

# Aviation and the Environment - Managing the Challenge of Growth

Meeting: CLEEN Market Survey Conference

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Federal Aviation Administration

Date: May 15, 2008



Federal Aviation  
Administration



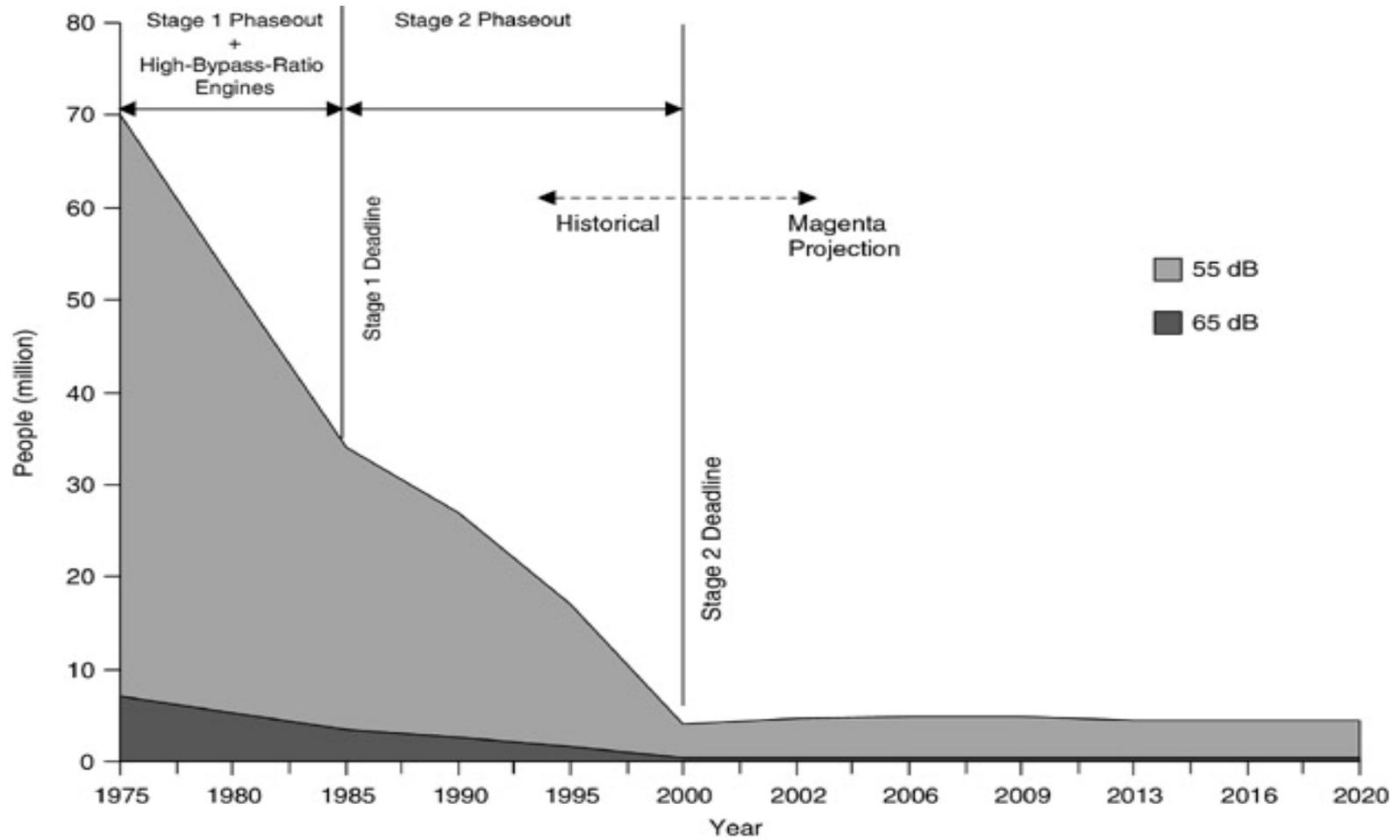
# Aviation Environmental Issues

- Anticipated increases in air transportation demand will place significant environmental pressures on the National Airspace System (NAS)
- Current operational trends show that environmental impacts resulting from aircraft noise and aviation emissions will be a critical constraint on the capacity and flexibility of the NAS unless managed and mitigated
- Aviation impacts affect community noise footprints, air quality, water quality, energy usage and availability, and the global climate



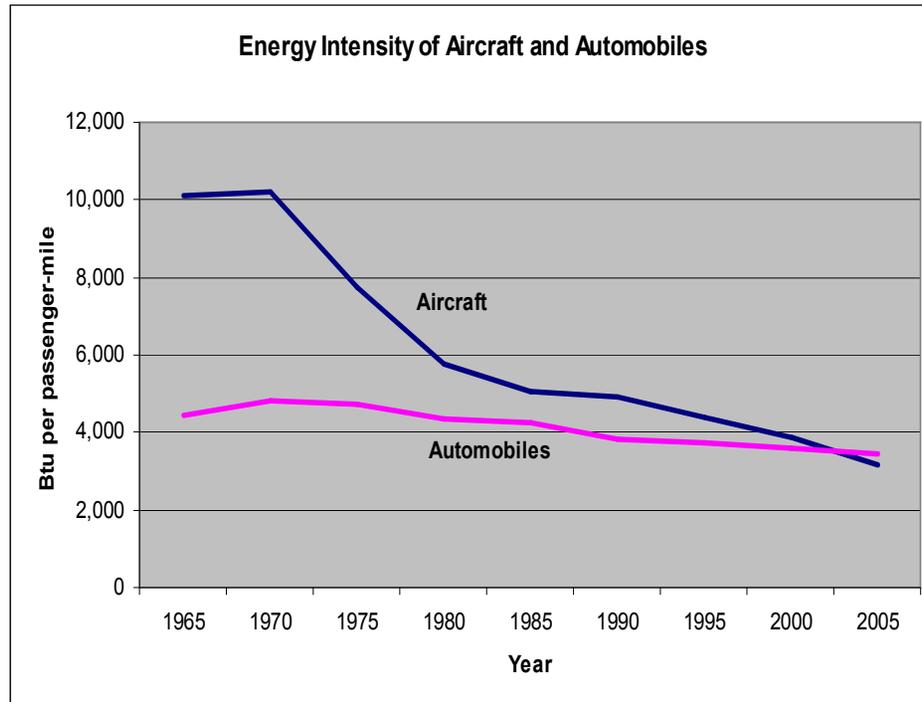
➤ *The challenge is to reduce aviation's environmental footprint, even with projected aviation growth*

# The Record: Noise Significant Improvements



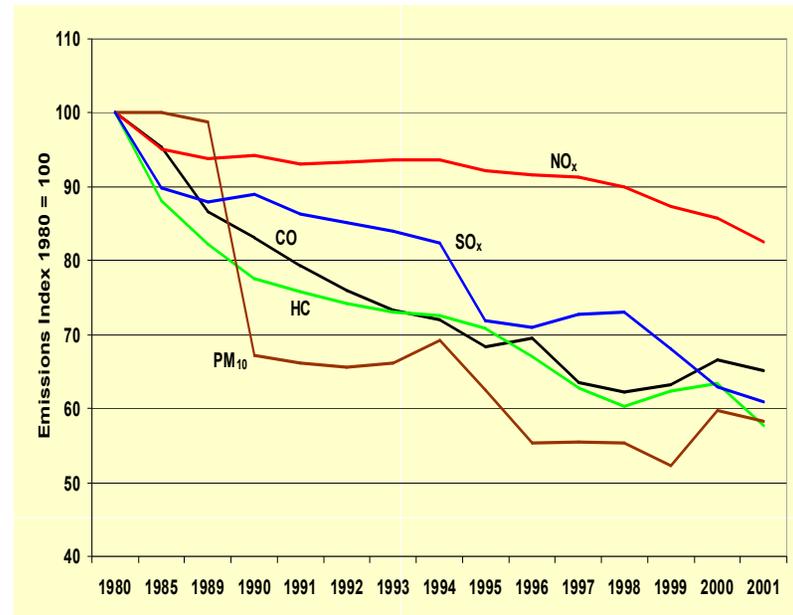
# The Record: Emissions Significant Improvements

## Energy Intensity Per Passenger Mile



Source: U.S. DOT, BTS

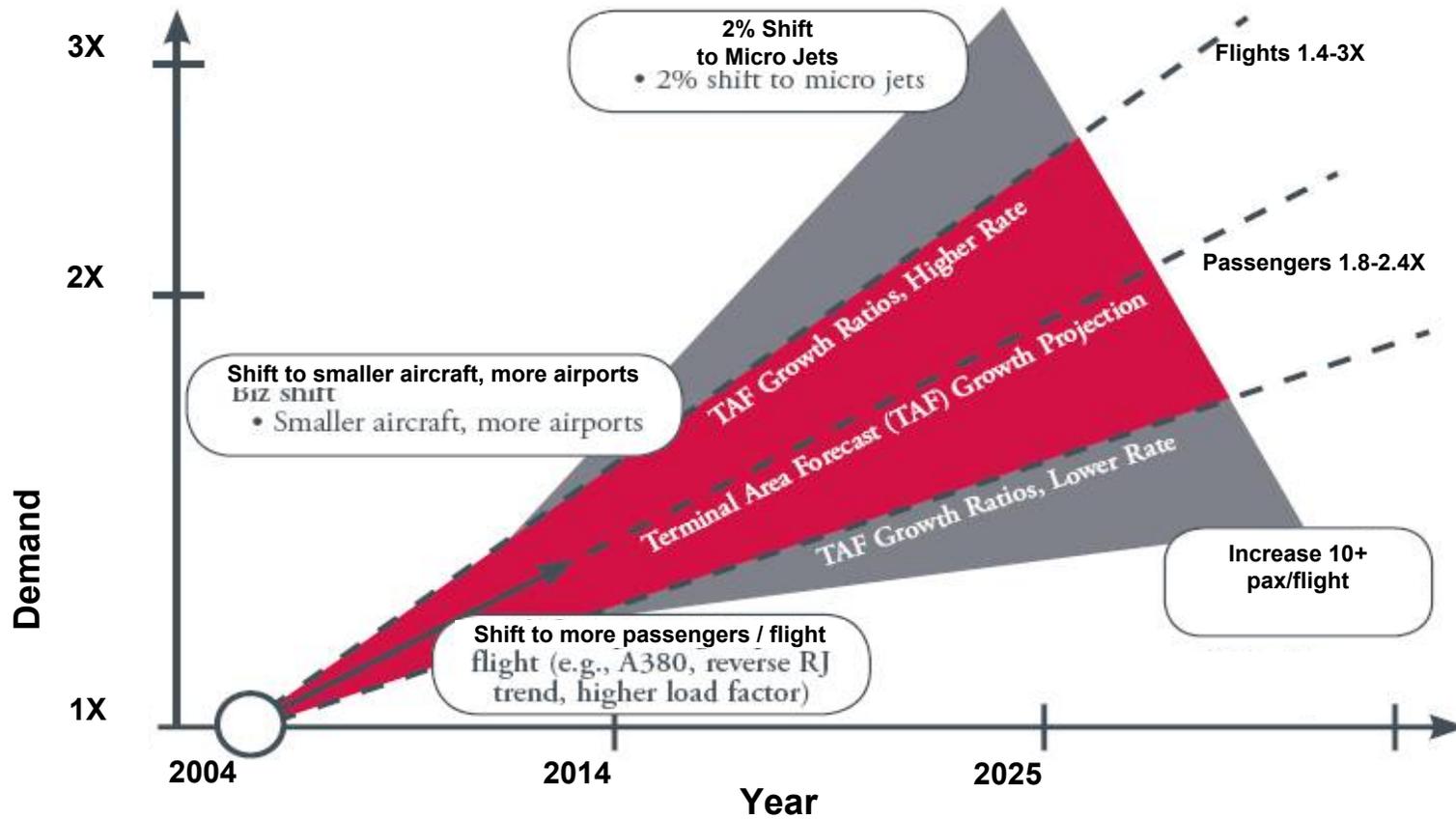
## Good Progress on Criteria Pollutants



Source: FAA Emissions Primer



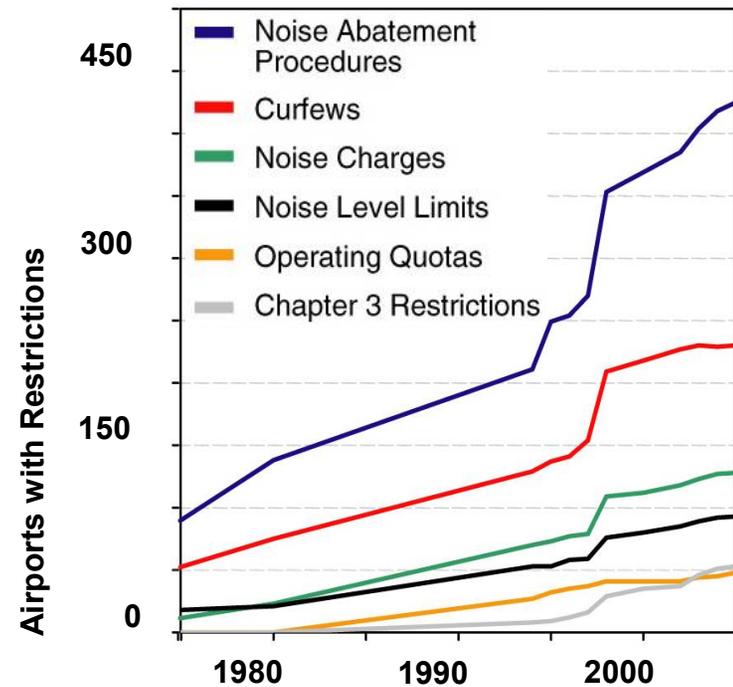
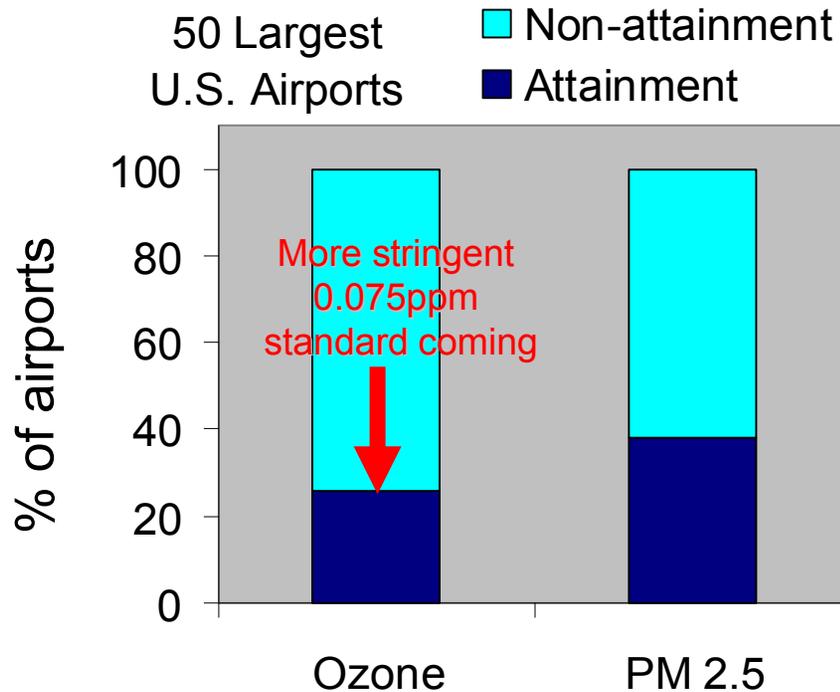
# The Challenge: Demand Continues to Grow



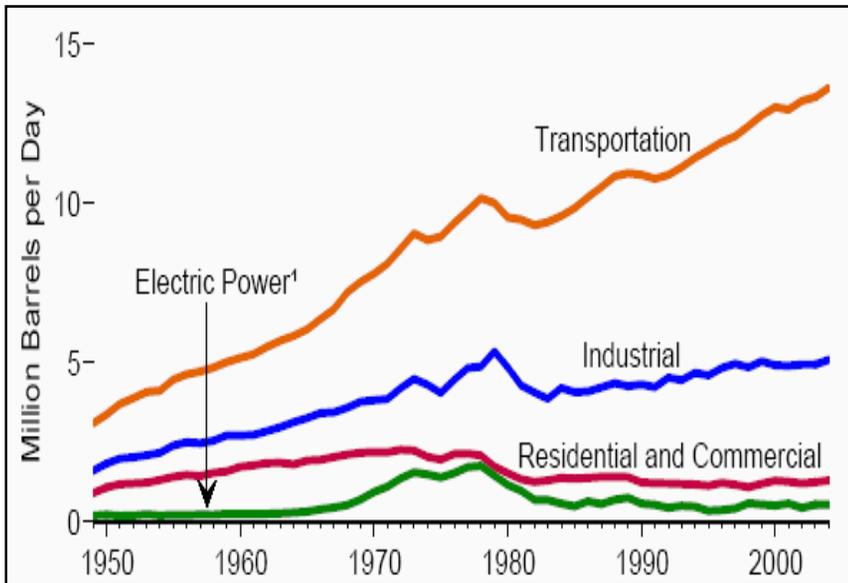
Source: NextGen Integrated Plan, 2004

# The Challenge: Environmental Issues Lead to Constraints

Compiled by Tam et al., 2007  
from Boeing data 9/13/05

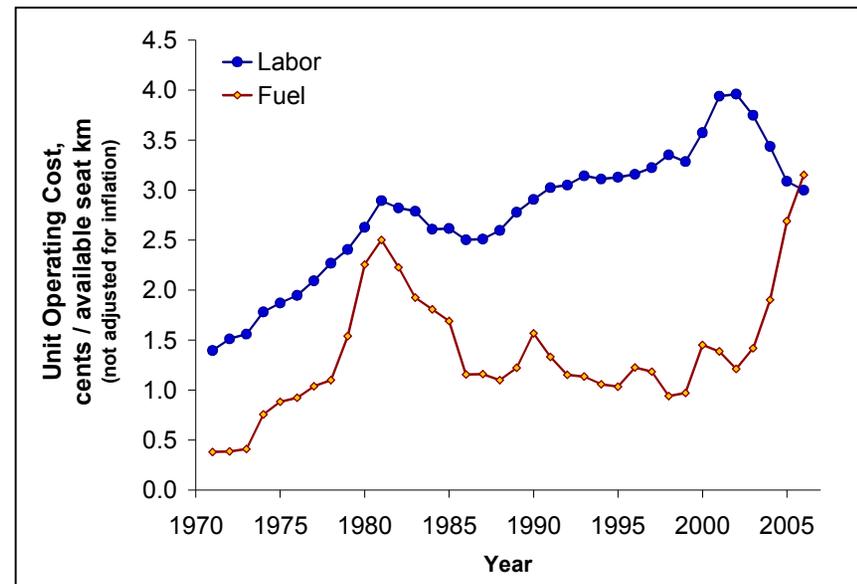


# The Challenge: Secular Shift in Energy Costs?



...and fundamental shift energy costs of to US airlines.

Transportation continues to have the largest reliance on oil...



Source: ATA

# The Challenge: Trade-offs in Potential Solutions

## Continuous Descent Approach

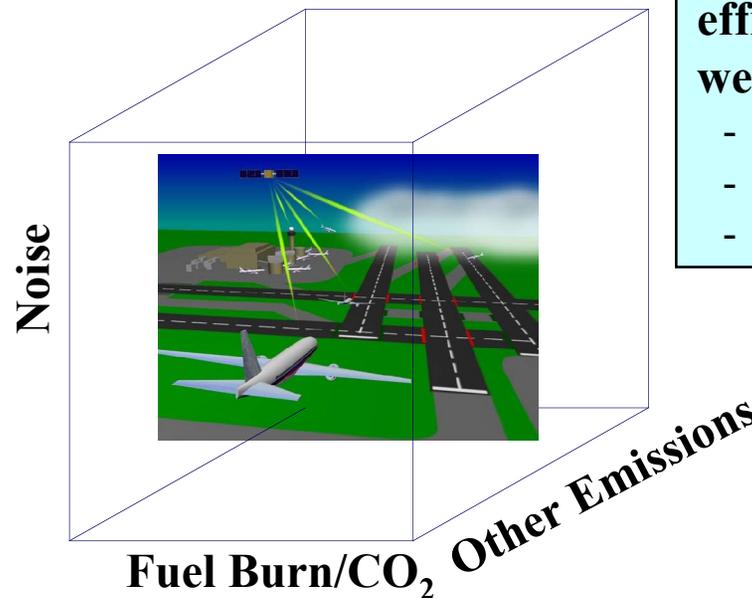
- Reduced **Noise**
- Reduced **Fuel Burn/CO<sub>2</sub>**

## Nacelle Modifications

- Reduced **Noise**
- Increased **Fuel Burn/CO<sub>2</sub>**

## Improved aerodynamic efficiency and reduced weight

- Reduced **CO<sub>2</sub>**
- Reduced **Noise**
- Reduced **NO<sub>x</sub>**



## Increased Engine Pressure Ratio & Temperatures

- Reduced **Fuel Burn / CO<sub>2</sub>**
- Reduced **HC and CO**
- Increased **NO<sub>x</sub>**

## Increased engine bypass ratio

- Reduced **Fuel Burn / CO<sub>2</sub>**
- Reduced **Noise**
- Increased **NO<sub>x</sub>**

# The Way Forward

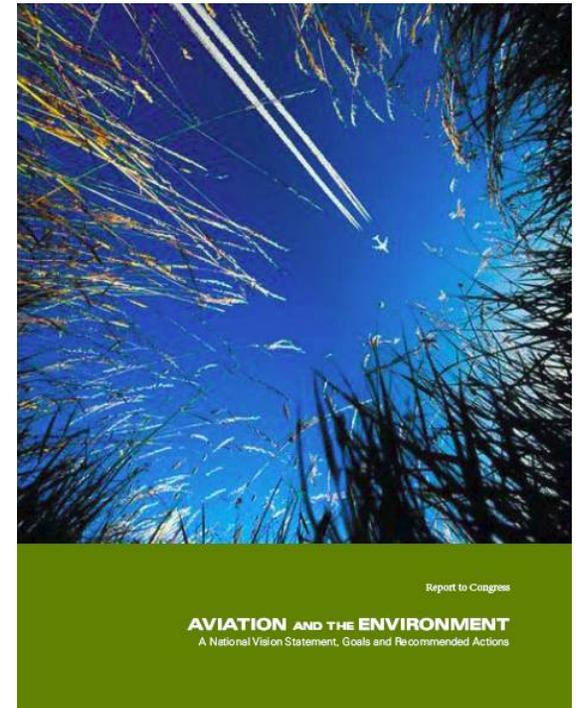
## NextGen Vision

*Provide environmental protection that allows sustained aviation growth*



## Our Goals

- Absolute reduction of significant *community noise* and *air quality* emissions impacts
- Reduce significant aviation impacts associated with *water quality*
- Limit or reduce the impact of aviation GHG emissions on the global *climate*
- Improve NAS *energy* efficiency and availability, including aircraft and air traffic operations and alt fuels development



# The Way Forward for the US: NextGen Plan

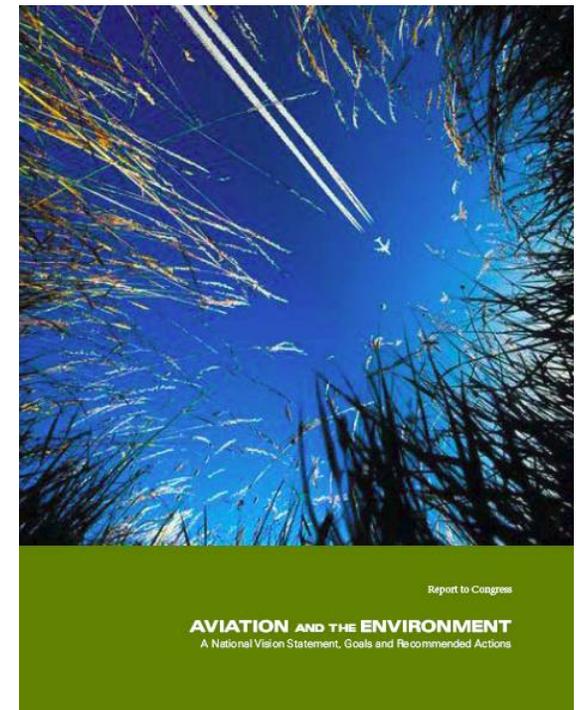
## NextGen Vision

*Provide environmental protection that allows sustained aviation growth*



## Key Initiatives:

- Better Scientific Understanding
- Integrated Analysis and Modeling
- Accelerate ATM Modernization
- Encourage New Aircraft Technology
- Explore Alternative Fuels
- Policy and Market Based Measures



# The Way Forward: New Aircraft Technology

## Opportunities



- Historically new technology accounts for 90% of environmental footprint reduction
- New concepts offer promise for improvement
- Collaborative demonstrations with industry can stimulate technology transition
- Need a balance in maturing technologies and enabling revolutionary concepts



# The Way Forward: Pursuit of New Fuels



## Opportunities

- ***Commercial Aviation Alternative Fuel Initiative***
- ***Formed to work in parallel with U.S. Military***
- ***To Facilitate Introduction of Alternative Aviation Fuels to:***
  - Secure a stable fuel supply
  - Reduce environmental impacts
  - Improve aircraft operations
  - Further research and analysis



## Some Closing Observations

- Despite past progress, environmental constraints to aviation growth remain
- Tackling environmental challenges is at the heart of the NextGen Plan
- Technology and operational changes may be enough to offset growth—especially if we succeed on alternative fuels.
- There is no “one best solution”—we need a variety of flexible, diverse, and compatible approaches.
- CLEEN is a key element of our strategy

