National Air Transportation Association
The Voice of Aviation Business

NATA Environmental Fact Sheet

Worldwide concern over climate change and the U.S. House of Representatives' introduction of a draft of the American Clean Energy and Security Act has focused attention on carbon emissions. Although aviation activity generates a small percentage of total emissions, the aviation industry recognizes its responsibility to minimize the consumption of natural resources and the production of emissions. While there is much written about the role aircraft play in generating emissions, it is important to highlight the facts on emissions concerning aviation.

- **Aviation accounts for only 3% of greenhouse gas (GHG) emissions worldwide,** according to data from the Intergovernmental Panel on Climate Change.

- **U.S. aviation industry has reduced GHG emissions by 13% since 2000.** General aviation and U.S. airlines are doing a better job of transporting passengers on less fuel, which includes harmonizing schedules, increasing load factors, switching to more fuel efficient aircraft and engines, and generally undertaking fuel-saving measures.

- **The use of jet fuel emits 2-3% less lifecycle GHGs than the use of other major grades of transportation fuels.**

- **Aircraft fuel efficiency, based on the amount of fuel consumption per passenger mile, improved by 23% from 2000 to 2006**, according to the U.S. Department of Transportation. During that same period, automobile fuel efficiency increased by 2%.

- **Aviation gasoline and jet fuel account for 12% of total petroleum product consumption**. According to data from the Department of Energy (DOE), aviation gasoline and jet fuel supply account for 1,624,000 barrels per day compared to 20,588,000 barrels of all petroleum products used per day.

- **Alternative fuels programs exist within aviation.** In early 2009, Continental Airlines in partnership with Boeing and GE Aviation became the first U.S. carrier to conduct a demonstration flight powered in part by alternative fuels. The Boeing 737-800 left George Bush Intercontinental Airport in Houston, TX, and flew for one hour and forty-five minutes with one engine powered by a mix of conventional jet fuel and a second generation biofuel produced from algae.

- **The implementation of NextGen could reduce CO_2 emissions by 12%**. According to the Federal Aviation Administration (FAA), the implementation of NextGen technology, specifically Automatic Dependant Surveillance – Broadcast (ADS-B) could reduce domestic aviation emissions by 12%. This reduction would occur with the increased fuel efficiency due to the lowering of aircraft separation minimums and more direct routing.

- **Aviation activities provide a tremendous positive economic impact for the amount of energy used.** According to the FAA, U.S. commercial aviation consumes less than 3 percent of U.S. total energy use, but drives about 6 percent of the U.S. gross economic output and just under 9 percent of national employment.

Aviation vs. Other Transportation Modes

The DOE has issued a publication titled *Transportation Energy Data Book: Edition 26* (June 1, 2007). In this publication, the DOE provides an annual statistical compendium designed to characterize transportation activity and explore data on other factors that influence transportation energy use. An analysis of this data can provide some very interesting insights. In order to obtain a relative comparison of the magnitude of carbon emissions for different modes of transportation, an analysis of fuel consumption is used. Because different types of fuel (gasoline, diesel fuel, jet fuel to name a few) provide different energy values, the data is normalized by looking at the energy use in British Thermal Units (BTUs). This provides a better comparison than actual gallons of fuel consumed. The table below shows the energy use for aviation and several other modes of transportation.

Mode of Transportation	BTUs Used (Trillions) in 2005	Percent of Total
Aviation	**2,477**	**9.0%**
Cars	9,140	33.4%
Light Trucks	8,108	29.6%
Medium/Heavy Trucks	4,577	16.7%
Water	1,366	5.0%
Pipeline	842	3.1%
Rail	657	2.4%

The table shows that aviation accounts for only 9% of the total transportation energy use. Cars and light trucks each use more than three times the energy as the aviation industry, and medium/heavy trucks account for about twice that of aviation. Highway transportation (cars, light trucks, and medium/heavy trucks) combine for almost 80% of the transportation energy use and thus contribute a similar level of GHGs. Aviation, on the other hand, is a much smaller contributor to energy use and GHG emissions.

Further analysis within the aviation group shows the relative contribution of commercial aviation versus general aviation. The table below shows this comparison.

Mode of Transportation	BTUs Used (Trillions) in 2005	Percent of Total Transportation
Aviation	**2,477**	**9.0%**
Domestic Carriers	1,861	6.8%
International Carriers	373	1.4%
General Aviation	242	0.9%

General aviation accounts for less than one percent of the total transportation energy use in the United States, and its fuel use is about one seventh that of the domestic air carriers.

The analysis of the relative efficiency of fuel use for different modes of transportation includes several additional factors. This analysis includes normalizing the data using the BTU content as did the previous analysis, but also includes the average passengers per vehicle, and provides a conversion into an equivalent miles per gallon (MPGe) based on the BTU content of gasoline (115,000 BTU per gallon). For example, automobiles have an average passenger use of 1.57 passengers per car. Using the DOE data, we find that cars use on average 3,496 BTUs per passenger mile and this corresponds to approximately 33 MPGe. The table below shows several modes of transportation and their corresponding MPGe.

Mode of Transportation	**Average Passengers per Vehicle**	**BTUs per Passenger Mile 2005**	**MPG Equivalent**
Aviation	**90.4**	**3,959**	**29 MPGe**
Cars	1.57	3,496	33 MPGe
Light Trucks	1.72	4,329	27 MPGe
Rail (Commuter)	32.9	2,569	45 MPGe
Rail (Intercity-Amtrak)	17.9	2,760	42 MPGe
Bus (Transit)	8.7	4,318	27 MPGe

This table shows that aviation provides the greatest average number of passengers per vehicle and the resulting MPGe of 29 is roughly the same as cars and light trucks. Aviation offers the vast advantage of moving large numbers of people quickly over many miles.

In summary, this analysis of transportation modes shows that aviation provides a very efficient mode of transportation and compares similarly to typical highway transportation (cars and light trucks) in per passenger equivalent miles per gallon. Additionally, the aviation industry contributes a much smaller percentage (about 9%) of the total energy use and, thus, contributes a much smaller percentage of GHG emissions as compared to highway transportation (about 80% for cars, light trucks and medium/heavy trucks).

Life Cycle GHG Emissions of Jet Fuel Vs. Other Major Grades of Transportation Fuel

One of the challenges of measuring a fuel's GHG emissions is accounting for the GHGs that were emitted in the production of the fuel and when it is used. This accounting is known as lifecycle greenhouse gas (LCGHG) emissions and includes GHG emissions during the 5 stages of fuel production and use.

Stage 1 – Raw Material Acquisition
Stage 2 – Raw Material Transportation
Stage 3 – Liquid Fuels Production
Stage 4 – Product Transport & Refueling
Stage 5 – Vehicle or Aircraft Operation

Only when all 5 stages are taken into account can you accurately measure the cost in emissions for using a particular fuel. A study funded by the U.S. Department of Energy's National Energy Technology Laboratory titled Development of Baseline Data and Analysis of Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels, November 2008 quantifies these LCGHG emission numbers for several major transportation fuels in 2005.

Life Cycle Stage	Conventional Gasoline	Conventional Diesel	Kerosene-Based Jet Fuel
Stage 1	7.3	6.6	6.8
Stage 2	1.4	1.3	1.3
Stage3	9.8	9.5	6.0
Stage 4	1.1	0.9	1.0
Stage 5	76.6	76.7	77.7
Total LCGHGe	96.3	95.0	92.9

*All numbers are kilograms CO_2 Equivalent per Million British Thermal Units Lower Heating Value (kg CO_2E/MMBtu LHV)

The study found that jet fuel, due to its lower refinery energy inputs, has 3.5% and 2.2% lower LCGHG emissions than gasoline and diesel, respectively.

What NATA Is Doing

NATA established its Environmental Committee to develop programs designed to assist member companies in minimizing their impact on the environment. The programs outlined below compose the early stages of the *NATA Climate Initiative*:

- ***Clear Skies:***
  NATA, in partnership with Carbon Neutral Plane, is pioneering a program called Clear Skies that will, for the first time, allow participating aviation companies to track and monitor GHG emissions from energy use. Participating companies will then have the option of purchasing verified carbon offsets for their GHG emissions. Phase I of the Clear Skies program will involve implementation and testing of monitoring and tracking of energy use.

- ***Green Aviation Facilities***:
  NATA encourages its member companies to meet proper environmental compliance standards, including a Spill Prevention Control and Countermeasure plan if fuel is stored above ground in tankers. The association is currently undertaking the development of best management practices that will allow aviation businesses to capitalize on becoming more energy efficient while minimizing their company's impact on the environment. To date, NATA has crafted best management practices for the following topics *(note: each topic directs the reader to a white paper on that issue)*:

  - Spill Prevention Control and Countermeasures
  - Hazardous Waste
  - Storm Water
  - Used Batteries
  - Used Oil
  - Used Fluorescent Lamps

- ***Public Relations Campaign:***
  NATA is developing a public relations campaign to provide the facts about aviation's impact on the environment and what its members are doing to ensure the protection of the environment.

- ***Support Next Generation Air Transportation System (NextGen):***
  NATA has encouraged its members to support H.R. 2881, a bill approved by the U.S. House of Representatives that would provide historic funding levels, nearly $13 billion, for the FAA's Facilities and Equipment account and accelerate implementation of NextGen. NextGen is the FAA's national plan to transform the air traffic control system from a ground-based navigation system using radar to a satellite-based system. This legislation will enable the FAA to make needed repairs and upgrades to existing facilities and equipment, and provide for high-priority safety-related systems.

  By utilizing new technologies, airspace routes can be better defined, allowing more aircraft and more routes to be determined within the airspace. And most importantly, utilizing new technologies to improve airspace use will enable aircraft to fly routes more directly, thereby minimizing noise and the impact on the environment.

- ***Cooperating with other industry stakeholders***:
  NATA has partnered with over 20 other aviation associations and groups to create *Aviation and Climate Change, The Views of Aviation Stakeholders*, a white paper that outlines a workable path forward in addressing aviation's impact on climate change.

The demand for air travel is increasing steadily. The FAA projects that by 2025 the number of domestic enplanements will have doubled to 1,482 million per year. The environmental impact of air travel is increasingly important to consumers, and the aviation industry is collaborating to address this important issue.