



Aviation and the European Union's Emission Trading Scheme

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Summary

Beginning January 1, 2012, most carbon dioxide (CO₂) emissions from commercial flights to, from, and within the European Union (EU) are covered by the EU Emission Trading Scheme (EU ETS). Flights are covered regardless of whether the airline or operator is based in the EU region. The EU ETS caps aviation emissions of CO₂ in 2012 at 97% of the average in 2004-2006 and at 95% in each year from 2013 to 2020. Each April, beginning 2013, covered aircraft operators must turn in emission “allowances” (permits) equal to the previous year’s emissions from their flights arriving at or departing from EU airports. Airline operators will receive free allowances for 82%-85% of their 2010 emissions. Airlines that have more allowances than they need may sell them to others or save them for future use. Airlines that need more allowances may buy them from EU auctions, other carriers, other emission sources in the EU ETS, brokers, or international emission trading mechanisms. A small reserve of free allowances will be available for new or rapidly expanding airlines.

The entry into force of an EU law covering international aviation emissions is a significant move in a two-decade process concerning whether and how aviation emissions of CO₂ may be abated. Even among those who agree on the benefits of reducing greenhouse gas (GHG) emissions, how to share reductions across nations and sectors remains a continuing, major controversy internationally and within countries. Emissions from international air transport have, since early negotiations, posed a particular challenge.

The 1997 Kyoto Protocol (to which the United States is not a Party) specified that Parties should pursue limitation or reduction of GHG emissions from aviation fuels, working through the International Civil Aviation Organization (ICAO), an agency of the United Nations. In 2008, the EU cited a lack of “substantive progress” in ICAO and legislated to include aviation in its existing EU ETS by 2012. ICAO members have agreed to a variety of voluntary actions and goals. In October 2011, faced with impending inclusion of aviation emissions in the EU ETS, the ICAO Council agreed to accelerate its work, including continuing to explore market-based measures, CO₂ standards for new aircraft, and other options.

EU officials have stated their preference for agreeing on global, binding measures in ICAO. One official stated that the EU would agree to suspend inclusion of aviation in the ETS only if a new global ICAO scheme met three conditions: it must deliver more emissions reductions than the EU ETS on its own; it must have targets and measures; and any action must be non-discriminatory and apply to all airlines. Alternatively, EU law allows exemptions for incoming flights from countries that have adopted “equivalent measures” to reduce emissions. Some countries are likely negotiating with the EU for an equivalent measures exemption for their airlines.

Air carriers from the United States and other countries have vociferously objected to inclusion of international aviation in the EU ETS. The U.S. government and other nations have pressed the EU to exclude foreign carriers. Two bills in Congress address the controversy. The U.S. House of Representatives passed H.R. 2594, the European Union Emissions Trading Scheme Prohibition Act of 2011. It would prohibit U.S. aircraft operators from participating in the EU ETS. It also would direct the Administration to negotiate and take other actions to ensure that U.S. civil aircraft operators are not penalized by any unilateral EU regulation of GHG emissions. A similar bill with more flexibility, S. 1956, was introduced in the Senate. In January 2012, House and Senate conferees on reauthorization of the Federal Aviation Administration (FAA) agreed to a sense of the Congress resolution opposing the EU action.

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Introduction

Absent regulation, greenhouse gas (GHG)¹ emissions from aviation are projected to rise rapidly due to the continuing increase in the number of passenger and cargo flights. To address these emissions, the European Union (EU) has chosen to regulate aviation emissions in its regional Emissions Trading Scheme (EU ETS). Aircraft operators flying to, from, or within the EU are covered whether or not they are based in the EU. Many aircraft operators oppose being regulated, and many countries have objected that the system infringes on their sovereignty.

The U.S. government is among those disputing the EU's inclusion of international aviation in the EU ETS, contending that any policies should be agreed under the International Civil Aviation Organization (ICAO) or bilaterally. U.S. airlines are pressing Congress for action to prevent the EU ETS from applying to them, and Members have agreed to a sense of the Congress resolution objecting to the scheme.

This report provides background on inclusion of international aviation in the EU ETS and sets forth possible options for congressional consideration. It summarizes the broad agreements internationally to address GHG emissions, and explains why emissions from aviation are a particularly difficult problem. The report then describes the EU's approach to abating GHG emissions, principally through its EU ETS, and how the scheme specifically covers aviation. The report outlines reasons that many international airlines and non-EU nations oppose the EU regulation, including a review of potential financial, technological, and competitiveness issues. It summarizes December 2011 rulings by the European Court of Justice on litigation raised by U.S. airlines. Responsive actions by the U.S. government and other countries are identified. Finally, the report offers options for congressional action as well as conclusions. Appendixes identify key upcoming dates in the EU ETS coverage of aviation, and summarize related activities under ICAO.

A Two-Decade Process to Address Aviation Emissions

EU inclusion of aviation in the EU ETS is the latest step in a two-decade process concerning whether and how aviation emissions of GHG may be abated. Formal international agreement to abate GHG emissions extends back to 1992, when 193 countries plus the European Union agreed to the United Nations Framework Convention on Climate Change (UNFCCC). In the 1997 Kyoto Protocol, the industrialized ("Annex I") Parties agreed to reduce their GHG emissions by, on average, 5% below 1990 levels during the period 2008 to 2012. The United States is a Party² to

¹ Greenhouse gases (GHG) include dozens of compounds that, through various processes, alter the incoming and outgoing energy of the Earth system. The changing energy balance induces climate change. The principal human-related GHG is carbon dioxide (CO₂), and about three-quarters of human-related CO₂ emissions result from combustion of fossil fuels. So, while scientific and policy concerns surround all GHG, the focus of this report and of the EU regulation of aviation GHG emissions is CO₂. However, several other types of emissions from aviation also affect the climate, including water vapor, nitrogen oxides, particulate matter, hydrocarbons, and others.

² An explanation of Signatories, Parties, entry into force, and a few additional terms of international treaties may be helpful: When nations negotiate an international agreement or treaty, the agreement is opened for signature. The *Signatories* often participate in further activities pursuant to the agreement until the agreement *enters into force*, typically after a majority or qualified majority of Signatories have deposited their instruments of ratification, acceptance, approval, or accession (depending on each nation's law) with the organizational host of the agreement (e.g., the United Nations). At the point that the agreement enters into force, only the nations that deposited such instruments become *Parties* to the treaty. Only these Parties are bound by the terms of the agreement and may (continued...)

the UNFCCC but did not accede to the Kyoto Protocol. The legally binding commitments under the Kyoto Protocol were understood to be a first step toward halting the rise of atmospheric GHG concentrations and slowing human-induced climate change. Parties have enacted a variety of measures aimed at abating GHG emissions, but most countries have expressed alarm that existing measures would be insufficient to stabilize human-induced climate change.

In 2010, the UNFCCC Parties adopted a global goal of holding a GHG-induced increase in the Earth's temperature below 2° Celsius (3.6° Fahrenheit).³ Achieving this goal would likely require more than halving current global GHG emissions.⁴

Even among those who agree on the benefits of reducing GHG emissions, how to share reductions across nations and sectors of the economy remains a continuing, major controversy internationally and within countries.⁵ Emissions from international air transport have, since early negotiations, posed a particular challenge.⁶

Under UNFCCC rules, almost all emissions are counted in the nation where they occur. Much of the emissions associated with international aviation, however, occurs in international air space. As with other sectors, aviation emissions could be counted in, and regulated by, the country where the aviation fuel is sold; however, small countries (such as the Netherlands, Malta, and Singapore) for whom sales of aviation and marine bunker fuels represent an unusually large portion of the economy have objected to this option. In part, they argue that they would have little influence over the technologies used by carriers based elsewhere. They also argue that, if all countries selling aviation fuels did not regulate emissions, fuel sales would shift to uncontrolled locations. This could result in economic transfers, losses, and emissions “leakage”—not the intended GHG reductions. As one of a package of compromises, the 1997 Kyoto Protocol (to which the United States is not a Party) specified that the industrialized country Parties should pursue limitation or reduction of GHG emissions from aviation bunker fuels, working through ICAO.⁷

The 1944 Chicago Convention on International Civil Aviation established the Provisional International Civil Aviation Organization, which became the ICAO in 1947.⁸ Since 1947, ICAO

(...continued)

participate (i.e., with speaking and voting rights) in further activities under the treaty. Non-Parties may be allowed to participate as *Observers*. For example, the United States is a Signatory to the Kyoto Protocol but declined to ratify it, and so is not a Party; the United States has official Observer status. As such, the United States is not bound by the Kyoto Protocol. Typically, treaties include provisions that allow a Party to withdraw from it. For example, Canada has announced its intention to withdraw from the Kyoto Protocol; at such time, it would no longer be a Party to it.

³ Conference of the Parties to the United Nations Framework Convention on Climate Change. “The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention,” Decision 1/CP.16. 2010.

⁴ See, for example, America's Climate Choices: Panel on Limiting the Magnitude of Future Climate Change; National Research Council. *Limiting the Magnitude of Future Climate Change*. Washington, D.C.: The National Academies Press, 2010.

⁵ For background on the international negotiations to address climate change, see CRS Report R40001, *A U.S.-Centric Chronology of the International Climate Change Negotiations*, by Jane A. Leggett.

⁶ Emissions from international maritime transport pose a similar challenge.

⁷ Article 2.2 of the Kyoto Protocol.

⁸ The Provisional International Civil Aviation Organization replaced the International Commission for Air Navigation (ICAN), which had been in existence since the early days of powered flight. When the Provisional International Civil Aviation Organization became the ICAO, it included additional member countries and was placed under the umbrella (continued...)

has been an entity of the United Nations. ICAO supports cooperation among its member countries on non-binding standards and recommended practices for safety, security, environmental protection, and other matters affecting civil aviation. The United States is a Signatory to the Chicago Convention and is one of 190 current member States of ICAO. While the European Union (EU) is not a Signatory of the Chicago Convention, all of its 27 member States are. The EU maintains an observer status within ICAO.

Since the 1997 mandate in the Kyoto Protocol, ICAO has produced technical information and a variety of voluntary options and recommendations pertaining to the limitation of aviation GHG emissions. In 2004, ICAO ruled out the option of a *global* emission trading scheme for aviation. Instead, it produced guidance for member States should they include international aviation in their own emission trading schemes. ICAO urged that inclusion be with “mutual agreement” and non-discriminatory. For several years, the EU warned that, without stronger action under ICAO, it would include the aviation sector in the existing EU ETS.

In EU Directive 2008/101/EC, adopted on November 19, 2008, the EU Council and Parliament amended the EU ETS to include aviation sources of CO₂ emissions,⁹ effective January 1, 2012. The lack of greater progress under ICAO also led Australia and New Zealand to proceed with including the aviation sector in their domestic carbon tax and GHG cap-and-trade schemes. However, both nations exempted international aviation fuels from their requirements.¹⁰

In October 2011, faced with impending inclusion of aviation emissions in the EU ETS, the ICAO Council agreed to accelerate its work and continue to explore market-based measures to “reach a global solution.” The ICAO Secretary General pledged to produce a proposal by the end of 2012; there are some indications that ICAO may present options to states in June 2012. An EU official has stated that ICAO is “the right place to advance action on market-based measures for aviation and the EU strongly supports its work.”¹¹ However, the official also stated that “what is agreed on market-based measures in ICAO must be a global solution and deliver more emissions reduction than under measures now in place, including by 30 countries applying the EU emissions trading system,” and must be agreed in a treaty (i.e., legally binding).¹² A later section of this report (“Activities in ICAO”) and **Appendix B** discuss in more detail the processes under ICAO and interactions with the EU.

(...continued)

of the United Nations (UN). It presently resides organizationally within the UN as a specialized agency under the jurisdiction of the UN Economic and Social Council.

⁹ Although aviation emits a number of compounds that influence local and global climates, only aviation’s carbon dioxide (CO₂) emissions are covered by the EU ETS. For some sectors, the EU ETS limits other GHG as well.

¹⁰ Information on the Australian control scheme is available from their Department of Climate Change and Energy Efficiency: <http://www.climatechange.gov.au>. New Zealand’s policies are available from the Ministry for the Environment: <http://www.mfe.govt.nz/issues/climate/policies-initiatives/index.html#nzets>.

¹¹ Delbeke, Jos. “A New Flightplan - Getting Global Aviation Climate Measures Off the Ground.” Keynote Address presented at the conference, A New Flightplan - Getting Global Aviation Climate Measures Off the Ground, February 7, 2012. http://ec.europa.eu/clima/news/docs/speech_en.pdf.

¹² Ibid.

View of Airlines for America (A4A)

"The airline industry advocates for a single, global sectoral approach to be managed by ICAO, which stipulates that our industry achieve a 1.5% average annual improvement in carbon and fuel efficiency through 2020, carbon-neutral growth from 2020, subject to critical government infrastructure and technology investments such as air traffic control modernization, and an aspirational 50% reduction in CO₂ emissions by 2050, relative to 2005 levels."

Source: Airlines for America, "ATA^[13] Calls EU ETS Application to U.S. Airlines Illegal," Washington, DC, July 5, 2011, available at <http://www.airlines.org/Pages/ATA-Calls-EU-ETS-Application-to-U.S.-Airlines-Illegal.aspx>.

Why Address Aviation Emissions?

Aviation contributes to climate change at regional and global scales through a variety of emissions, including carbon dioxide, nitrogen oxides (leading to ozone pollution), water vapor, particulate matter (soot), and other pollutants. Scientists estimate that all these types of emissions from global aviation in 2005 accounted for about 5% of the human effect on global temperature rise.¹⁴ Emissions of carbon dioxide (CO₂) are about half of aviation's effect, or about 2%-3% of the total.¹⁵ The EU's Emission Trading Scheme regulates only CO₂ emissions from aviation.

Aviation: Relatively Large Among Many Small Emission Categories

Although fossil fuels account for roughly three-quarters of all CO₂ emissions, fossil fuel combustion is by a diffuse set of sources: powerplants, vehicles, home heating, industrial processes, etc. Many countries that are addressing climate change have acted first on the largest sources of emissions: powerplants and motor vehicles. After those source categories, the remaining categories typically are small shares of the total. Of course, as the emissions of the controlled sources shrink, the shares of the remaining categories grow.

Aviation also combusts fuel, and its share of CO₂ emissions is about 2%-3% of the global, human-related total (excluding changes in forests and other land uses). This is about the same as all CO₂ emissions from Germany or Korea. International aviation emissions—only from flights that cross sovereign boundaries—are a smaller share—about 1.5% in 2009 (about the same as Italy's or Mexico's CO₂ emissions).¹⁶

¹³ Airlines for America (A4A) was called the Air Transport Association (ATA) until mid-2011. Both names are used throughout this report, depending on the context and timing of events in the discussion.

¹⁴ Technically, aviation emissions were about 5% of the human-related "radiative forcing," which is the influence on global average temperature at the top of the troposphere. Lee et al., *op. cit.* This estimate was produced by the scientists who authored the aviation section of the 2007 assessment report of the Intergovernmental Panel on Climate Change, on which ICAO also relied for its published analyses. The 2007 IPCC report concluded that the radiative forcing of aviation in 2005, but based on 2000 operations data, was 14% lower.

¹⁵ In this instance, climate change is measured as "global warming"—the increase in the average annual global temperature measured at the top of the atmosphere. Other measures of climate change (e.g., cloudiness, changing precipitation) could mean other shares for aviation than the ones cited here.

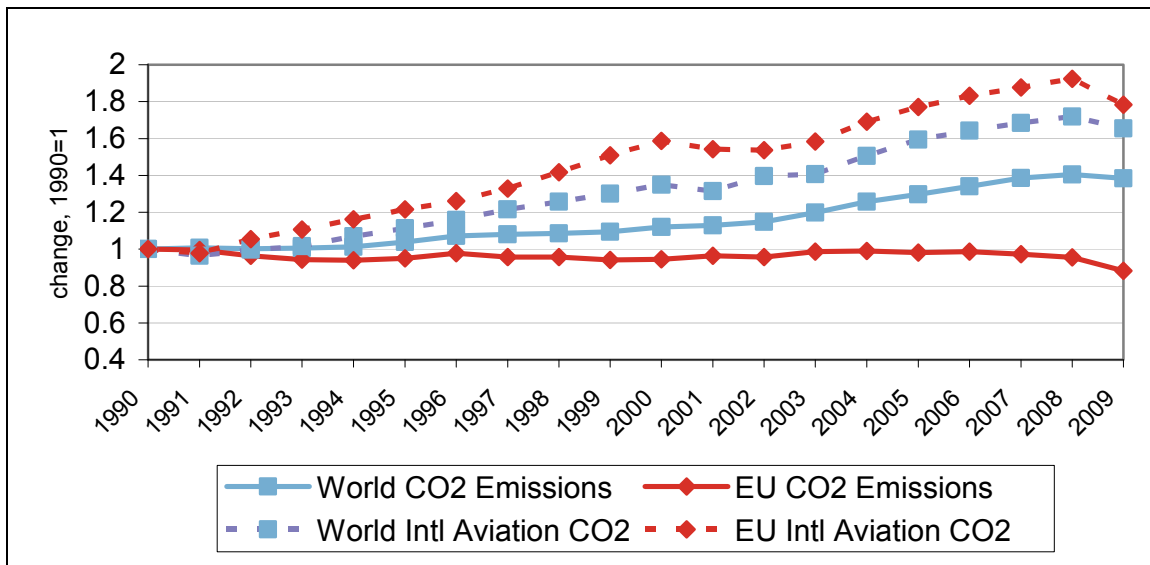
¹⁶ Calculated by CRS from IEA data: "CO₂ Highlights 1971-2009." Paris, France, 2011.

One of the Fastest Growing Sources of Emissions

Aviation has been one of the most rapidly growing sources of CO₂ emissions. **Figure 1** illustrates the indexed changes in CO₂ emissions from international aviation compared to all fossil fuel use, for the EU and the world. In the EU, fossil fuel emissions fell by about 5% from 1990 to 2009, while the emissions from aviation fuels sold in the EU rose by about 80%. This was more than the increase of all emissions from Spain.

Globally, also, aviation emissions rose faster than all fossil fuel emissions, though the difference was less. ICAO estimated that CO₂ emissions from all aviation (not just international) almost doubled from 1990 to 2006. This compared with a 34% increase from all fossil fuel use.¹⁷

Figure 1. Percent Changes in CO₂ Emissions from International Aviation and All Fossil Fuel Use, in the World and in the EU



Source: CRS figure using data from IEA CO₂ emissions estimates, 1971-2009. Data base from 2011.

Counteracting Influences: Demand Growth and Efficiency Gains

Past and projected emissions growth in the aviation sector are influenced by two counteracting forces: expanding aviation services and improving efficiency.

Expansion of Air Transport Demand

Carbon dioxide emissions from aircraft are increasing due to expanding demand for aviation services. Economic growth, globalization, falling air fares (after accounting for inflation), liberalization of air service markets, and the desire for rapid transport have driven demand for passenger travel and cargo transport. Both passenger and cargo traffic have grown much more rapidly than economic growth over past decades. From 1999 to 2009, carriers saw a 4.3% average

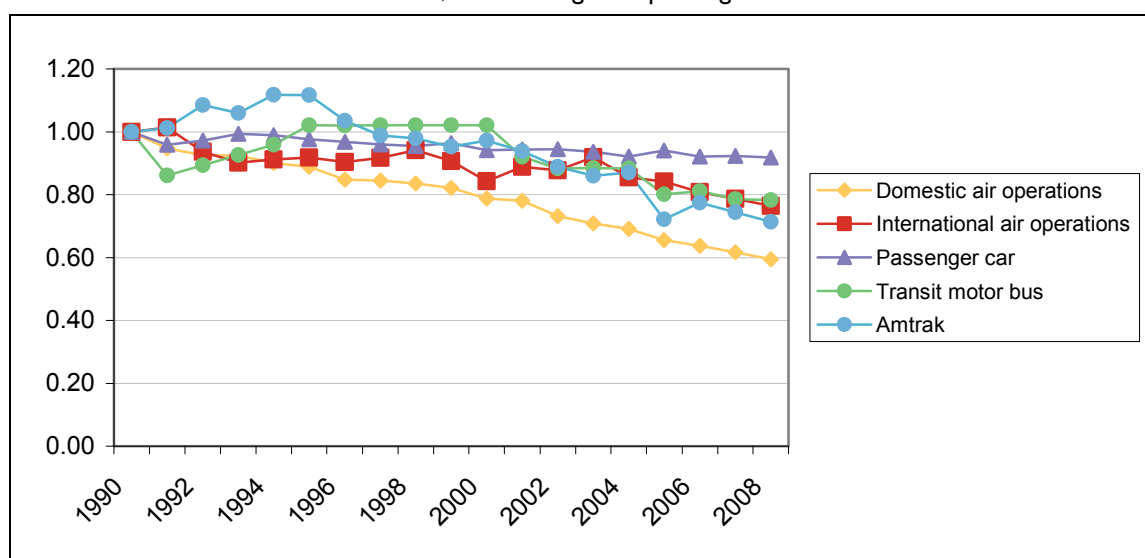
¹⁷ CRS calculated the estimate of CO₂ emissions from fossil fuels using IEA data, 1971-2009.

annual growth in revenue-passenger-kilometers (RPK), while cargo shipments saw a 2.6% annual average growth despite economic weakness at the end of the decade.¹⁸

Past Improvements in Fuel Efficiency and Emissions per Passenger-Mile

Aviation emissions would be higher if not for improved fuel efficiency in commercial aviation industry. U.S. domestic air operations reduced their fuel intensity (energy consumed per passenger-mile carried) by 41% between 1990 and 2008—more than any other mode of passenger transportation—and U.S. airlines' international air passenger operations reduced fuel intensity by 24% (See **Figure 2**).¹⁹ More recently, the U.S. carriers' trade group reports that carriers have done a better job of keeping pace with growth, reducing absolute fuel burn and emissions by 10% from 2000 to 2010.²⁰

Figure 2. Change in Fuel Intensity of U.S. Passenger Transportation by Mode
1990-2008, 1990 average Btu/passenger-mile = 1



Source: CRS figure using data from Bureau of Transportation Statistics. "National Transportation Statistics." U.S. Department of Transportation, Table 4-20. Data extracted January 23, 2012.

Further Improvements May Help Suppress Emissions

Several changes are projected to reduce significantly the rates of aircraft fuel consumption and emissions over the next decade. More efficient aircraft designs will be coupled with air traffic management improvements to reduce delays and minimize inefficient routing of aircraft.

¹⁸ ICAO statistics.

¹⁹ Bureau of Transportation Statistics. "National Transportation Statistics." U.S. Department of Transportation, Table 4-20. Data extracted January 23, 2012.

²⁰ Nancy N. Young, Vice President, Environmental Affairs, Air Transport Association of America, Inc., 2011 ACI-NA International Aviation Issues Seminar: Significant (and Challenging) Environmental Issues, December 1, 2011. According to National Transportation Statistics, international fuel consumption rose during this period, while total and domestic fuel consumption declined (NTS, Table 4-8, Certificated Air Carrier Fuel Consumption and Travel).

Alternative fuels, including biomass-based fuels, could also penetrate the aviation market with benefits for emissions and energy security.

Improved air traffic management will likely help suppress emissions and save fuel. For example, in the United States, the FAA estimates that its Next Generation Air Transportation System (NextGen) air traffic modernization efforts will reduce aviation fuel consumption by an estimated 1.4 billion gallons, cutting cumulative CO₂ emissions by 14 million tons between 2010 and 2018.²¹ Similarly, the EU has set goals for its Single European Skies Air Traffic Management Research Initiative (SESAR) to reduce per flight fuel consumption and CO₂ emissions by 10% from improvements in air traffic management alone by 2020.²²

Additional CO₂ emissions reductions may be realized from a gradual transition to more efficient aircraft fleets. For example, Boeing Commercial Airplanes claims that its newly certified wide-body B-787 Dreamliner, the first large airliner to make extensive use of lightweight composite materials in its construction, uses 20% less fuel and produces 20% less CO₂ than the similarly sized Boeing B-767.²³ Similarly, Airbus touts that its A350 airplane currently in development will achieve fuel burn and CO₂ emissions reductions of 25% compared to its current long-range competitor through use of a lighter composite fuselage, improved engines, and an advanced wing design optimized for cruise flight.²⁴ As airlines gradually phase out older aircraft and replace them with newer, more fuel efficient models, corresponding reductions in CO₂ emissions may be achieved. The advanced concepts in the B-787 and A350 will largely be limited to medium- and long-range operations. In the near term, short haul aircraft like the B-737 and A320 are expected to get more fuel efficient engines and some improvements in aerodynamics, but these changes are likely to yield much smaller comparative reductions in CO₂ emissions than technologies for newly designed aircraft. Observers expect that deliveries of A320s and B-737s will continue at least through 2020.²⁵

Biomass-based fuels can have net CO₂ emissions approaching zero, when they are produced with feedstocks (i.e., plant material) that sustainably gets carbon from the atmosphere (i.e., through photosynthesis). U.S. airlines have used biomass aviation fuels in commercial flights. However, the cost to produce these fuels remains uncompetitive, with future supply uncertain. Some in the industry are bullish on biofuel potential: reportedly, the CEO of Alaska Air Group affirmed, “What we need is an adequate, affordable and sustainable supply. To the biofuels industry: If you build it, we will buy it.”²⁶ The International Air Travel Association has said, “Savings of up to 80% [of carbon emissions] are on the table if the industry can get it right.”²⁷ Others caution that

²¹ Federal Aviation Administration, *FAA's NextGen Implementation Plan*, March 2011.

²² SESAR Joint Undertaking, *European Air Traffic Management Master Plan, Edition 1*, Brussels, Belgium, March 30, 2009.

²³ Boeing Commercial Airplanes, Backgrounder: Boeing 787 Dreamliner Being Designed for Environmental Performance, Seattle, WA.

²⁴ Airbus, *A350 XWB*, available at <http://www.airbus.com/aircraftfamilies/passengeraircraft/a350xwbfamily/>.

²⁵ See, e.g., Max Kinsley-Jones, “No A320 Replacement ‘Until 2024’: Airbus,” *Flightglobal*, available at <http://www.flightglobal.com/news/articles/no-a320-replacement-until-2024-airbus-332442/>.

²⁶ Geiver, Luke. “‘If you build it, we will buy it’ says airline CEO on biojet fuel,” *Biorefining Magazine*. November 10, 2011. <http://www.biorefiningmagazine.com/articles/5938/if-you-build-it-we-will-buy-it-says-airline-ceo-on-biojet-fuel>.

²⁷ Airlines International. “Environment - The Growth of Biofuels.” International Air Transport Association (IATA), January 2010. <http://www.iata.org/pressroom/airlines-international/december-2010/pages/environment.aspx>.

biofuels may not be commercially viable for years, and supply may be too limited to reduce emissions.²⁸

Aviation Emissions Projected to Grow Rapidly

Further improvements to aircraft design, air traffic operations, and commercial biofuels are anticipated to yield meaningful reductions in aircraft fuel efficiency and CO₂ emissions per ton-kilometer. Nonetheless, a net increase in fuel consumption and CO₂ emissions is anticipated from continued growth in worldwide flight operations. ICAO forecasts that CO₂ emissions from aviation are likely to grow by 3%-4% annually for the next few decades.²⁹ More specifically, ICAO projects that aviation's CO₂ emissions would grow globally to 2.5 to 2.9 times the 2006 emissions by 2036, and 3.5 to 4.5 times the 2006 emissions by 2050.³⁰ (ICAO projections do not include possible penetration of non-fossil fuel use into the aviation market.) Under ICAO's scenarios of future aviation emissions, the sector's emissions in 2050 would comprise about 20% of the global emissions compatible with holding projected global temperature increases to 2°C.³¹

As the EU and other countries implement their laws to reduce other major sources of GHG emissions, aviation emissions would continue to increase in absolute terms and as a share of total GHG emissions. Hence, the EU has chosen to address aviation emissions in its comprehensive climate change policy package.

EU's Legal Obligations to Reduce GHG Emissions

Under the Kyoto Protocol, the European Union (EU) agreed to a GHG target of 8% below 1990 levels on average in the period from 2008 to 2012.³² In the context of international negotiations on how to mitigate GHG beyond 2012, the EU committed to reduce its GHG emissions to 20% below 1990 emissions by 2020.³³ The EU's overall GHG targets have been embodied in EU law³⁴

²⁸ Hileman, James I., David S. Ortiz, James T. Bartis, Hsin Min Wong, Pearl E. Donohoo, Malcolm A. Weiss, and Ian A. Waitz. *Near-Term Feasibility of Alternative Jet Fuels*. Santa Monica CA: RAND Corporation, sponsored by the FAA, 2009. <http://web.mit.edu/aeroastro/partner/reports/proj17/altfuelfeasrpt.pdf>.

²⁹ ICAO. *ICAO Environment Report 2010: Aviation and Climate Change*. Quebec, Canada: published under the authority of the Secretary General, 2010. p. 31.

³⁰ *Ibid.*, p. 33, and Figure 2, p. 32.

³¹ Runge-Metzger, Artur. "Aviation and Emissions Trading: ICAO Council Briefing" presented at the ICAO Council, September 29, 2011. http://ec.europa.eu/clima/policies/transport/aviation/docs/presentation_icao_en.pdf.

³² For more information on the United Nations Framework Convention on Climate Change and on the Kyoto Protocol, see CRS Report R40001, *A U.S.-Centric Chronology of the International Climate Change Negotiations*, by Jane A. Leggett.

³³ The EU Parliament and Council enacted this target in June 2009. The EU has also pledged that it would reduce its emissions to 30% below 1990 levels by 2020 if international agreement can be reached on a mandate to negotiate a legally binding treaty by 2015 that would include GHG mitigation obligations by all major emitting countries and that would take effect by 2020.

³⁴ For example, Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol; Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC; and 2010/778/EU: Commission Decision of 15 December 2010 amending Decision 2006/944/EC determining the respective emission levels allocated to the Community and each of its Member States under the Kyoto Protocol pursuant to Council Decision 2002/358/EC.

with corresponding measures enacted to achieve the emission reduction goals. The EU and its member States must take the necessary measures to comply with the emissions levels embodied in EU law (Decision 2002/358/EC).

In December 2011, the EU and other Parties agreed to a second commitment period of the Kyoto Protocol, beginning in 2013. While the terms are not yet settled, all Parties expect that the legally binding GHG target for the EU will be at least as stringent as the 20% target embedded in EU law. For 2050, the EU has adopted a strategy proposed to reduce GHG emissions to 80%-85% below 1990 levels.

In the GHG accounting rules under the UNFCCC, emissions from international aviation and maritime transport (“bunker fuels”) are not tallied in each Party’s inventory subject to its legally binding GHG reduction target.³⁵ Still, the language of the Kyoto Protocol mandates the Parties to pursue limitation or reduction of aviation emissions.

The EU enacted its Emissions Trading Scheme, a “Climate and Energy Package,” and other measures in a community-wide approach to meeting its GHG targets. An “Effort Sharing Decision” set national emissions targets for 2020 for each member State for sectors not covered by the EU ETS, with an overall emissions reduction from non-ETS sectors of 10% from 2005 levels. The emissions from most sectors are now regulated by the EU or its member States, either by performance standards (e.g., for motor vehicles) or by being included in the EU’s Emissions Trading Scheme (EU ETS). The **Text Box** shows targets for some major sectors, in and outside of the EU ETS. The EU is also expanding incentives for renewable energy and pursuing carbon capture and storage technologies.

The EU’s GHG Emissions Targets by Sector

The EU has enacted a set of nearly comprehensive policies to control GHG emissions across most sectors. The EU ETS is only one piece of the strategy. Across all programs, the GHG targets for 2020 for aviation and other sectors, compared to 2005 levels, are:

Aviation: 5% below 2004-2006 average levels

Electricity generation and industry: 21% below 2005 levels in the EU ETS

Buildings: 10% below 2005 levels

Agriculture: 10% below 2005 levels

Non-aviation transport: 10% below 2005 levels

The EU’s Emissions Trading Scheme covers electricity generation and energy intensive industry, constituting about 50% of all EU GHG emissions. For the sectors other than aviation, the emission cap by 2020 will be 21% below 2005 emission levels. The EU’s policy also requires by 2020 that renewable energy provide 20% of overall energy consumption, and that energy efficiency improve by 20%.

³⁵ Up to 1997, Parties disagreed about whether each Party should be responsible for emissions from sales of aviation fuels to international carriers or flights departing that country. The agreed GHG inventory methods required Parties to account for emissions from their sales of international bunker fuels but report them distinctly from the rest of the national total, pending policy decision. The Kyoto Protocol’s Article 2.2 represents Parties’ implicit understanding that aviation emissions would not be counted in each Party’s “assigned amount” or cap on emissions.

How the EU's Emissions Trading Scheme Works

The “Emissions Trading Scheme” (EU ETS) is one of the primary instruments the EU uses to achieve its legislated GHG reduction targets. The EU ETS is a “cap and trade” program.³⁶ Under the EU ETS, the European Union (EU) plus Iceland, Liechtenstein, and Norway have set a cap, or a maximum quantity, on annual carbon dioxide (CO₂) emissions from major industrial sources. Each individual source is given or must purchase a quantity of “allowances” or permits to emit one metric ton of CO₂.³⁷ At the end of each year, each source of emissions must turn in a number of allowances at least equal to its emissions for the year. If the source does not turn in sufficient allowances, it must pay a fine. Over time, the emissions caps will decline and fewer allowances will be issued, forcing CO₂ emissions to decline as well to the enacted levels of the cap. Eventually, the EU foresees auctioning all allowances rather than giving a portion free to emission sources. (How aviation is included in the EU ETS is discussed in a later section; see “Aviation Provisions in the EU ETS.”)

To minimize compliance costs and give flexibility to emissions sources, the EU ETS allows emission allowances to be traded. A source that has more allowances than it needs may sell the extra to another source that needs more, or to other entities, such as an allowance broker. The allowance market sets the price for the allowances. If a source can reduce one ton of emissions at a cost lower than the price of an allowance, the EU ETS gives it the profit incentive to reduce emissions and sell allowances. It also gives businesses (e.g., technology companies) motivation to develop and deploy new, lower-cost means to reduce emissions.

Currently, the EU ETS covers aviation in addition to other CO₂-emitting sectors: electricity generation; fuel combustion plants; oil refineries; iron and steel works; and manufacturers of cement, glass, lime, bricks, ceramics, pulp and paper. At present, the EU ETS covers about half of the EU's CO₂ emissions.

Beginning in 2013, the EU ETS will include petrochemicals, ammonia, and aluminum manufacturers, and will extend emissions covered from some sources (not aviation) to include nitrous oxides (N₂O) and perfluorocarbons (PFC).

Aviation in the EU ETS

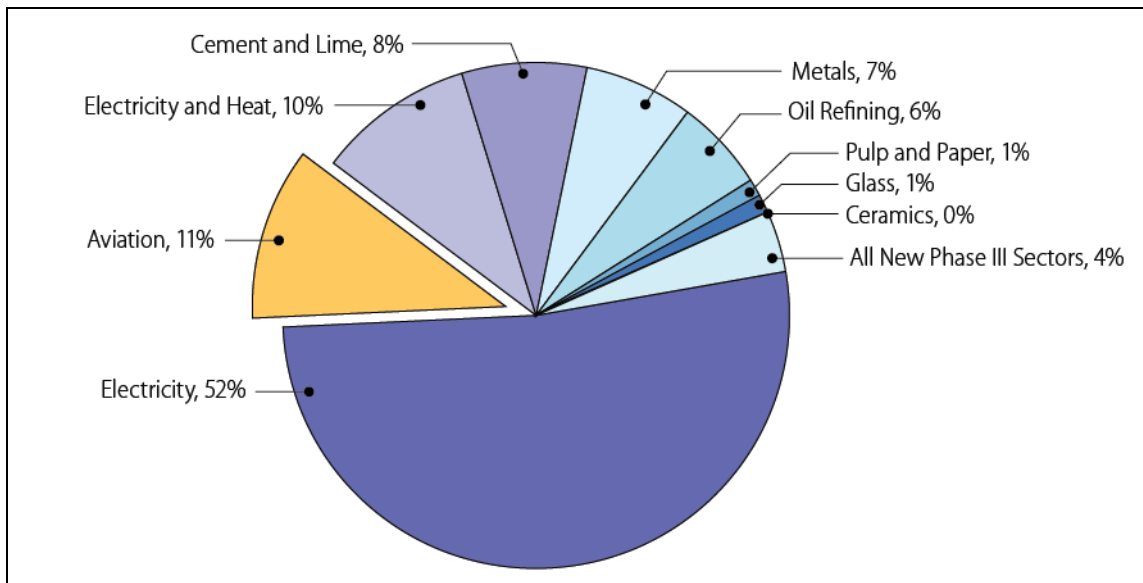
The EU reports that about 3% of its greenhouse gas emissions come from civil aviation activities. The share coming from flights between EU and non-EU airports is smaller. The EU is concerned about aircraft emissions because, as **Figure 1** illustrates, from 1990 to 2010, overall CO₂ emissions in the EU declined by about 5% while aviation emissions rose by about 80%. Emissions from aviation have been growing faster than those from any other sector. They are projected to continue rising due to increases in air travel and air-cargo shipments.

³⁶ For a simple explanation of how an emissions cap-and-trade system works, see the Policy Tools section of CRS Report R41973, *Climate Change: Conceptual Approaches and Policy Tools*, by Jane A. Leggett.

³⁷ The ETS now includes emissions of nitrous oxides from some sources as well. For simplicity and because the nitrous oxide requirements do not apply to aviation, this memorandum will focus on CO₂ alone.

Civil aviation emissions account for 11% of GHG emissions covered by the EU ETS. They are the second largest share of any sector, after power generation (see **Figure 3**). Civil aircraft serving the EU emit more GHG than petroleum refineries and steel plants, and more than additional sectors, such as petrochemicals and aluminum, that must comply beginning in 2013. The EU determined that, to progress towards its goal of stabilizing CO₂ concentrations in the atmosphere, and to treat aviation comparably with other sectors, aviation emissions needed to be regulated.

Figure 3. Sectoral Shares of the CO₂ Emissions Cap of the EU ETS in 2013



Source: CRS figure based on Philip Good. "Tourism, aviation and emissions trading" DG Climate Action, European Commission. March 14, 2010.

The EU has used a multi-pronged approach to address aviation GHG emissions, seeking measures in its member States and multilaterally. According to the EU, the EU ETS is one of several policy instruments it is using to reduce aviation emissions; other instruments include research on new technologies and biomass fuels (the Clean Sky Joint Technology Initiative), work under ICAO to develop a CO₂ standard for new aircraft, and modernization of air traffic management under the Single European Sky and SESAR program (Single European Sky Air Traffic Management Research).³⁸

Though the EU's existing aviation programs are expected to help slow the growth of emissions, EU countries have viewed global actions as necessary ultimately to reducing aviation emissions. In particular, the EU has pressed for common standards to be adopted through ICAO for CO₂ emissions for new aircraft, and for mandatory global market-based measures (MBM). MBM could include an emissions fee or emissions trading system.

Since 1998, ICAO Members, including the member States of the EU, have worked through ICAO toward measures to abate aviation emissions. The EU recently stated, "Europe has worked within ICAO and the UNFCCC to reach a global agreement on aviation emissions for over 15 years.

³⁸ <http://www.sesarju.eu/about/background>.<http://www.sesarju.eu/about/background>.

However progress has been slow and does not match the urgency of the climate problem. Europe has taken action due to the lack of substantive progress at the international level.”³⁹

In 2008, the European Parliament and Council enacted a new law, Directive 2008/101/EC, amending the EU ETS (Directive 2003/87/EC) to include aviation activities.⁴⁰

Aviation Provisions in the EU ETS

Effective January 1, 2012, the EU ETS covers most CO₂ emissions from aviation to, from, and within the region. The EU ETS caps aviation emissions in 2012 at 97% of the average 2004-2006 emissions on covered flights. The cap declines to 95% of historical emissions for 2012-2020, and may be further reduced beyond 2020 pending EU review. The requirements apply to all civilian aircraft arriving at or departing from airports in the EU, Norway, Iceland, and Liechtenstein, not just airlines based in those territories.

The EU ETS exempts certain types of flights from the cap-and-trade scheme, including military aviation; search & rescue flights; state flights transporting third countries' heads of state, heads of government, and government ministers; and police flights. Also exempted are operators that meet *de minimis* criteria.⁴¹ Many of the hundreds of U.S. aircraft operators may be excluded from the EU ETS because they fly below the *de minimis* criteria.

For administrative simplicity, each airline will be administered by only one of the participating countries. Aircraft operators have been listed by the EU and advised to contact the “competent authority” in the country that will administer their participation in the scheme. Covered airlines monitored their activities and emissions during 2010 and were required to report them to the competent authority by March 31, 2011. As with other emitters in the EU ETS, each aircraft operator will have to turn in allowances to the “competent authority” to cover its annual emissions by April of the following year.

For each metric ton of CO₂ a source emits, it must turn in one allowance. During 2012, 85% of the emissions allowances to the aviation sector will be given free to aircraft operators and 15% auctioned. During the period 2013 to 2020, 82% will be given free, while 15% will be auctioned and 3% will go into a reserve for rapidly expanding airlines and new entrants into the market. The initial allocation of free allowances to each operator is based on the “benchmark” times the number of ton-kilometers its aircraft flew on flights to, from, or within the EU during 2010. Each operator receives 0.6797 free allowances (the “benchmark”) for each covered 1000 ton-kilometers of covered flights. In 2013 to 2020, when the cap declines to 95% of the 2004-2006 emissions level, the benchmark shrinks as well (see **Table 1**).

³⁹ EU. “Argumentaire: Inclusion of aviation in the EU ETS.” Provided by the European Union Delegation to the United States of America, 2011.

⁴⁰ Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community.

⁴¹ *De minimis* criteria exclude from the ETS directive the following types of flights:

- those performed by aircraft with a maximum take-off weight of less than 5,700kg (roughly 12,500 pounds);
- those by operators with fewer than 243 flights for three consecutive four-month periods, or flights with total annual emissions lower than 10,000 metric tons per year.

Table I. Emission Allowances for Aviation in the EU ETS(one allowance permits one metric ton of CO₂ emission)

Trading Period	Annual Area-Wide Cap	Distributed Free	Benchmark (per 1000 ton-km)	Auctioned	Special Reserve (total over 8 years)
2012	214,777,670	182,561,019	0.6797	32,216,651	0
Each year 2013-2020	210,349,264	172,486,396	0.6422	31,552,390	50,483,824

Source: CRS table with information from Decision of the EEA Joint Committee, No 93/2011 (July 20, 2011), http://ec.europa.eu/clima/policies/transport/aviation/allowances/docs/eea_20072011_en.pdf.

Note: This table covers all countries participating in the system: the EU plus Norway, Liechtenstein, and Iceland.

An airline that requires more allowances than its free allocation may bid for them at periodic auctions held by national governments or purchase them from sources holding allowances that wish to sell. Because the aviation requirements are part of an “open” emission trading system, these allowances may be traded with allowances from other emission sources under the EU ETS, from brokers, or from approved “certified emission reductions” generated by reducing GHG from projects in developing countries. Similarly, airlines receiving allowances may sell them to others.

If an airline does not comply with the EU ETS, it is subject to an “excess emissions penalty.” The penalty is set at €100 (US\$130) for each ton of CO₂ emissions exceeding the allowances surrendered—an amount many times the highest expected allowance prices in the market. The aircraft operator also remains liable for submitting allowances in the following year for those emissions. The EU law provides for sanctions that include the possibility that a repeatedly non-complying airline might, as a last resort, be banned from operating in the EU.⁴²

Disposition of Revenues

In each year, 15% of the aviation allowances will be auctioned by member States. While the Directive leaves it to those member States to decide how to use revenues generated by auctioning allowances, it also instructs that revenues

should be used to tackle climate change in the EU and third countries, inter alia, to reduce greenhouse gas emissions, to adapt to the impacts of climate change in the EU and third countries, especially developing countries, to fund research and development for mitigation and adaptation, including in particular in the fields of aeronautics and air transport, to reduce emissions through low-emission transport and to cover the cost of administering the Community scheme. The proceeds of auctioning should also be used to fund contributions to the Global Energy Efficiency and Renewable Energy Fund, and measures to avoid deforestation.⁴³

⁴² The threat of a ban is found in paragraph 5 of the amended Directive: “In the event that an aircraft operator fails to comply with the requirements of this Directive and where other enforcement measures have failed to ensure compliance, its administering Member State may request the Commission to decide on the imposition of an operating ban on the aircraft operator concerned.”

⁴³ Directive 2008/101/EC, Article 3(d)(4).

Member States must inform the European Commission (EC, the EU implementing body) how revenues were used. Though an instruction like this to member States is unusual in EU law, some airline representatives have criticized the discretionary nature of it. Some express concern that the funds may not be used within the aviation sector and/or that they may not be used to reduce GHG emissions.

Potential EU Exemptions with Equivalent Measures by Other States

EU Directive 2008/101 provides for the EC to consider “options available in order to provide for optimal interaction” between the EU ETS aviation provisions and the measures adopted by a “third country” (i.e., non-EU country) to reduce aviation emissions. The options may include exemption from the allowance requirements of flights incoming from a third country that has adopted its own measures to reduce aviation emissions; in this case, outbound flights from the EU to the third country would be subject to the EU ETS, but inbound flights would be subject to the legal regime of the country in which they originate. The exclusion would require an amendment to the EU law. The options may include amendments to other “non-essential elements” of the aviation provisions, as well. Also, the EC may recommend that the EU Council open negotiations with a third country on an agreement, with unspecified terms and conditions.

The EU law directs that the EU and its member States continue to seek agreement on global measures to reduce GHG emissions from aviation. This would include negotiations, for example, under ICAO or the UNFCCC. Recently, an official stated that the EU would agree to suspend inclusion of aviation in the EU ETS only if a new global ICAO scheme met three conditions:

- it must deliver more emissions reductions than the EU ETS on its own;
- it must have targets and measures; and
- any action must be non-discriminatory and apply to all airlines.

Estimated Impacts on U.S. Airlines

The EU Commission has identified hundreds of U.S. aircraft operators that fly to or from EU airports and therefore could be subject to the EU ETS. Many are freight operators that provide relatively infrequent service to the EU, and therefore may fall below the de minimis level of emissions for compliance. Large U.S.-based passenger carriers, such as United Airlines, Delta, and American, have sufficient European operations to be covered by the scheme, as do major express cargo carriers FedEx and UPS.

The first distribution of free allowances for 2012 occurred in February 2012. Notably, with more than a year before aviation allowances must be surrendered to comply with the EU ETS, a number of large airline companies have been buying European allowances while prices are low. Several commodity exchanges are launching trading in the EU aviation allowances (EUAAAs).

Complying with the EU ETS is likely to increase costs for international air carriers, although the extent and significance are likely to depend on developments that cannot be known at this time. Some of the controversy may be explained by different views concerning:

- emission reduction potentials of technological and operational strategies;
- projected future allowance prices;⁴⁴
- effects on demand for aviation services;
- effects on research and development (R&D) and investment in new systems;
- potential for profit opportunities and windfalls for some; and
- competitive dynamics.

These issues are explained in the sections below.

Emission Reduction Potential of Technical Improvements

Advancing technologies are expected to help aircraft operators to reduce their emissions, and consequently some portion of their needs for allowances. The aviation industry, in conjunction with many governments, is developing more fuel efficient technologies (as discussed in a previous section). Some more efficient technologies would be phased in with new aircraft, while others could be retrofitted, or “dropped in” (e.g., winglets, or certain low carbon biofuels). New air traffic control systems are projected to curb aircraft fuel consumption and emissions over the next decade. The rate at which these operational systems improve will depend on government funding, and will affect private companies’ fuel efficiency and CO₂ emissions.

Anticipating these changes, the International Air Transport Association, representing 240 airlines and 84% of air traffic, has adopted a voluntary goal of reducing fuel efficiency and CO₂ emissions per revenue tonne-kilometer by at least 25% by 2020 compared to 2005 levels.

Voluntary efficiency improvements are likely insufficient to assure compliance with the EU ETS. One uncertainty is the rate and cost (or savings) of deploying further efficient technologies and biofuels with and without fiscal incentives or regulatory requirements, such as the EU ETS. The EU considers that the certainty of an emissions cap reduces the risk to businesses that invest in advanced technologies that help reduce emissions.

Different Assumptions about Allowance Prices

A principal reason for differences in cost estimates is varying future prices assumed for carbon allowances. Allowance prices in the coming decade could be higher or lower than recent prices. On the one hand, prices are likely to rise in the future as the European economies strengthen, more sources are capped by the emissions trading system, and the emissions caps tighten. On the other hand, slower than anticipated economic growth, advances in efficiency and technologies in other sectors, and potentially large supplies of certified emission reductions in developing countries could dampen prices for many years.

Two contrasting cost estimates underscore the importance of allowance price assumptions: In 2009, the Air Transport Association of America (ATA)⁴⁵ estimated that the EU ETS would cost

⁴⁴ Currency exchange rates used in estimates differ among analyses and over time as well, contributing to as much as 20% of differences.

⁴⁵ The ATA has changed its name to Airlines for America, A4A.

U.S. carriers \$3.1 billion over nine years, or an average of \$344 million per year.⁴⁶ A Bloomberg Government analysis⁴⁷ in November 2011 prepared a critical analysis for comparison: It estimated that, depending on the price of allowances, the total compliance cost would range between \$0.9 billion and \$4.2 billion over nine years, if airlines do not shift to more fuel-efficient planes or to lower-carbon fuels. At average allowance prices since 2005 (US\$11.40 per metric ton CO₂), the cost would be \$2.1 billion over nine years, or \$233 million per year. Bloomberg concluded that the allowance price would need to be 50% higher than the average since 2005 to reach the ATA's cost estimate.⁴⁸

The existing oversupply of emissions allowances in the EU and a near-term economic slowdown in the EU could serve to reduce the relative impacts on U.S. operators over the next few years.⁴⁹ In the longer term, allowance prices may be tempered by low-cost emissions reductions in other sectors and other regions. As recommended by ICAO, the EU ETS is an "open" trading system, meaning that allowance trading may take place with other sectors covered by the EU ETS, foreign trading systems, and "certified emission reductions" generated in developing countries under the Kyoto Protocol. If, for example, industrial emitters in Europe have less need for EU ETS allowances than they now project, those allowances could be sold in the secondary market, adding to supply and dampening prices.

The newspaper *The Australian*⁵⁰ cited an allowance price forecast of the EU open trading system by the Swiss investment bank UBS. UBS expected the EU price for allowances to average €5 per metric ton (approx. US\$6.40) in 2012-2013. Further, UBS predicted that EU ETS allowances would remain in surplus until 2025. As of early January 2012, allowance futures prices for 2015 were settling at around €8.45, though they had ranged as high as €12.05 in September 2011. Some observers believe that businesses may have been acquiring and/or saving ("banking") emission allowances during the second EU trading period, 2008-2012, to use in the post-2013 period. Although rising allowance prices are generally expected, it remains very uncertain to what degree they may rise over the coming decade.

⁴⁶ Airlines for America, "ATA Predicts U.S. Industry, Economy Will Lose Billions due to Unlawful EU ETS," Washington, DC, July 27, 2011, available at <http://www.airlines.org/Pages/ATA-Predicts-U.S.-Industry,-Economy-Will-Lose-Billions-due-to-Unlawful-EU-ETS.aspx>.

⁴⁷ Zisman, Matthew, and Randolph Walerius. EU Aviation Emissions: Impact on U.S. Airlines and Freight Carriers. Bloomberg Government, November 29, 2011.

⁴⁸ Ibid.

⁴⁹ If the downturn in demand were sufficiently strong, operators could receive more allowances than they need, which could be "banked" for future use or sale when allowance prices rise. Some critics contend that giving aircraft operators a high percentage of allowances for free increases the potential for windfall profits for the sector. On the other hand, an economic downturn sufficient to render purchase of allowances unnecessary could have a severe impact on the sector.

⁵⁰ Maher, Sid. "Europe's \$287bn carbon 'waste': UBS report." *The Australian*, November 23, 2011. <http://www.theaustralian.com.au/national-affairs/europes-287bn-carbon-waste-ubs-report/story-fn59niix-1226203068972>.

Alleged Effects on R&D and Investment in New Equipment

Airlines and A4A, the U.S. industry trade group (formerly ATA), have raised concerns that the purchase of allowances may have an unintended consequence: limiting airlines' funds to invest in more fuel efficient aircraft and aircraft modifications, such as next-generation avionics, that could reduce emissions. Airlines and A4A have expressed specific concern that European government receipts from the EU ETS may not fund environmental projects or to help reduce emissions from aviation sources. They argue that aviation emissions reductions could be achieved more readily if the aviation industry could instead invest directly in new aircraft, retrofitting of existing aircraft, and alternative fuels.⁵¹

Potential for Profit Opportunities and Windfalls

The EU ETS could also provide carriers with a profit opportunity. Over the next nine years, aircraft operators will receive free allowances equal to 82%-85% of their historic CO₂ emissions of flights to and from EU airports. In total, the EC asserted that the free allowances could be worth €20 billion (US\$27 billion) over the next nine years.⁵² These allowances are assets that the carriers are free to sell, potentially using the proceeds to upgrade their fleets, acquire more fuel-efficient equipment or switch to lower-carbon biofuels which, in turn, would lower emissions per ton-kilometer, thereby reducing the need for allowances and reducing exposure to fuel expense volatility.⁵³

Some analysts believe that carriers could make “windfall” profits from the freely distributed allowances under less competitive conditions. A recent study⁵⁴ by MIT researchers and others estimated that the cost impact of the EU ETS on U.S. carriers would be small and that aviation operations would continue to grow. Airline profits could increase, especially if carriers are able to pass on all additional costs to their customers. This possibility, however, would depend on the degree of competition and the portion of the costs of allowances that airlines can pass through to customers. Windfalls could result if carriers increase ticket prices to reflect the prices of all allowances but only need to pay for a fraction of them, or are able to sell unneeded allowances. On the other hand, researchers concluded that profits would decline to the degree that carriers must purchase a greater share of their allowances and that competition increases.

It is too early to assess the degree to which carriers will be able to pass allowance prices through to customers, or to reduce their emissions growth. In January 2012, immediately following the inclusion of aviation sources in the EU ETS, some major U.S. airlines began to impose \$3 surcharges on passenger tickets for European flights, while German carrier Lufthansa indicates that it would increase its fuel surcharge to reflect the cost of purchasing carbon allowances later

⁵¹ Ibid.

⁵² Questions & Answers on the inclusion of aviation in the EU's Emission Trading System (EU ETS) (20/01/2012), http://eeas.europa.eu/delegations/russia/press_corner/all_news/news/2012/20120120_en.htm.

⁵³ <http://www.bloomberg.com/news/2011-09-26/airlines-may-use-carbon-permit-windfall-to-replace-aircraft-eu-says.html>.

⁵⁴ Malina, Robert, Dominic McConnachie, Niven Winchester, Christoph Wollersheim, Sergey Paltsev, and Ian A. Waitz. “The impact of the European Union Emissions Trading Scheme on US aviation.” *Journal of Air Transport Management* 19, no. 0 (March 2012): 36-41.

in the year.⁵⁵ China has ordered its airlines not to raise ticket prices to cover potential allowance costs.

Competitive Dynamics

Including aviation within the EU ETS may also affect competitive dynamics within the airline industry globally, particularly if the price of allowances were to rise significantly. In the air cargo sector, where leasing and subleasing of aircraft already are common, high allowance prices could encourage carriers subject to EU ETS to sublease space from contract operators that have sufficiently few EU flights that they are not required to obtain allowances. The same applies to chartered passenger flights. As small operators grow, however, they could exceed the *de minimis* criteria and become subject to allowance requirements.

Among airlines providing scheduled international passenger service, EU-based carriers will be required to obtain allowances for a far higher proportion of their total flights than non-European carriers. The non-EU carriers will be able to spread the cost of the allowances across a large volume of flights not subject to allowances, potentially gaining a competitive advantage.

If non-EU carriers were exempted from the EU ETS, as other countries have demanded, they could gain a further cost advantage over their European competitors. Arguably, this could distort competition in the EU market, and reduce the ability of European airlines to pass any additional costs through to customers.

The need to purchase allowances also has the potential to affect the entry of new carriers on routes between the United States and Europe. Because allowance allocations are based on historic emissions, they could disfavor carriers that wish to enter the EU market or to expand more rapidly than their competitors. (China, for example, argues that its carriers will be particularly disadvantaged for this reason.) To alleviate this potential problem, beginning in 2013, the EU will reserve 3% of annual aviation allowances for new or rapidly expanding operators.

Incremental Price per Trans-Atlantic Ticket

One benchmark for assessing the cost to aviation in the EU ETS is the amount it may add to the price of a trans-Atlantic airline ticket. The EU anticipates that the impacts of its ETS will be negligible. According to the European Commission,

The inclusion of aviation in the EU ETS is expected to have a limited impact on ticket prices. Based on current carbon prices, the actual costs per ticket of a transatlantic flight would increase by less than 2 Euro [US\$2.65], assuming that the value of the free allowances would not be passed to the passenger. If it were to be passed through, the ticket price could increase by around 12 Euro [US\$15.85].⁵⁶

⁵⁵ Nancy Trejos, "United-Continental, US Airways, Delta Add Europe Surcharge," *USA Today*, January 5, 2011.

⁵⁶ <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1077>. In other words, if the airlines charge passengers for the value of 100% of allowances (including the 82%-85% they get free), rather than the smaller percentage they may need to purchase to cover their emissions, consumers will pay more.

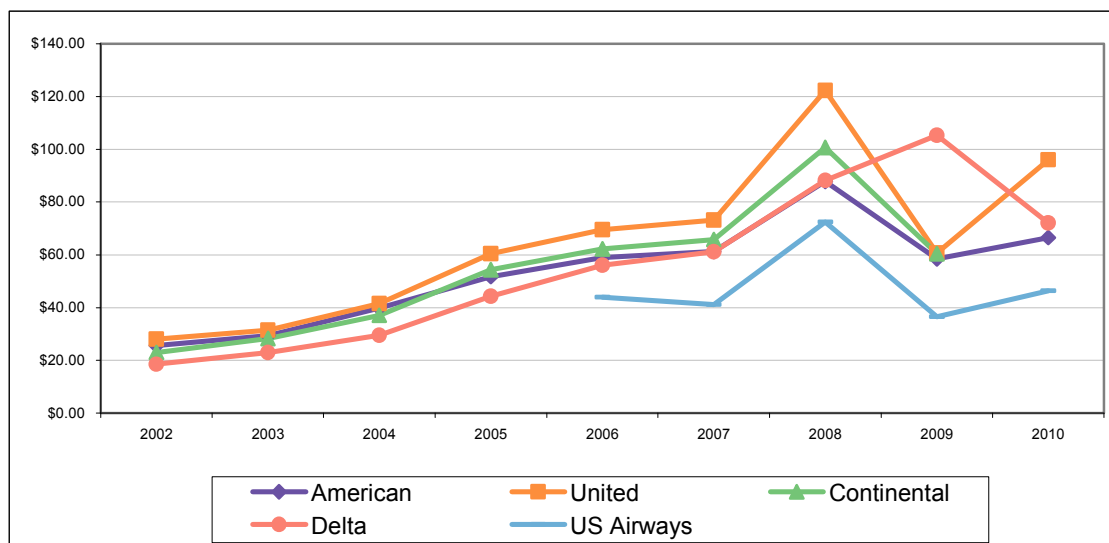
A rough calculation by CRS supports the EU's estimate. According to the EU Commission, the per-passenger emissions on a flight between New York and London are estimated at 385 kg. At a hypothetical EU allowance price of €10 per metric ton, if all allowances needed to be purchased, the incremental cost would be about €3.85 per passenger (about \$5 at current exchange rates, or over US\$6 at the weakest dollar exchange rates of the past few years). However, as aircraft operators receive free 85% of allowances for 2012 and 82% for 2013-2020, the per-passenger costs in the near term could be less than \$1 to \$2 per passenger from New York to London, and proportionally more on longer flights. On most flights between the EU and the United States, the additional per-passenger cost will likely be less than \$5 in the near term, given the high proportion of free allowances provided.

In the near term, the incremental costs of complying with the EU ETS are likely to be small per passenger. This is reflected in the initial responses by several airlines to their new inclusion in the scheme: By the beginning of January 2012, Delta Airlines began to test its ability to pass costs on to its customers by adding a \$3 surcharge to transatlantic tickets, though Delta declined to say that this surcharge is linked to compliance with the EU ETS.⁵⁷ Soon after, additional airlines, including United and American, followed with identical surcharges, as have a variety of foreign airlines. The small size of the surcharges relative to other expenses and charges (e.g., baggage fees and fuel expenses) means that its effects are likely to be difficult to track as compliance and competition play out.

While the per passenger cost may be estimated to be relatively small, it could fluctuate in the future depending on the pricing of emission allowances. Current projections indicate that the market may remain relatively stable in the near term. Some airlines have voiced concerns about potentially volatile allowance prices, coupled with recent volatility in jet fuel prices. However, fuel price increases and allowance prices are likely to move in opposite directions,⁵⁸ with one tending to moderate the effect of the other.

⁵⁷ Note, however, that these concerns reflect, according to economic theory, how market competition should motivate businesses to respond to the policy incentives, to innovate, and to adjust their emissions and costs. Those operators that are able to respond at least cost should gain market share relative to competitors that cannot.

⁵⁸ When fuel prices increase, they will tend to suppress demand for fossil fuels and resultant CO₂ emissions. Thus rising fuel prices will tend to drive down emission allowance prices. Conversely, when emission allowance prices are high, they will tend to suppress demand for fossil fuels and their prices. While large increases in fuel prices may tend to significantly moderate the cost of carbon allowances, increases in the cost of carbon allowances would likely have a much smaller influence on the effect of jet fuel prices and airline operating costs because they are likely to make up a comparatively small proportion of the total costs (as opposed to fuel prices which are a major component of airline costs).

Figure 4. Fuel Expense per Passenger 2002-2010 for Several U.S. Airlines

Source: CRS figure using data from AirlineFinancials.com, extracted January 24, 2012, http://www.airlinefinancials.com/airline_data_comparisons.html.

Notes: Data cover all flights, not just trans-Atlantic or long-haul flights. To the degree that trans-Atlantic flights use more fuel than the average, represented in this figure, their per-passenger fuel expenses would be greater than shown here.

The scale of the impact of the EU ETS may be illustrated by comparing the approximate costs of allowances and jet fuel: According to the Energy Information Administration, one barrel of jet fuel leads to emissions of about 0.40 metric tons of CO₂. In early 2012, the price of an allowance was 9 Euros, or about \$12 per barrel of jet fuel. In comparison, the price of a barrel of jet fuel was almost US\$140 per barrel, having risen from about US\$50 per barrel in 2009.⁵⁹ By comparison, rising fuel expenses are a much greater expense for the aviation industry. The incremental cost of complying with the EU ETS in the near term may be around 5%-10% of the historic increase in fuel expense per passenger witnessed from 2002 to 2010 (**Figure 4**). Rising fuel expenses also require a rising share of airlines' revenues, from around 12%-15% in 2002 to around 26%-35% in 2010. Those higher fuel expenses alone increase incentives for airlines to improve efficiency and deploy biofuels that would, in turn, facilitate compliance with the EU ETS. On the other hand, to the degree that the cost of EU ETS compliance may be small, compared to rising fuel prices, the extra incentive of the EU ETS to reduce emissions would be comparably small.

Significance of Extra EU ETS Costs to U.S. Carriers

Even if the compliance with the EU ETS were to cost several dollars per trans-Atlantic ticket (a small percent change), compliance costs may be understood in the context of broader conditions in the aviation industry: strenuous competition, other rising costs, and strongly fluctuating profit margins.

⁵⁹ IATA, IATA Economics, Jet Fuel Price Monitor, price extracted 5 March 2012. http://www.iata.org/whatwedo/economics/fuel_monitor/Pages/index.aspx.

First, airlines are concerned about effects that any higher ticket prices may have on demand for air services. Other experts estimate that any such impacts on air travel are likely to be small. Though passenger demand is sensitive to ticket prices, it is generally assessed to be somewhat “price inelastic” especially in long-haul aviation.⁶⁰ In other words, an increase in price would result in a proportionately smaller decline in customer demand. Sensitivity to prices varies strongly across fare classes, with first and business class travelers being less price sensitive than economy class travelers. Airlines may choose how to allocate allowance costs among fare classes, including allocating more of a price increase to less sensitive customers.

Second, the incremental costs could reduce operating margins. Faced with demand suppressed by continued economic weakness, coupled with market competition, companies may not be able to pass on the incremental costs of the EU ETS to customers. If they cannot pass on their compliance costs, they may experience lower operating margins and lower profits. If they can pass on the market value of all allowances, including the ones they receive free, their profits may expand. At expected allowance prices, this does not appear to be among the main factors to affect airline profits.

External Objections to Covering Foreign-Based Airlines in the EU ETS

The United States and several other non-European countries have voiced opposition to inclusion of their airlines in the EU ETS. Some countries say that EU regulation of their airlines violates their national sovereignty.

A principal argument is that the scheme requires allowances for the portions of flights to and from the EU that occur outside of EU airspace. This would include portions of flights over countries that are neither the origin nor destination. Several countries contend that this violates their sovereignty. Some say that the required allowances equate to a charge for using a third country's airspace—for example, when a flight from San Francisco to Paris flies over Canada.

Another effect is that a flight from San Francisco to Paris will require more emissions allowances than a flight from New York to Paris, even though the two flights may fly identical flight paths once they enter European airspace. Some allege that this could prompt airlines to stop over flights in countries near the EU (e.g., Morocco) rather than fly long-distance flights directly to or from EU airports.⁶¹

⁶⁰ InterVISTAS Consulting, Inc. *Estimating Air Travel Demand Elasticities: Final Report*. Prepared for the International Air Travel Association, December 28, 2007. This report cautions that price elasticities of demand vary in important ways depending on the type of customer, the scope of price increases, etc. However, it states that the price elasticity of demand for trans-national price increases (i.e., an increase in price for all routes from a location) is about -0.6. That is, for a 1% increase in price, demand might decrease by about 0.6%. Hypothetically, if the cost of a roundtrip transatlantic ticket increased by \$6, or very roughly 1% of a discount economy fare, demand might decrease by about 0.6% (more among low-fare passengers than among high-fare passengers, who also tend to be less price sensitive).

⁶¹ Ernst & Young and York Aviation. *Inclusion of Aviation in the EU ETS: Cases for Carbon Leakage*, October 31, 2008.

Non-European countries assert that the EU's unilateral action to include aviation provisions in the EU ETS undermines ICAO's role as the central forum to address GHG emissions from international aviation, as mandated in the Kyoto Protocol.

The EU has defended its position. EU officials assert that the EU ETS is consistent with the Kyoto Protocol, and that the Kyoto Protocol does not confer an exclusive mandate upon ICAO. They also state that bringing international aviation under the EU ETS does not contradict or undermine ICAO's role and ICAO's actions with regard to the mitigation of CO₂ emissions from aviation sources. In addition, EU officials contend that ICAO's 2004 decision ruling out the option of a *global* emission trading scheme for aviation left the EU free to impose its own emission trading scheme without violating ICAO agreements.⁶² Further, the EU denies that the scheme infringes on national sovereignty, saying that the reach of the aviation provisions is analogous to U.S. security requirements for departing flights that wish to land in the United States.

Litigation: Air Transport Association of America v. Secretary of State for Energy and Climate Change⁶³

The Air Transport Association of America (ATA), along with several airlines based in the United States, challenged Directive 2008/101 in European courts, claiming that the EU law is in breach of both customary international law and various international agreements⁶⁴

The lawsuit was originally brought on December 16, 2009, before the High Court of Justice of England and Wales in the United Kingdom, the administering member State for the airlines involved in the lawsuit.⁶⁵ Because the claims challenged the validity of an EU law, the English court referred the case to the European Court of Justice for a preliminary ruling on July 8, 2010.⁶⁶

⁶² 2008/101/EC, paragraph (9), <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:008:0003:0021:en:PDF>. The relevant text reads:

At the sixth meeting of the ICAO Committee on Aviation Environmental Protection in 2004, it was agreed that an aviation-specific emissions trading system based on a new legal instrument under ICAO auspices seemed sufficiently unattractive that it should not then be pursued further. Consequently, Resolution A35-5 of the ICAO's 35th Assembly held in September 2004 did not propose a new legal instrument but instead endorsed open emissions trading and the possibility for States to incorporate emissions from international aviation into their emissions trading schemes. Appendix L to Resolution A36-22 of the ICAO's 36th Assembly held in September 2007 urges Contracting States not to implement an emissions trading system on other Contracting States' aircraft operators except on the basis of mutual agreement between those States. Recalling that the Chicago Convention recognises expressly the right of each Contracting Party to apply on a non-discriminatory basis its own air laws and regulations to the aircraft of all States, the Member States of the European Community and fifteen other European States placed a reservation on this resolution and reserved the right under the Chicago Convention to enact and apply market-based measures on a non-discriminatory basis to all aircraft operators of all States providing services to, from or within their territory.

⁶³ This section was prepared by Daniel T. Shedd, CRS Legislative Attorney, 7-8441.

⁶⁴ Case C-366/10, *Air Trans. Assoc. of America v. Sec. of State for Energy and Climate Change*, 2011, available at <http://curia.europa.eu/juris/document/document.jsf?text=&docid=117193&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=381567>.

⁶⁵ *Id.*

⁶⁶ *Id.*

The ATA⁶⁷ challenged the law on several grounds, claiming that the EU law violated the Chicago Convention, the Open Skies Agreement⁶⁸ between the United States and the EU, the Kyoto Protocol, and various principles of customary international law regarding airspace sovereignty and the freedom to fly over the high seas.⁶⁹ On December 21, 2011, the European Court of Justice, the highest court in the European Union, rejected these claims and upheld the law.⁷⁰ This ruling cannot be appealed and will be returned to the UK court to implement.

The ATA's Arguments

The ATA attacked the Directive on multiple grounds. It objected to the EU's unilateral imposition of a cap-and-trade system on airlines that are not based in the EU. The ATA argued that any environmental standards or market-based mechanisms to reduce GHG from aviation should be implemented through ICAO. The ATA contended that unilateral imposition could lead to the double regulation of aircraft emissions if other countries established their own measures for reducing aviation emissions. The ATA further objected to the Directive because it covers emissions that occur outside of EU airspace, when an aircraft is traveling to or from the EU on an international flight. Finally, the ATA claimed that the Directive's requirement to surrender allowances amounts to an impermissible tax or charge on airline fuel.

Summarizing the ATA's arguments, the Advocate General for the European Court of Justice stated:

First, they contend that the European Union is exceeding its powers under international law by not confining its emissions trading scheme to wholly intra-European flights and by including within it those sections of international flights that take place over the high seas or over the territory of third countries. Secondly, they maintain that an emissions trading scheme for international aviation activities should be negotiated and adopted under the auspices of the ICAO; it should not be introduced unilaterally. Thirdly, they are of the opinion that the emissions trading scheme amounts to a tax or charge prohibited by international agreements.⁷¹

Opinion of the European Court of Justice

The European Court of Justice decided this case by answering two questions. First, the court examined whether the plaintiff airline companies and associations, as individuals rather than state actors, could use any of the international agreements or principles of customary international law to challenge the Directive's validity. Second, the court examined whether international agreements and customary international law would invalidate the Directive if the ATA had rights to challenge it.

⁶⁷ The ATA has since changed its name to Airlines for America, A4A.

⁶⁸ The U.S.-EU Air Transport Agreement, signed April 30, 2007, <http://www.state.gov/e/eb/rls/othr/ata/e/114768.htm>.

⁶⁹ *Id.*

⁷⁰ *Id.*

⁷¹ Opinion of Advocate General Kokott, Case C-366/10, *Air Trans. Assoc. of America v. Sec. of State for Energy and Climate Change*, 2011, available at <http://curia.europa.eu/juris/document/document.jsf?text=&docid=110742&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=381567>.

In answering the first question, the court found that the ATA could not challenge the Directive under the Chicago Convention, because the EU is not a Party to the Convention, or the Kyoto Protocol, because the Kyoto Protocol does not grant an individual an interest that could be raised before the court. The court found, however, that the ATA could challenge the Directive under parts of the Open Skies Agreement and customary international law. In answering the second question, the court determined that the Directive is valid under the Open Skies Agreement and the principles of customary international law.

Chicago Convention and Kyoto Protocol: The ATA Cannot Use the Chicago Convention or Kyoto Protocol to Challenge the Validity of Directive 2008/101

The court reasoned that for an individual to be able to challenge the validity of an EU law on the grounds that it violates a separate international agreement, the EU must be bound by the international agreement.⁷² The court determined that although all 27 of the European Union member States are bound by the Chicago Convention, the EU, as a distinct entity, has not signed the agreement. The EU merely holds an observer status under the Chicago Convention. The court determined that the EU is therefore not bound by the Chicago Convention and the ATA could not use the Chicago Convention to challenge the validity of an EU law.⁷³

The court found that the EU is bound by the Kyoto Protocol. However, the court reasoned that in order for an individual to use an international agreement to challenge the validity of an EU act, the “nature and broad logic” of the international agreement “must be capable of conferring rights which an individual can invoke before the courts.”⁷⁴ Furthermore, the specific provisions relied upon must be “unconditional and sufficiently precise to enable an individual to invoke them before the courts.”⁷⁵ On this basis, the court rejected ATA’s arguments raised under the Kyoto Protocol. The ATA argued that, under Article 2(2) of the Kyoto Protocol, the EU must only seek to reduce emissions from aviation activities by working through the ICAO. However, the court noted:

[T]hat provision, as regards its content, cannot in any event be considered to be unconditional and sufficiently precise so as to confer on individuals the right to rely on it in legal proceedings in order to contest the validity of Directive 2008/101. Consequently, the Kyoto Protocol cannot be relied upon in the context of the present reference for a preliminary ruling for the purpose of assessing the validity of Directive 2008/101.⁷⁶

Thus, the ATA could not rely upon the Chicago Convention or the Kyoto Protocol to challenge the validity of the EU law.

⁷² *Id.* at ¶ 52.

⁷³ *Id.* at ¶ 60, 71-72. The court noted that if the EU had assumed all of the powers exercised by the EU member States under the Chicago Convention, then the EU would be bound by the Convention. However, the court stated that because the powers “have not to date been assumed in their entirety by the European Union, the [European Union] is not bound by that convention.” *Id.*

⁷⁴ Opinion of Advocate General Kokott, Case C-366/10, *Air Trans. Assoc. of America v. Sec. of State for Energy and Climate Change*, ¶ 71, 2011; Case C-366/10, *Air Trans. Assoc. of America v. Sec. of State for Energy and Climate Change*, ¶ 74, 2011.

⁷⁵ *Id.* at ¶ 74, 2011.

⁷⁶ Case C-366/10, *Air Trans. Assoc. of America v. Sec. of State for Energy and Climate Change*, ¶ 77-78, 2011.

Ruling: Directive 2008/101 Does Not Violate the Open Skies Agreement or the Principles of Customary International Law

Despite disallowing the ATA to use the Chicago Convention or the Kyoto Protocol to challenge the validity of the Directive, the court determined that the ATA could use Article 7 (aircrafts shall be subject to the laws of a state while it is within that state's territory), portions of Article 11 (customs taxes or fees cannot be imposed on fuel that is onboard an aircraft), and a portion of Article 15(3) (environmental regulations must be nondiscriminatory and compliant with ICAO standards) of the Open Skies Agreement to challenge the Directive's validity.⁷⁷ Furthermore, the ATA could challenge the Directive pursuant to the customary international law principles of (1) complete state sovereignty over its airspace; (2) freedom of flight over the high seas; and (3) the high seas are free from state sovereignty.⁷⁸ However, the court found that Directive 2008/101 is consistent with the Open Skies Agreement and customary international law.

The court disagreed with ATA's claim that Directive 2008/101 violates Article 7 of the Open Skies Agreement and various principles of customary international law because it regulates aircraft both when they are entering and departing the European Union, and when they are flying over the high seas or a third country's territory.⁷⁹ The court declared that the Directive does not impermissibly regulate aircraft extraterritorially. The court noted that the trading scheme is not triggered by aircraft operators flying over the high seas or over the territory of any country. Rather:

[i]t is only if the operators of such aircraft choose to operate commercial air routes arriving at or departing from aerodromes situated in the territory of the Member States that, because their aircraft use such aerodromes, those operators are subject to the allowance trading scheme... It follows that Article 7(1) of the Open Skies Agreement does not preclude the application of the allowance trading scheme set up by Directive 2003/87 to operators of aircraft, such as airlines established in the United States, when their aircraft engage in flights which arrive at or depart from [the European Union].⁸⁰

The court's reasoning also led it to dismiss ATA's arguments based on customary international law. It reiterated that the mere fact that the number of allowances is determined by the full length of a flight does not mean that the Directive regulates aircraft operators outside the EU's jurisdiction.⁸¹ Again, the court emphasized that the Directive only regulates aircraft that choose to land at or depart from an EU aerodrome and does not regulate aircraft that merely fly over the high seas or through another country's airspace. The court determined the Directive to be valid under these principles of customary international law.⁸²

With regard to Article 11 of the Open Skies Agreement, the court disagreed with ATA's position that the Directive, which calculates how many allowances must be surrendered by measuring how much fuel has been burned, imposes an impermissible tax or duty levied on airline fuel.⁸³ The court declared that the law "constitutes a market-based measure and not a duty, tax, fee or charge

⁷⁷ *Id.* at ¶ 111, 2011.

⁷⁸ *Id.*

⁷⁹ *Id.* at ¶ 131.

⁸⁰ *Id.* at ¶ 132-35.

⁸¹ *Id.* at ¶ 121-30.

⁸² *Id.* at ¶ 121-129.

⁸³ *Id.* at ¶ 136.

on the fuel load.”⁸⁴ The court distinguished the trading scheme from a tax by noting that an airline, under the trading scheme, could potentially make a profit by burning less fuel and selling excess allowances.

The court also found the Directive to be compliant with Article 15(3) of the Open Skies Agreement. The ATA argued that the Directive is incompatible with ICAO environmental standards and impermissibly limits the volume and frequency of air traffic in contravention to Article 15(3).⁸⁵ However, the court again dismissed ATA’s arguments and ruled that the Directive does not infringe on any ICAO environmental standards, finding that there is no indication that the “implementation of market-based measures ... would be contrary to the aviation environmental standards adopted by the ICAO.”⁸⁶ The ATA further argued that, because the EU acted unilaterally, the Directive could lead to double regulation if another country imposed its own market-based mechanisms on the aviation sector. Although an ICAO resolution indicates that market-based mechanisms “should not be duplicative,” the court noted that the Directive contains provisions that enable the EU to alter its market-based system to ensure that airlines are not doubly regulated when operating on international routes.⁸⁷

The court noted that under Article 15(3) of the Open Skies Agreement, a Party is permitted to limit the volume and frequency of air traffic for environmental reasons, but such environmental measures must be nondiscriminatory.⁸⁸ Because the Directive regulates both international and domestic commercial flights that arrive in or depart from the EU in the same manner, the court held that the Directive is not discriminatory and “not invalid in light of Article 15(3) of the Open Skies Agreement.”⁸⁹

Because the Court of Justice has upheld the validity of Directive 2008/101, the law will remain in force and airlines using EU airports will be required to participate in the EU ETS.

U.S. Government Actions

The United States government has objected to the inclusion of aviation in the EU ETS and warned that inclusion of U.S. airlines in the scheme could spark protracted trade disputes. A December 16, 2011, letter from Secretary of State Hillary Clinton and Transportation Secretary Ray LaHood to European Commission officials asserted that the EU ETS is inconsistent with international law and urged the EU to work with the broader international community in the context of the ICAO forum to address the challenges of reducing aviation emissions.⁹⁰

Also on December 16, 2011, the U.S. Department of Transportation (DOT) issued an order requiring nine major European airlines and seven U.S. airlines to submit detailed data on the free allowances allocated under the EU ETS, as well as passenger and cargo data.⁹¹ The U.S. carriers

⁸⁴ *Id.* at ¶ 147.

⁸⁵ *Id.* at ¶ 148.

⁸⁶ *Id.* at ¶ 149.

⁸⁷ *Id.* at ¶ 150-51.

⁸⁸ *Id.* at ¶ 153-54.

⁸⁹ *Id.* at ¶ 155-57.

⁹⁰ Madhu Unnikrishnan, “U.S. Threatens Action Against EU ETS,” *Aviation Daily*, December 20, 2011.

⁹¹ “U.S. Demands Data From European and US Airlines As It Fires Off First Retaliatory Salvo In Growing Dispute (continued...)”

are also required to submit information regarding any amounts paid to administering European countries under the EU ETS for the purchase of auctioned carbon allowances. A4A expressed its approval of the action. A4A noted that the information can be used to assist in its arguments against the application of the EU ETS to U.S. airlines, although it remains unclear how the data could specifically be used.⁹²

As is typical in national environmental laws, the EU ETS law provides for penalties against aircraft operators that do not comply with its requirements. For its part, the United States has responded by threatening trade sanctions if the EU makes an attempt to force foreign airlines to comply with the emissions trading system.⁹³

Conceivably, the Administration could agree to an ICAO instrument that could be achieved under existing U.S. authorities and appropriated resources. For example, the U.S. Environmental Protection Agency (EPA) has authority under the Clean Air Act to regulate emissions, including GHG emissions, from aircraft. It already uses this authority to bring U.S. aircraft emission standards (for example, for nitrogen oxides) in line with those agreed under ICAO. It could also do so for CO₂. The Administration has shown no indication, however, that it would agree to any requirements that are not: “technology-following”;⁹⁴ agreed with FAA, EPA, and other relevant agencies (e.g., the Navy on biofuels); and well accepted by the U.S. aviation industry, as in the past.

The Article 84 Option

A possible course of action for countries opposing the EU ETS is to file a formal complaint before ICAO in what is referred to as an Article 84 filing.⁹⁵ Article 84 of the Chicago Convention establishes a formal ICAO process for settling differences among member countries. Under ICAO rules, the complaining state would submit an Article 84 application including detailed facts, supporting data and legal arguments, and relief sought. The member country against which the complaint is levied would be informed of the complaint and provided with a copy of the

(...continued)

With EU Over ETS,” *GreenAir Online.com*, available at <http://www.greenaironline.com/news.php?viewStory=1412>.

⁹² Airlines for America, *A4A Comment on DOT Request for Airline Emissions Data*, Washington, DC, December 16, 2011, available at http://www.airlines.org/Pages/news_12-16-2011.aspx.

⁹³ “Aviation and Emissions Trading,” July 10, 2008, EurActiv.com at <http://www.euractiv.com/en/climate-change/aviation-emissions-trading/article-139728>.

⁹⁴ Regulations are sometimes characterized as “technology-following” or “technology-forcing.” Technology-following regulations inscribe the performance of technologies already widely commercially deployed. By the time such regulations are adopted, most of the regulated entities will already exceed the standard. Technology-following standards act on so-called technology late-adopters or laggards. In contrast, technology-forcing regulations require, or are based on, performance of leading-edge technologies that may be commercially in use by early adopters, or may be demonstrated but not yet commercially deployed on a significant scale. (In the latter case, the regulations allow a transition period from current to forced technology performance.) Most industrialized countries, including the United States, tend to rely on technology-forcing regulations. Some companies and countries use technology-forcing regulations to gain competitive advantage. ICAO’s recommended standards are technology-following. See, for example, the discussion in Warwick, Graham. “Aircraft Emissions Standards Hard To Craft.” *Aviation Week* (August 15, 2011). http://www.aviationweek.com/aw/jsp_includes/articlePrint.jsp?headline=Aircraft%20Emissions%20Standards%20Hard%20To%20Craft&storyID=news/awst/2011/08/15/AW_08_15_2011_p45-352574.xml.

⁹⁵ On June 5, 2012, in a hearing before the Senate Committee on Commerce, Science, and Transportation, Secretary of Transportation Ray LaHood confirmed that the U.S. government is contemplating filing a complaint under Article 84.

complainant's submittal and offered the opportunity to present a counterclaim. Under a timetable set by the ICAO Council, the parties would be given the opportunity to file additional pleadings and make oral arguments, which may include the testimony of witnesses or experts. Ultimately, the Council, after hearing oral arguments in the case, would render a decision. The proceedings may be discontinued if the applicant provides written notification that it does not wish to proceed, unless the respondent specifically objects within a specified timeframe set by the Council. As previously noted, the EU is not a member of ICAO. Therefore, any Article 84 filing in the case of the EU ETS would have to be levied against one or all of its member States.

International Actions

Many countries have opposed inclusion of international aviation in the EU ETS. On July 28, 2011, member countries of the Latin American Civil Aviation Commission signed a joint declaration urging the EU not to unilaterally impose its ETS on foreign flights without prior agreement with affected countries. The countries requested that ICAO continue its work toward a framework for market-based criteria for aircraft emissions reductions or greenhouse gas limitations.

Subsequently, on September 30, 2011, 26 ICAO member countries including the United States, China, India, Japan, Korea, Russia, Mexico, and several Latin American countries, signed a joint "Delhi Declaration" at the New Delhi meeting of the ICAO Council opposing inclusion of international aviation in the EU ETS. Instead, the declaration supports ICAO efforts to develop meaningful aircraft carbon emissions standards with a target of adopting such standards at the General Assembly in 2013. It urges the EU to refrain from including non-EU flights in the EU ETS and to work collaboratively with the international community. Besides EU Member States, a number of countries did not join the declaration: Australia, Canada, New Zealand, and others.

Since the aviation component of the EU ETS began in January 2012, some governments have instructed their airlines not to participate, threatened to sue the EU, or suggested they might impose trade sanctions. Less publicly, there are indications that some governments may be negotiating to explore exemptions for their airlines based on "equivalent measures" or other arrangements.⁹⁶ For example, the Chinese government unveiled a plan to reduce its airlines' CO₂ emissions intensity (emissions per revenue metric ton-kilometer) to 22% below 2005 levels by the end of 2020.⁹⁷ EU officials have stated that they are exploring whether China's policies might be granted an equivalent measures exemption.⁹⁸

⁹⁶ Mukherjee, Kritivas. "India, EU try to break logjam over airline carbon tax." *Reuters Online*, February 3, 2012. <http://www.reuters.com/article/2012/02/03/uk-india-eu-airlines-idUSLNE81202520120203>.

⁹⁷ Flieger, Arthur. "China's Civil Aviation to Cut Emissions by 22% by 2020." *Flieger Law*, 2011. <http://fliegerlaw.com/blog/?p=71>. See also Smets, Isabelle. "Chinese airlines banned from participating in ETS." *Europolitics*. Brussels, February 6, 2012. <http://www.europolitics.info/europolitics/chinese-airlines-banned-from-participating-in-ets-art325264-46.html>: "Concerning China in particular, the Commission says it is prepared to discuss the possibility for airlines to be exempted from the system if China sets up 'equivalent measures' designed to reduce CO₂ emissions from air transport (this is a case for exemption foreseen in the EU Directive). Climate Action Commissioner Connie Hedegaard described as a 'step in the right direction' the publication by China's civil aviation authority, on 13 April 2011, of guidelines requiring national airlines to improve their energy efficiency and reduce their emissions by 22% from 2005 levels."

⁹⁸ "EU Threatens China, India over Airline Emissions." *EurActiv.com*, May 15, 2012. <http://www.euractiv.com/transport/eu-threatens-china-india-airline-emissions-news-512722>.

Indian sources followed China's lead in urging their airlines not to comply or in threatening retaliatory fees or other reactions.⁹⁹ The Indian government in 2011 asked carriers not to submit their emissions data to the EU, and two India carriers (like 10 Chinese carriers) subsequently missed the March 31, 2012, date for reporting 2011 emissions. EU administering states have sent letters to the carriers with a new mid-June deadline and warning of possible sanctions for continued non-compliance.¹⁰⁰

Representatives of 26 countries, a "coalition of the unwilling" including China, India, Japan, Russia, the United Arab Emirates, and the United States, are meeting to seek a common response to the EU inclusion of international aviation. For example, in February 2012, many of those countries identified a variety of possible responses, including prohibiting non-EU airlines from participating in the EU ETS, refusing to discuss operating rights with EU aircraft operators, imposing retaliatory taxes on EU airlines, or exercising Title 84 Settlement of Differences rules under ICAO (see "The Article 84 Option").¹⁰¹ Those governments said, however, that they would not undertake a joint response; each government would select its own appropriate responses. According to news reports, the Department of State has said it would be "premature" to discuss specific retaliatory measures.¹⁰²

An EU official noted that "any measures that discriminate against European companies will obviously be taken to ... international court."¹⁰³ Senior EU officials have indicated that a global treaty under ICAO that includes emission targets and "robust measures" could lead to EU flexibility in applying the EU ETS law. They see the ICAO aim to propose global market-based measures by the end of 2012 as an avenue for resolving the conflict.

Activities in ICAO

ICAO recognizes the Kyoto Protocol requirement for industrialized nations to reduce greenhouse gas emissions. Also, the 1997 Kyoto Protocol (to which the United States is not a Party) specified that the industrialized country Parties should pursue limitation or reduction of greenhouse gas (GHG) emissions from aviation bunker fuels, working through ICAO.¹⁰⁴

Through the 2000s, the EU has warned that, without stronger action under ICAO, it would include the aviation sector in the EU ETS. In October 2011, faced with the 2012 implementation of the EU's cap on aviation emissions, the ICAO Council agreed to accelerate its work and

⁹⁹ The Hindu Business Line. "Retaliatory Action Likely Against EU for Carbon Tax on Airlines from India." January 30, 2012. <http://www.thehindubusinessline.com/industry-and-economy/article2845392.ece>.

¹⁰⁰ "EU Threatens China, India over Airline Emissions." EurActiv.com, May 15, 2012. <http://www.euractiv.com/transport/eu-threatens-china-india-airline-emissions-news-512722>.

¹⁰¹ "Joint declaration of the Moscow meeting on inclusion of international civil aviation in the EU-ETS." As reported by *Russian Aviation*. Moscow, 22 February. <http://www.ruaviation.com/docs/1/2012/2/22/50/print/>.

¹⁰² "UPDATE 4-Foes of EU airline CO2 rules agree on tactics." Reuters.com, February 22, 2012. <http://www.reuters.com/article/2012/02/22/eu-airlines-idUSL5E8DM3YD20120222>.

¹⁰³ EU Ambassador to New Delhi Joao Cravinho, as quoted in Euroactiv.com, "EU envoy pushes airline carbon law waivers," 24 January 2012. <http://www.euractiv.com/climate-environment/eu-envoy-pushes-airline-carbon-law-waivers-news-510351>.

¹⁰⁴ Article 2.2 of the Kyoto Protocol.

continue to explore market-based measures to “reach a global solution.” **Appendix B** describes the major related activities and policies of ICAO to address GHG.

Latest ICAO Policy

In November 2011, the ICAO Assembly agreed to an aspirational goal of improving fuel efficiency by 2% annually and stabilizing its global CO₂ emissions at the 2020 levels. The ICAO Assembly has committed to making further progress, focusing on (1) States’ action plans and assistance to States, (2) sustainable alternative fuels for aviation, (3) exploration of global schemes for market-based measures, and (4) global aspirational goals, in order to move international aviation closer to a sustainable future. It says that it has shifted from a “standards and policies setting” phase to an “implementation” mode, based on voluntary submission of action plans by member States.

Also in November 2011, a majority of ICAO member States adopted a declaration urging the EU and its member States to refrain from including international aviation operations to or from EU member States in the EU emissions trading system. The EU member States, Australia, New Zealand, and several other countries submitted reservations against this resolution or did not vote to support it. By consensus, the member States confirmed the important role of ICAO and urged acceleration of ICAO’s work on market-based measures (MBMs). The ICAO statement to the 2011 UNFCCC negotiations in Durban urged: “It is of utmost importance that market-based measures for international aviation should be treated as one element of ICAO’s comprehensive mitigation strategy to achieve the global aspirational goals, as part of global solutions for the sustainable future of international aviation, and not in isolation.”¹⁰⁵

To this end, ICAO agreed to develop by the end of 2012 “a clear roadmap towards the development of global solutions.”¹⁰⁶

Congressional Action

Despite objections by the U.S. and other governments, the EU has stated that flights to and from the EU will remain covered by the EU ETS unless they are exempted due to “equivalent measures” in other countries, or unless the EU determines that a global, binding agreement has been reached under ICAO or the UNFCCC that would reduce aviation emissions by at least as much as the EU ETS. Aviation representatives have raised the issue to Members of Congress.

Some Members of Congress have objected to coverage of U.S. international aviation by the EU ETS and may consider further legislative responses to the EU action. A sense of the Congress resolution was agreed by House and Senate conferees and was included in the FAA Modernization and Reform Act of 2012 (P.L. 112-95). Specifically, Section 509 of the act expresses the sense of the Congress that implementation of international aviation provisions of the EU ETS is inconsistent with the Chicago Convention on International Civil Aviation and other

¹⁰⁵ ICAO, “Statement from the International Civil Aviation Organization (ICAO) to the thirty-fifth Session of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA 35)” (Durban, South Africa; November 28 to December 3, 2011).

¹⁰⁶ *Ibid.*

relevant aviation agreements, and is antithetical to building international cooperation to address effectively GHG emissions from international civil aviation. It expresses a view that the EU should instead work through ICAO to develop a consensual approach, and holds that the U.S. government should use all available political, diplomatic, and legal tools to ensure that the EU ETS is not applied to U.S.-registered aircraft.

Other bills in the House and Senate seek more specific actions to exclude U.S. aircraft from participating in the EU ETS. In October 2011, the House of Representatives passed H.R. 2594, the European Union Emissions Trading Scheme Prohibition Act of 2011. It would prohibit U.S. aircraft operators from participating in the EU ETS. It also would direct the Administration to negotiate and take other actions to ensure that U.S. civil aircraft operators are “held harmless” by any unilaterally imposed EU regulation.

A companion Senate bill, S. 1956, was introduced in December 2011. The Senate bill is similar to H.R. 2594. However, it would give greater flexibility to the Secretary of Transportation to prohibit U.S. carriers from complying with the EU ETS, basing it on a determination that doing so would be in the public interest.

Among the concerns expressed in both bills are that:

- The EU scheme was imposed unilaterally.
- Non-EU aircraft operators must have allowances to cover their emissions over non-EU countries and in international airspace for flights to and from the EU.
- The EU’s coverage of international aviation emissions undermines cooperation under ICAO.
- The EU law does not require administering States to use the revenues collected from the aviation allowances for environmental purposes in the same sector.
- EU responses to the objections raised by the U.S. government have been deemed unsatisfactory.

If either of the bills were to be enacted, the language could pose challenges for U.S. aircraft operators serving the EU. Were the Secretary of Transportation to prohibit them from participating in the EU ETS, that could be construed as an instruction not to comply with the laws of the EU and its member States. This could prevent those operators from receiving their shares of allowances.¹⁰⁷ It also could subject those operators to non-compliance penalties, including exclusion from the EU aviation market.

Several courses of action for Congress seem possible, perhaps in conjunction with the Administration:

- prohibit U.S. aircraft operators from participating in the EU ETS and let play out any non-compliance actions on the part of EU administering authorities and U.S. Administration responses;
- continue political pressure on the EU and its member States to amend their laws governing inclusion of aviation in the EU ETS;

¹⁰⁷ The first allocation of emission allowances to aircraft operators is February 28, 2012.

- pass a resolution encouraging ICAO to accelerate work on adoption of a global trading scheme, CO₂ limits on aircraft engines, or other actions to limit international aviation emissions;
- encourage the Administration to pursue action under the World Trade Organization(WTO), although the basis for action may be undetermined;¹⁰⁸
- support domestic programs, under existing or new authorities, that the EU might accept as “equivalent measures” and facilitate economical compliance of U.S. aircraft operators with the EU ETS requirements, such as continued development and deployment of biomass-based aviation fuels, or hypothetically, a U.S. emissions charge-and-rebate scheme;
- support domestic actions that provide benefits to the United States, such as improvements in air traffic management, research in more fuel efficient equipment design, etc., that would also reduce U.S. aviation emissions. Such actions might be bundled into the voluntary national program encouraged by ICAO and negotiated with EU as justification to exempt U.S. carriers arriving in EU airports.

Other options may be proposed as the debate evolves.

Conclusions

1. The European Union is bound by international and domestic laws to reduce its greenhouse gas emissions to 20% below 1990 levels by 2020. As of 2009, aviation was the largest source of GHG emissions not yet covered by measures designed to reduce GHG emissions. As the EU did not foresee effective global measures emerging from cooperation under ICAO, as mandated under the 1997 Kyoto Protocol, the EU extended its Emissions Trading Scheme (EU ETS) to control aviation emissions effective January 1, 2012. (Australia and New Zealand have also included aviation in their domestic programs, but not international flights to and from their countries.)
2. The European Court of Justice (ECJ) has ruled that including aviation in the EU ETS is lawful according to international customary law and bilateral aviation treaties. As the ECJ is the highest court in the EU, there is no appeal to this decision. As such, the EU has proceeded to implement its law, as have EU member States, which have transposed EU law into their national laws.
3. Reportedly, all major U.S. aircraft operators have been complying with the EU ETS requirements (reporting requirements began in 2010). None has said publicly that it will not continue to comply in the system. Several Chinese and India carriers, however, have missed a March 31, 2012, reporting deadline, and EU administering states may apply penalties if the carriers miss a new mid-June deadline. A checkpoint will occur on April 30, 2013, when aircraft operators must

¹⁰⁸ See, for example, Bartels, Lorand. “The Inclusion of Aviation in the EU ETS: WTO Law Considerations.” ICTSD Trade and Sustainable Energy Series No. 6 SSRN eLibrary (November 15, 2011) (suggesting that the EU ETS may not be justifiable under WTO law).

- submit allowances sufficient to cover their emissions in 2012 for flights to and from the EU ETS countries.
4. H.R. 2594 (passed by the House in October 2011) and S. 1956, the European Union Emissions Trading Scheme Prohibition Act of 2011, if enacted, would direct the Secretary of Transportation to prohibit U.S. aircraft operators from complying with the EU ETS. This could force them into making a choice of breaking either U.S. or EU law and subject them to financial or even access penalties. Congress may further consider and take legislative action in 2012.
 5. The United States Government has opposed unilateral imposition of the EU ETS on emissions from flights, or portions of flights, that occur outside of EU airspace. China, India, Russia, and other countries, as well as many aviation associations, have also objected strenuously to coverage of international aviation. China has threatened that its carriers will not pay for emission allowances if they are needed to comply with the system
 6. As the International Air Carriers Association (IACA) has stated, "... the real issue is political, not legal."¹⁰⁹ The airline industry foresees resolution ultimately found working through ICAO, not the courts. The EU continues to insist that it would prefer expeditious agreement under ICAO to an effective *global* scheme to reduce international aviation emissions, but that it will implement its laws in the absence of a multi-lateral agreement.
 7. ICAO has agreed to accelerate some of its work on CO₂ standards for new aircraft, "drop-in" biomass fuels for aircraft, voluntary national programs to address emissions from aviation, other research into more efficient aviation technologies, and market-based measures (MBMs)—potentially including emissions trading systems. It remains unclear whether any ICAO agreements would be "aspirational" and voluntary, as past decisions, or whether they would have some degree of legal force to assure implementation by all Members. The EU insists that any ICAO must be a treaty, having binding requirements.
 8. Additional questions about the future work of ICAO arise: first, whether ICAO will maintain its distinction of responsibilities between "developed" and "developing" countries—a bifurcation that the Durban Platform¹¹⁰ under the UNFCCC has apparently removed; and, second, how ICAO may pursue apparent agreements in its resolutions that financing would be provided to developing countries for their actions to abate aviation emissions.
 9. The EU intends to continue to implement the aviation components of the EU ETS, although it has left open the possibility of exempting certain flights. In particular, the EU may exempt flights arriving in EU airports from other countries that adopt "equivalent measures" to address aviation emissions as long as those measures are non-discriminatory.
 10. One EU official stated that the EU would agree to suspend inclusion of aviation in the ETS only if a new global ICAO scheme met three conditions: it must deliver more emissions reductions than the EU ETS on its own; it must have

¹⁰⁹ IACA, "Emissions Trading Concerns Will be Solved Through ICAO, not in Court." News and Views, 1 January 2012, <http://www.iaca.be/index.cfm?9AAC75F4-1851-F050-B2AF-25B0B4948D39>.

¹¹⁰ <http://unfccc.int/2860.php>.

- targets and measures; and any action must be non-discriminatory and apply to all airlines. Alternatively, EU law allows exemptions for incoming flights from countries that have adopted “equivalent measures” to reduce emissions.
11. The political conflict on aviation emissions could decline over the next two years as aircraft operators improve their understanding and ability to comply with the EU ETS requirements. Various trends are likely to influence positions, including airlines’ efforts to improve fuel efficiency, and growth of demand for air services if or as economic recovery continues. Current conflict also may be resolved by multi-lateral agreements under ICAO or the United Nations Framework Convention on Climate Change. Alternatively, the conflict could continue, with potential financial sanctions, retaliatory trade actions, and economic ramifications.
 12. Additional strategies to reduce or resolve the dilemma may exist. For example, it is unclear whether options have been explored bilaterally between the United States and the EU regarding types of measures that might provide domestic benefits, in the United States’ view, and satisfy the EU’s goal of reducing aviation emissions. New options might facilitate resolution of the conflict between the two governments. For example, some options in the United States may exist that would yield domestic benefits, notably improving air traffic efficiency, or supporting new infrastructure for aviation biofuels, that would also reduce aviation emissions.

Appendix A. Notable Dates for Aviation in the EU ETS

19 November 2008	EU Directive 2008/101/EC amends the EU ETS Directive (2003/87/EC) to include aviation activities
9 February 2009	The EU Commission publishes its preliminary list of aircraft operators included in the EU ETS
2 August 2009	The Commission publishes its Guidance on Annex I activities and its Decision on historic aviation emissions to be used for benchmarking aviation emissions in the EU ETS
1 January 2010	Start of first monitoring period of aviation activities and emissions, for determining historical annual emissions by aircraft operators
1 January 2011	Start of second monitoring period for determining annual emissions
31 March 2011	Deadline for aircraft operators to submit 2010 emissions data and 2010 benchmark data
1 April 2011	EU ETS expands to include Iceland, Liechtenstein, and Norway (EFTA, or known collectively with the EU as EU-EFTA)
20 April 2011	EU publishes updated list of aircraft operators subject to the EU ETS (Reglement 394/2011)
26 September 2011	EU Commission sets the ton-km benchmark used to allocate emissions allowances to aircraft operators
1 January 2012	Start of third monitoring period for annual emissions; beginning of first compliance period with emissions limits
31 March 2012	Deadline for air carriers to submit emissions reports for 2011
28 February 2012	Administering Authorities in EU Member States issue allowances for 2012 to those aircraft operators that successfully applied for them
11 June-29 June 2012	ICAO 196 th Council Phase
17 September-5 October 2012	ICAO Council Session—Committee Phase
29 October-16 November 2012	ICCAO 197 th Council Phase
31 March 2013	Aircraft operators' 2012 Annual Emissions reports due
30 April 2013	Final date for covered aircraft operators to surrender allowances for 2012 emissions to Administering Authorities

Appendix B. ICAO and Its Approach to Addressing GHG Emissions

Background on ICAO

Under the Chicago Convention, States agree to undertake “to collaborate in securing the highest practicable degree of uniformity in regulations . . . in all matters in which such uniformity will facilitate and improve air navigation.”¹¹¹ The Chicago Convention also prohibits States from relying upon the State of registration of aircraft as a basis for discriminating, either in promulgating laws affecting international civil aviation or in allowing access to airports.¹¹²

ICAO develops non-binding standards, guidance, and policies for States and the aviation industry to use. ICAO does not have regulatory authority. Once it adopts guidance or standards, it is up to member States to enact ICAO’s recommendations into law or regulation and to enforce them, as appropriate. ICAO has dispute resolution procedures when disagreements arise on how States may be implementing their regulations or ICAO’s resolutions.

ICAO’s Approach to Addressing GHG Emissions

ICAO has focused on four approaches to address GHG emissions from international aviation:

- development of data and scientific background;
- market-based measures:
 - emissions levies (or fees);
 - emissions trading systems;
 - voluntary measures, including national action plans;
- technological solutions; and
- operational measures.

Most of this work is conducted by the 21-member Committee on Aviation Environmental Protection (CAEP),¹¹³ which recommends standards that may be adopted by the ICAO Council (the executive committee¹¹⁴) and Assembly (comprising delegates of all 190 member States). The ICAO standards are not legally binding on the United States until they are promulgated as regulations under the Clean Air Act by the U.S. Environmental Protection Agency. (They are enforceable by FAA.) To assist with its mission to address GHG emissions, ICAO also established in 2007 the Group on Action on International Aviation and Climate Change (GIACC) to recommend an aggressive program of action to ICAO.

¹¹¹ Chicago Convention Article 37.

¹¹² Chicago Convention Articles 11 and 15.

¹¹³ The United States is a member of CAEP.

¹¹⁴ The United States is on the ICAO Council.

Data and Scientific Background

ICAO produces through expert groups a number of data sets and documents to underpin its consideration of guidance, standards, and recommendations. To this end, ICAO holds conferences and workshops and issues documents that help build a common reference set among stakeholders.

Operational Measures

ICAO's CO₂ reduction strategy aims at improvement of Air Traffic Management (ATM). It has issued the Global Air Navigation Plan to assist States and regional planning organizations. It includes such emissions-related aspects as flexible use of airspace, air traffic flow management, terminal area design and management, performance-based navigation, and other options. ICAO has also produced guidance in its Operational Opportunities to Minimize Fuel Use and Reduce Emissions. CAEP is in the process of producing updated guidance.

Emissions Fees

On emission-related levies, ICAO made a policy statement in 1996 strongly recommending that any environmental levies be in the form of charges (i.e., on actual emissions performance) rather than taxes, and that the funds collected should be applied in the first instance to mitigating the environmental impact of aircraft engine emissions. Such charges should be based on the costs of mitigation to the extent that costs can be properly identified and directly attributed to air transport. In 2001, the Assembly recognized the continuing validity of this policy, urged States to refrain from unilateral action to introduce emission-related levies inconsistent with the policy, and called for further studies and the development of further ICAO guidance on the subject. In 2004, ICAO¹¹⁵ reiterated its 1996 resolution on emission-related levies¹¹⁶ on aviation and urged Member states to refrain from imposing them unilaterally until at least the following ICAO Assembly in 2007.

Emissions Trading

In 2004, the ICAO Assembly endorsed further development of an open¹¹⁷ emissions trading scheme for international aviation, with further work focused on two alternative approaches: one for a voluntary trading system, and one to “provide guidance for use by Contracting States, as appropriate, to incorporate emissions from international aviation into Contracting States’ emissions trading schemes consistent with the UNFCCC process.”¹¹⁸ In short, the ICAO resolution anticipated that member States might cover international emissions in their own emissions trading schemes. In 2007, a resolution ruled out the option of a *global* emission trading

¹¹⁵ ICAO. Report of the Executive Committee on Agenda Item 15. ICAO, December 4, 2004. ICAO.

¹¹⁶ ICAO makes a conceptual distinction between taxes—with the purpose of raising revenues—and levies—with the purposes of cost recovery for services provided. In the case of environmental levies, they would apply to use of the atmosphere or some other publicly held resource for disposal of private waste (including engine emissions).

¹¹⁷ An “open” trading system is one in which allowances allocated to or required in one sector may be traded with allowances from other covered sectors. In other words, an aircraft operator would be able to sell allowances to brokers or facilities in other sectors, or to purchase them in the multi-sectoral market. In a closed trading system, allowances could be bought and sold only within the same sector. Aviation in the EU ETS is an open trading system.

¹¹⁸ ICAO. 2004. op. cit., Appendix I.

scheme for aviation. Instead, it produced guidance for member States should they include international aviation in their own emission trading schemes. ICAO urged that inclusion be with “mutual agreement” and non-discriminatory.

ICAO's efforts on MBMs include a methodology for calculating carbon emissions from aviation sources for use in carbon offset programs.

Voluntary Measures

Aspirational Global Goals

The ICAO Assembly agreed¹¹⁹ that States will work through ICAO to achieve a global annual fuel efficiency improvement rate of 2% for the medium term (up to 2020) and an aspirational global annual fuel efficiency improvement rate of 2% through 2050. The Member States agree that this goal would not be attributed to individual States and that each State may voluntarily contribute to reaching the goal.

In addition, ICAO resolved that it and its Member States would “work together to strive to achieve a collective medium-term global aspirational goal of keeping the global net carbon emissions from international aviation from 2020 at the same level,” taking into account a variety of circumstances, from growth in the international aviation industry to the respective capabilities of Member States.¹²⁰

National Action Plans

ICAO's program of action urges member countries to adopt action plans to address, in particular, CO₂ emissions from international civil aviation activities with the goal of establishing comprehensive plans based on the roadmap for action through 2050 adopted by the ICAO General Assembly in 2010. ICAO's program helps identify appropriate measures to reduce emissions from international aviation operations, monitor progress toward achieving worldwide goals. Under a 2010 ICAO agreement, member States are invited to voluntarily submit national action plans to reduce CO₂ emissions from aviation. Those plans may be submitted annually, with the first by the end of June 2012.

The voluntary action plans are expected to contain, at a minimum, information on (1) national contacts; (2) expected results of the plan, ideally to 2050; (3) a list of measures; and (4) information on any needs for assistance.

Financial Assistance to Low-Income Countries

ICAO has agreed to help low-income States with specific needs to address GHG emissions, through targeted technical and financial assistance. Because GHG emissions from aviation are not covered by the Kyoto Protocol, no financing is available through the Kyoto Protocol mechanisms.

¹¹⁹ ICAO. “A37-19: Consolidated statement of continuing ICAO policies and practices related to environmental protection—Climate Change.” October 2011. <http://www.icao.int/sustainability/Documents/A37-Env-Resos-9958.pdf>. Clauses 4 and 5.

¹²⁰ Ibid. Clause 6.

ICAO weighed in on one option for international financing of measures by low-income countries under the UNFCCC, as put forward by the UN Secretary General's High-level Advisory Group on Climate Change Financing (AGF).¹²¹ That option would generate revenues with MBMs, such as carbon or passenger fees, applied to international aviation. In particular, ICAO stated that,

It should be noted that the global aspirational goals for the international aviation sector, adopted by the 37th Session of the ICAO Assembly, will require adequate financial resources within the sector itself, enabling it to effectively respond to the global climate change challenge.

In 2009, the ICAO High Level Meeting stated, "further elaboration on measures to assist developing States and to facilitate access to financial resources, technology transfer and capacity building."¹²² ICAO asserts that it is the appropriate institution to deal with aviation financing. It can adapt the financial instruments to aviation specific goals and assist developing countries. It can provide assistance not only financially, but also through technology transfer and capacity building.

Technology Solutions

Since the 1997 mandate in the Kyoto Protocol, ICAO has produced technical information and a variety of voluntary options and recommendations. In 2001, the ICAO Assembly¹²³ called for emphasis on technical solutions to address GHG emissions while continuing consideration of market-based measures. ICAO takes a "technology following"¹²⁴ approach to standards, embodying technologies that are widely in use (i.e., a majority of users) and encouraging their adoption by remaining manufacturers and operators.

ICAO has focused on two technological areas for reducing GHG emissions: engine certification standards and alternative aviation fuels. In 2010 ICAO adopted its most recent emission certification standards for nitrogen oxides (NO_x), which contribute to formation of ozone (a local air pollutant) and GHG. The U.S. EPA is in the process of promulgating regulations in line with ICAO's standards.

ICAO also agreed in February 2010 on a plan to develop an aviation CO₂ emission "certification standard" for aircraft engines, for consideration at the end of 2013. The Secretary General has indicated that the organization would release a proposal at the end of 2012, an acceleration of the process. This standard would cover *reporting* of CO₂ emissions from engines; it is not expected to

¹²¹ For more information on assistance to low-income countries to address climate change, see CRS Report R41808, *International Climate Change Financing: Needs, Sources, and Delivery Methods*, by Richard K. Lattanzio and Jane A. Leggett.

¹²² "Capacity building" is a term of art often used to describe assist to developing countries to enhance governance and the effectiveness of the private sector. It may cover assistance to improve the rule of law, civil engagement, efficiency of administration, training for private sector activities, etc. Some capacity building is provided through public channels and some through private and other non-governmental channels.

¹²³ ICAO Assembly Resolution A33-7 Appendix I, adopted by the 33rd Session of the ICAO Assembly in September/October 2001.

¹²⁴ The "technology following" approach is in contrast to a "technology forcing" approach, which sets standards based on technologies that are demonstrated and commercially available, but in use only by the leading edge (a minority) of manufacturers and operators.

address *limitation* of CO₂ emissions. Before any standard would be binding in the United States, the EPA would need to promulgate a corresponding regulation.

Propelled by rising and volatile prices for fossil-based aviation fuels, ICAO and its member States have given increasing support to development and demonstration of biomass-based fuels. ICAO produced a Global Framework for Aviation Alternative Fuels, and endorses the use of sustainable alternative fuels for aviation, particularly use of “drop-in” fuels in the near and medium term.

ICAO has identified the need for financing of alternative fuel infrastructure and incentives. To that end, it is discussing a possible framework with the World Bank and the Inter-American Development Bank.

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