Aviation and GHG Emissions: Managing the Challenge of Growth

Meeting: Group on International Aviation and Climate Change

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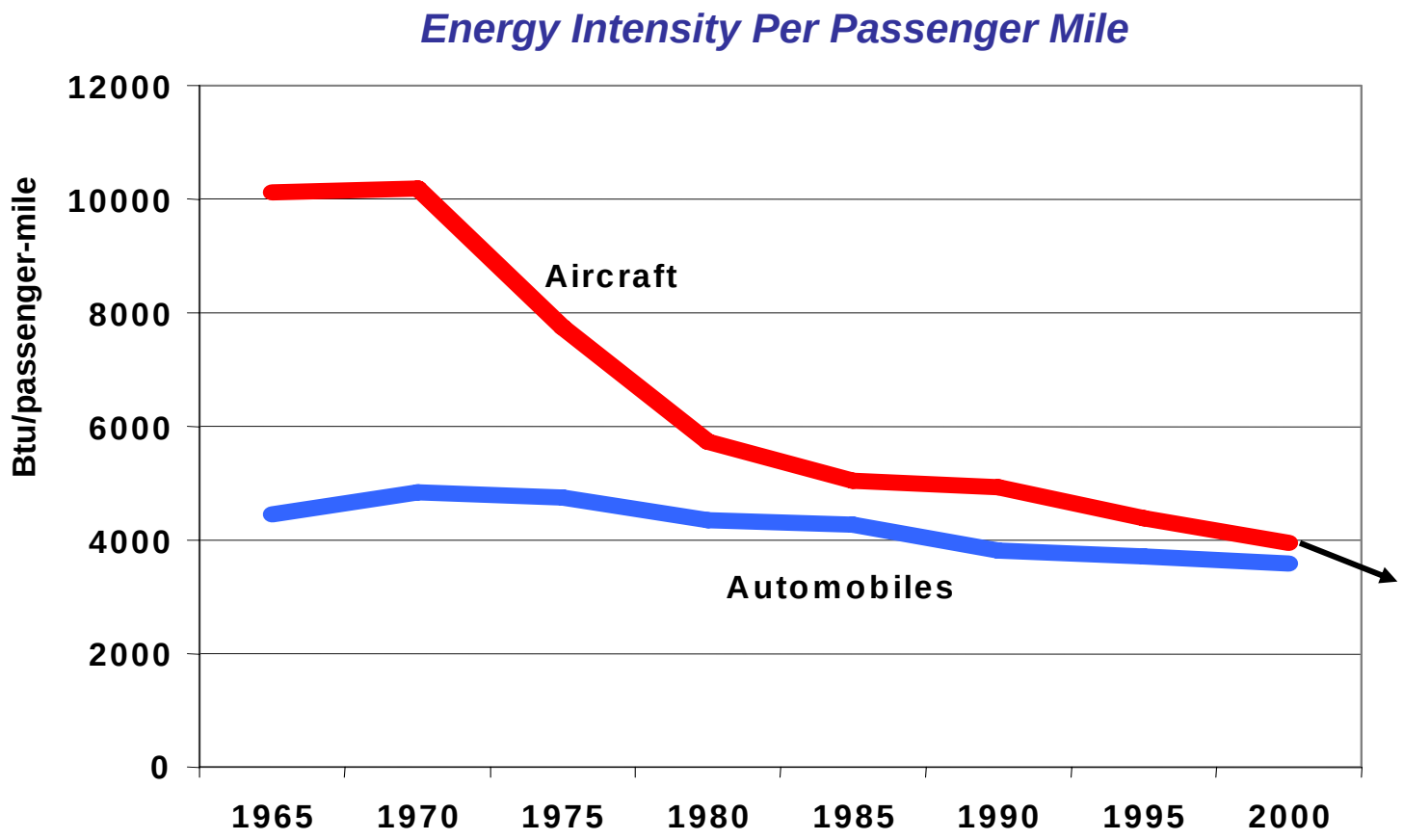
Outline

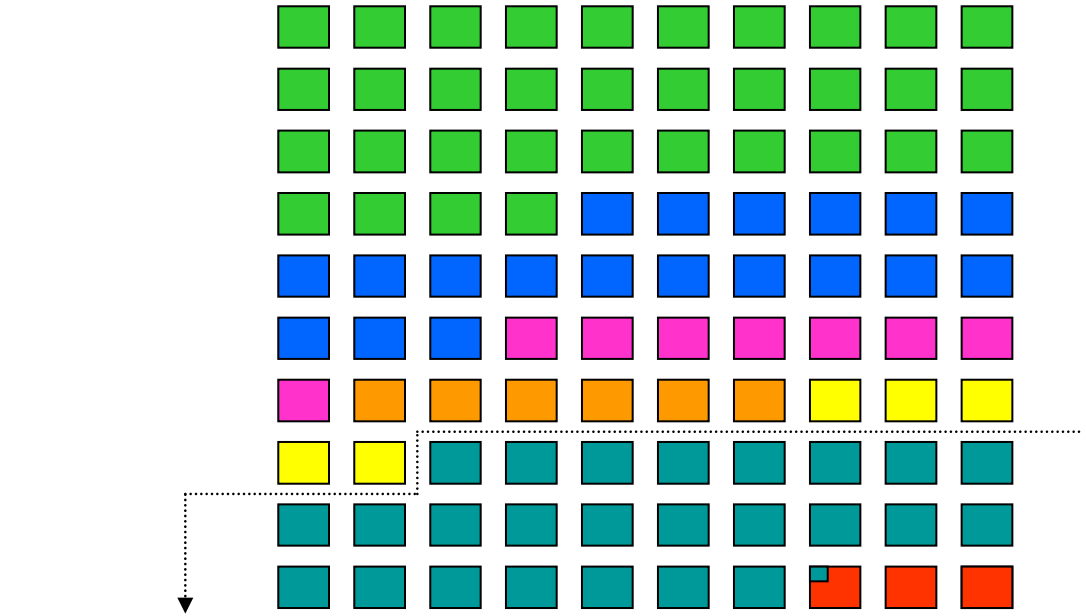
- The Historical Record
- Some Evolving Issues
- NextGen- The US Way Forward
- Some Closing Observations

The Record: Significant Improvements



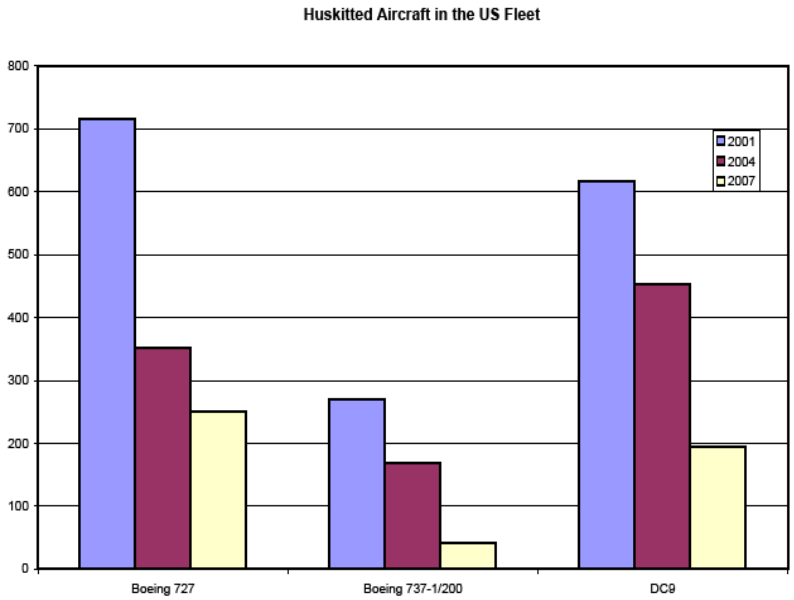
Source: FAA Emissions Primer

The Record: US Aviation GHG Emissions



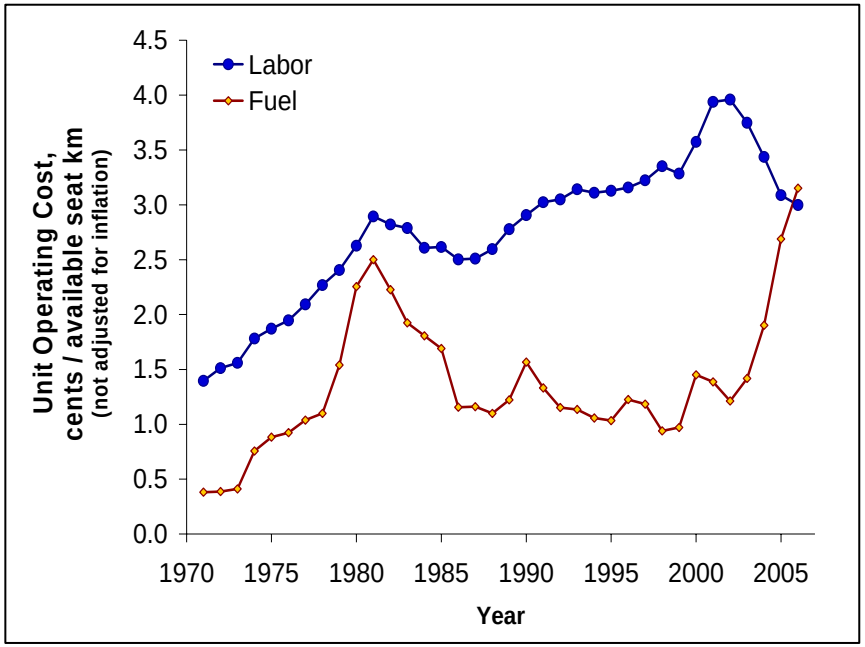
Source: U.S. EPA DATA - 2005

The Record: Recent Structural Changes



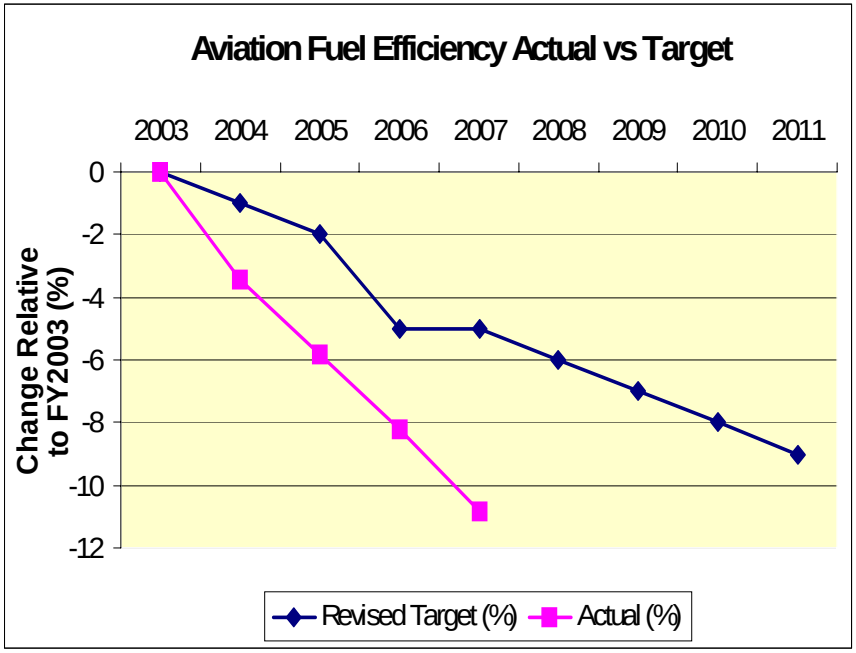
Significant Restructuring US Aircraft Fleets…

…and secular change in airline fuel costs…

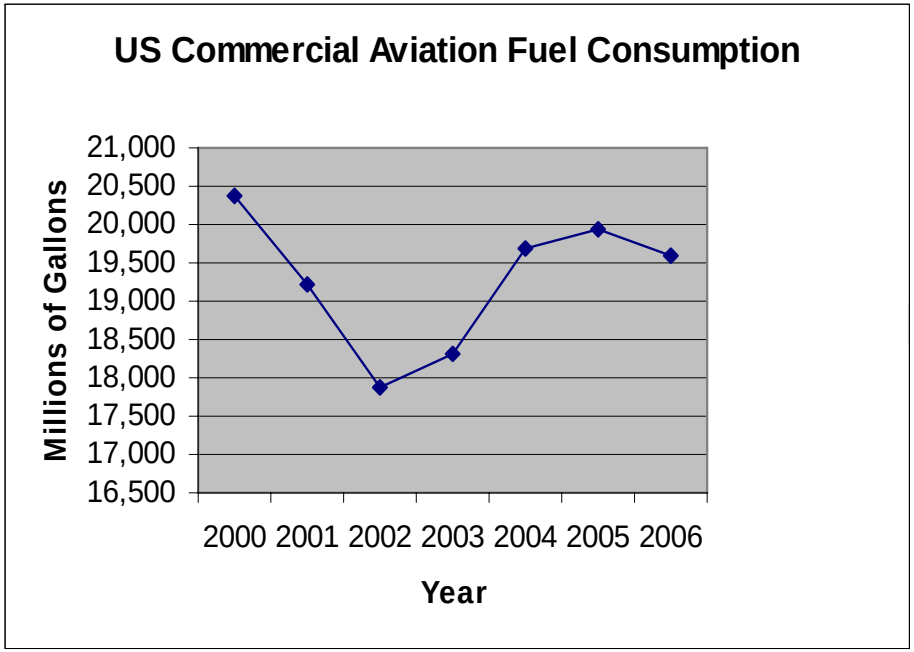


Source: ATA

The Record: US Aviation Emissions Growth Down

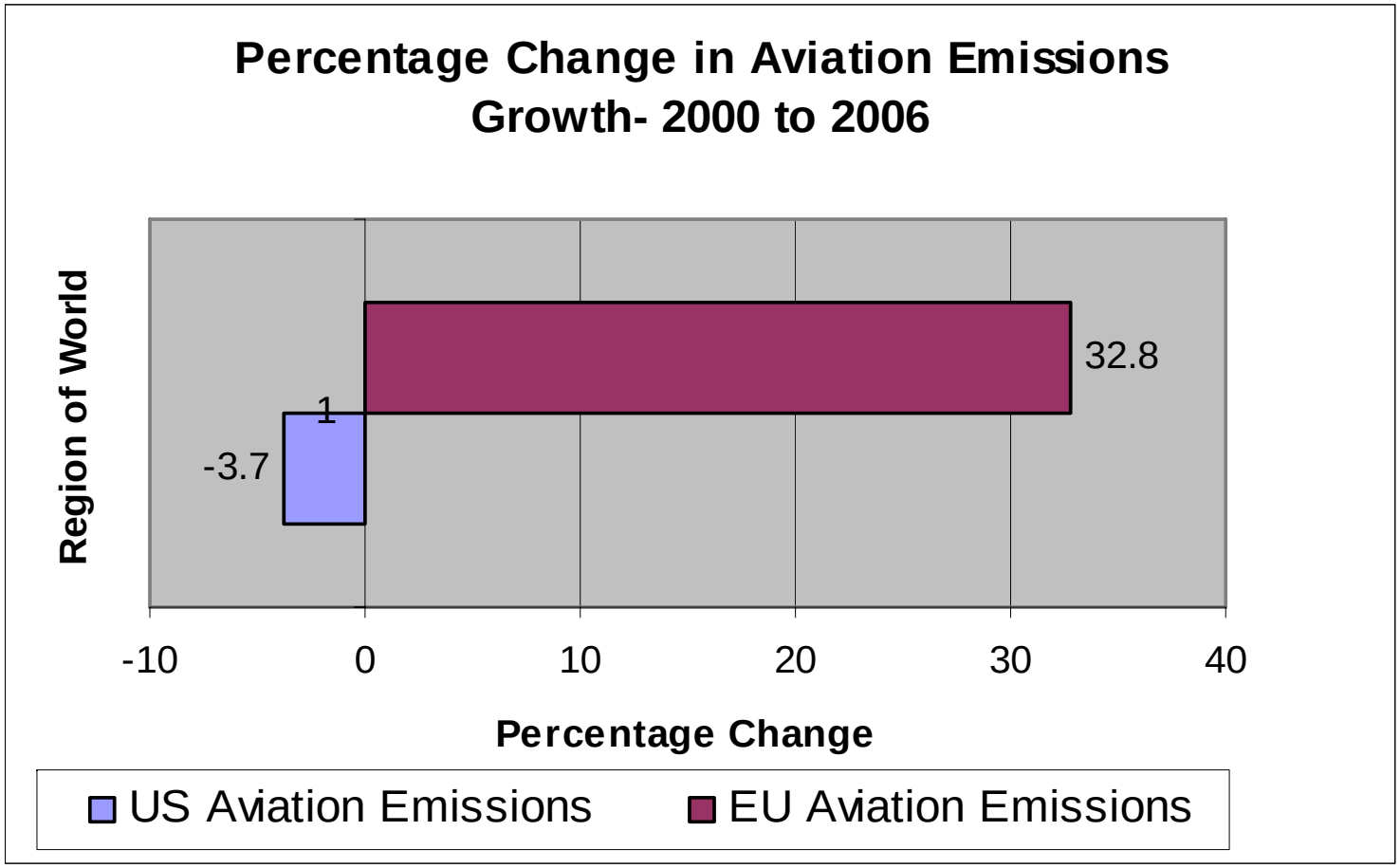


Source: FAA



Source: BTS

The Record: Difference In Mature Market Performance

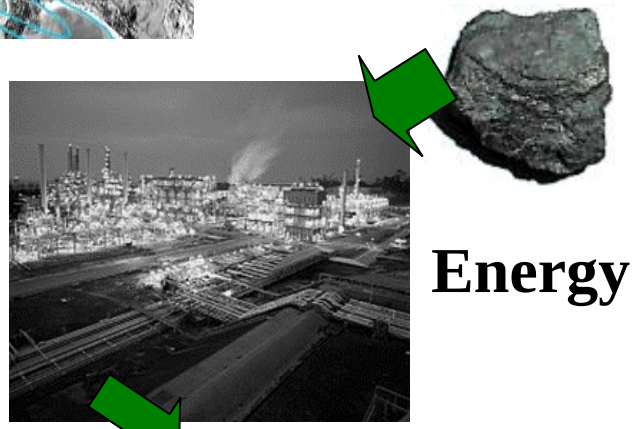


Source: Volpe: Note EU 15

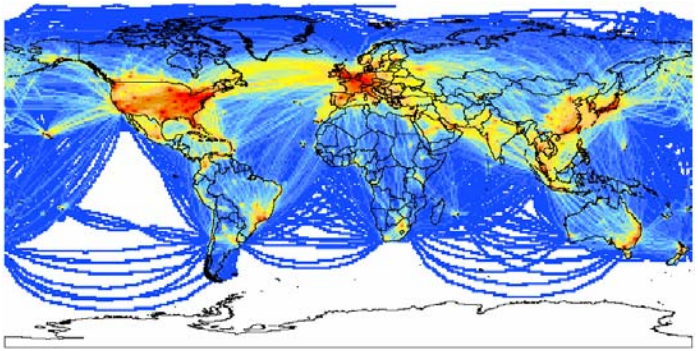
Evolving Issues: Multiple Environmental Challenges

Community Noise Impacts

Air Quality



Energy



Water Quality

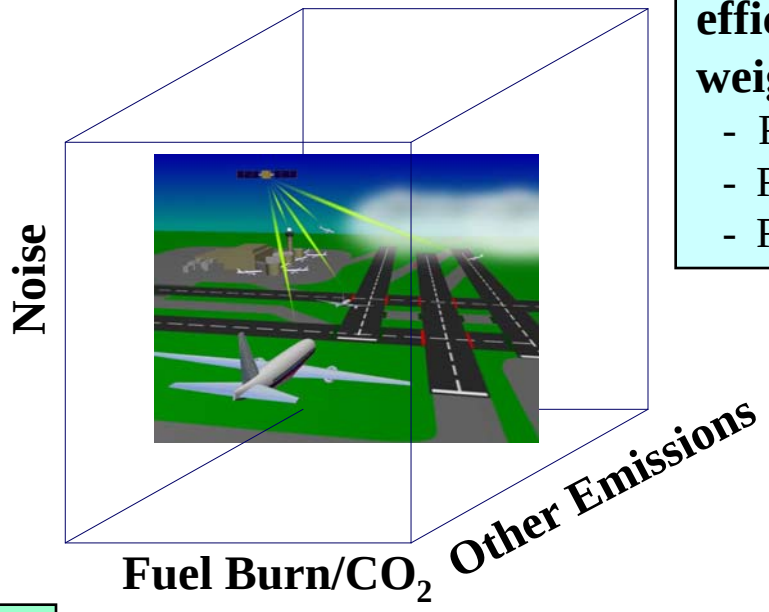
Global Climate

Challenge: No Simple Solutions- Trade-offs in Impacts

Continuous Descent Approach
- Reduced **Noise**
- Reduced **Fuel Burn/CO_2**

Nacelle Modifications
- Reduced **Noise**
- Increased **Fuel Burn/CO_2**

Increased Engine Pressure Ratio & Temperatures
- Reduced **Fuel Burn / CO_2**
- Reduced **HC** and **CO**
- Increased **NO_x**

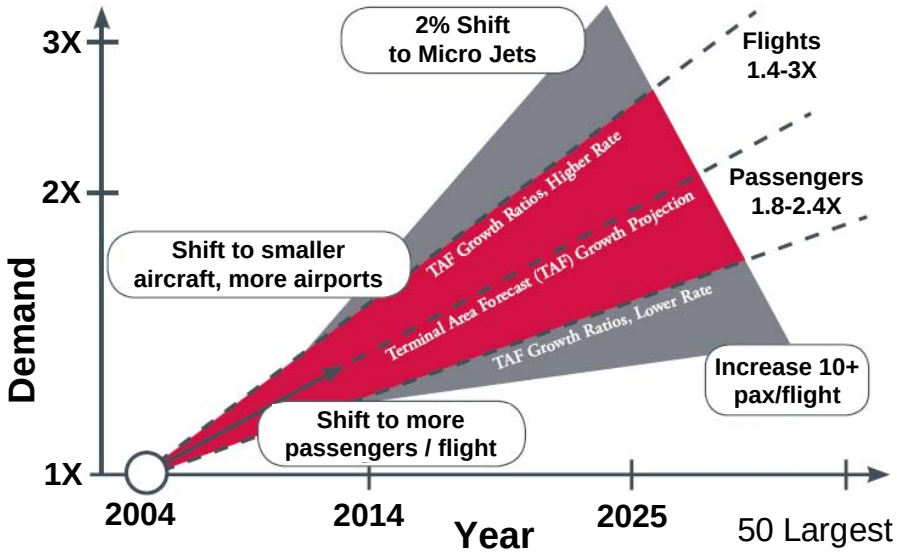


Improved aerodynamic efficiency and reduced weight
- Reduced **CO_2**
- Reduced **Noise**
- Reduced **NO_x**

Increased engine bypass ratio
- Reduced **Fuel Burn / CO_2**
- Reduced **Noise**
- Increased **NO_x**

Evolving Issues: Demand Growing and Potential Constraints

Growing Demand



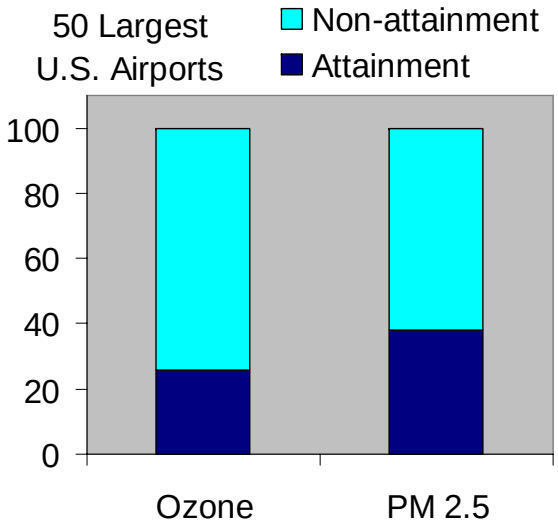
Source: NextGen Integrated Plan, 2004

… as is the environmental footprint…

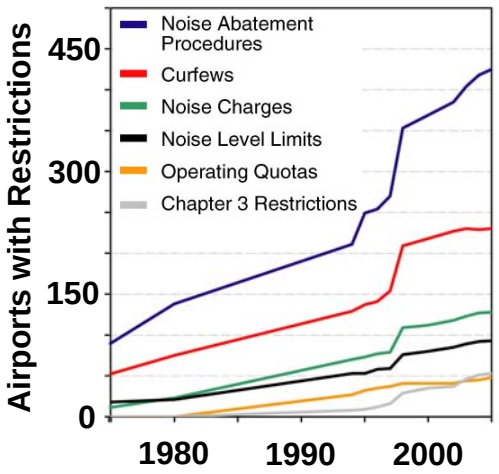
Preliminary Emissions for NextGen 2X Growth Scenario

HC	*+ 75%*
CO	*+ 70%*
NOx	*+ 90%*
SOx	*+ 85%*

… and this is coupled with environmental capacity constraints.



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

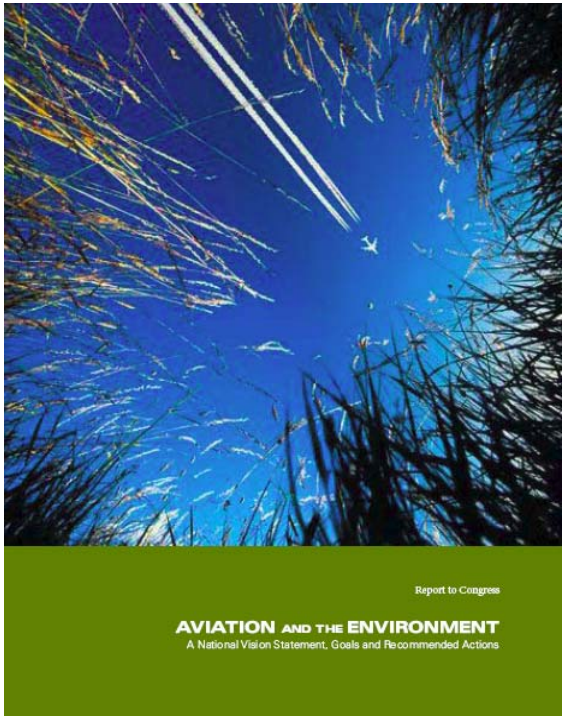


NextGen Vision

Provide environmental protection that allows sustained aviation growth

Key Initiatives:

- Better Scientific Understanding
- Accelerate ATM Modernization
- Encourage New Aircraft Technology
- Develop Alternative Fuels
- Consider Cost-Beneficial Market-Based Measures
- Accelerate International Collaboration



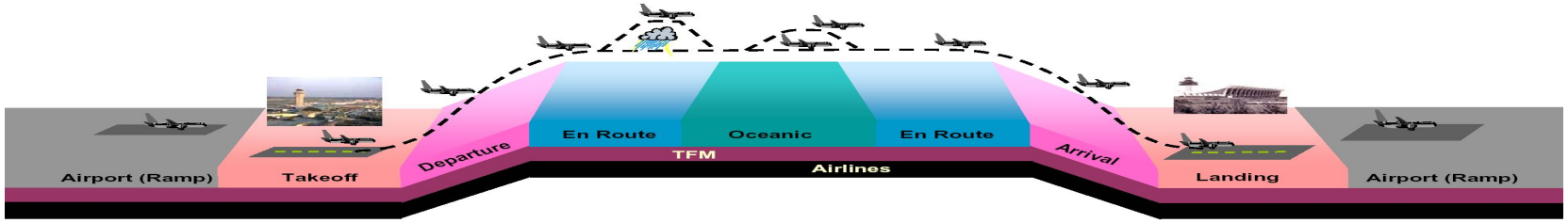
The Way Forward: Understanding the Problem

- Better science-based understanding of the impacts of aviation emissions on climate change
- Improved metrics, measurement techniques, and modeling capability to quantify and predict impacts and to understand inter-relationships of aviation environmental factors

The Way Forward: Accelerate Improved ATM

Opportunities

- New technologies to improve air traffic management will help reduce emissions. An example is RVSM – Reduced Vertical Separation Minimums. Full implementation of RVSM may reduce fuel use by ~300 million gallons each year.
- Other operational approaches, such as continuous descent arrivals, can reduce fuel burn as well as noise
- Reducing congestion, and optimizing airport ground and terminal air space operations offer great promise for future reductions of noise and emissions



The Way Forward: New Aircraft Technology

Opportunities

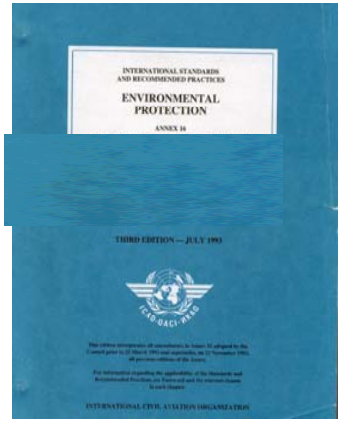
- Historically new technology accounts for 90% of environmental footprint reduction
- New concepts offer promise for improvement
- Collaborative demonstrations with industry can stimulate technology transition
- Need a balance in maturing technologies and enabling revolutionary concepts

The Way Forward: Pursuit of New Fuels

- Synthetic Fuels May Be More Environmentally Friendly
- Looking at the Full Range of fuels
- Helps Manage Interdependencies
- Enhances Energy Security
- Commercial Aviation Alternative Fuel Initiative

The Way Forward: Market-Based Measures (MBMs)

- US believes MBMs can have a role.
- MBMs should not be a first resort.
- MBMs should be cost-beneficial in their application.
- Applying MBMs to another country's airlines should be consistent with ICAO guidance and only on the basis of mutual consent.
- Neet to think about positive incentives for technology change.



The Way Forward: International Collaboration

Work through various ICAO activities to develop and implement a credible, global framework for the aviation community to address greenhouse gas emissions.

Conduct research to identify and better measure the issues and impacts associated with aircraft noise and aviation emissions, and generate improved solutions to deal with these problems. Cooperative efforts ongoing with numerous countries, research organizations, and industry around the globe.

The Atlantic Interoperability Initiative to Reduce Emissions (AIRE) seeks to accelerate development of operational procedures that will reduce aviation's environmental footprint on a "gate-to-gate" basis- covering each stage of aircraft operations: surface, departure, enroute, and arrival.

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.
- International goals in efficiency or emission intensity should be considered.
- As with noise, there is no "one best solution" and various countries' solution set will differ.
- Technology and operational improvements- with alternative fuels- could eliminate need for demand reducing market-based measures.
- Need to identify accelerate opportunities for international collaboration.