

NASA/FAA Environment R&D Activities

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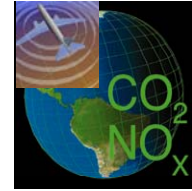
**Presented to FAA's Research, Engineering and Development
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Subcommittee (RAS) Joint Meeting**

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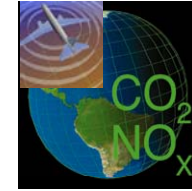
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Outline



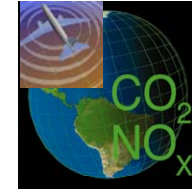
- Motivation
- NASA/FAA Environment R&D Relationship
- NASA's Vehicles Systems Project (VSP)
 - Quiet Aircraft Technology (QAT) Highlights
- FAA Environment R&D
 - Highlights - Environmental Design Space & Center of Excellence
- Some thoughts on Metrics
- Summary

Aviation Environmental Challenges



- By products of aviation (noise and emissions) impact quality of life and health
- Environmental issues constrain system capacity
 - Aircraft noise issues are limiting airport capacity
 - Over 600 operational constraints at US airports
 - Over \$300M spent each year to mitigate noise at US airports
 - Local community noise issues are delaying construction of new runways at major airports needed to increase capacity
 - International airports imposing increasingly stringent operation restrictions due to noise
 - Aircraft engine emissions are becoming increasingly important
 - Over 25% of U.S. commercial airports in nonattainment or maintenance areas for national ambient air quality standards
 - 43 of 50 top U.S. airports in nonattainment or maintenance areas
 - Increased community concern about aviation related emissions, including hazardous air pollutants and particulate matter
 - Community concerns hinder capacity growth

NASA-FAA Environment R&D Relationship



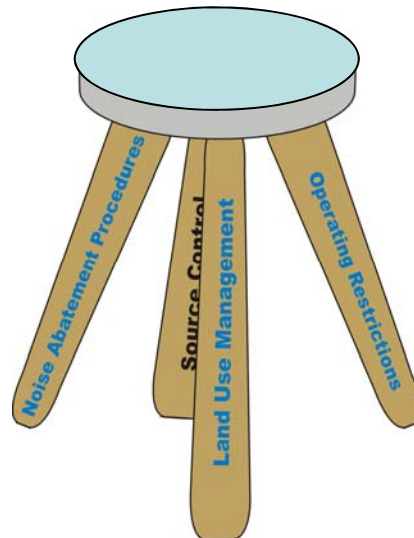
NASA - exploratory research and early technology development

FAA - aircraft noise and emissions modeling and assessment tools for regulatory process and aircraft certification and regulatory issues

Source Control

Abatement Procedures

Balanced Approach

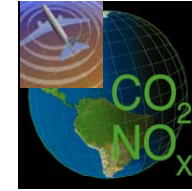


Abatement Procedures

Land Use

Operating Restrictions

FAA Environment & Energy R,E&D Program

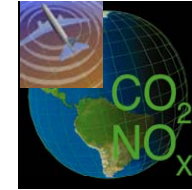


- Develop information, tools, methods, and technologies that help mitigate the adverse impacts of aircraft noise and emissions upon the environment and ease capacity concerns

Program Elements

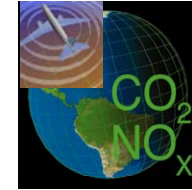
- Noise and Emissions Analysis and Interrelationships - Analytic and planning tools that reveal aviation's impacts upon the environment and the consequences of alternative courses of action
- Aircraft Noise - Improve certification standards and operational procedures; promote compatible land use; and assess abatement technologies and mitigation measures
- Aviation Emissions - Advance state of science/knowledge of atmospheric/health effects of aviation emissions; improve aircraft certification standards and operational procedures; and assess control technologies and mitigation measures

FAA / NASA Center of Excellence for Aircraft Noise and Aviation Emissions



- New Center under FAA's Centers Program
- NASA plans to participate as full partner
- Scope of Work:
 - Socio-economic Effects of Noise and Noise Mitigation
 - Noise Abatement Flight Procedures
 - Compatible Land Use Management
 - Airport Operational Controls
 - Atmospheric and Health effects of aviation emissions, including impact of hazardous air pollutants and PM
- Proposals received and evaluated July 2003
- Winning team notified 20 August 2003:
Consortium led by MIT and including Boise State University, Florida International University, Pennsylvania State University, Purdue University, Stanford University, University of Central Florida and University of Missouri – Rolla

For Sorrento Workshop: Examples of FAA Aviation Environmental Metrics

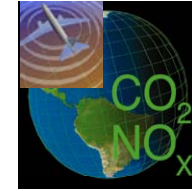


Noise: Maintain or reduce the number of people exposed to significant noise through 2008, as measured by a 3-year moving average, from the 3-year average for FY 1999-2001.

Emissions: Improve aviation fuel efficiency per revenue plane-mile by 1% per year through 2008, as measured by a 3-year moving average, beginning with the 3-year average of Calendar Years 2000-2002.

For Sorrento Workshop: Examples of NASA

Environmental Metrics



Noise: Quiet Aircraft Technology (QAT) - Reduce the perceived noise levels of future aircraft by one half (10 dB) from today's₁₉₉₇ subsonic aircraft within 10 years, and by three quarters (20 dB) within 25 years

Emissions:

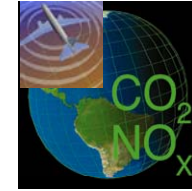
Ultra Efficient Engine Technology (UEET) –

- Fuel burn reductions of up to 15 % (equivalent reductions in CO₂)
- Landing/Takeoff (LTO) NO_x reductions of 70% relative to 1996 International Civil Aviation Organization (ICAO) Standards

NASA Enterprise Emissions Objectives -

- 70% LTO NO_x reduction
- 25% CO₂ reduction

For Sorrento Workshop: Some Thoughts for Consideration on Goals/Metrics



- Should look beyond current regulations
 - Other pollutants considered?
 - Other metrics? (e.g., beyond current DNL for noise)
- Aviation environmental impact addressed internationally
 - Should we derive common goals/metrics internationally?
 - How can we do this while maintaining competitive spirit?
- How do changes in fleet mix (e.g., regional jets, the potential growth of personal air vehicles, etc.) affect goals and metrics?
- Aviation is a subset of transportation
 - Should goals/metrics consider sector wide impact?
- Mitigating environmental impact provided a societal benefit
 - Devising goals/metrics which take into account societal impact very complex?
 - Examples where this has been done successfully?
 - Can we apply to aviation?

Summary



- ➔ Aircraft noise and aviation emissions are critical national/international environmental issues
- ➔ Noise and emissions will continue to constrain air travel growth until technical solutions are developed
- ➔ Technology to reduce community noise and aviation emissions impact is about quality of life, including unconstrained growth
- ➔ Significant progress reducing adverse environmental impacts of aviation, but sustaining trend challenging – requires reliance among various stakeholders
- ➔ A balanced, integrated approach is the key to future breakthrough community noise and aviation emissions impact reductions