

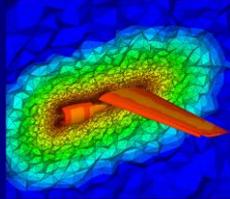
NASA Airspace Systems  
Environmentally Focused Research

Green Aviation Summit  
NASA Ames Research Center  
September 8-9, 2010

John A. Cavolowsky  
Director  
Airspace Systems Program  
Aeronautics Research Mission  
Directorate

# ARMD Programs

Vehicle

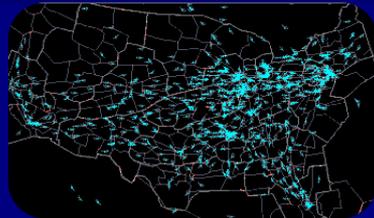


**Fundamental Aeronautics  
(\$228M)**



**Integrated Systems Research  
(\$113M)**

Operations



**Airspace Systems (\$82M)**

Supporting

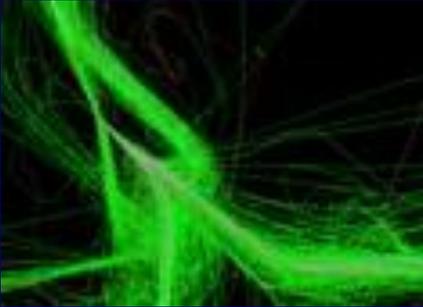


**Aviation Safety (\$79M)**



**Aeronautics Test (\$76M)**

# Airspace Systems Program Focus



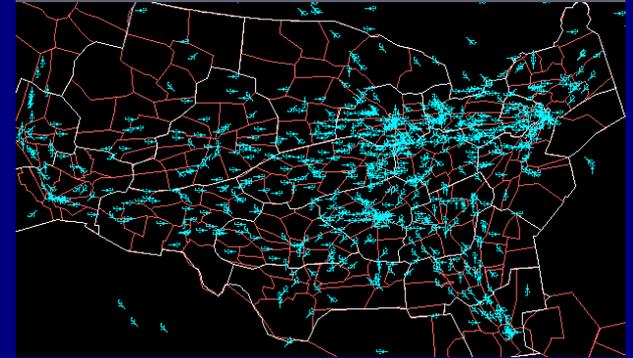
Perform the foundational research to enable the development of revolutionary improvements to, and modernization of, the National Airspace System, as well as the introduction of new systems for vehicles whose operation can take advantage of the improved, modern air traffic management system.



# Program Organization

## ***Concepts and Technology Development:***

Develops and explores fundamental concepts, algorithms, and technologies to increase throughput of the National Airspace System and achieve high efficiency in the use of resources such as airports, en route and terminal airspace.



***Systems Analysis, Integration and Evaluation:*** Matures integrated concepts through evaluation, provides integrated solutions, characterizes airspace system problem spaces, defines innovative approaches, and assesses potential system impacts and design ramifications.



# The National Policy and Plan and NextGen

“Advance technologies and operations to enable significant increases in the energy efficiency of the aviation system...”

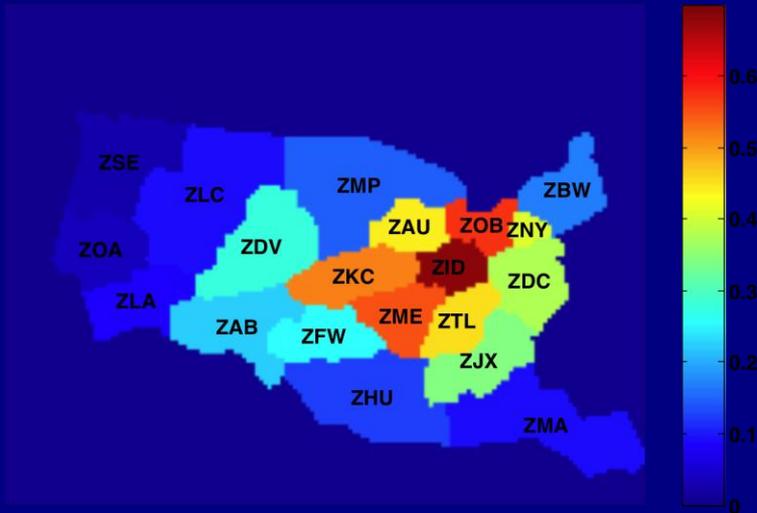
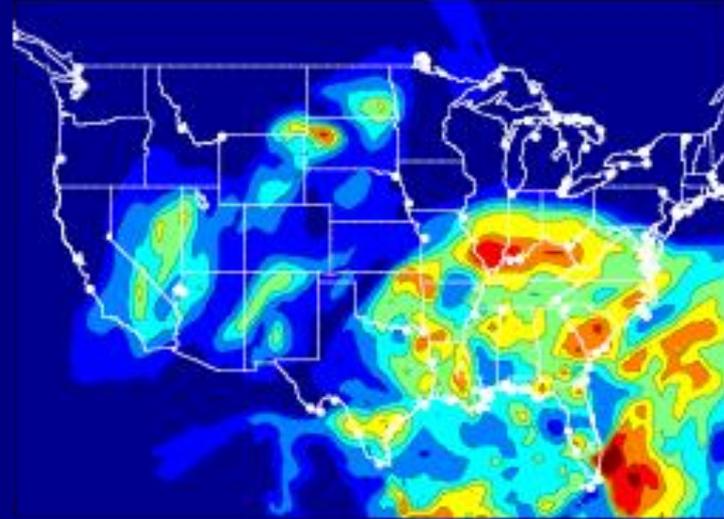
Develop “operational procedures to decrease the significant environmental impacts of the aviation system...”

NextGen: Reduce noise, emissions, and fuel consumption and balance aviation’s environmental impacts with other societal objectives



# Airspace Environmental Challenges

Contrails lead to increased earth temperature, but can be avoided.

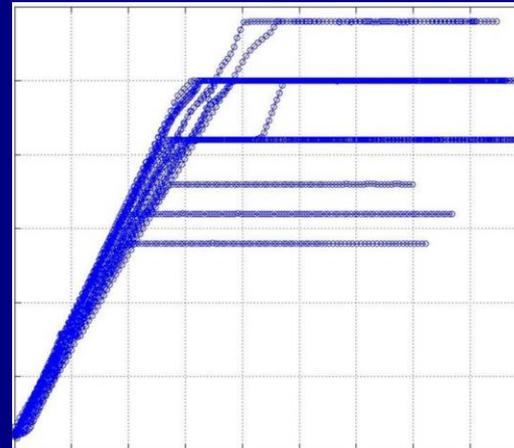
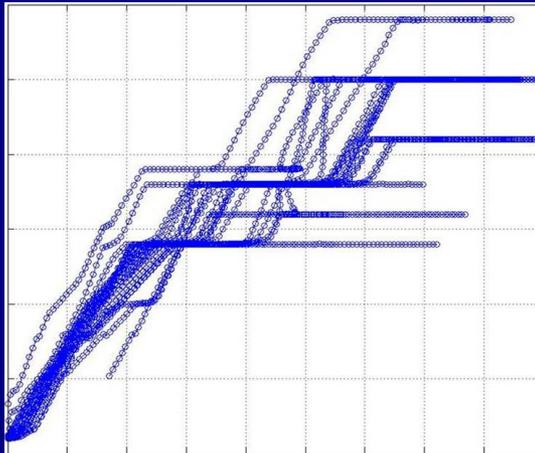


But how is the extra fuel burn balanced against the environmental benefit?

# Airspace Environmental Challenges

Current “dive and drive” descents and vectoring and to maintain arrival spacing in the terminal area are fuel inefficient, noisy and require multiple controller/pilot interactions.

**Efficient Descent Advisor**  
conserves fuel, reduces noise and controller/pilot workload



Descent Profiles: Without EDA and with EDA

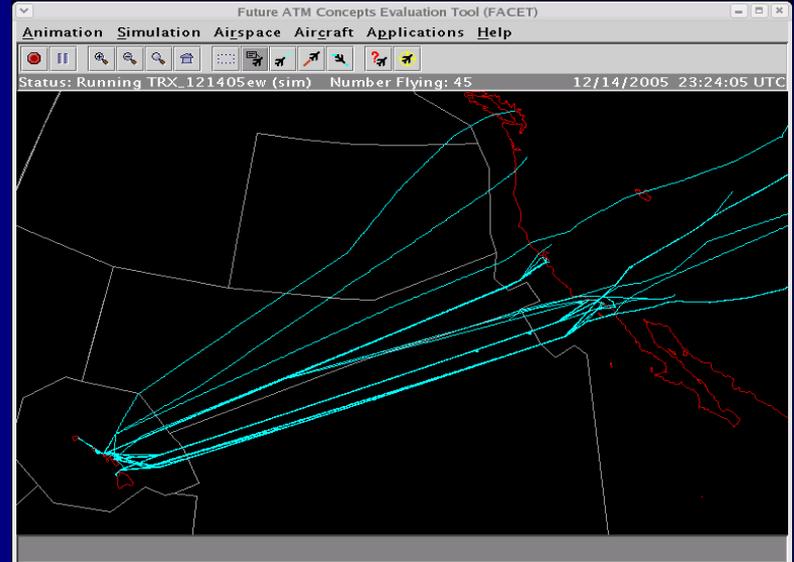
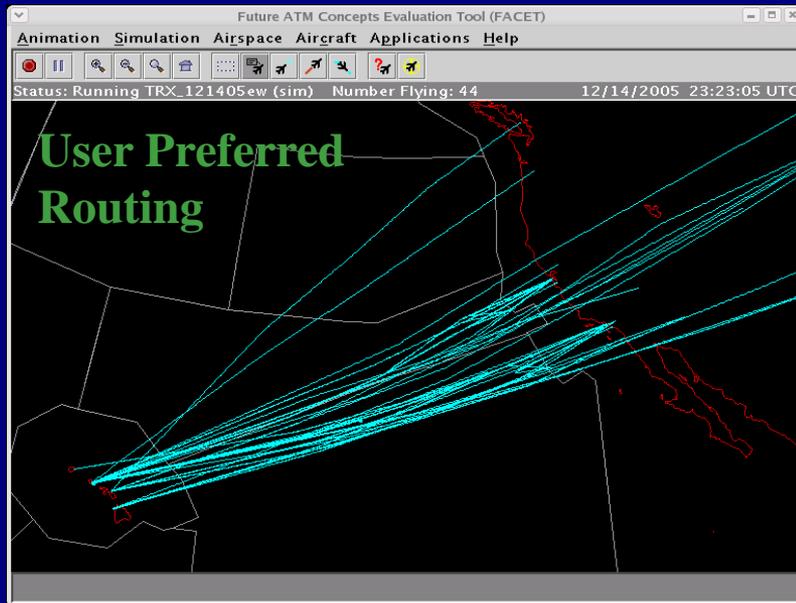
# Airspace Environmental Challenges

Predictable surface operations reduce taxi and hold times allowing a reduction of noise and emissions in airport neighborhoods



# Airspace Environmental Challenges

Traffic flow management can reduce demand-capacity imbalances



Optimizing traffic flows, addressing weather uncertainties and reducing ground delays reduce fuel consumption and emissions

# Summary

*NextGen concepts and technologies are maturing*

*Environmental research has been accelerated*

*Research is making progress toward initial technology  
product transitions*

*Actively engaged in research and new transition  
initiatives with industry, academia, and government  
partners*