STATEMENT OF DANIEL K. ELWELL, ASSISTANT ADMINISTRATOR, OFFICE OF AVIATION POLICY, PLANNING AND ENVIRONMENT, FEDERAL AVIATION ADMINISTRATION, BEFORE THE HOUSE TRANSPORTATION AND INFRASTRUCTURE COMMITTEE, SUBCOMITTEE ON AVIATION, ON AVIATION EMISSIONS. MAY 6, 2008

Chairman Costello, Congressman Petri, Members of the Subcommittee:

I am pleased to appear before you this morning to address an issue that is central to any discussion of aviation and the environment, aviation emissions. Today I will provide a brief overview of the Federal Aviation Administration's (FAA) activities that help to minimize the environmental impacts associated with aviation emissions, some observations on the current international discussion on emissions trading for aviation, and how Congress can help in moving forward our efforts to address aviation greenhouse gas (GHG) emissions. What should be clear is there is a strong commitment at the very heart of the Next Generation Air Transportation System (NextGen) plan that we have developed--a commitment to provide a systematic, well-informed and performance-based approach to tackling aviation emissions and other environmental issues.

The aviation industry is experiencing record growth globally. It is moving the equivalent of 1/3rd of the world's population each year across the world. Airbus and Boeing have record sales, and two of the fastest growing economies in the world--China and India--are on track to build 100 new airports in the next decade to meet demand.

At the same time, just as aviation is knitting together the world, redefining what opportunity and what neighbor means, concern has grown about its contribution to

greenhouse gas emissions and potential impacts on climate change. Aircraft emissions remain a central environmental concern and challenge as they contribute to global climate change and impact the local air quality near airports, and thus could slow the growth of aviation and the benefits it brings to our nation. While we do not have all the answers at this point, what we do have in the NextGen plan is a commitment to provide a systematic, well-informed and performance-based approach to tackling aviation emissions and other environmental issues.

There appears to be a disconnect between perception and performance on aviation emissions, at least in the United States. In some quarters there is a perception that aviation greenhouse gas emissions are growing out of control and that it needs to be reined in by emissions caps and taxes. But consider the facts that we know about performance of the sector and our plans for continued improvement.

Worldwide, aviation represents less than 3% of total man made greenhouse gas emissions. And in the U.S., how have we been doing? The Environmental Protection Agency (EPA) has measured domestic aviation emissions at approximately 3% of GHG emissions. And there is a very positive trend. When you compare today to 2000, U.S. commercial aviation is moving 12% more passengers and 22% more freight while burning less fuel, reducing our carbon output by a million tons. This compares favorably with the U.S. economy overall and aviation has clearly outperformed passenger vehicles in improving its energy efficiency in the past few decades (see Chart 1).

Now let's give these numbers some context. Consider, for example, the performance of the other major aviation market in the world: the European Union. Between 2000 and 2006, aviation CO_2 emissions in the U.S. declined by about 4%. During the same period in Europe, emissions increased by around 30%! In part, this explains our different perceptions of the problem across the Atlantic (see Chart 2).

The fastest means of reducing aviation emissions is to reduce the amount of fuel that is burned. The aviation industry has made and continues to make significant improvements in fuel efficiency. Commercial jet aircraft fuel efficiency has improved 70% [1]over the last 40 years and continues to get better. On a per passenger mile basis, Boeing's new 787 will be as fuel efficient as today's subcompact hybrid car. Also, according to the Air Transport Association (ATA), U.S. commercial airlines have committed to a 30% improvement in fuel efficiency over 2005 by 2025.

FAA tracks commercial aviation fuel efficiency and encourages fuel efficiency by U.S. airlines. In just the past four years (2003-2007), U.S. airlines have improved their fuel efficiency 11% (see Chart 3). Since 2000, the restructuring of U.S. airline fleets in the aftermath of September 11th, the rise in fuel costs, utilization of fuel efficient operational procedures, and improvements in air traffic management have all contributed to these savings. With oil now over $100 dollars per barrel and fuel at about a third of operating cost, you can imagine the incentive U.S. airlines have to reduce fuel consumption.

---

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

Further, given the weakness of the dollar, the price of fuel for U.S. airlines is about 50% higher than their European counterparts (see Chart 4).

I noted the contribution FAA has made in improving the emissions efficiency of air transport in the United States. Some efforts, like the introduction of Reduced Vertical Separation Minimum (RVSM), have been very successful, saving about 3 million tons of CO_2 annually. RVSM is an International Civil Aviation Organization (ICAO) approved concept that reduces the aircraft separation standard at certain high altitudes, allowing aircraft to safely fly more optimum profiles, gain fuel savings and increase airspace capacity. Other efforts, like the redesign of the Northeast airspace, are more difficult to put in place, but no less important to our overall goal of increasing capacity while minimizing emissions.

So, the good news is we are starting from a record of exceptional performance historically as we move ahead. So what is our program as we go forward?

First, we must improve our scientific understanding of the impacts of aviation emissions. While CO_2's impacts are well known, our understanding of impacts from other emissions--especially at altitude--ranges from fair to poor (see Chart 5). We must ensure that we identify the harmful emissions, accurately measure their impact and design appropriate technologies, or procedures to mitigate or eliminate their effects. This is especially true given the interdependencies that exist—for example, strategies to increase fuel efficiency (and therefore reduce CO_2 emissions) can make it more difficult to reduce

emissions of nitrogen oxides. As part of our NextGen effort to advance our understanding in this area, we recently launched the Aviation Climate Change Research Initiative (ACCRI) in partnership with the National Aeronautics and Space Administration (NASA) and other agencies. This initiative will help accelerate our scientific understanding to inform policy decisions in this area.

Second, we must accelerate air traffic management improvements and efficiencies to reduce fuel burn. Improving energy efficiency has the dual benefit of improving both environmental and operational performance of the aviation sector. As I said before, we have saved millions of tons of carbon emissions over the past couple of years by putting RVSM in place. We are accelerating implementation of other enhanced air traffic control navigation and other procedures to further improve the fuel efficiency of the system. Through the use of Required Area Navigation (RNAV) and Required Navigation Performance (RNP) technology, aircraft will be able to use descent procedures that burn less fuel and result in quieter operations. In addition, satellite-based air traffic control paired with Automatic Dependent Surveillance-Broadcast (ADS-B) technology on aircraft allow for safer but closer separations between aircraft and more direct routing, which will improve fuel efficiency and also reduce carbon dioxide emissions. In essence, NextGen itself will improve environmental performance. We are already achieving early gains at a test program at Dallas-Fort Worth International Airport, where American Airlines' use of NextGen-related procedures is reducing carbon dioxide emissions by levels equivalent to removing 15,000 cars from the road for a year.

A good example of emissions reductions from aviation operational improvements is Continuous Descent Arrival or CDA. CDA allows an airplane to fly a continuous descent path to land at an airport, rather than the traditional "step downs" or intermediate level flight operations. The airplane initiates descent from a high altitude in a near "idle" engine (low power) condition until reaching a stabilization point prior to touch down on the runway. Trials in Louisville, KY have shown a fuel savings (and thus GHG savings) averaging about 12% for the arrival portion of the flight. And testing at Atlanta Hartsfield International Airport of continuous descent arrivals shows savings of 1,300 pounds of carbon dioxide for each and every flight.

CDA is one of those win-win strategies, having environmental and operational benefits that can reduce noise, emissions, and fuel burn, as well as flight time. The cumulative impact of measures like this throughout the system can have a real impact. As additional advanced aircraft and air navigation procedures planned for the NextGen system are developed and deployed, we will see an even greater reduction in greenhouse gas emissions impacts from aviation.

Third, we must hasten the development of promising environmental improvements in aircraft technology. This builds upon the fact that the vast majority of improvements in environmental performance over the last three decades have come from enhancements in engine and airframe design. Both the House and Senate have included a number of our environmental proposals in their pending aviation reauthorization bills (H.R. 2881 and S. 1300) including a proposal to create a research consortium, to be called CLEEN--

Continuous, Low Energy, Emissions, and Noise--focused on accelerating the maturation of lower energy, emissions and noise technology for aircraft. While action on that legislation is not completed, we already have in place a cooperative working relationship with NASA and broad participation of outside stakeholders through our research advisory committee, the Partnership for AiR Transportation Noise and Emissions Reduction (PARTNER) Center of Excellence advisory board, and our NextGen Environmental Working Group.

Fourth, it is imperative to explore the potential of alternative fuels for aviation--fuels that could have benefits for energy security as well as emissions performance, depending on the fuel's lifecycle greenhouse gas emissions profile. The FAA is a major partner in the Commercial Aviation Alternative Fuels Initiative, or CAAFI. CAAFI's participants, which include a cross-section of airlines, manufacturers, airports, fuel producers, federal agencies and international players, are implementing a road-map to explore the use of alternative fuels for commercial aviation. Let me emphasize this is not "pie in the sky". CAAFI participants have already used coal-to-liquid and gas-to-liquid fuels in jets, and most recently completed a bio-fuels flight demonstration. We are keenly aware production processes could increase the overall carbon footprint, so CAAFI is doing careful life cycle carbon emissions analyses and focusing on approaches that will lead to overall reductions.

Data indicate that low sulfur synthetic and bio-based fuels promise significant health benefits from reductions in Particulate Matter (PM) emissions. Certain fuel options also

promise reduced carbon emissions. To begin to measure these, FAA sponsored a life-cycle analysis of the "well to wake" greenhouse gas emissions of multiple alternative fuels in a study due this spring that addresses the feasibility of alternative fuels for aviation.

Finally, a variety of market-based measures may offer assistance in managing aviation emissions growth. Approaches using tax incentives, emissions trading or carbon offsets may all have a role to play, though each can pose challenges in design and implementation. Consider carbon offsetting. This is a scheme which allows airline passengers to pay for carbon reductions accomplished somewhere else to compensate for the emissions generated by the aircraft flight they took. While offered by several airlines, a number of questions have arisen related to calculations of carbon emissions (calculations of the same flight can produce carbon numbers that vary by a factor of three) and how the funds collected are spent. More recently in the U.S. we are looking for market-based measures to increase utilization of congested airspace, so that we can simultaneously increase efficiency and drive down emissions per passenger.

With respect to emissions trading, the U.S. participated in the development of emissions trading guidance for aviation under the auspices of ICAO, the United Nations standard setting organization of international aviation. The U.S. and the rest of the world, except for Europe, agreed on this guidance last September for countries that decide to employ emissions trading for international aviation. The overwhelming majority of countries--developed and developing--all agreed emissions trading should only be applied to another

country's airlines on the basis of agreement between States. European countries refused to join consensus, as their proposed legislation would force international airlines into their emissions trading system without the consent of governments

The U.S. has significant concerns about the European Union (EU) legislation that is currently being developed to place aviation into their emissions trading system. On top of the legal issues with respect to the Chicago Convention and our air services agreements, recent discussions with EU officials made clear that adoption of emissions trading for aviation has become an end in itself, rather than improving environmental performance. The facts that U.S. airlines pay substantially more for their fuel than their European competitors, that the U.S. has a domestic fuel tax unlike their EU competitors, and that U.S. airlines have actually reduced their emissions unlike the substantial growth from EU airlines, were dismissed.

As ICAO recognized in its work, an emissions trading system is only one approach and it remains the decision of a State whether to employ such a measure. Market based measures can reduce emissions at lower costs. However, the price of fuel already provides both airlines and manufacturers strong market incentives to reduce fuel consumption. Between 1985 and 2004, aviation outperformed every other transport mode in reducing its emission intensity (see Chart 6). Between 2000 and 2006, the price of fuel more than doubled. Consequently, U.S. commercial carriers bought 750 million fewer gallons in 2006 than they purchased in 2000 even while carrying twelve percent more passengers and 22 percent more cargo. This lends support to the 2001 finding of

ICAO's Committee on Aviation Environmental Protection (CAEP) that the price of fuel obviates the need for CO_2 emissions standards for aviation.

Environmental advances in the aviation sector historically have been most helped by positive economic measures that further stimulate research and innovation in the industry's fleets. As the record on aircraft noise and fuel efficiency demonstrates, implementation of new technology and operational procedures have been remarkable tools for limiting and reducing aviation environmental impacts.

As a recent Congressional Budget Office report (February 2008) highlighted, use of emissions trading as a market-measure to reduce emissions poses a number of issues. FAA remains concerned that such issues become more complex when dealing with aircraft that operate internationally. A poorly designed and implemented emissions trading system could actually hamper the ability of aviation to become cleaner and quieter.

We believe ICAO must continue to exercise global leadership to achieve aviation growth in an environmentally responsible fashion. ICAO offers the best forum to find the harmonized approaches we need for a global industry like aviation. It allows the proper balance of collaboration and State sovereignty. We are committed to supporting that effort. In February, I represented the U.S. at the first meeting of the fifteen-nation Group on International Aviation and Climate Change (GIACC). This high-level group was conceived during last year's ICAO Assembly and is developing an international plan to

address international aviation greenhouse gas emissions. Our hope is to take the approach I have outlined here--a balanced approach derived from the recognition that operational and technological environmental performance improvements, coupled with market measures where necessary, can form the basis to derive data-driven, challenging, aspirational goals for the international community in reducing the growth of aviation's greenhouse gas emissions impacts. At the GIACC, we ultimately seek an effective, globally devised strategy, collaboratively entered into.

In addition to FAA's work at ICAO we are pursuing partnerships with other authorities and the international industry in a number of highly technical system areas to advance improvements in aviation's environmental performance. For example, last year the FAA and European Commission (27 countries) announced the Atlantic Interoperability Initiative to Reduce Emissions, or AIRE. The AIRE initiative is targeted to undertake demonstrations in both the U.S. and Europe to accelerate the ability of airlines and air navigation authorities to employ enhanced air traffic procedures that reduce aviation's emissions and noise footprint on either side of the Atlantic. We (the U.S., Australia and New Zealand) also just launched a similar initiative in the Pacific—ASPIRE--or the Asia and South Pacific Initiative to Reduce Emissions.

Aviation has succeeded in its first century because it has constantly met the challenge of innovation and record setting – flying faster, cleaner, quieter and safer. In doing so, aviation has transformed the world. Any fair reading of history will show that until now,

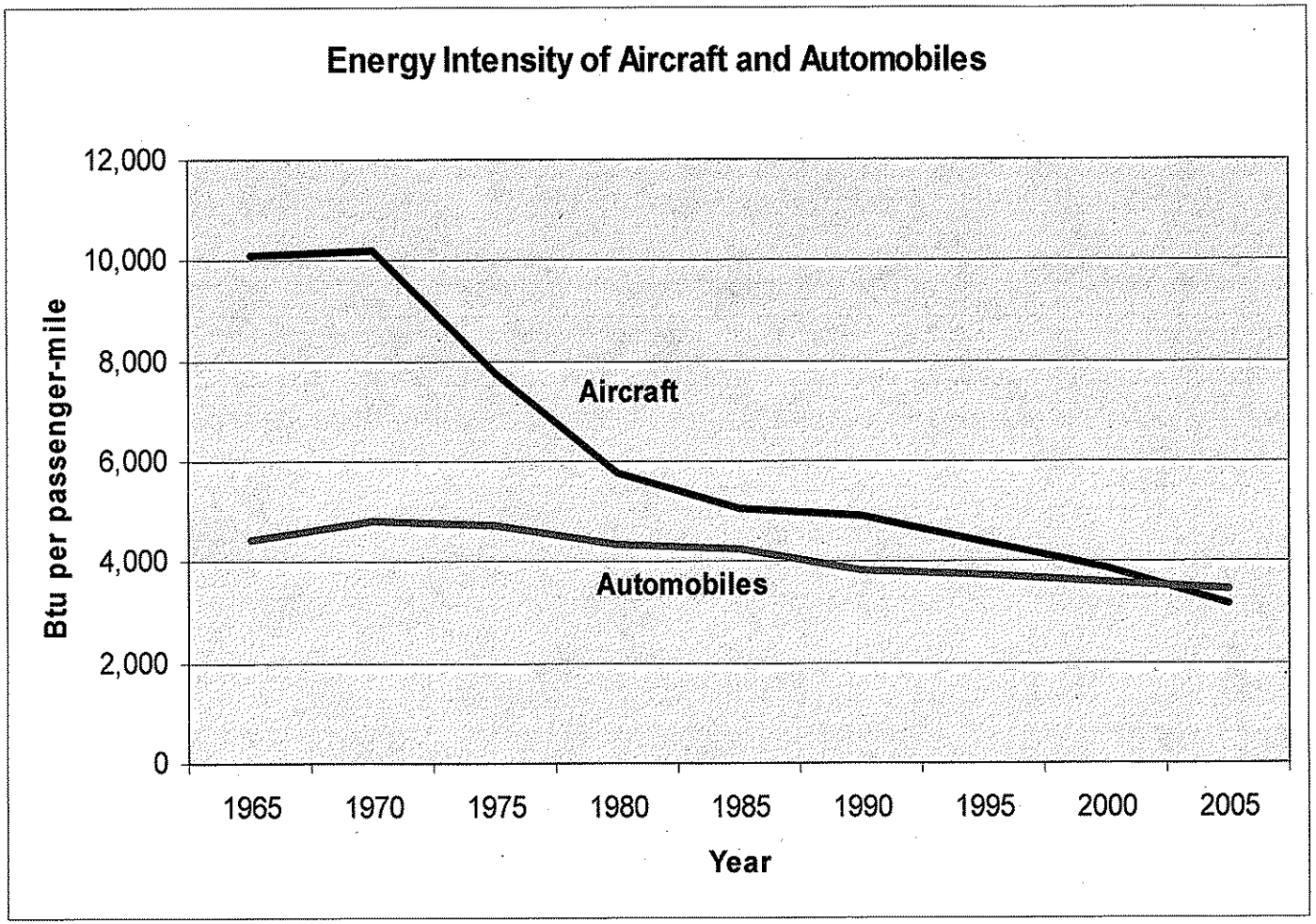
aviation has done an exceptional job in improving its environmental performance. But to be blunt, the issue is not past performance, but what we are doing for the future.

In closing, it is clear today that aircraft emissions impact the climate, are an issue of both domestic and international concern and remain a potential constraint on the future growth of aviation. It is also evident we have no "silver bullets." What we do have is an approach to reduce aviation greenhouse gas emissions in a growing NextGen system. We have already initiated a number of endeavors – "silver buckshot" if you will – that will help get us there. We need the help of Congress. We have outlined a significant set of initiatives underway to address aviation emissions. We have proposals before Congress in FAA's reauthorization proposal that, if authorized and funded, would accelerate all these efforts.

Success will require partnership and shared responsibilities among many stakeholders—with air carriers operating cleaner and quieter aircraft; airframe and engine manufacturers improving efficiency of their products; air traffic management facilitating environmentally-friendly procedures consistent with safe and efficient operation; alternative fuel producers scaling up environmentally sound fuel production; airports investing in cleaner infrastructure; and federal programs and investments supporting the necessary technology and operational improvements. The FAA is committed to working with all stakeholders to find the right balance to manage capacity growth while addressing aviation emissions.

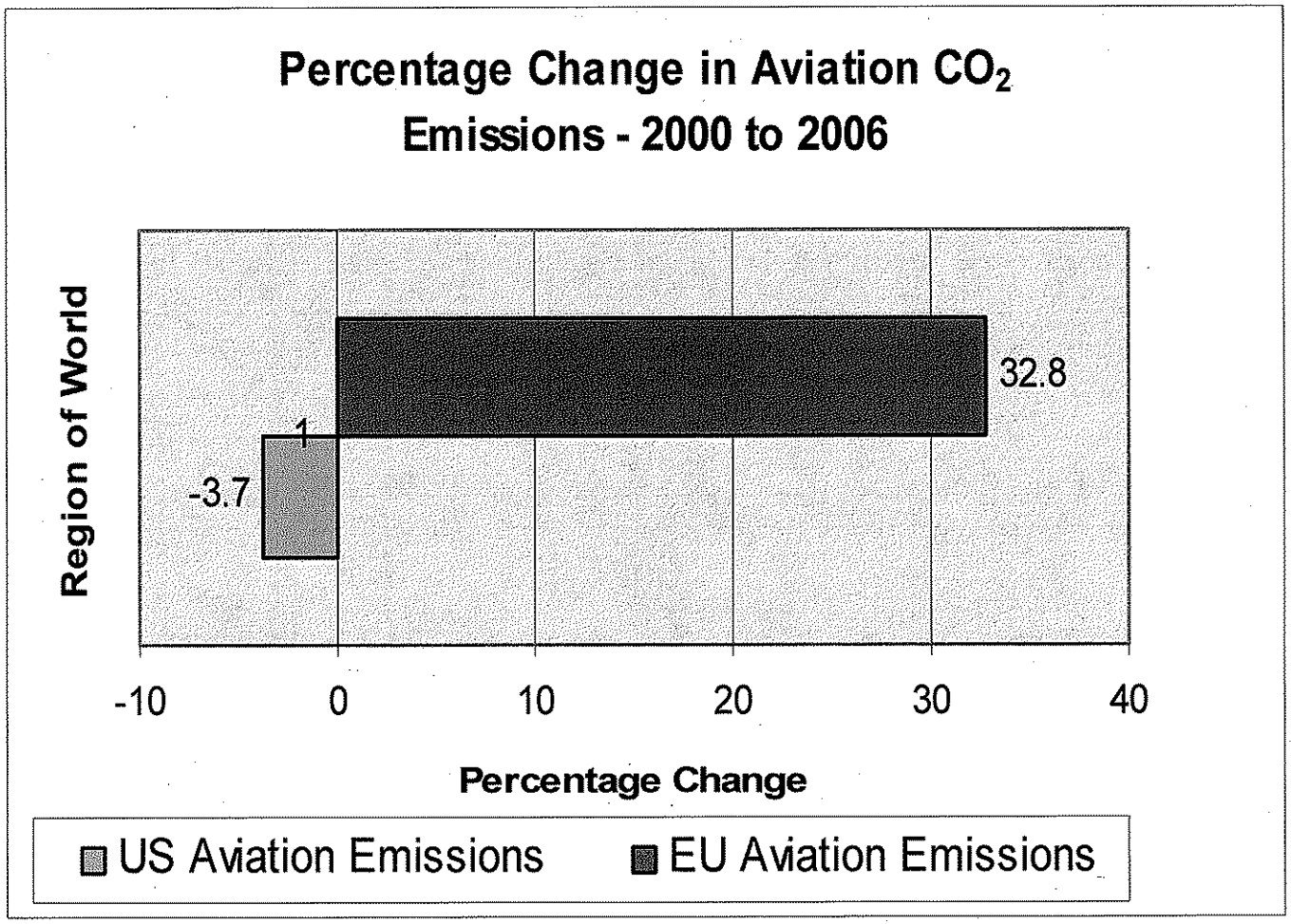
Mr. Chairman, that completes my prepared statement. I would be happy to answer any questions you or Members of the Committee may have.

Chart 1: U.S. Commercial Aircraft and Automobiles



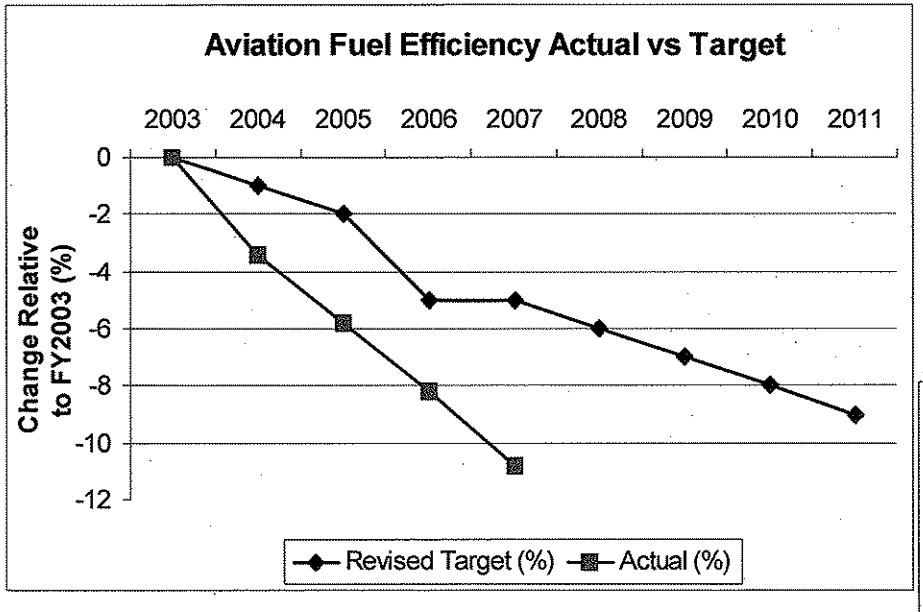
Source: U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 2007,* Table 4-20: Energy Intensity of Passenger Modes

Chart 2: Differences in GHG Performance

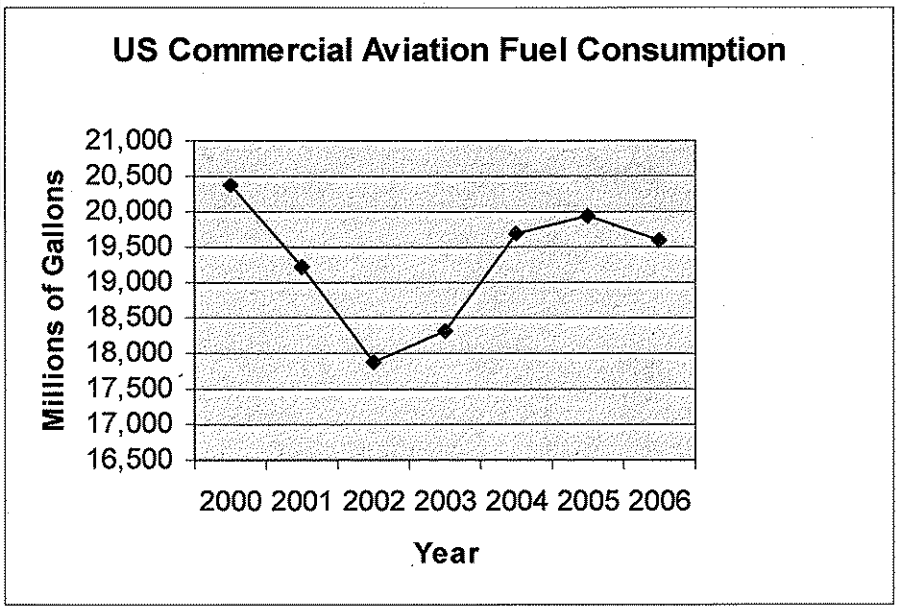


Source: Volpe. (Note: For EU-15)

Chart 3: US Aviation Emissions Growth Down

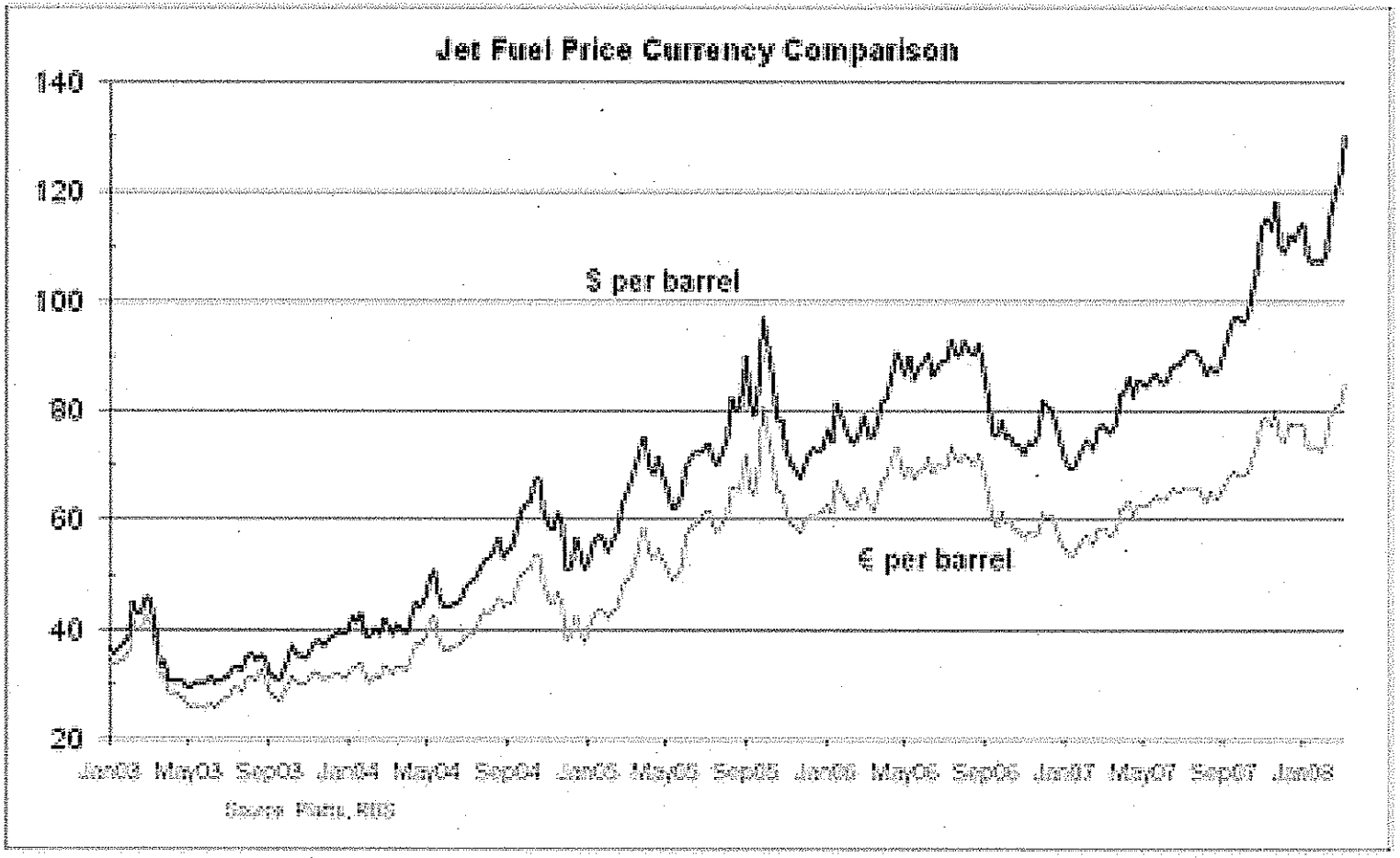


Source: FAA



Source: U.S. DOT, BTS

Chart 4: Fuel Is Even More Expensive for US Airlines



Source: International Air Transport Association (IATA) and Platts

Chart 5: Better Understanding of GHG Emissions

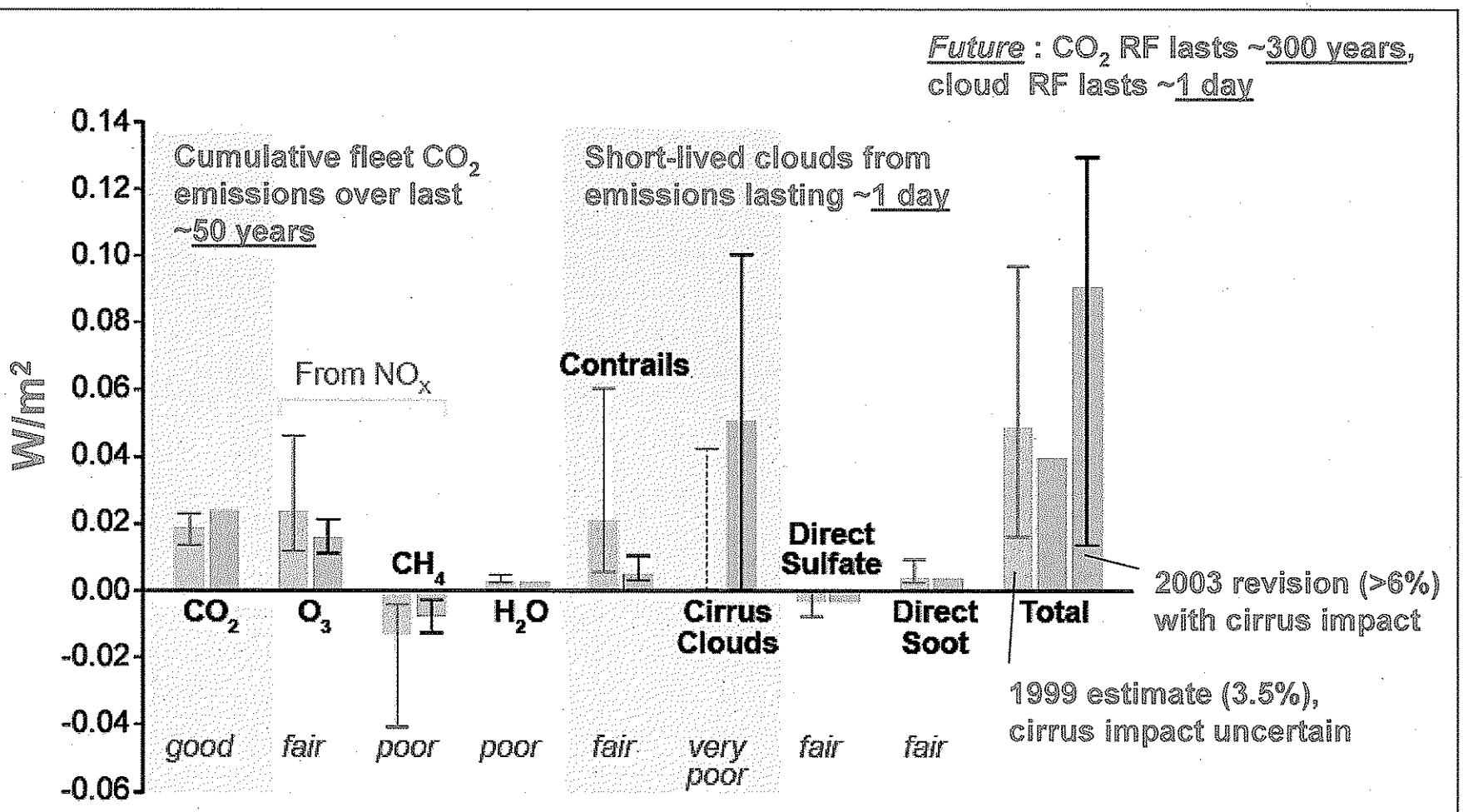
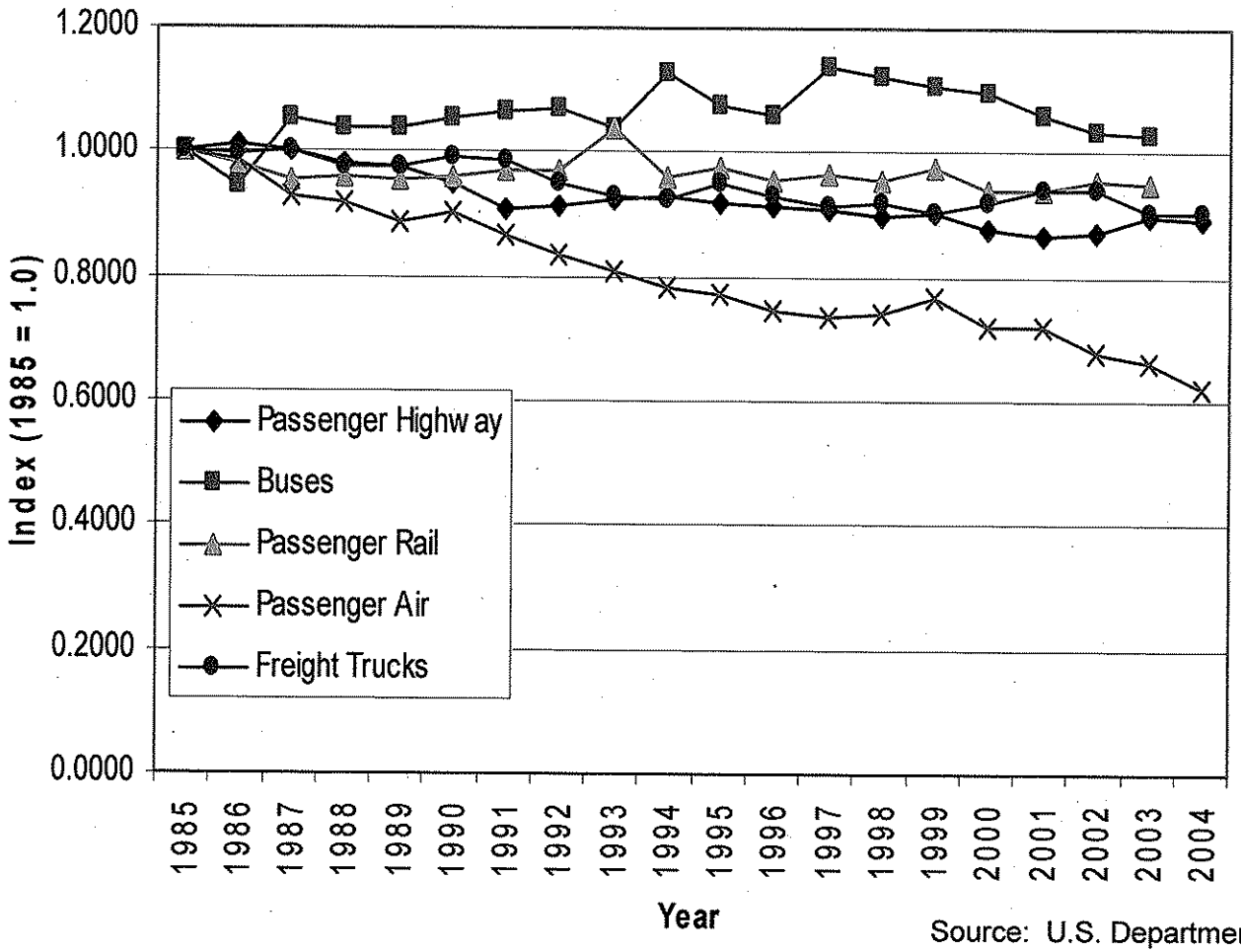


Figure adapted from IPCC (1999) with additional data from Schumann (2003)

Chart 6: Energy Intensity Trends by Transportation Mode



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