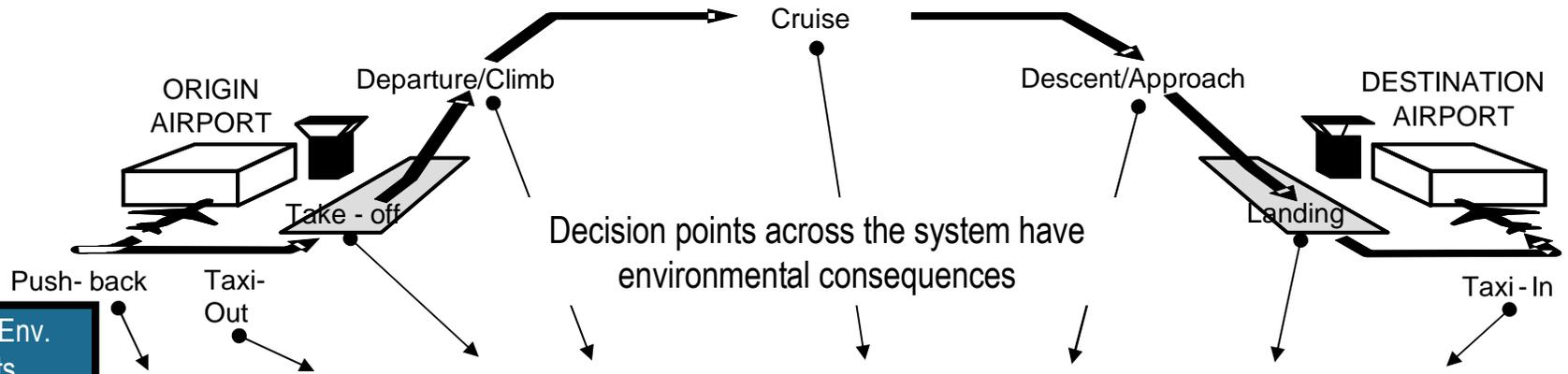
## aviation

# issues have a prominent role in

- ▶ Interest in reducing aviation environmental impacts continues to increase (political, international, public, etc.)
- ▶ Aviation growth will likely be accompanied by increased environmental impacts
- ▶ Environmental issues can constrain growth, flexibility, or efficiency
- ▶ If not well planned environmental issues can effect the efficiency of air transportation system changes

Environmental and energy challenges must be addressed to fully realize the benefits of aviation

# Environmental challenges and cross the air transportation system



NextGen Env. Aspects	Push-back	Taxi-Out	Take-off	Departure/Climb	Cruise	Descent/Approach	Landing	Taxi-In
Noise		?	x	x	?	x	x	?
Air Quality	x	x	x	x	?	x	x	x
Climate	x	x	x	x	x	x	x	x
Energy	x	x	x	x	x	x	x	x
Water	x	x	x				x	x

- Operations, infrastructure, or technology can have environmental benefits and impacts
- Environmental benefits/impacts also result from ground support equipment, facilities, ground transportation to airports, etc.
- Environmental benefits/impacts can be influenced by external mechanisms (e.g., EPA, ICAO, local communities)

# Aviation 2025 Plan establishes Quantitative Metrics

## Aspects Destination Quantitative 2025 Metrics (for 2018)

### Noise

“ The U.S. population exposed to significant aircraft noise around airports has been reduced to less than 300,000 persons.

### Air Quality

“ Aviation emissions contribute 50 percent less to significant health

### Climate

“ Aviation emissions are on a trajectory for carbon neutral growth using a 2005 baseline.

### Energy

“ Improve energy efficiency (fuel burned per miles flown) by at least 2 percent annually.

“ One billion gallons of renewable jet fuel is used by aviation by 2018.

“ A replacement fuel for leaded aviation gasoline is available by 2018 that is usable by most general aviation aircraft.

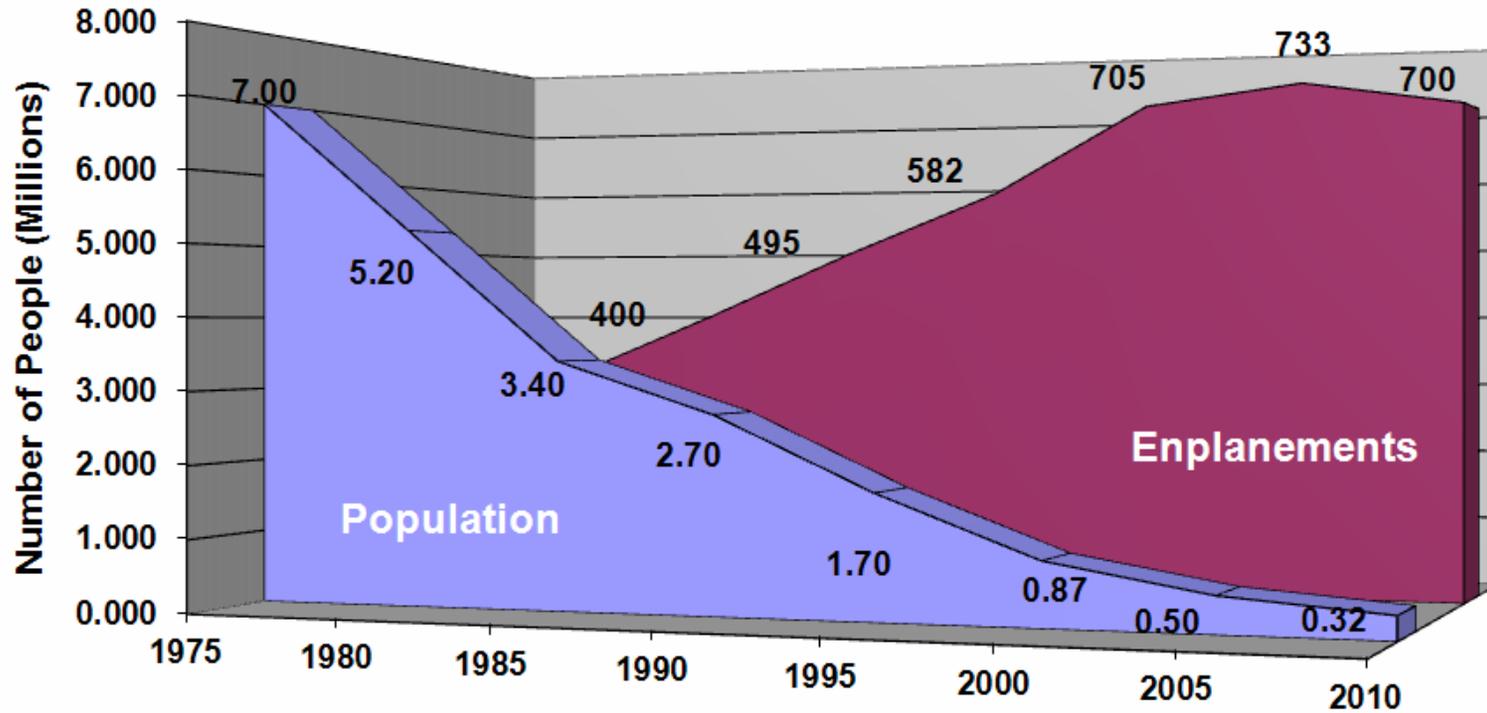
# on Air Transportation System (NEXTGEN) Environmental Approach



<http://www.faa.gov/nextgen/>

- Five Pillar Strategy for Addressing  
Environment & Energy Issues:
- “ Advance Scientific Understanding  
& Improve Analysis Capabilities
  - “ Accelerate Operational Changes
  - “ Mature New Aircraft Technology
  - “ Develop Alternative Fuels
  - “ Policies & Market Based Measures

## The Historical Record: Order of Magnitude Noise Exposure Reduction Despite Traffic Growth



# Reducing Noise Impacts

## ***Longstanding balanced approach:***

*Noise reduction at the source*

- Stage 4: increased stringency in aircraft noise standards*

*Land use compatibility planning and management (DNL  $\leq$   
65 dB is noise-compatible)*

- Large Federal investment in Part 150 Noise Compatibility  
Planning*

*Noise abatement operational procedures*

*Aircraft operational restrictions*



Your complimentary  
use period has ended.  
Thank you for using  
PDF Complete.

[Click Here to upgrade to  
Unlimited Pages and Expanded Features](#)

## search Workshops

Identify research needed to advancing understanding of the annoyance & sleep disturbance effects of aircraft noise

*Goal: Advance the scientific knowledge needed by the aviation community to more optimally address the impacts of aircraft noise on society*

“AUG 2009 - Ottawa, Ontario

“DEC 2009 - Washington, DC

“MAR 2010 - San Diego, CA

Presentations & Synthesis Report:

<http://www.fican.org/faaworkshop.html>



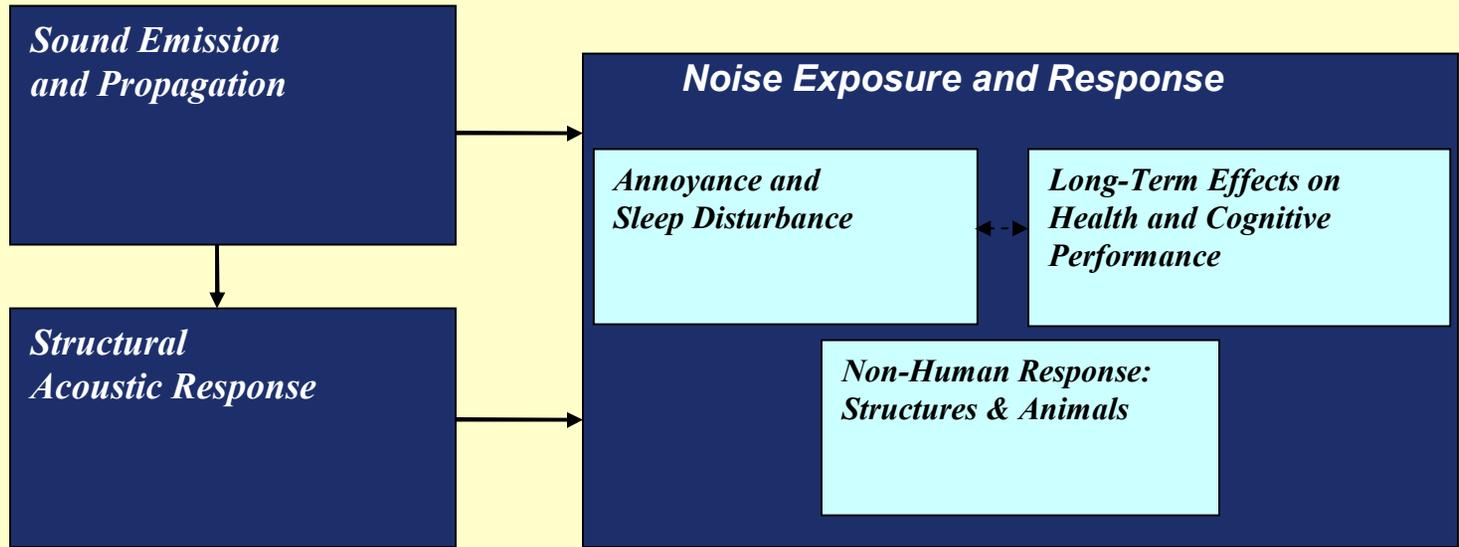
# Meeting

## Aviation Noise Impacts Research Roadmap

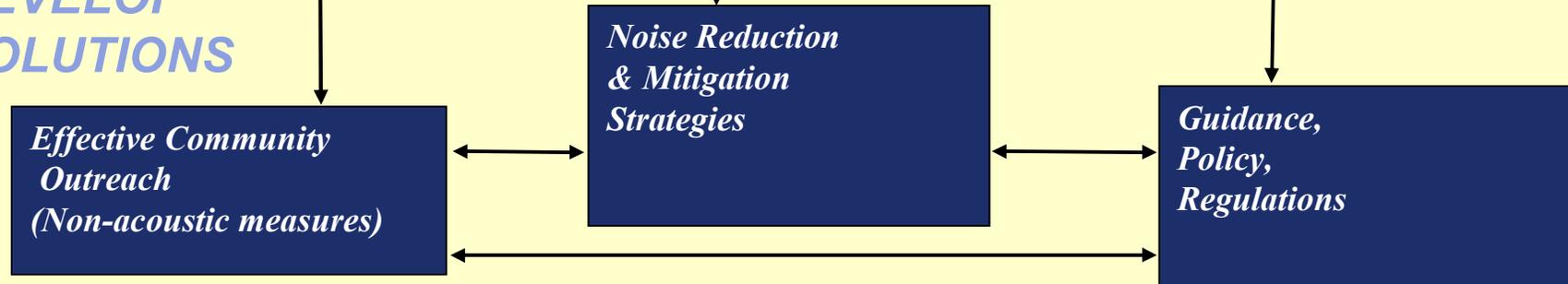
- “ April 19-20, 2011 - Washington DC, public forum: 105 attendees, 26 presentations (6 international)
- “ Four panels:
  - Noise effects on health and welfare
  - Aircraft noise modeling
  - Noise in National Parks and wilderness
  - Costs of aircraft noise on society
- “ Presentations are available at [http://www.fican.org/pages/2011Aviation Noise Impacts Roadmap Presentations.htm](http://www.fican.org/pages/2011Aviation_Noise_Impacts_Roadmap_Presentations.htm)
- “ Roadmap is available at <http://www.faa.gov>; specifically, [http://www.faa.gov/about/office\\_org/headquarters\\_offices/apl/research/science\\_integrated\\_modeling/media/NoiseRoadmap\\_2011\\_FINAL.pdf](http://www.faa.gov/about/office_org/headquarters_offices/apl/research/science_integrated_modeling/media/NoiseRoadmap_2011_FINAL.pdf)

# search Framework

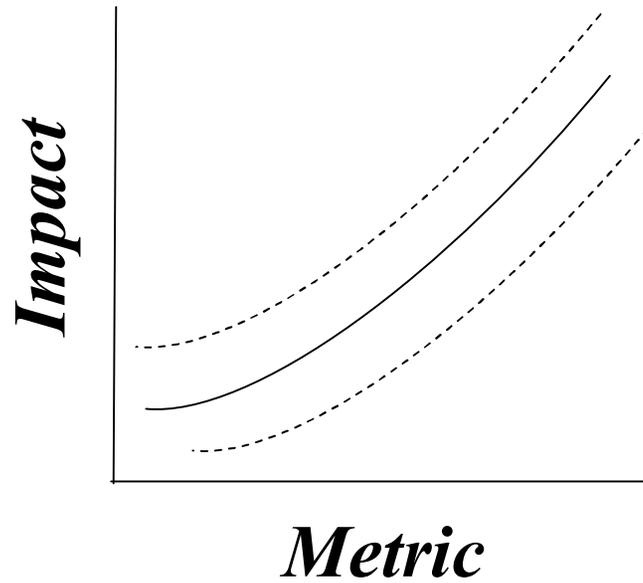
## UNDERSTAND PROBLEM (CHARACTERIZE NOISE)



## DEVELOP SOLUTIONS



# Noise Roadmap



Timeframe	Metric	Impact	Work
Current	DNL	% Highly Annoyed	
Near-Term	DNL	% Highly Annoyed	New Noise Surveys
Far-Term	?	?	Ongoing Research

## Research Areas

### 1. Noise effects on health and welfare

- . Survey to update annoyance dose response curve
- . Potential health & welfare impacts, including areas currently considered noise-compatible

### 2. Noise in National Parks and wilderness

- . Impacts dose response of visitors and wildlife

### 3. Aircraft noise modeling

- . Source and performance data
- . Propagation and performance modeling
- . Unconventional aircraft

### 4. Costs of aircraft noise on society

- . Common currency with other environmental costs for informed decision making

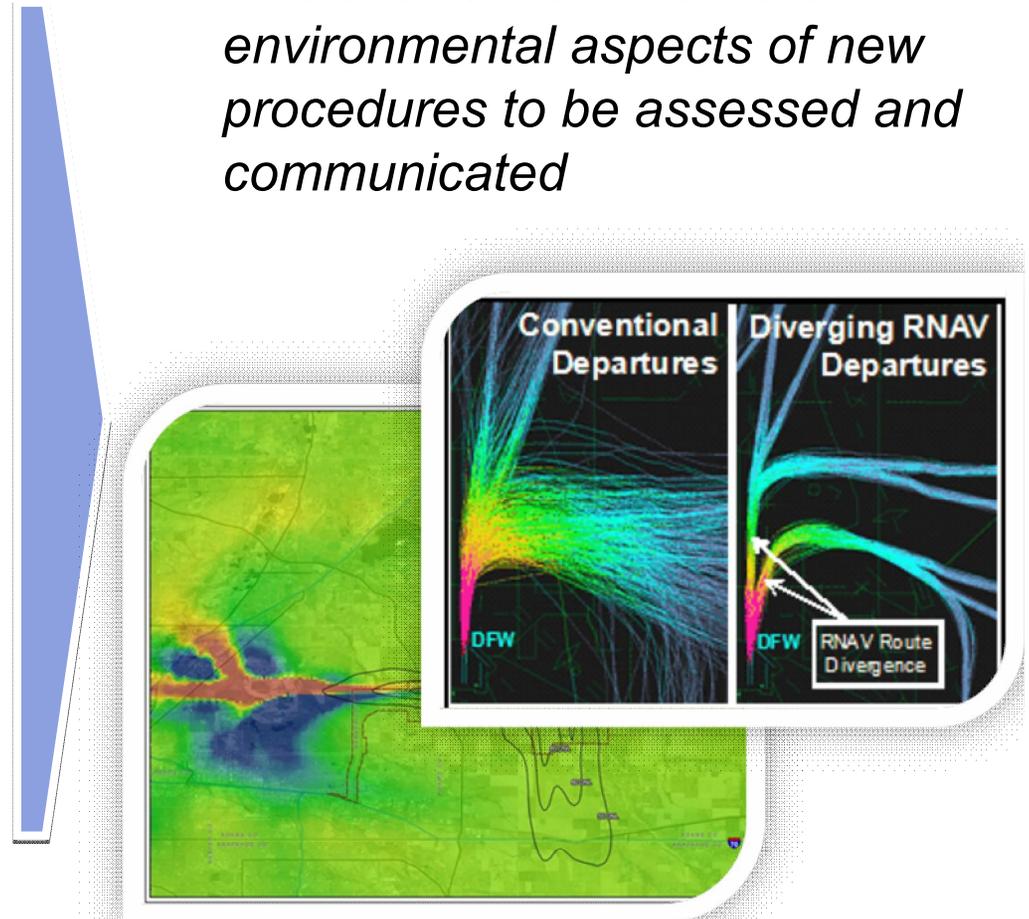
## and Annoyance Study

- ” **Office of Airports and Environment and Energy are starting an effort to resurvey for annoyance around airports**
  - . Building upon an existing Transportation Research Board Airports Cooperative Research Program (ACRP) project that will be doing surveys
  
- ” **Still in planning phases**
  
- ” **Goal of Study**
  - . Inform definition of significance

# Environmental Analysis Tools

- “ FAA’s analysis tools can evaluate changes in environmental aspects (i.e., air quality, fuel burn, and noise)
- “ FAA’s **Aviation Environmental Design Tool** (AEDT): Ability to conduct airspace-related noise analysis
- “ **Allow for regional noise analysis**
  - . *Enable analysis of fuel burn and emissions*

*This allows the full suite of environmental aspects of new procedures to be assessed and communicated*



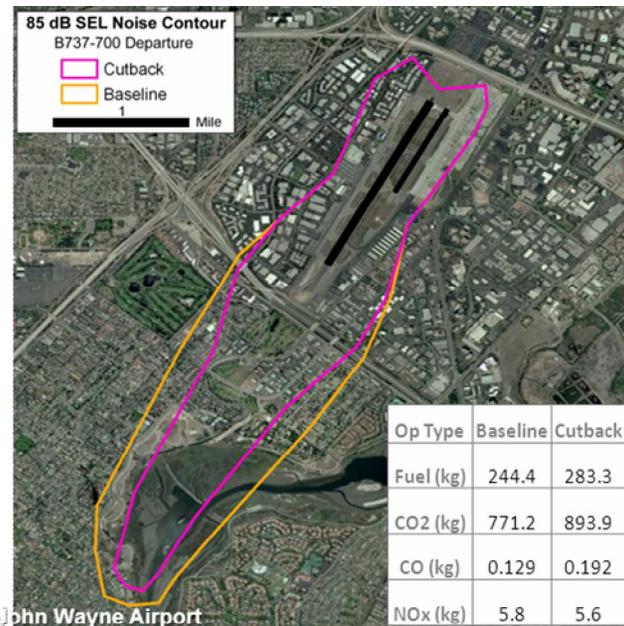
# Environmental Modeling

## COMPUTING AVIATION NOISE, FUEL BURN, AND EMISSIONS INTERDEPENDENCIES

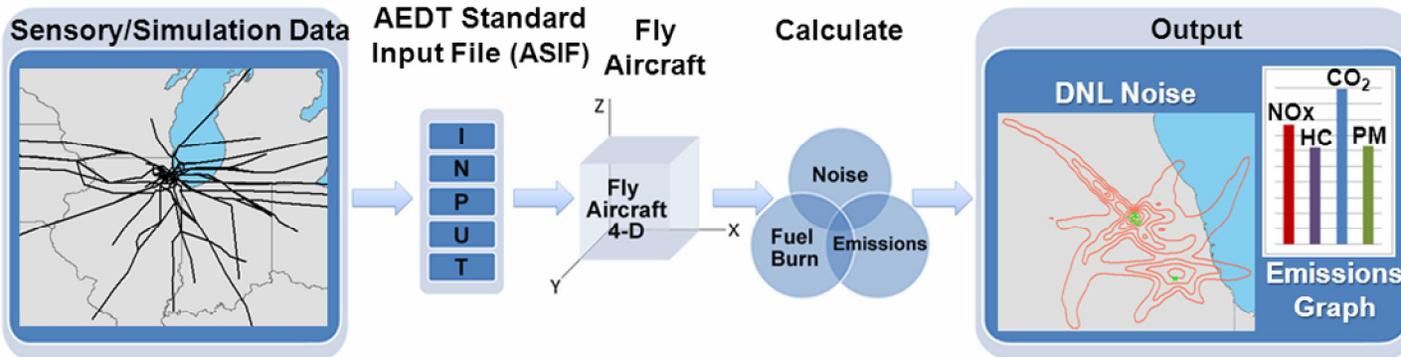
### Highlights of the AVIATION ENVIRONMENTAL DESIGN TOOL (AEDT)

- Dynamically models aircraft in 4 dimensions—X, Y, Z, & time
- Scalable from single flight to global analyses
- Unified tool supporting regulatory compliance and agency policy development
- Integrated capability with key air traffic tools and databases, e.g., TARGETS, ETMS, and ACES
- Analyze and visualize interdependencies of noise, fuel burn, and emissions within one tool
- Aircraft performance data used to quantify environmental consequences of airspace design decisions

### Impact of Procedural Changes on Noise, Fuel Burn and Emissions



### AEDT Modeling Process



Federal Aviation Administration Office of Environment and Energy  
 AEDT Lead: Ralph Iovinelli, [Ralph.Iovinelli@faa.gov](mailto:Ralph.Iovinelli@faa.gov)  
[http://www.faa.gov/about/office\\_org/headquarters\\_offices/apj/research/models/](http://www.faa.gov/about/office_org/headquarters_offices/apj/research/models/)  
 Volpe Center Environmental Measurement and Modeling Division  
 AEDT Lead: Jonathan Koopmann, [Jonathan.Koopmann@dot.gov](mailto:Jonathan.Koopmann@dot.gov)  
<http://www.volpe.dot.gov/cei/ees.html>

Chicago Flight Data

Chicago Environmental Impacts

May 4, 2012



Federal Aviation Administration



## **AEDT 2a was released on the FAA website on March 21, 2012**

- [http://www.faa.gov/about/office\\_org/headquarters\\_offices/apl/research/models/aedt/](http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/aedt/)

## **“ Federal Register Policy Statement was released on March 27, 2012**

- [http://www.ofr.gov/\(S\(kxrzvze2i0cfndhjhz42jac\)\)/OFUpload/OFRData/2012-07354\\_PI.pdf](http://www.ofr.gov/(S(kxrzvze2i0cfndhjhz42jac))/OFUpload/OFRData/2012-07354_PI.pdf)

## **“ Uncertainty Quantification Executive Summary**

- [http://www.faa.gov/about/office\\_org/headquarters\\_offices/apl/research/models/aedt/media/AEDT\\_2a\\_Uncertainty\\_Quantification\\_Executive\\_Summary.pdf](http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/aedt/media/AEDT_2a_Uncertainty_Quantification_Executive_Summary.pdf)

## “ Guidance on Using AEDT 2a to Conduct Environmental Modeling for FAA Air Traffic Airspace and Procedure Actions

- [http://www.faa.gov/about/office\\_org/headquarters\\_offices/apl/environment\\_policy\\_guidance/guidance/media/AEDT\\_Guidance\\_Memo.pdf](http://www.faa.gov/about/office_org/headquarters_offices/apl/environment_policy_guidance/guidance/media/AEDT_Guidance_Memo.pdf)
- Identifies AEDT 2a as the FAA approved model for noise, emissions and fuel burn calculations of Air Traffic Airspace and Procedure Actions
  - “ Includes a technical appendix on how to model within the framework of FAA Order 1050

## AEDT 2a replaces NIRS (Noise Integrated Routing System)

- . Used for Air Traffic airspace and procedure actions where the study area is:
  - “ Larger than the immediate vicinity of an airport;
  - “ Incorporates more than 1 airport; and/or
  - “ Includes actions above 3,000 feet AGL
  
- “ **AEDT 2b is scheduled to be released in mid-2014**
  - . Majority of development will occur in the next year
  - . Guidance will be developed to be released with the tool
  - . When released, will be used for all FAA NEPA analyses

## Group for PBN Implementation

- “ **Focus on achieving safety, efficiency, and environmental goals**
- “ **Engage stakeholders in the process**
  - . **FAA**
  - . **Airport Authority**
  - . **Air Carrier(s)**
  - . **Local Community**

### Local Community Benefits

- “Improvements to airport access and efficiency
- “PBN often reduces air emissions and climate impacts
- “PBN may change certain communities noise exposure

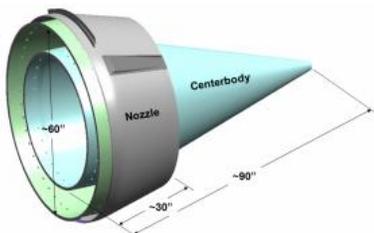
*...key is to engage the community, early as a partner, to reduce local concerns and misinformation*

# er Energy, Emissions and Noise (CLEEN)



- " 5 yr effort to accelerate technology commercialization
- " Reduces aircraft fuel burn, emissions and noise
- " 50% cost share; total FAA budget: ~\$125M

**Ceramic Matrix Composite (CMC) Nozzle**

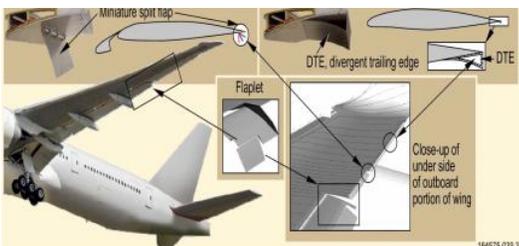
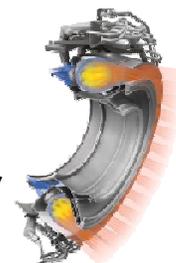


" **CMC Blade Tracks**

" **Dual-Walled Turbine Blade**

" **Future alt fuels**

**TAPS II Low NOx Combustor**

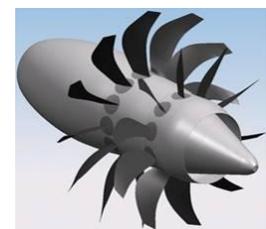
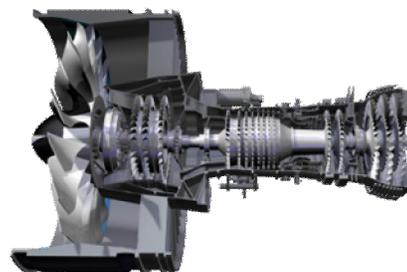


**Adaptive Trailing Edge**

" **Lighter weight, higher temp engine**

**Boeing | GE | Honeywell | Pratt & Whitney | Rolls-Royce**

**Ultra-high Bypass Ratio Geared Turbofan**



**Open Rotor**

" **Flt Mgt Sys / Air Traffic Mgt Sys Integration**



*Your complimentary  
use period has ended.  
Thank you for using  
PDF Complete.*

[Click Here to upgrade to  
Unlimited Pages and Expanded Features](#)

ncy

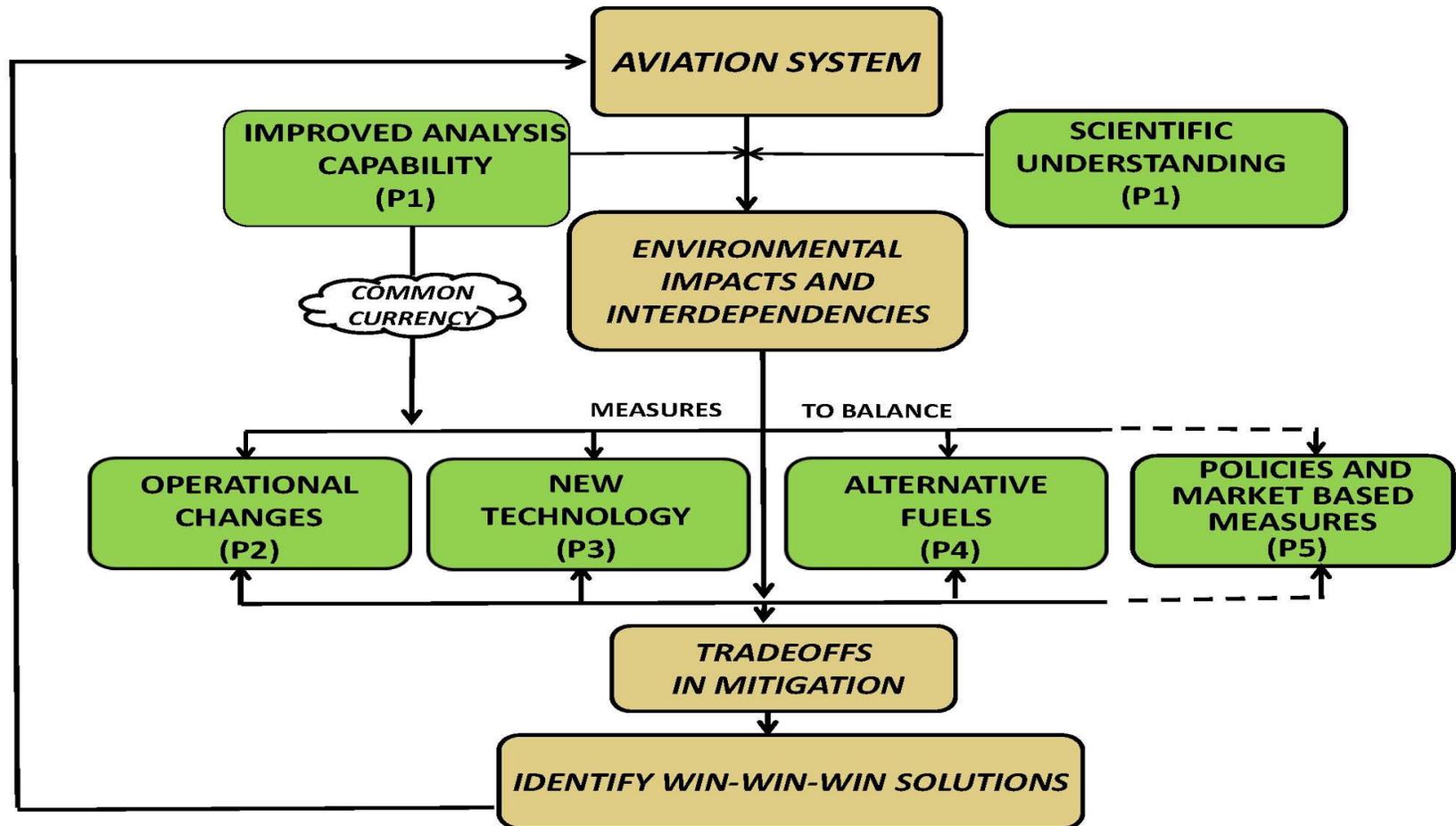
International Civil Aviation Organization  
Committee on Aviation Environmental Protection  
(ICAO/CAEP) conducting an analyses to evaluate  
need for further noise stringency



# Prohibition on Operating Certain Aircraft Weighing 75,000 pounds or less not complying with Stage 3 Noise Levels.

- “ For civil subsonic jet airplanes for which an airworthiness certificate (other than an experimental certificate) has been issued, to or from an airport in the United States unless the Secretary of Transportation finds that the aircraft complies with stage 3 noise levels.
- “ A related U.S. regulation exists under 14 CFR Part 91 Subpart I (section 91.853) . Operating Noise Limits that applies to Subsonic Jet Airplanes and Subsonic Transport Category Large Airplanes that weigh more than 75,000 lbs.
- “ About 439 operators with around 639 domestic aircraft are affected
- “ Average age of the affected aircraft is 36.7 years.
- “ Restrict and impact about 5% of international flight operations.
- “ Hushkits may be available for some aircraft, but given age of the aircraft, it may be not cost effective.
- “ Effective December 31, 2015

# Framework



- “ We are assessing challenges, trends, and interdependencies in a rigorous manner to set goals.
- “ Pursuing our goals through a combination of air traffic innovation, fleet modernization & alternative fuels and utilize policy and market based measures as necessary.
- “ Continuously checking tradeoffs to understand cost/benefit of various solutions sets.
- “ Striving to meet aspirations



*Your complimentary  
use period has ended.  
Thank you for using  
PDF Complete.*

[Click Here to upgrade to  
Unlimited Pages and Expanded Features](#)

# Questions

