# U.S. House of Representatives
## Committee on Transportation and Infrastructure
Washington, DC 20515



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May 5, 2008

**SUMMARY OF SUBJECT MATTER**

**TO:** Members of the Subcommittee on Aviation

**FROM:** Subcommittee on Aviation Staff

**SUBJECT:** Hearing on "Aviation and the Environment: Emissions"

## PURPOSE OF HEARING

The Subcommittee on Aviation will meet on Tuesday, May 6, 2008, at 2:00 p.m., in room 2167 of the Rayburn House Office Building, to receive testimony regarding aviation emission issues.

## BACKGROUND

As demand for aviation services continues to grow, so too does aviation's possible impact on the environment. The Federal Aviation Administration ("FAA") forecasts that airlines are expected to carry more than 1 billion passengers by 2016, increasing from approximately 769 million in 2007. At the same time, fuel costs are rising, causing air carriers to actively search for increased fuel efficiencies, which would also have positive impacts on the environment. Currently, aviation accounts for about 3 percent of the world's greenhouse gas emissions ("GHG").[1] A small proportion (roughly two percent) of the atmosphere is composed of GHG (water vapor, carbon dioxide, ozone (nitrogen oxides ("NOx") and water vapor), and methane). According to the National Research Council ("NRC"), these gases change the earth's atmosphere to a temperature warm enough to support life. Water vapor is historically the most abundant GHG; other GHGs trap heat in the atmosphere at a greater rate than water vapor and together these GHGs increase the earth's temperature. The NRC found that "direct atmospheric measurements made over the past 50 years have documented steady growth in the atmospheric abundance of carbon dioxide ("$CO_2$") . . .

[1] Intergovernmental Panel on Climate Change ("IPCC"), *Aviation and the Global Atmosphere* (1999).

$CO_2$ has increased by nearly 35 percent over the Industrial Era (since 1750)."[2] Once in, some GHGs reside in the atmosphere for potentially hundreds of years.[3]

In the last 40 years, aviation emissions per passenger mile have decreased by 70 percent.[4] According to the FAA, $CO_2$ emissions dropped in the United States by 4 percent between 2000 and 2006, at the same time, commercial aviation moved 12 percent more passengers and 22 percent more freight. Without further improvements to engine, airframe technology, or air traffic management, the preliminary computations in the Joint Planning Development Office's[5] ("JPDO") Next Generation Air Transportation System ("NextGen") plan show that aviation noise and emissions are likely to increase by 140-200 percent by 2025 under future aviation growth scenarios unless aggressive actions are taken to control and reduce aviation's environmental footprint. Environmental issues – unless forcefully addressed – could limit the ability to provide the growth in capacity and fully utilize the capabilities of the NextGen program. Along side the potential for growth, the industry has shown a history of self-help. According to the Air Transport Association ("ATA"), the airlines have achieved a 35 percent increase in fuel efficiency since 2001. Though jet fuel represents about thirteen percent of petroleum use, it represents only three percent of the total United States' energy consumption.

## I. U.S. Government Programs

### a. Research

Historically, most of the substantial aviation environmental gains have come from new technologies. The FAA's goal is to encourage a fleet of quieter, cleaner aircraft that operate more efficiently with less energy. The FAA states that solutions that involve technology improvements in engines and airframes in a foreseeable timeframe require successful maturation and certification of new technologies within the next 5-8 years.

In 2004, the National Aeronautics and Space Administration ("NASA") established a five-year goal to deliver technologies (at a near-commercial readiness level) to reduce $CO_2$ emissions of new aircraft by twenty-five percent. NASA aeronautic budgets have continued to decline since 2004 and, in early 2006, NASA's Aeronautic Mission Directorate realigned itself to focus on basic/fundamental research, leaving most of the proposal above underfunded. During this same time period, FAA planned to invest $10 million a year to develop a comprehensive framework of aviation environmental analytical tools and methodologies to assess interdependencies between noise, emissions, and economic performance to more effectively analyze the full costs and benefits of proposed actions.[6] This latter FAA work is ongoing.

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[2] NRC, *Potential Impacts of Climate Change on U.S. Transportation* (March 11, 2008) at 27.
[3] Id. at 56.
[4] IPCC, *Aviation and the Global Atmosphere* (1999).
[5] In 2003, *Vision 100 – Century of Aviation Reauthorization Act* created the JPDO which is responsible for coordinating a public/private interagency partnership to bring the NextGen into use by 2025. The agencies involved include: the Departments of Transportation, Defense ("DOD"), Homeland Security, Commerce, FAA, NASA, and the White House Office of Science and Technology Policy.
[6] FAA, *National Aviation Research Plan, Report of the FAA to the United States*, Washington, DC, (February 2004).

NASA's focus on fundamental research leaves other agencies, including the FAA, the job of transitional and applied research, thereby impacting NextGen efforts, which includes several emission and fuel efficiency research and development items. Though NASA still plans to perform JPDO research, it will perform only fundamental research and not developmental work and demonstration projects.

**b. NextGen**

Under the current air traffic control system, controller workload, radio frequency voice-communication congestion, and the coverage and accuracy of ground-based navigational signals impose practical limitations on the capacity and throughput of aircraft in the system, particularly in busy terminal areas near major airports and around certain choke-points in the en route airway infrastructure where many flight paths converge. Both the FAA and independent experts have noted that increasing the national airspace capacity at the rates forecasted would be extremely difficult, if not impossible, using existing infrastructure, technologies and operational procedures.

The NextGen plan consists of new concepts and capabilities for air traffic management and communications, including: navigation and surveillance that rely on satellite-based capabilities; data communications; and enhanced automation. These technologies will allow adaptability by enabling aircraft to adjust more rapidly to unpredictable factors such as weather and traffic congestion. They will also allow for more precise and efficient flight route patterns.

Implementation of NextGen will have a dual impact of modernizing the aviation system while providing benefits to the environment. Among NextGen's goals are the capability to reduce the number of people exposed to significant noise levels; the significant health and welfare impacts of aviation on the population (from $CO_2$, NOx, water quality, particulates); and aircraft fuel consumption rates. Core elements of NextGen include improving operational procedures, introducing new technology in aircraft and engines, and developing alternative fuels. According to the FAA, conversion to a satellite-based, NextGen navigation system would cut emissions and delays by approximately 15 percent. For example, Automatic Dependent Surveillance-Broadcast ("ADS-B")[7] will enable more precise control of aircraft during flights to allow closer separations between aircraft and more direct routing. Continuous Descent Arrivals ("CDA") allows aircraft to remain at cruise altitude longer and avoid excess fuel burn associated with traditional landing procedures as it approaches an airport, therefore decreasing emissions and noise. Area Navigation ("RNAV") and Required Navigation Performance ("RNP") will descend on a precise route, avoiding populated areas and thereby decreasing noise and emissions.

According to the JPDO, an Environmental Management System will be fully integrated into all NextGen operations to ensure that the objective of environmental protection, which allows for sustained aviation growth, will be built into the system. In addition to enhanced air traffic procedures, NextGen will coordinate research into alternative fuels and cleaner/quieter engine and

[7] ADS-B uses global positioning system ("GPS") satellite signals, transponders aboard the aircraft, and a system of nearly 400 ground stations, to give pilots an unprecedented level of situational awareness. Since the ADS-B data is more accurate and refreshed at a far more rapid rate than is possible with radar, it will allow controllers to more closely sequence aircraft in high congestion areas.

airframe technologies that will be inserted in a timely manner into the fleet and look at cost-effective market-based approaches to limiting GHGs (e.g., emission trading or carbon offsets).

The FAA is also participating in international efforts to accelerate environmentally friendly procedures. The Atlantic Interoperability Initiative to Reduce Emissions was formed in 2007 by the United States and the European Commission ("EC") to enhance air traffic procedure demonstration projects. The United States also started a similar cooperative initiative with Australia and New Zealand in February 2008.

## III. Industry Efforts to Reduce Emissions

### a. Air Carriers/Manufacturers

There are significant incentives for airlines to reduce fuel use, especially as fuel costs today represent over 30-50 percent of airline operating costs in the United States. According to ATA, every penny of oil price increase adds $190-200 million a year to industry aviation fuel costs. Air carriers are employing a wide variety of procedures to reduce fuel consumption, including: single-engine taxi procedures and selective engine shutdown during ground delays; cruising longer at higher altitudes and employing shorter, steeper approaches and flying slower; optimizing flight planning for minimum fuel-burn routes and altitudes; investing in winglets to reduce aircraft drag and reduce fuel burn; using airport power rather than onboard auxiliary power units when at the gates; and experimenting with towing aircraft during some portion of travel to and from the gate. Another significant, though expensive way airlines have decreased emissions, is by using newer aircraft.

Innovation in environmental technologies to reduce noise and emissions has produced the bulk (90 percent) of the improvements in environmental performance in the U.S. aviation sector over the past few decades. Investing billions of dollars in research and development, U.S. manufacturers, with contributions by NASA, have made great strides in engine innovations and other technologies to save fuel and decrease emissions in the last three decades. The Boeing 787, for example, comprises a 20 percent decrease in fuel use and $CO_2$ emissions, 60 percent reduction of noise, and 28 percent less NOx over the airplane it replaces. However, manufacturers have expressed concerns that the United States risks losing its global leadership in aeronautics to Europe due to reduced NASA and FAA research and development programs.

### b. Alternative Fuels

Fuel costs are also motivating air carriers, airports and manufacturers to look at innovations in alternative fuels to decrease long-term cost and emissions. In partnership with airlines, airports, and manufacturers, FAA launched the Commercial Aviation Alternative Fuels Initiative ("CAAFI"). CAAFI is leading efforts to develop alternative fuels to ensure an affordable and stable supply of environmentally progressive aviation fuels. CAAFI seeks to promote the development of alternative fuels that offer equivalent levels of safety and compare favorably with petroleum-based jet fuel on cost and environmental bases.

Through CAAFI, participants from industry, government, universities, fuel suppliers, and over a half dozen U.S. government agencies share and collect needed data, and motivate and direct research on aviation alternative fuels. Within CAAFI, there are four teams that work on: fuel

certification and qualification; research and development; environmental impact; and, economics and business cases. CAAFI's work to date includes:

- Creating roadmaps to communicate aviation needs and solutions;
- Disseminating flight-test information on synthetic fuels and bio-fuels;
- Supporting research and development on low carbon fuels sourced from plant oils, algae and biomass;
- Understanding life-cycle environmental impacts of production and use of alternative fuels;
- Planning for certification in 2008 of a 50 percent synthetic fuel, 2010 for 100 percent synthetic fuel, and 2013 for bio-fuels;
- Developing a handbook for calculating environmental and economic benefits and costs of alternative fuels for airports; and
- Educating public and private interests on the unique needs and practical solutions for aviation in the area of alternative fuels.

### c. Airports

Increased flights and load factors challenge airports to increase capacity while mitigating the environmental impact on the local community. The majority of our nation's busiest airports fall in ozone non-attainment areas.[8] Air carriers and airports are working together to decrease emissions and fuel consumption. Electrifying the airport gates to provide preconditioned air and a ground power system improves air quality by eliminating the emissions resulting from the use of the aircraft's internal power generators that are run on jet fuel. Many airports are also putting resources into infrastructure for natural gas, electric, biofuels, and propane refueling stations that benefit the airport and also pubic users, including commercial vans, courtesy shuttles, and taxis. Airports are also participating in the U.S. Green Building Council's Leadership in Energy and Environmental Design program and using renewable energies such as solar and hydroelectric power to heat and cool their buildings. Many airports have recycling programs and high occupancy vehicle ground transportation programs for getting passengers to and from the airport. Since 2005, airports in Clean Air Act non-attainment areas have taken advantage of $6.6 million in FAA Airport Improvement Program funds for infrastructure improvements to reduce emissions through the Voluntary Airport Low Emissions ("VALE") program. The Airport Cooperative Research Program run by the National Academies of Science Transportation Research Board is funding a guidebook on preparing airport greenhouse gas inventories.

## IV. EU Emissions Trading Scheme

On December 20, 2006, the EC published a proposed directive to cover civil aviation under its Emissions Trading Scheme ("ETS"), which is intended to reduce $CO_2$ and other greenhouse gases. According to the European Union ("EU"), its aviation emissions have increased by 87 percent since 1990.[9] The proposed directive unilaterally includes the United States and other non-EU airlines and sidesteps the normal process for dealing with aircraft emissions through the International Civil Aviation Organization ("ICAO") and international air service agreements. Under

[8] According to the Environmental Protection Agency, a nonattainment area is a locale that does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

[9] EU's aviation emissions have increased dramatically in large part due to the increase of low cost carriers as well as the inefficiencies of 27 separate air traffic control systems.

the current EC proposal, air carriers landing in EU countries would be required to buy 10 percent of their 2004-6 average emissions starting in 2012. Under the rules being proposed by the EU, an airline would have to surrender emissions allowances for the entire duration of its trip. For example, an airline flying from Los Angeles to London, England would pay for the entire 6,000 miles and not just the portion flown in EU airspace. Additionally, not only would the airline be required to pay the EU carbon allowances, joining the EU ETS offers no protection from additional fees put in place by EU member states. Great Britain doubled its air passenger duty fee last year based on an emissions justification. Other EU nations are considering the option of additional fees. The United States is opposed to the current EU scheme stating that it violates international aviation law, offers no protection to U.S. airlines from multiple charges, diverts revenue to subsidize EU industry and governments, and unilaterally mandates a single solution rather than negotiating with the United States and other countries to develop a performance-based approach that recognizes each country's sovereignty to implement appropriate measures.

At its September 2007 Assembly meeting, ICAO agreed that any type of ETS should only be applied **based on mutual consent** between countries. ICAO approved guidance for establishing the structural and legal basis for aviation's participation in an open trading system, and including key elements such as reporting, monitoring, and compliance, while providing flexibility. ICAO also chartered a Group on International Aviation and Climate Change (GIACC) to discuss an international plan to actively address aviation GHGs. Composed of political level officials from 15 key aviation states, the GIACC seeks to find multiple avenues for addressing aviation's climate change contributions. By fall 2009, it will develop a menu of measures from which states may choose to address emissions. These could include performance targets (e.g., fuel efficiency) and cost-beneficial market-based measures (e.g., charges or emissions trading). GIACC's goal is to maintain flexibility so that states choose what is appropriate for their particular market and industry situation.

Another international organization addressing emissions is the Air Transport Action Group (ATAG), which met in Geneva in April of 2008. The ATAG, primarily industry based, agreed on a declaration for commercial aviation to move towards carbon neutral growth and a vision of eventually achieving carbon free technology. ATAG plans to achieve this through focusing on a four-pillar approach to climate change: investment in new technology; increasing operational efficiency; air traffic and airport infrastructure improvements; and appropriate economic measures.

## V. H.R. 2881, the FAA Reauthorization Act

H.R. 2881, which passed the House on September 20, 2007, includes several provisions related to the environment, noise mitigation and land use initiatives. Section 132 allows airport operators to reinvest the proceeds from the sale of land that an airport acquired for a noise compatibility purpose, but no longer needs for that purpose -- giving priority, in descending order, to the following: reinvestment in another noise compatibility project at the airport; reinvestment in another environmentally-related project at the airport; reinvestment in another otherwise eligible AIP project at the airport; transfer to another public airport for a noise compatibility project; and finally, payment to the Airport and Airways Trust Fund.

Sections 503 and 504 allow the FAA to accept funds from airport sponsors to conduct special environmental studies for ongoing federally-funded airport projects, or studies to support approved airport noise compatibility measures or environmental mitigation commitments, or to hire

staff or obtain services to provide environmental reviews for new flight procedures that have been approved for airport noise compatibility planning purposes.

Section 505, the CLEEN engine and airframe technology partnership, directs the FAA, in coordination with NASA, to enter into a 10-year cooperative agreement with an institution, entity, or eligible consortium to carry out the development, maturing, and certification of continuous lower energy, emissions and noise engine and airframe technology, including aircraft technology that reduces noise levels by 10 decibels at each of the three certification points relative to 1997 subsonic jet aircraft technology.

Section 506 phases out all civil subsonic jet stage 2 aircraft less than 75,000 pounds in the 48 contiguous states within five years. Section 507, the Environmental Mitigation Pilot Program, funds six projects at public-use airports to take promising environmental research concepts into the actual airport environment to demonstrate measurable reductions of aviation impacts on noise, air quality or water quality.

In addition, section 818, the Redevelopment of Airport Noise Properties Pilot Program, provides new tools to encourage airport compatible redevelopment of noise impacted properties adjacent to airports to ensure joint comprehensive land use planning.

## WITNESSES

### PANEL I

**Dr. David W. Fahey**
Research Physicist
National Oceanic and Atmospheric Administration

**Mr. Daniel K. Elwell**
Assistant Administrator
Aviation Policy, Planning, and Environment
Federal Aviation Administration

**Dr. Gerald Dillingham**
Director, Physical Infrastructure Issues
U.S. Government Accountability Office

### BRIEFING

**Ambassador John Bruton**
Head of the Delegation of the European Commission to
the United States of America

## PANEL II

**Mr. Bill Glover**
Managing Director, Environmental Strategy
The Boeing Company

**Mr. James C. May**
President and CEO
Air Transport Association

**Mr. Douglas E. Lavin**
Regional Vice President for North America
International Air Transport Association

**Mr. Richard L. Altman**
Executive Director
Commercial Aviation Alternative Fuels Initiative

**Mr. Mark Reis**
Managing Director
Seattle Tacoma International Airport

**Captain Mary Ann Schaffer**
Air Line Pilots Association

**The Honorable James Kitchenman Coyne, III**
President
National Air Transportation Association
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