

# Global Warming and Air Transport: Meeting the Challenge of Sustainable Growth

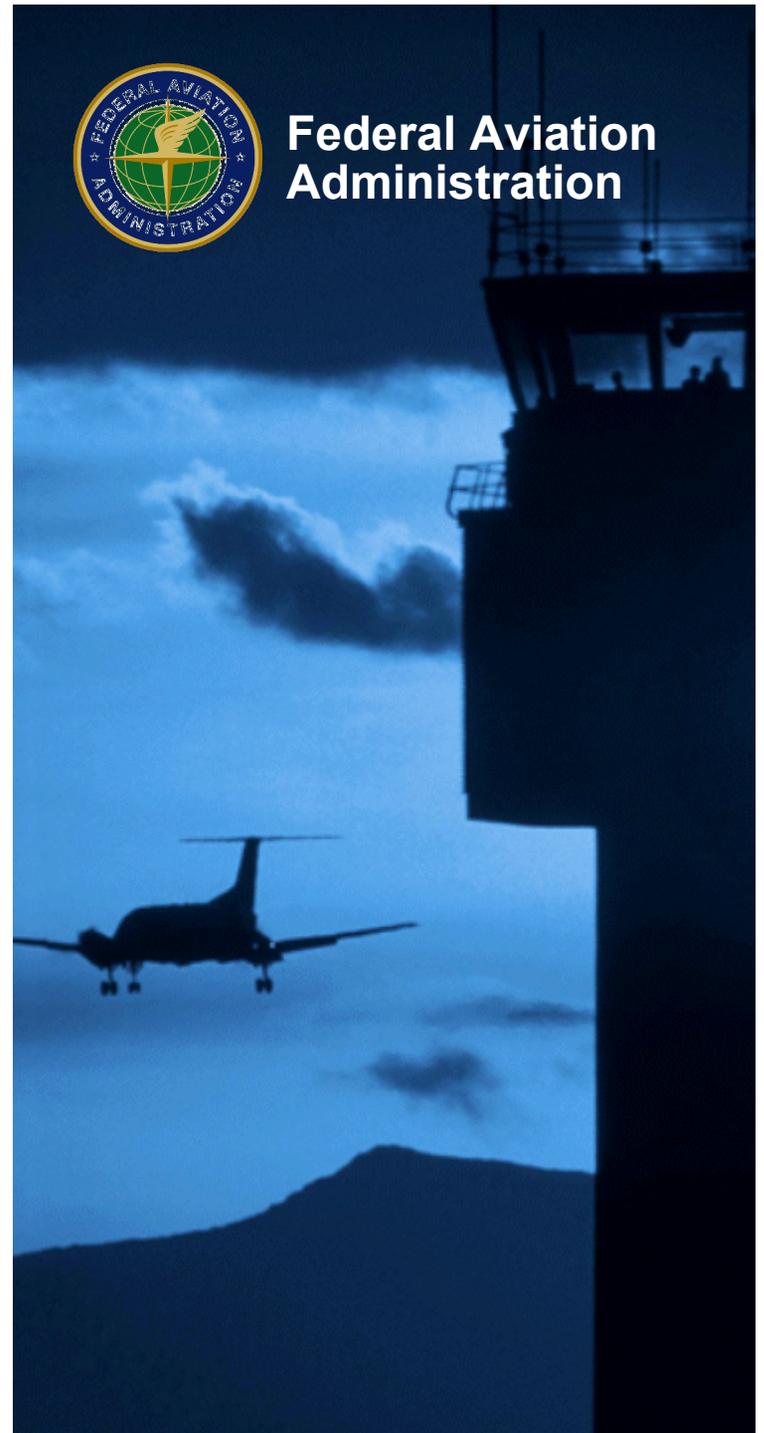
**Meeting:** FAA Forecast Conference

**By:** Carl Burleson  
Director, Office of Environment  
and Energy

**Date:** April 1, 2009



**Federal Aviation  
Administration**



# Outline

- Environmental Drivers
- U.S. Aviation Performance
- The Challenge Ahead
- A Way Forward – The NextGen Approach
- Some Closing Observations



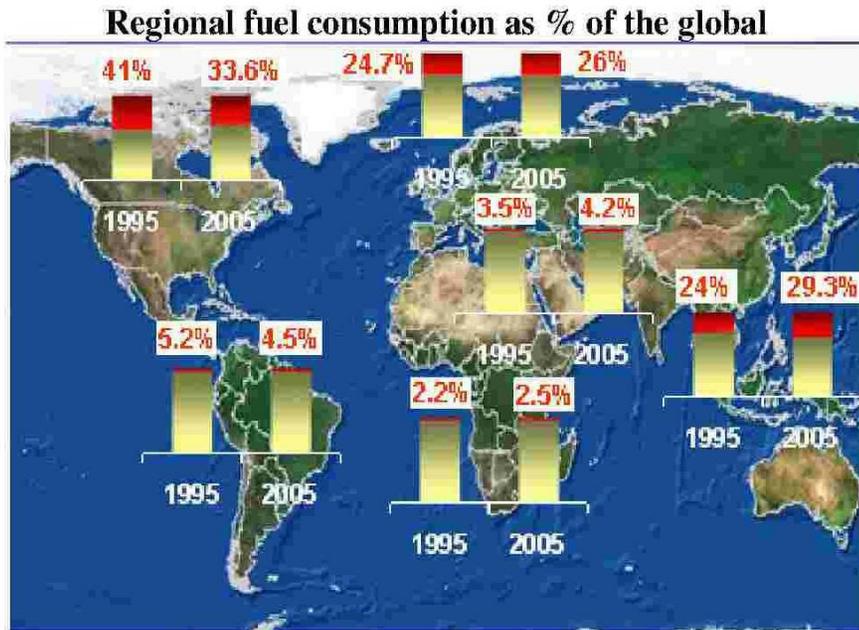
# U.S. Aviation Environmental Drivers

- Aviation impacts community noise footprints, air quality, water quality, energy usage and availability, and the global climate.
- Trends show environmental impacts from aircraft noise and aviation emissions will be a critical constraint on capacity growth.
- Fundamental changes ongoing from economic downturn, fuel costs, and financial turmoil.



➤ ***The challenge is to ensure energy availability and affordability and reducing aviation's environmental footprint, even with projected aviation growth***

# U.S. Experience: Aviation Emissions Performance

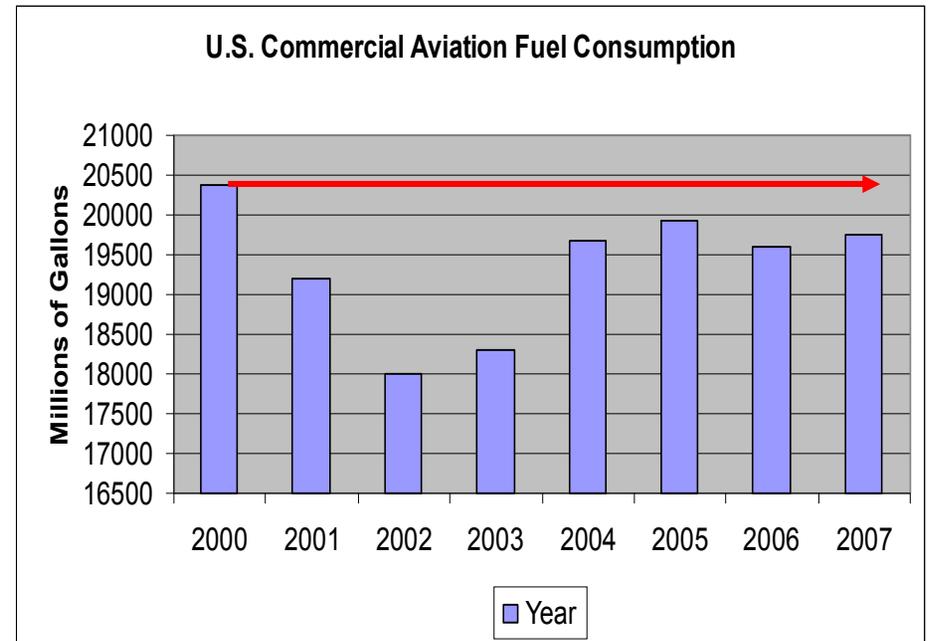


Source: ICAO based on OAG timetable

\*By region of registration

**U.S. commercial aviation shrinks in its relative contribution to global emissions...**

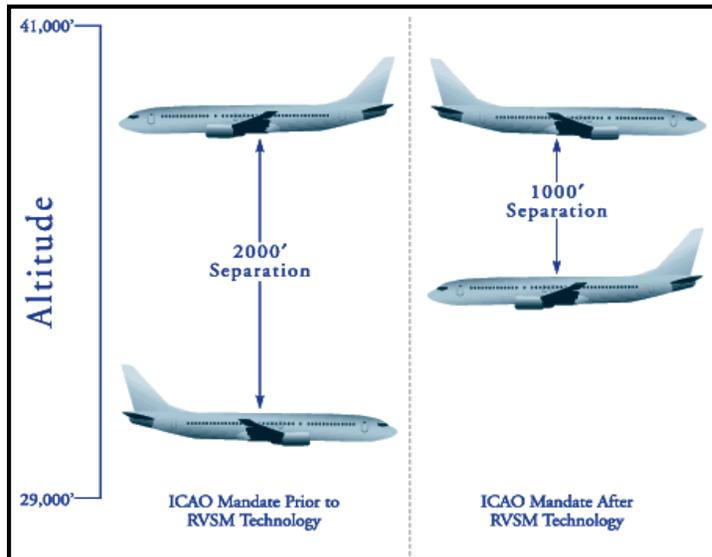
**...while absolutely reducing its carbon footprint since 2000.**



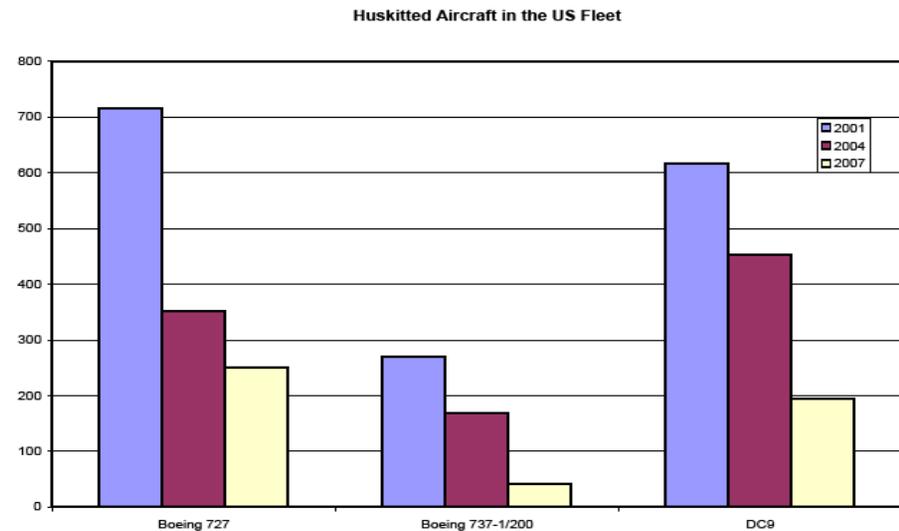
Source: BTS

# U.S. Experience: Changes in ATM and Fleets

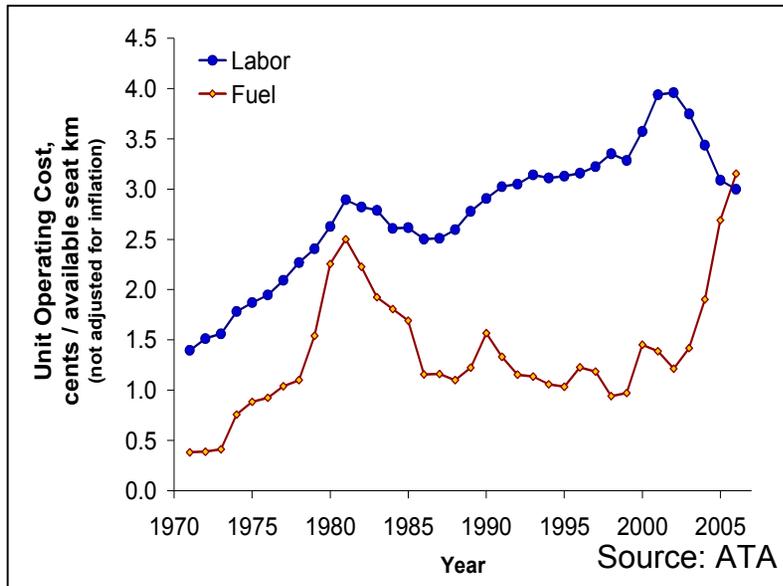
## *Innovation in air traffic management...*



## *...and significant fleet change.*



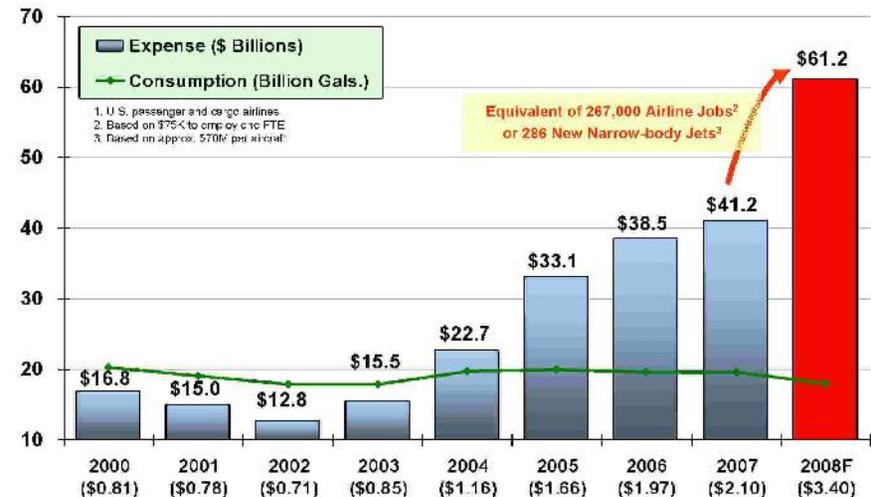
# U.S. Experience: Structural Changes in Fuel Prices and Costs



*...as fuel costs forecast to increase five-fold since 2002.*

*U.S. airline fuel costs greater than labor costs...*

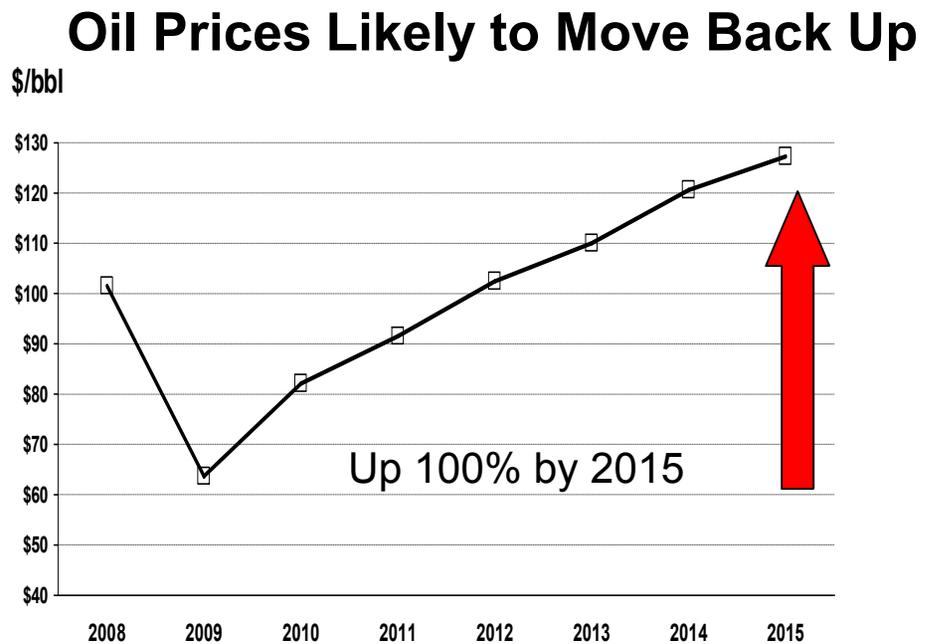
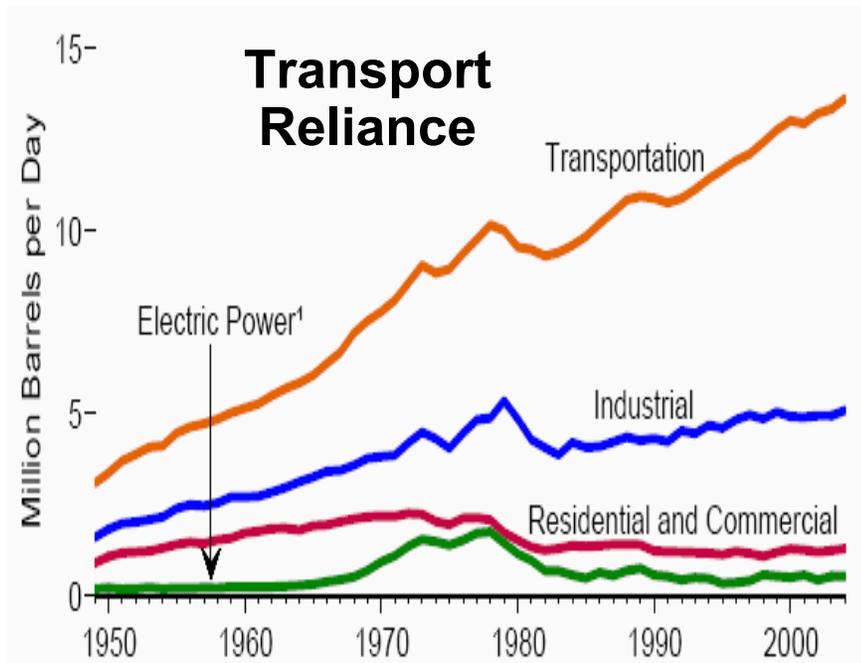
**2008 Jet Fuel Expense<sup>1</sup> Will Break 2007 Record**  
 Total Expense (Excluding Taxes and Into-Plane Fees) Could Exceed \$61 Billion



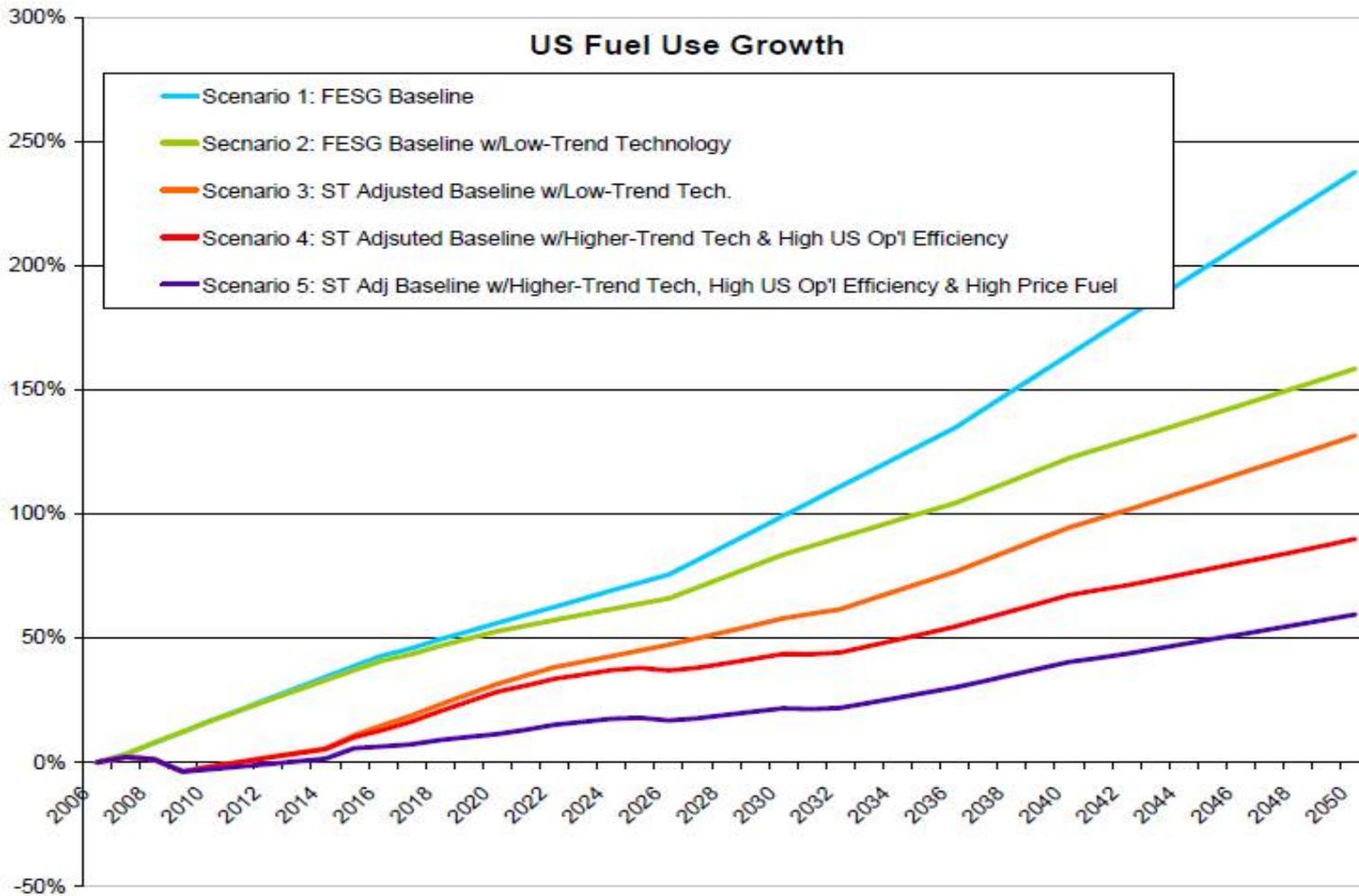
Note: Value in parentheses below year is average price paid per gallon excluding taxes, into-plane fees, pipeline tariffs and hedging costs  
 Sources: ATA, Energy Information Administration, Department of Transportation

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# The Challenge Ahead: Oil & Energy Dynamics



# The Challenge-Some U.S. Fuel Scenarios



Source: FAA Preliminary Analysis



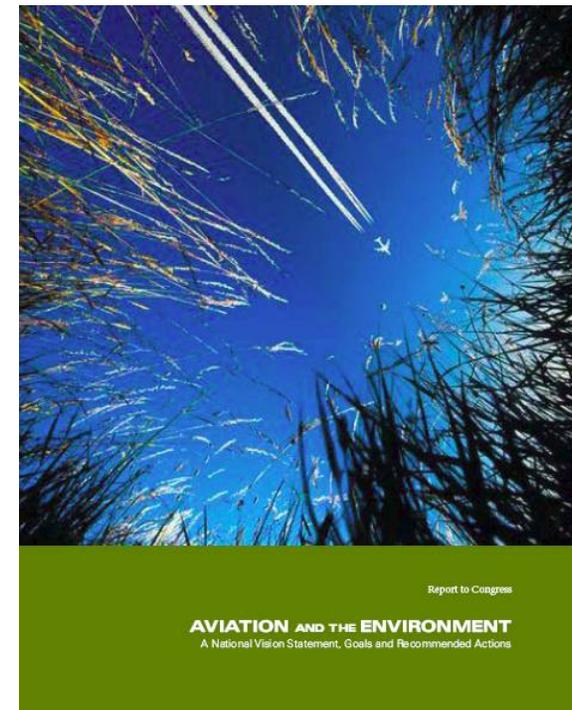
# Measures to Tackle the Challenge

## NextGen Vision

*Provide environmental protection that allows sustained aviation growth*

Key Initiatives:

- Continued Local Mitigation
- Better Scientific Understanding
- Accelerate Operational Changes
- Mature New Aircraft Technology
- Develop Alternative Fuels



# A Way Forward: Continuing Mitigation Efforts



- **Airport Configuration and Operation for Better Efficiency**
  - New runways, extensions, taxiways, preferential runway use
- **Airport Ground Measures**
  - Run-up areas, aircraft taxiing, noise shielding
- **Aircraft Flight Procedures**
  - Noise abatement flight tracks, departure profiles
- **Land Use Measures**
  - Land acquisition, soundproofing, easements, purchase assurance, zoning, local land use plans and controls, subdivision regulations, building codes, urban redevelopment, noise disclosure
- **Program Support Measures**
  - Noise monitoring, complaint response, pilot education, noise advisory committees, noise abatement officer, property advisory services, periodic program review
- **Voluntary Airport Low Emissions (VALE) Program**
  - Financing low emission vehicles, refueling and recharging stations, gate electrification, and other airport air quality improvements for airports in clean air non-attainment and maintenance regions.

# A Way Forward: Better Understand the Problems

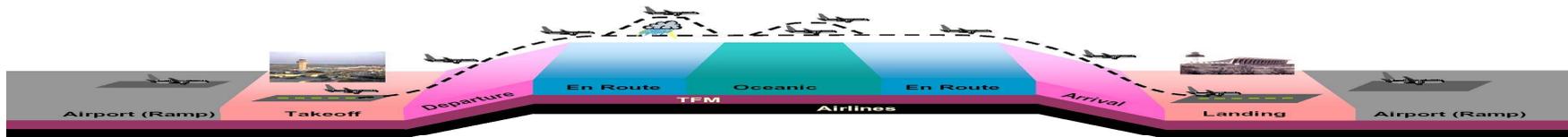
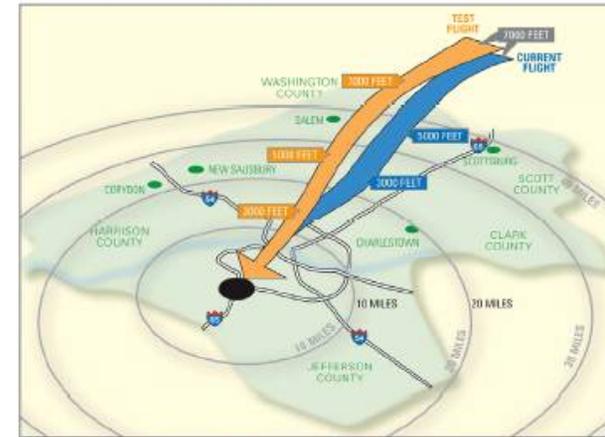


- Use better science-based understanding of the impacts of aviation emissions on climate change to make decisions.
- Improved metrics, measurement techniques, and modeling to quantify and predict impacts and to understand inter-relationships of aviation environmental factors.
- Research roadmaps in noise, air quality, and climate change.



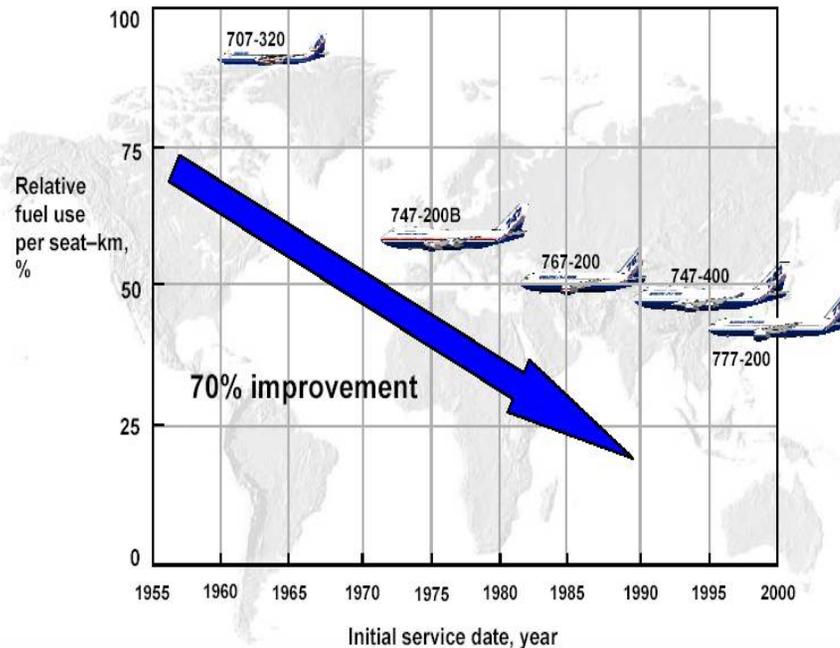
<http://web.mit.edu/aeroastro/partner/reports/climatewrksp-rpt-0806.pdf>

# A Way Forward: Transforming Air Traffic Management

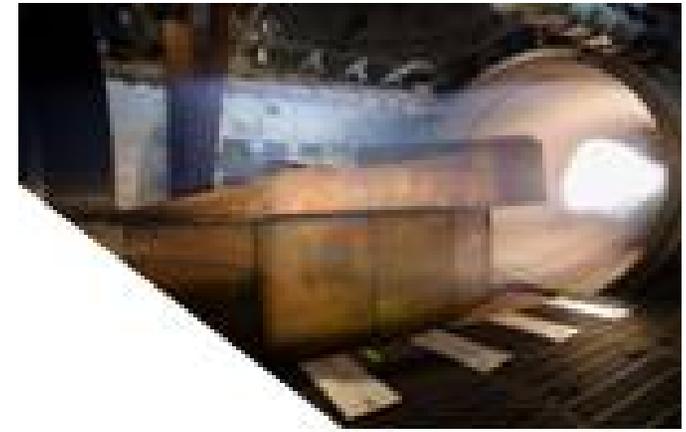


New air traffic management capabilities and procedures will allow us to further reduce aviation's environmental footprint

# A Way Forward: Fostering New Aircraft Technology



BOEING

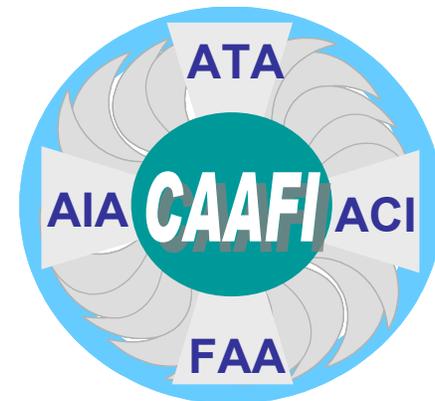


## FAA Continuous Low Energy, Emissions and Noise (CLEEN)

Establishing a consortium to accelerate development of aircraft and engine technologies – to reduce noise, air quality, and greenhouse gas emissions.

# A Way Forward: Accelerating Use of Sustainable Energy

<p><b>Jatropha</b> ready: 2-4 years</p> <p><b>Benefits</b></p> <ul style="list-style-type: none"><li>•Uses marginal land</li><li>•Agronomy is sufficiently advanced</li></ul> <p><b>Challenges</b></p> <ul style="list-style-type: none"><li>•Warm climates only</li><li>•Mechanical harvesting not yet mature</li></ul>	<p><b>Algae</b> ready: 8-10 years</p> <p><b>Benefits</b></p> <ul style="list-style-type: none"><li>•High productivity</li><li>•Potential for scale</li></ul> <p><b>Challenges</b></p> <ul style="list-style-type: none"><li>•Major process tech. innovation needed</li><li>•GMO risks</li></ul>
<p><b>Halophytes</b> ready: 2-4 years</p> <p><b>Benefits</b></p> <ul style="list-style-type: none"><li>•Uses desert land and salt water</li><li>•Part of system designed for GHG reduction</li></ul> <p><b>Challenges</b></p> <ul style="list-style-type: none"><li>•Proven at pilot scale to-date</li><li>•Improve agronomy for cost reduction</li></ul>	<p><b>Camelina</b> ready: now</p> <p><b>Benefits</b></p> <ul style="list-style-type: none"><li>•Ready-to-go</li><li>•Can integrate with traditional agriculture</li></ul> <p><b>Challenges</b></p> <ul style="list-style-type: none"><li>•Limited total potential owing to yield</li><li>•Somewhat tied to grain market swings</li></ul>



## Commercial Aviation Alternative Fuel Initiative

<http://caafi.org>

- Looking at a range of fuels
- Potential to enhance energy security and environmental performance
- Assessing business, safety, and environmental aspects
- Aggressive certification targets
- Operational use in 3-5 years

# Some Things to Watch in the Year Ahead



## • International Influences

- UNFCCC Copenhagen Meeting
- ICAO GIACC Process
- EU ETS

## • Legislation

- Energy & Climate Bills
- FAA Reauthorization

## • NextGen Initiatives

- Policy Approach/Goals/Targets
- CLEEN Launch
- Alternative Fuels

# Some Closing Observations

- Aviation greenhouse gas emissions may prove the most significant long-term challenge to growth
- It's critical we understand impacts and have robust information and good metrics.
- The aviation sector needs an integrated environmental strategy- including goals to address aviation's GHG emissions growth.
- As with noise, there is no "one best solution." Success should be based on performance- not adoption of a particular measure.
- NextGen technology and operational improvements- with alternative fuels- could reduce or eliminate need for demand reducing market-based measures.



