

Aviation Capacity and Growth: Meeting the Climate and Energy Challenge

Meeting: Transport Forum 2009

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**Federal Aviation
Administration**



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



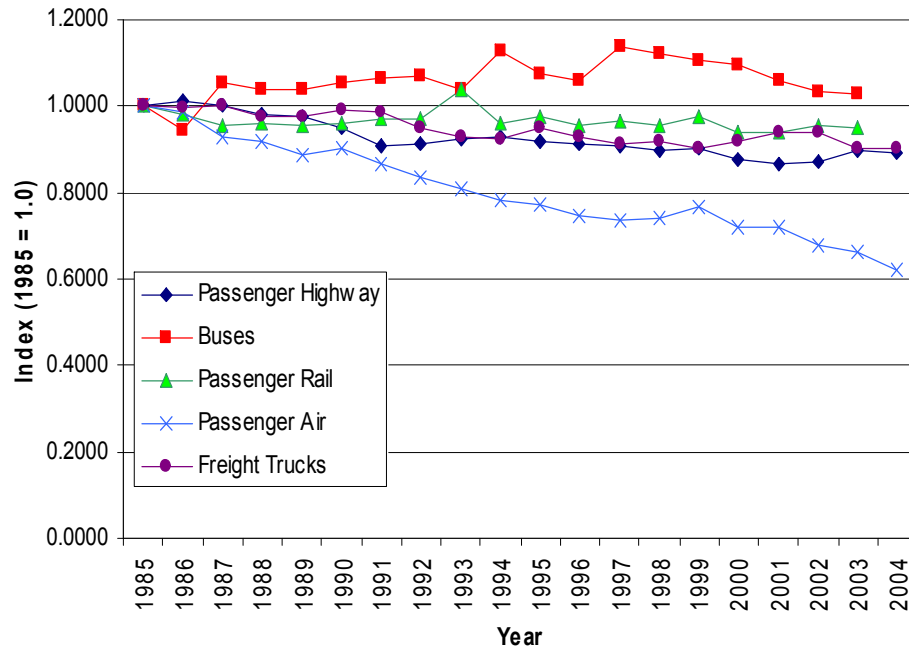
Aviation Environmental Drivers

- 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***

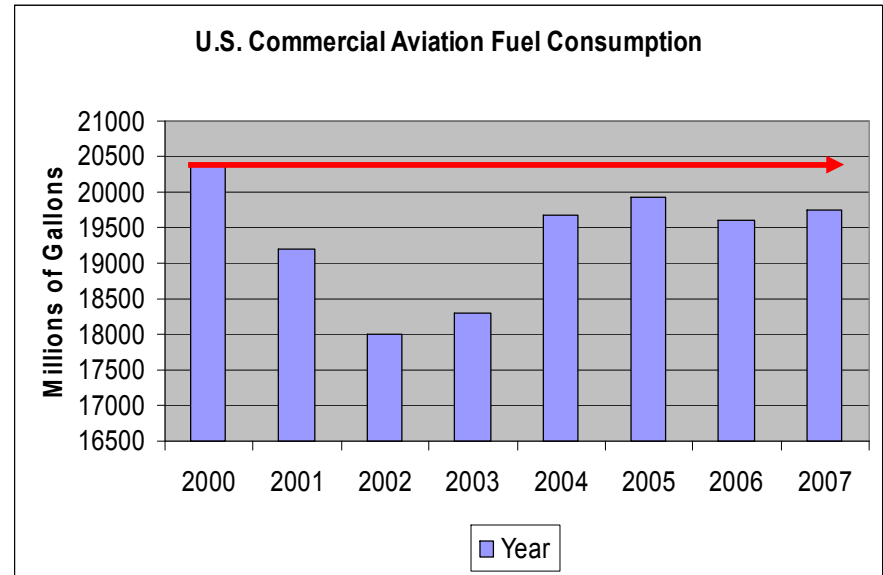
U.S. Experience: Aviation Emissions Performance



Source: U.S. Department of Energy, U.S. Energy Intensity indicators. (intensityindicators.pnl.gov)

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

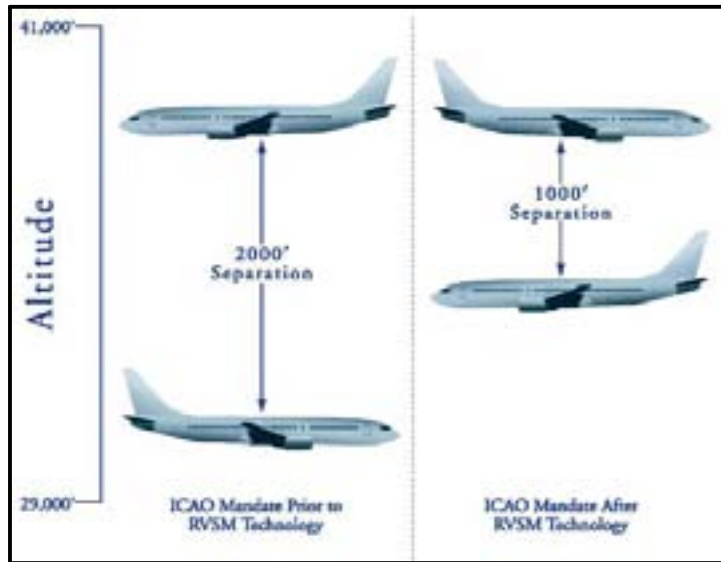
U.S. commercial aviation shows most improvement in energy efficiency...



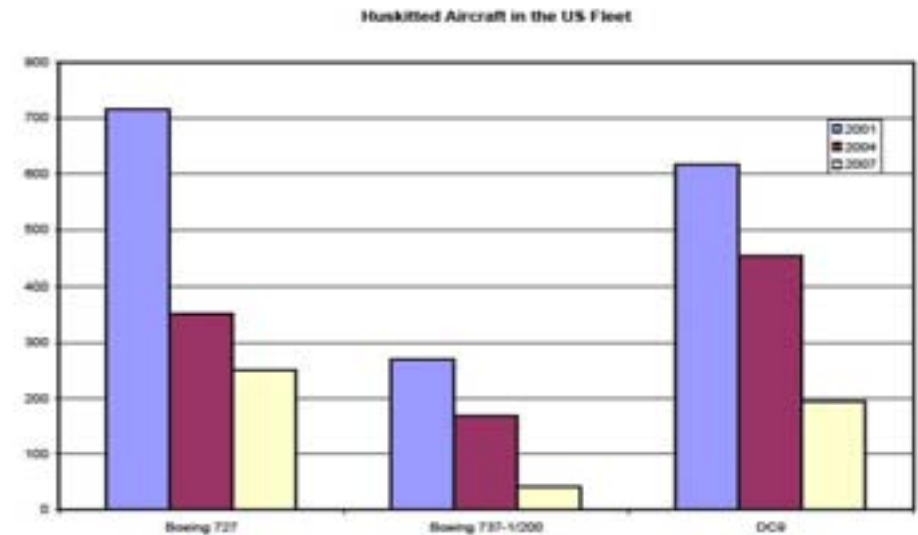
Source: BTS

U.S. Experience: Changes in ATM and Fleets

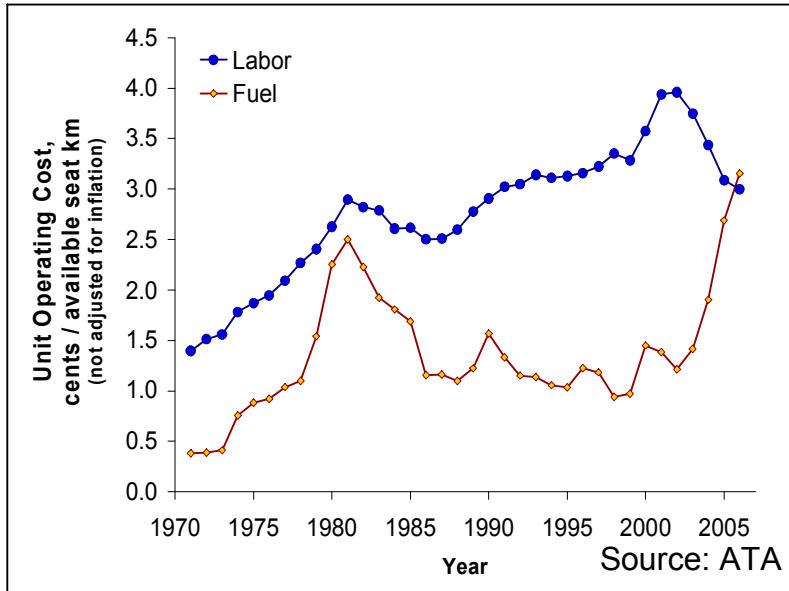
Innovation in air traffic management...



...and significant fleet change.



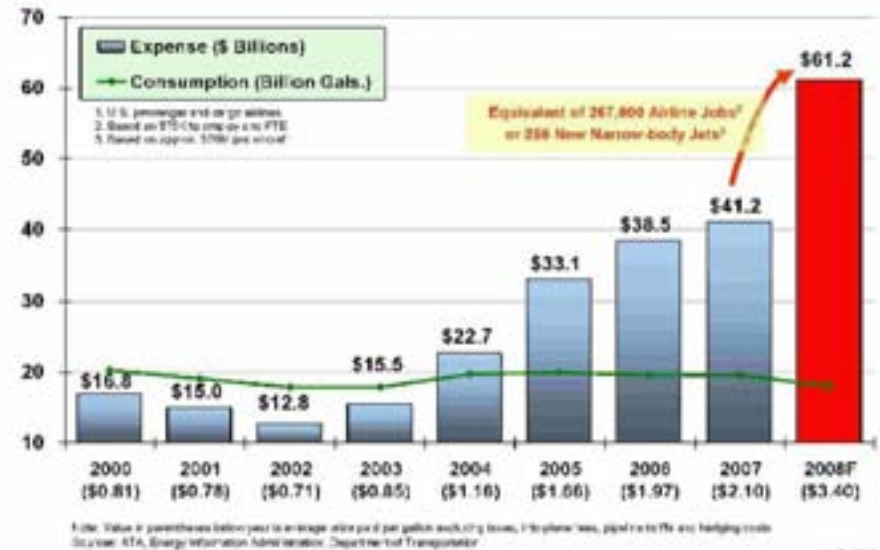
U.S. Experience: Structural Changes in Fuel Prices and Costs



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

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

2008 Jet Fuel Expense¹ Will Break 2007 Record
 Total Expense (Excluding Taxes and Into-Plane Fees) Could Exceed \$61 Billion

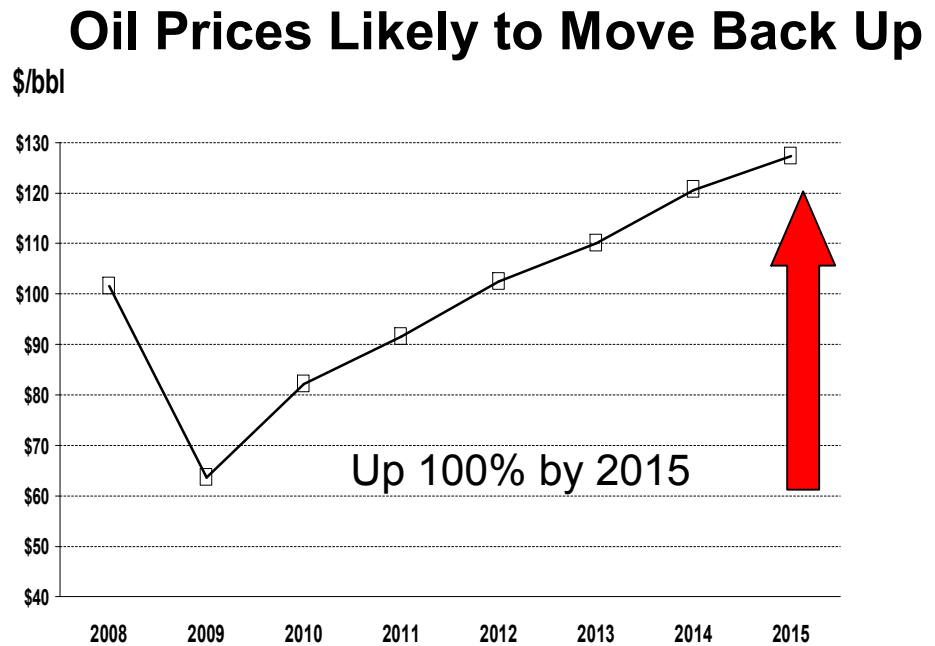
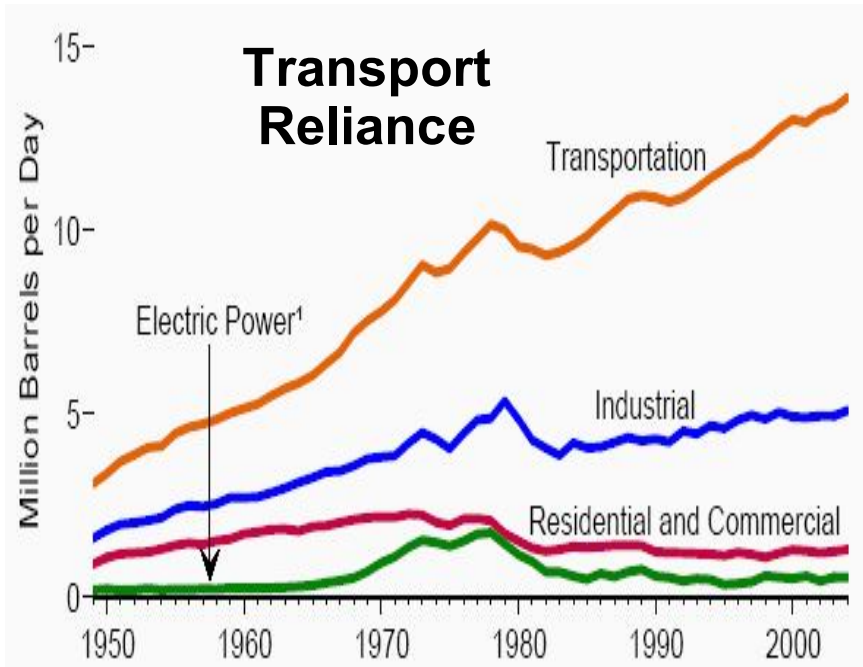


No Place for Complacency-Some U.S. Fuel Scenarios

Source: FAA Preliminary Analysis



Challenge Ahead: Oil & Energy Dynamics

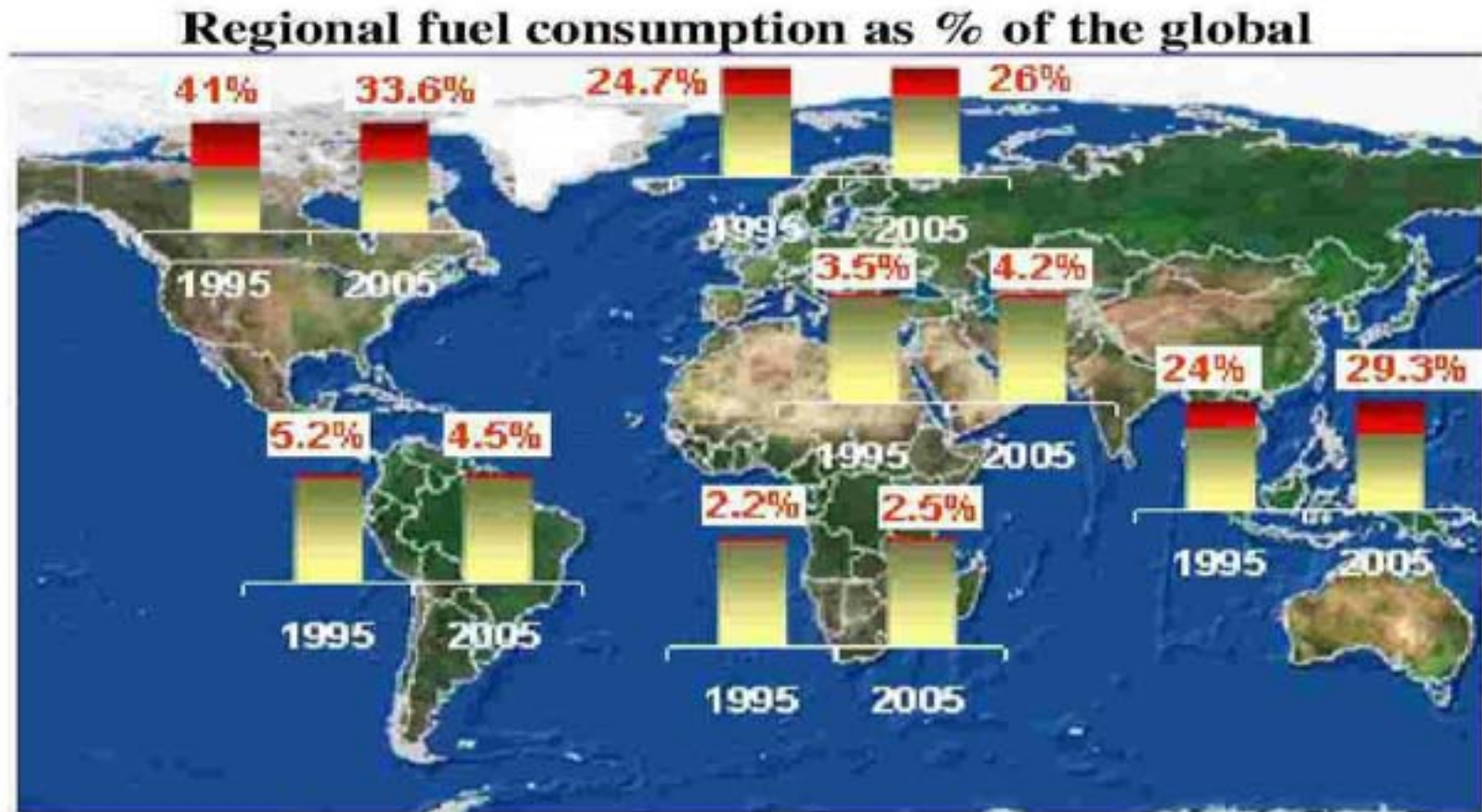


Challenge Ahead: Growing Role of Developing Countries

Rank	Country	RPKs	% RPKs	Cum %
1	UNITED STATES	1244694456	33.43%	
2	EU	909917091	24.44%	57.9%
3	CHINA	272563311	7.32%	65.2%
4	JAPAN	153288868	4.12%	69.3%
5	AUSTRALIA	99614166	2.68%	72.0%
6	CANADA	94680009	2.54%	74.5%
7	SINGAPORE	82904045	2.23%	76.7%
8	REPUBLIC OF KOREA	69292450	1.86%	78.6%
9	UNITED ARAB EMIRATES	65121483	1.75%	80.3%
10	RUSSIAN FEDERATION	63192258	1.70%	82.0%
11	THAILAND	50809492	1.36%	83.4%
12	BRAZIL	50688932	1.36%	84.8%
13	MALAYSIA	49578130	1.33%	86.1%
14	INDIA	46150555	1.24%	87.3%
15	MEXICO	34122966	0.92%	88.3%
16	SOUTH AFRICA	29191380	0.78%	89.0%
17	INDONESIA	28243288	0.76%	89.8%
18	NEW ZEALAND	26092980	0.70%	90.5%
19	TURKEY	24297389	0.65%	91.2%
20	SAUDI ARABIA	23793457	0.64%	91.8%



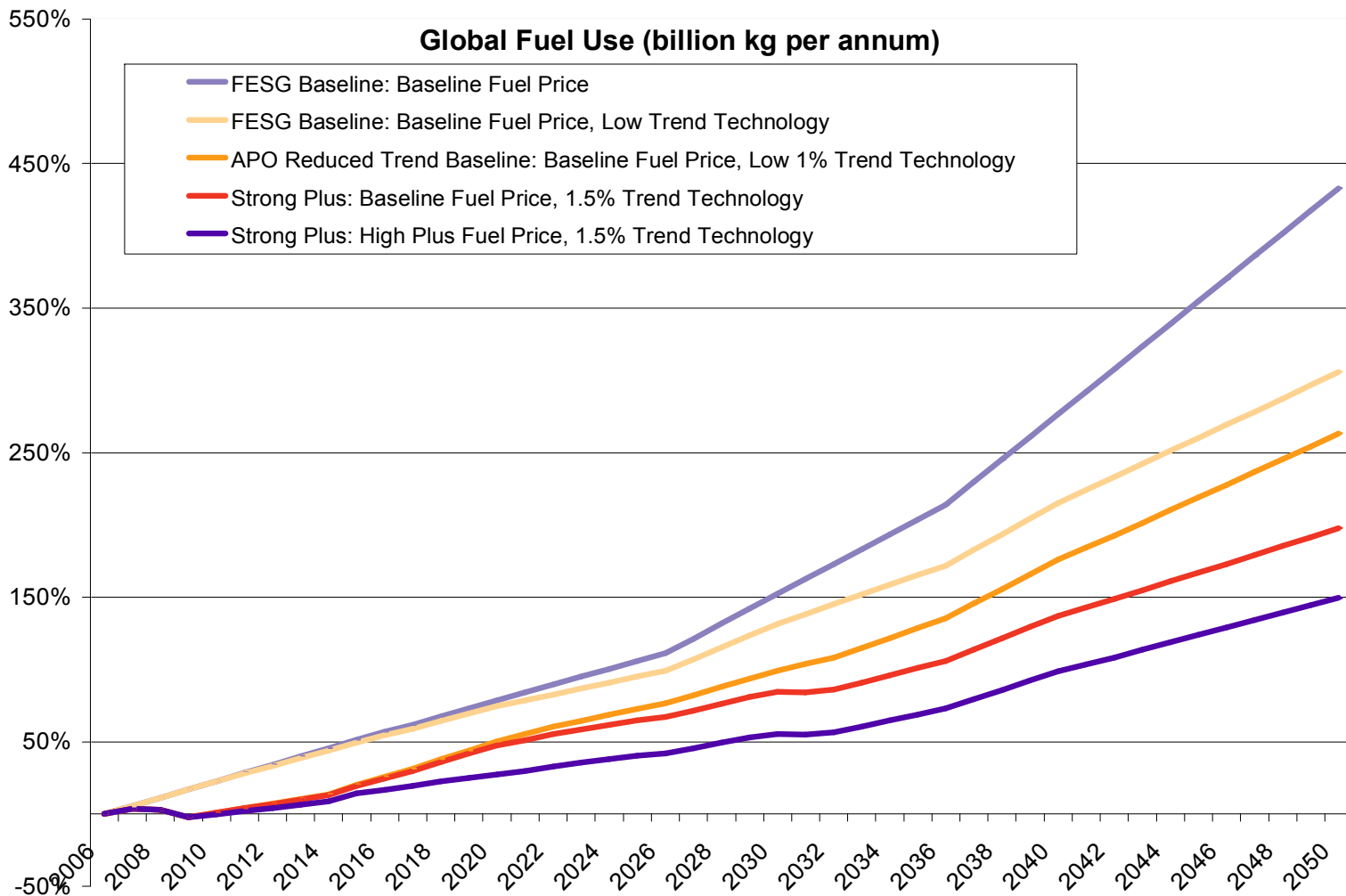
Challenge Ahead: Changing Patterns of Emissions Growth



Source: ICAO based on OAG timetable

*By region of registration

Challenge Ahead: Some Global Aviation Fuel Scenarios



Source: FAA Preliminary Analysis



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
- International Collaboration



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.



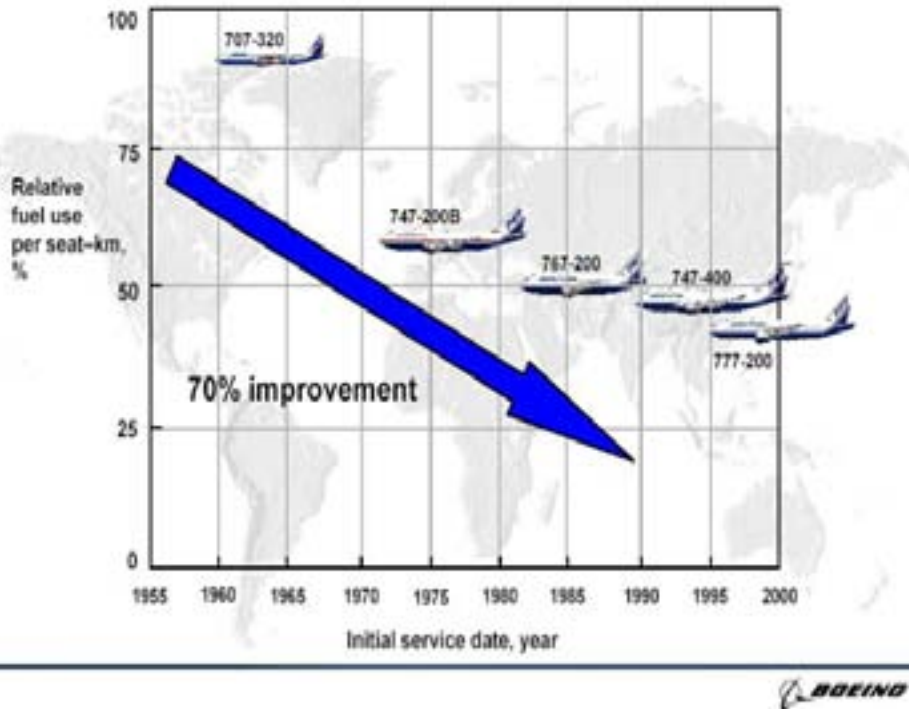
<http://web.mit.edu/aeroastro/partner/reports/climatewrksp-rpt-0806.pdf>

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

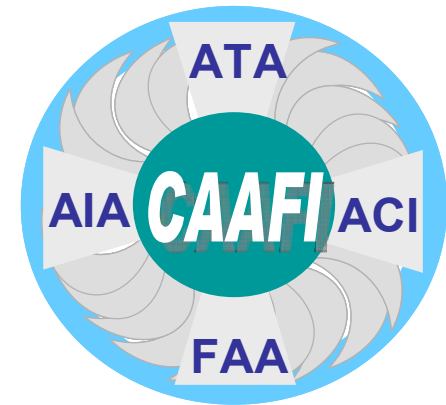


FAA Continuous Low Energy, Emissions and Noise (CLEEN)

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



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

A Way Forward: International Collaboration is Crucial



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.

<http://web.mit.edu/aeroastro/partner/index.html>



ASPIRE and AIRE seek 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, en-route, and arrival.



ICAO's Group on International Aviation and Climate Change is a senior level policy group that is charged with developing a consensus-based action program for the aviation community to address greenhouse gas emissions.



What Might the World Bank Do?

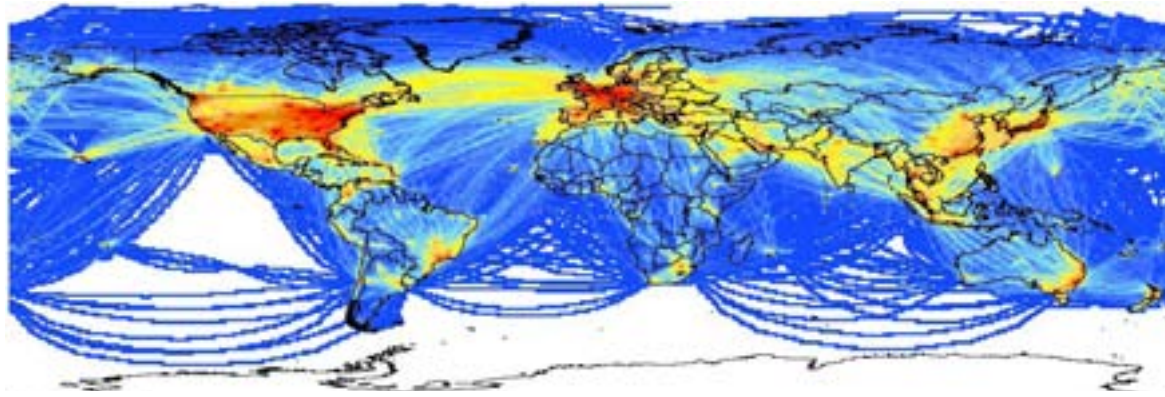


Figure from FAA System for Assessing Aviation's Global Emissions (SAGE)
http://www.faa.gov/about/office_org/headquarters_offices/aep/models/sage/



- ***Key Role of Developing Countries in Aviation Growth***
- ***Need to Tackle Growth and Environmental Protection***
- ***Foster Improvements in Airport Infrastructure***
- ***Accelerate Modernization of Air Traffic Management***
- ***Explore Opportunities for Sustainable Alternative Fuels***

Some Closing Observations

- Despite past progress, climate and energy issues could be largest constraint on future growth of aviation.
- The aviation sector needs an approach that balance growth and environmental protection.
- Developing world is playing an increasing role in aviation growth- hence emissions.
- Airport infrastructure changes, air traffic modernization, and sustainable fuels can play a large part in meeting the challenge.
- World Bank has great opportunity to foster and accelerate these types of initiatives



