



Overcoming the barriers to international aviation greenhouse gas emissions abatement

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Abstract

Under business-as-usual conditions, international aviation greenhouse gas emissions will grow substantially over the next 20 to 30 years. The realisation of the likely trajectory of international aviation emissions has sparked debate about the future of aviation and the existing governance and policy structures. This paper reviews the progress made on international aviation emissions abatement, provides an analysis of the reasons for the delay and outlines a proposal to advance the debate on how to impose carbon prices on emissions. The conclusion is reached that criticisms of the International Civil Aviation Organization (ICAO) are, to some extent, unfounded. ICAO's failings are a product of political differences between member states on fundamental climate policy issues. These political problems are compounded by the fact that under existing international aviation law, there are restrictions on the rights of a state to unilaterally impose carbon pricing requirements on foreign aircraft. To overcome these problems, ICAO member states should consider the imposition of an international aviation emission charge that is indexed to account for equity concerns and partially hypothecated to support land use, land use change and forestry (LULUCF) projects.

1. Introduction

The aviation industry has expanded considerably in recent times. In 1990, the scheduled world revenue tonne kilometres (RTK) (passenger and cargo) amounted to approximately 235 billion revenue tonne kilometres (RTK).¹ By 2006, it was over 510 billion, which included almost four trillion revenue passenger kilometres (RPK)² generated by the aviation industry's 2.1 billion customers (ICAO 2000a; 2007a). In the same year, total revenues of the scheduled airlines of the parties to the *Convention on International Civil Aviation of December 1944* (Chicago Convention) topped US\$450 billion, more than 120 per cent above the levels in 1990 (ICAO 2007a).

The primary driver of the aviation industry's growth has been international flights. Between 1990 and 2005, total international RTK increased by 141 per cent, or approximately six per cent per annum. In contrast, total domestic RTK rose by only 54 per cent over this period, just under three per cent per annum. The surge in international flights has seen the international proportion of total global aviation traffic increase from 58 per cent in 1990 to 69 per cent in 2005 (ICAO (1991 – 2007); IATA (2000 – 2007)).

Projections of continuing strong international traffic growth have raised concerns about the prospect of an explosion in international aviation greenhouse gas emissions. Projections based on the International Civil Aviation Organization's (ICAO) 2007 traffic forecasts indicate that international aviation CO₂ emissions are likely to increase by 111 – 144 per cent between 2005 and 2025 (i.e. from 416 Mt to between 876 – 1,013 Mt) (Macintosh and Wallace 2008). Emission increases of this magnitude would jeopardise the prospects of achieving risk averse climate objectives, such as limiting the increase in the global average surface temperature to less than 2°C.

Despite increasing debate about aviation and climate change, progress on international aviation climate policy has been limited. ICAO, which is responsible for addressing international aviation pollution, has struggled to come to terms with the issue. Due to disagreements between ICAO member states, ICAO's policy initiatives have been focused primarily on voluntary mechanisms, which have done little to curb the growth in emissions. Most of the gains achieved to date have been a product of the financial pressures associated with rising fuel prices. The economic imperative to cut fuel costs has led to improvements in air traffic management (ATM), operational practices, and engine and aircraft design. These changes have resulted in dramatic improvements in the emission intensity of the international aviation task, which fell by 40 per cent between 1990 and 2005 (Macintosh and Wallace 2008). Yet these improvements were unable to prevent a sharp rise in total emissions. Between 1990 and 2005, international aviation CO₂ emissions increased by 42 per cent, rising from 292 to 416 Mt (IEA 2007).

The objectives of this paper are to provide an overview of the developments in international aviation climate policy, analyse the political and legal impediments to

¹ A tonne kilometre is equal to one tonne of load (passenger or cargo) transported one kilometre.

² A passenger kilometre is equal to one passenger transported one kilometre.

reform and present a proposal on how to progress international aviation emissions abatement. Section 2 analyses the effectiveness of the frameworks governing international aviation emissions. Section 3 evaluates the impediments to addressing international aviation emissions. Section 4 analyses the legal issues that have obstructed progress. Section 5 outlines the policy proposal, which involves a hypothecated emission charge. Section 6 provides a conclusion.

2. The effectiveness of current frameworks

The aviation industry is split into two parts for the purposes of greenhouse gas emissions accounting and climate governance. Under the United Nations Framework Convention on Climate Change (UNFCCC), domestic aviation emissions are required to be included in national emission totals and are intended to be addressed at the national level within the UNFCCC/Kyoto Protocol regime (IPCC 2006). In contrast, international emissions are excluded from national emission totals and are only reported in UNFCCC national inventory reports as a memo item. Further, Article 2(2) of the Kyoto Protocol vests responsibility for international aviation emissions in ICAO. The same process was followed in relation to international shipping; only responsibility was passed to the International Maritime Organization (IMO).

The reasons for the separation of international and domestic aviation emissions relate to the nature of international transport and the UNFCCC/Kyoto greenhouse accounting framework. The emission accounting rules dictate that emissions are only attributable to a country if they result directly from activities that occur within its territory. For example, countries that export fossil fuels are not responsible for the embodied carbon. The emissions from the use of these fuels are attributable to the country where the fuel is burned. International transport involves movements between countries, creating difficulties for the standard accounting system. Much of the fuel used in international transport occurs in or over the high seas, and in or over the territory of countries that have no direct involvement in the relevant transport movement (i.e. when planes transit through a country's airspace). Placing international transport in a separate category and transferring responsibility for these emissions to separate UN bodies was seen as a convenient solution to a difficult problem.

ICAO has had little success in curbing the growth in international aviation emissions or progressing effective policy solutions. Appendix A provides a detailed timeline of ICAO's activities concerning climate change and emissions abatement. From this timeline, the following issues and achievements stand out.

- ICAO's request to the Intergovernmental Panel on Climate Change (IPCC) to prepare a report on aviation, which led to the publication of the seminal report on aviation and climate change, *Aviation and the Global Atmosphere*, in 1999 (IPCC 1999).
- The gradual tightening of engine standards and recommended practices for emissions of mono-nitrogen oxides (NO and NO₂, collectively referred to as

NO_x). The emission standards in Annex 16 of the Chicago Convention relate to NO_x, HC, CO and smoke emissions during the LTO (landing and takeoff) cycle (i.e. below 900 m). They were first introduced in 1981 and were intended to address local air quality issues. However, by lowering emissions of these gases and particles (particularly NO_x), they generate broader climate system benefits.³

- The Committee on Aviation Environmental Protection's (CAEP) work in encouraging the reduction of emissions through improved ATM, in particular the preparation of the guidance document, *Operational Opportunities to Minimize Fuel Use and Reduce Emissions* (Circular 303) (ICAO 2004a).
- ICAO's expression of support for an open emissions trading scheme (ETS) (i.e. an ETS that includes other sectors) in which international aviation is gradually integrated into national ETSs, provided it is done on the basis of mutual agreement (ICAO 2001; 2004b; 2007b).
- The preparation and publication of guidance material on voluntary ETSs and the integration of international aviation into national ETS (ICAO 2007c; 2007d).
- ICAO's inability to develop guidance on greenhouse gas emission charges due to ongoing disputes about their legality and suitability.
- CAEP's decision not to pursue an ICAO standard for regulating CO₂ emissions (CAEP 2001).
- The establishment, following a request of the ICAO Assembly in late 2007, of the Group on International Aviation and Climate Change (GIACC) for the purpose of developing a Programme of Action on International Aviation and Climate Change (ICAO 2007b).
- The publication of ICAO's first environmental report in late 2007 (ICAO 2007e).

As the above list demonstrates, ICAO's abatement achievements have been limited. The slow rate of progress has frustrated many and exposed ICAO to robust criticism from environmental groups and other institutions and individuals concerned about climate change. For example, the European Federation for Transport and Environment has argued:

In the ten years since the Kyoto Protocol was signed ICAO has failed to deliver any mandatory policies to deliver emissions stabilisation or reductions. Instead the organisation has attempted to close the door, one

³ There is evidence the NO_x standards may not have substantially improved environmental outcomes because the benchmarks have not been set significantly below pre-existing performance levels (Ralph 2007).

by one, on almost every conceivable policy measure for reducing greenhouse gas emissions from the sector. It is a devastating record (EFTE 2007, p. 5).

Growing community concern about aviation's climate impacts and ICAO's policy failings prompted the European Union (EU) to propose the unilateral inclusion of international flights in the EU Emissions Trading Scheme (ETS) by 2012 (EC 2005; 2006; CEU 2007). This proposal has attracted strong criticism from many ICAO countries, particularly the United States (US). At the Ninth Meeting of Directors of Civil Aviation of the Central Caribbean, the US stated that:

By unilaterally covering non-EU carriers, the EU proposal raises serious international legal questions with regard to sovereignty, the Chicago Convention, and bilateral air services agreements. It imposes on the sovereign rights of other States, fails to wait for the ICAO guidance on emissions trading and to take into account other States' efforts in this area, and ignores the consensus and reciprocity that has underpinned the international aviation regime for more than sixty years (US 2007, p. 3).⁴

Following the announcement of the EU proposal, ICAO reiterated that all parties should refrain from unilaterally imposing carbon price obligations on other states and that these measures should only be introduced on the basis of mutual agreement (ICAO 2007b).

The EU's willingness to proceed with the ETS proposal in the face of widespread international opposition is a sign of the intensity of the pressure for more action to be taken on aviation emissions abatement. However, the existing international policy and governance structures have proven resistant to reform. At 36th Session of the ICAO Assembly in late 2007, there were signs of progress. In particular, the Assembly requested the Council to establish the GIACC for the purpose of developing an 'aggressive' Programme of Action on International Aviation and Climate Change. It also asked states to report on a set of actions to reduce airspace congestion and requested that the Council establish a set of environmental indicators that states could use to evaluate policy outcomes (ICAO 2007b). Yet no substantive advances were made in relation to the key policy levers for abatement; integrating international aviation emissions into national ETSS and emission charges.

EU countries have pushed for the use of charges as a means of constraining emissions growth for a number of years. Very few non-EU countries have supported their efforts. CAEP undertook a considerable amount of work on greenhouse charges in the 1990s and early 2000s, but progress has been stalled since 2004 due to disputes about their appropriateness and legality.

There are problems with the strategy of relying on the extension of national ETSS as the sole market mechanism for achieving abatement outcomes. Mandatory national ETSS are in their infancy. The EU ETS is the most advanced scheme in

⁴ See also USDT (2005).

operation and it will not include any aviation emissions until 2012. There are several other schemes in operation or under active consideration, for example in Japan, Canada, the United Kingdom, Denmark, Australia, New Zealand and certain states in the US. However, it will take several years for most of these schemes to reach the level of operational maturity where the integration of international aviation emissions would be possible. Even then, it is questionable whether many nations will be willing to invest the financial and political capital necessary to achieve this objective. Negotiating the necessary bilateral and multilateral agreements to facilitate the integration would be time consuming, complex and costly. There are also concerns about the potential for carbon pricing mechanisms to expose aviation-dependent industries to adverse trade effects, resulting in carbon leakage (i.e. where industries or demand are displaced to countries without emission controls).

Apart from the integration of international aviation into national ETSs, ICAO's climate strategy is built around voluntary mechanisms and information instruments. These types of measures are likely to be ineffective. At best, they are a starting point for a more comprehensive approach. This point is emphasised in ICAO's own research on the role of voluntary mechanisms. For example, the report of CAEP/5 notes in its consideration of the research undertaken by Working Group 5 that:

The main findings ... are that voluntary measures alone could not achieve an ambitious emission reduction target. They would have to be used in conjunction with other measures. ... They are primarily looked at as transitional measures (CAEP 2001, p. 2-3).

Similarly, at the ICAO Assembly's 33rd Session, a resolution was passed 'noting that in the short-term voluntary measures could serve as a first step towards future actions to further reduce emissions' (ICAO 2001, I-46).

3. The impediments to reform

The *Convention on International Civil Aviation* (Chicago Convention) was negotiated at the Chicago Conference in November – December 1944, during the later stages of World War II. The Convention and the related instruments that emerged from the conference were intended to promote the orderly expansion of international aviation. Support for this objective is expressed in the preamble to the Convention, which states:

... the undersigned governments having agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically.

At the heart of the Chicago Convention lies the principle that each country has complete and exclusive sovereignty over the airspace above their territory. This principle provides the basis for the restrictions on the operation of international

services into or over the territory of another state. For example, Article 6 prohibits scheduled international services operating over the territory of a contracting state without its permission. The legal framework that emerged from the Chicago Convention sought to promote international aviation, while respecting the customary international rule regarding the sovereign rights of states to air space over their lands and territorial waters.

The parties to the Convention envisaged that the rights to operate services between and within other countries (so-called 'traffic rights') would be the subject of separate bilateral agreements. There are now approximately 3,000 bilateral air services arrangements in operation around the world, which provide the backbone of the regime governing international aviation (Wang 2001). These bilateral agreements are increasingly complimented by multilateral air service agreements covering traffic rights in selected geographical regions, including the EU and parts of the Caribbean, South America, West Africa and South-East Asia (ICAO Secretariat 2007).

The Chicago Conference of 1944 also produced the *International Air Services Transit Agreement* (also called the 'Two Freedoms Agreement'), under which contracting states grant foreign aircraft from other contracting states the right to transit over their territory without landing (the first freedom) and the right to land in their territory for non-traffic purposes (i.e. refuelling and maintenance) (the second freedom). This agreement has assisted in opening up international aviation and provided a basis for the negotiation of bilateral and multilateral agreements. As of July 2007, 125 states were parties to the Two Freedoms Agreement and the ICAO Assembly continues to urge countries to join the agreement to assist in the liberalisation of international aviation (ICAO Secretariat 2007; ICAO 2007b).

The Chicago Convention contains provisions that seek to standardise technical and operational issues such as markings, navigational facilities, pilot licensing and aircraft certification. The standardisation of these matters was seen as important in facilitating orderly growth. The Convention also established ICAO, whose objectives include:

... to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport so as to: ... (a) insure the safe and orderly growth of international civil aviation throughout the world; ... (i) promote generally the development of all aspects of international civil aeronautics.⁵

The success of ICAO and the legal framework in promoting international aviation is evidenced by the expansion of the industry over the past 60 years. While it has achieved its growth objectives, it is unclear whether the existing regime is equipped to deal with climate change.

⁵ Under the Convention, ICAO is responsible for the preparation and dissemination of international standards and guidelines for technical and operational issues.

A key hurdle in developing and implementing effective measures to address aviation emissions is that the Chicago Convention and the web of international agreements stemming from it were not designed to accommodate environmental concerns that do not pose a direct threat to human health. The overriding objective of the international regime has been to promote growth and ensure public safety. In recent years, the focus on expansion has intensified as a result of the air transport liberalisation agenda, which ICAO has facilitated and actively encouraged.⁶ At the ICAO Assembly's 36th Session, it reaffirmed that the organisation is intended to have a primary role in advancing liberalisation (ICAO 2007b). The structure of the international aviation regime is seemingly weighed against the needs of the climate system. While ICAO expresses concern about the environment,⁷ its primary function, and that of the legal framework, is to facilitate orderly traffic growth.

The tensions within the ICAO structure and its failure to take decisive action have led to calls for the responsibility for addressing international aviation greenhouse gas emissions to be transferred to the UNFCCC.⁸ While the frustration at the pace of progress is understandable, it seems unlikely that transferring responsibility for international aviation emissions to the UNFCCC would remove the barriers that are hindering progress. There are two main blockages preventing the introduction of effective abatement measures. Firstly, the positioning of states on greenhouse policy, in particular the reluctance of developing nations and many developed nations to undertake significant near-term abatement. The debates within ICAO have mirrored those in the UNFCCC. Generally, in both forums, the countries of the EU have expressed a willingness to pursue significant near-term abatement. Their proposals have been opposed by the US and other developed countries such as Japan, Canada and Australia on the grounds that aggressive action is unjustified and unfair unless developing countries also agree to curb emissions. Developing countries have resisted pressure to accept binding emission reduction targets on equity grounds, with states relying on the principle of common but differentiated responsibility to justify their position. Transferring responsibility for international aviation from ICAO to the UNFCCC would not resolve these political differences.

The second barrier to progress is the nature of the international legal rights and obligations under the Chicago Convention and other associated agreements. To date, ICAO's efforts to address international aviation's impacts on the climate

⁶ ICAO's Worldwide Air Transport Conferences in 1994 and 2003, and ICAO's Global Symposium on Air Transport Liberalization, played an important part in advancing aviation liberalisation. The 2003 conference produced the *Declaration of Global Principles for the Liberalization of International Air Transport* (ICAO 2003), which provided a platform for the negotiation of open skies and other bilateral agreements. ICAO has also produced several publications and guidelines to facilitate liberalisation (for example, *Safety and Security Aspects of Liberalization* (ICAO Secretariat 2005) and *Template Air Services Agreements* (ICAO 2008)).

⁷ For example, ICAO's strategic objectives for 2005 – 2010 include to 'minimize the adverse environmental effects of global civil aviation activity, notably aircraft noise and aircraft engine emissions' by developing new measures to 'limit or reduce the impact of aviation greenhouse gas emissions on the global climate' (ICAO 2004c).

⁸ See, for example, EFTE (2007).

system have focused on three areas: operational measures, technology and standards, and market measures. ATM improvements that reduce emissions tend to be relatively uncontroversial because they are usually consistent with the financial interests of airlines and airports. There have been intense debates about standards, especially in relation to NO_x emissions during the LTO cycle. However, the NO_x standards are a secondary issue in the climate debate, being primarily related to local air quality issues. The legal discussions about abatement measures have concentrated on market measures (i.e. emission taxes, charges and ETs). Four main legal matters have been raised.

- The right of a state to impose a carbon price requirement in relation to fuel used or emissions by foreign aircraft outside of its airspace (often referred to as the 'geographic scope' question).
- Whether the imposition of a carbon price requirement on foreign aircraft would contravene Article 12 of the Chicago Convention, which relates to the 'rules of the air'.
- Whether the imposition of a carbon price requirement on foreign aircraft would contravene Article 15 of the Chicago Convention, which prohibits the imposition of fees, dues and charges in respect solely of the right of transit over, or entry and exit from, the territory of the state.
- Whether the imposition of a carbon price requirement on foreign aircraft would contravene Article 24 of the Chicago Convention and other similar requirements in bilateral air services agreements concerning the rights of states to impose taxes and charges on fuel used in relation to the provision of international aviation services.

4. The legal blockages

Emission taxes and charges

There is a long-standing ICAO practice to categorise aviation levies as either taxes or charges on the basis of their purpose and design. Charges are levies to cover costs of providing facilities and services, or damage remediation costs, related to civil aviation. In contrast, taxes are levies to raise general revenues that are applied for non-aviation purposes.

Article 24 of the Chicago Convention prohibits the imposition of duties on aircraft that are engaged in international aviation, 'subject to the customs regulations of the State'. It also exempts fuel on board aircraft from 'customs duty, inspection fees or similar national or local duties and charges'. ICAO has sought to extend the fuel tax and charge exemptions via its *Policies on Taxation in the Field of International Air Transport* (ICAO 2000b), which recommends the reciprocal exemption of all fuel used in international aviation from 'customs or other duties'. For these purposes, customs and other duties are defined as including 'import, export, excise, sales, consumption and internal duties and taxes of all kinds' levied upon fuel. The policy also states that duties and taxes should not be imposed on

the acquisition of fuel used by aircraft in connection with international air services 'except to the extent that they are based on the actual costs of providing airports or air navigation facilities and services and used to finance the costs of providing them' (i.e. they must be charges not taxes).⁹ This policy advice has been incorporated into most bilateral air service agreements, meaning the vast majority of aviation fuel used in international flights is now free of taxes and charges.

A common form of wording of the fuel tax and charge exemption provisions in bilateral air service agreements is as follows.

The following shall be exempt from customs duties, excise duties, inspection fees and other national duties and charges: ... (c) fuels, lubricating oils (including hydraulic fluids) and lubricants destined for the designated airline of one Contracting Party to supply aircraft operating agreed services, even when these supplies are to be used on any part of a journey performed over the territory of the Contracting Party in which they have been taken on board.¹⁰

Given the breadth of this provision, it is difficult to avoid the conclusion that a tax or charge levied on fuel use would contravene the agreement. It could be argued that a tax or charge levied on emissions is distinguishable from a fuel levy. However, given the practical effect of the measure (i.e. all fuel currently in use results in emissions of CO₂ that are proportional to fuel burn), this argument is unlikely to be persuasive.

The EU has sought to defend emission charges against claims they would violate Article 24 on the grounds that the Article 'deals only with tax exemptions applying to fuel cargo movements across borders' (Council Special Group on Legal Aspects of Emissions Charges 2005, A-2). According to this approach, the references in the Article to 'similar national or local duties and charges' should be read narrowly and be confined to levies concerning customs duties and inspection fees. The alternative interpretation advanced by many non-EU countries is that Article 24 should be read more broadly and that it prohibits any levies that are linked to fuel use 'per se' (Council Special Group on Legal Aspects of Emissions Charges 2005, A-3). Central to this approach is the ICAO *Council Resolution on Environmental Charges and Taxes* adopted on 9 December 1996 (149/16), which:

- strongly recommended that any environmental levies be in the form of charges rather than taxes and that the funds collected should be applied in the first instance to mitigating the environmental impact of aircraft engine emissions; and
- urged states considering the introduction of emission-related charges to take into account the non-discrimination principle in Article 15 and to be guided by several other principles, including that:

⁹ ICAO (2000b), Resolution 1(e).

¹⁰ *Australia and Russian Federation Air Services Agreement*, 11 July 1994, Article 12(2).

- there should be no fiscal aims behind the charges;
- the charges should be related to costs; and
- the charges should not discriminate against air transport compared with other modes of transport.

On the basis of this resolution and state practice, many non-EU states argue that, in order for an emission charge to be permissible, it must be linked to damage remediation costs. For this to occur, the damage cost must be identifiable and the revenue raised must be used to mitigate the relevant environmental harm. If a climate levy is framed as a tax on fuel or emissions, the non-EU argument is that it is similar to a customs duty and is therefore prohibited under Article 24 because that Article exempts fuel on board foreign aircraft from levies of this nature.

Article 15 provides an additional difficulty for countries wanting to unilaterally impose emission charges on foreign aircraft. The majority of the Article concerns the rights and duties of states regarding access to airports and navigation facilities. Contracting states are required to ensure all public airports and public navigation facilities are available for use by foreign aircraft under uniform conditions applicable to national aircraft and that there is no discrimination between foreign and national aircraft in relation to the charges for the use of these facilities. The final sentence in Article 15 states:

No fees, dues or other charges shall be imposed by any contracting State in respect solely of the right of transit over or entry into or exit from its territory of any aircraft of a contracting State or persons or property thereon.

There are two main schools of thought on the interpretation of Article 15 in relation to carbon pricing. The European approach has been to argue that the final sentence should be read in context and that Article 15 is concerned solely with fees and charges for the use of airports and navigation facilities. Emission charges are not designed to raise revenue to cover the costs of these facilities and, as a result, they fall outside of the scope of the Article. Further, the prohibition on charges contained in the final sentence only concerns fees and charges 'in respect *solely* of the right of transit' (emphasis added). As emission charges are levied on pollution, not just the right of transit, arguably they do not fall foul of this provision.

The alternative position is that the final sentence of Article 15 must be read in light of Council Resolutions and state practice, whereby it has become generally accepted that Article 15 prohibits the imposition of fees and charges unless they are related to the provision of services and facilities, or damage remediation costs. Hence, emission charges are not prohibited under Article 15, but there are restrictions on their design and implementation (i.e. they must be linked to damage costs).

The other major obstacle to the introduction of emission charges is the question of geographic scope, which concerns the sovereignty of nations over airspace and the rights of states to impose restrictions or conditions on emissions in airspace outside of their jurisdiction. The dominant view amongst ICAO member states is that a country does not have the right to unilaterally impose emission charges on foreign aircraft in relation to emissions outside of its jurisdiction ('extraterritorial emissions'). This position was articulated in the draft *Framework for Guidance on Implementation of CO₂ Emission Charges* prepared by Working Group 5, which states that:

States have complete and exclusive sovereignty over the airspace above their territories. As a result, it also stands that an individual State has no authority to assess a charge for emissions outside its sovereign territory (CAEP 2004, 2B-3).

The draft framework also notes that states may agree among themselves to act jointly in the interest of harmonisation and that it 'may be possible to have a global agreement that establishes a charge for emissions over the open seas, though no such agreement currently exists' (CAEP 2004, 2B-3). In a pointer to what would follow, CAEP/6 failed to reach agreement on the draft framework.

The opposing EU view is that the imposition of emission charges on foreign aircraft in relation to extraterritorial emissions does not contravene the rights of other states. Most of the published material on the geographic scope question concerns the EU proposal to include international aviation in its ETS in 2012. In this context, the EU nations have argued that the non-discrimination principle contained in Article 11 requires that, if a carbon price is introduced for international aviation, it must be applied to all aircraft regardless of whether the relevant states have consented to its imposition. Article 11 provides that the laws and regulations of a state 'relating to the admission to or departure from its territory of aircraft engaged in international air navigation, or to the operation and navigation of such aircraft while within its territory, shall be applied to the aircraft of all contracting States without distinction as to nationality'.

The European interpretation is based upon the notion that carbon pricing requirements are laws or regulations relating to the admission and departure of aircraft. The chief condition therefore, is that the relevant laws must not discriminate with respect to nationality. According to this view, questions of sovereignty do not arise because the laws do not 'limit or otherwise regulate' the operation of flights outside of the territory of the state. They only regulate admission and departure from the state's territory (Wit *et al.* 2005, p. 174). Hence, the fact that the carbon pricing requirements may be determined at least partly on the basis of emissions that occur outside the state's territory is immaterial. Wit *et al.* (2005), in their report for the European Commission about the proposal to include international aviation emissions in the EU ETS, articulated the EU view.

[The] requirement to surrender allowances would purely constitute an obligation related to the admission to and/or departure from EU airports

The EU emissions trading scheme would ... not involve intervention in the operation or navigation of air carriers or their traffic rights, nor would it restrict the emissions caused by individual aircraft inside or outside the EU territory. The only direct implication of the scheme for any air operator would be an obligation to surrender allowances in respect of emissions from his aircraft using EU airports.¹¹

ETS requirements

The threshold issue when evaluating the legality of ETS requirements is whether they qualify as a tax or charge. Some commentators have suggested that an ETS permit requirement is a tax for the purposes of Article 15 (Vreede 2008); presumably on the grounds it has a similar effect on aviation operators as an emission tax or charge. This is true in economic terms. However, there is an argument that ETS permit requirements are more in the nature of a regulatory requirement concerning a transferable property right than a tax or other levy. Unlike a tax, the imposition of an emission permit requirement on aviation operators does not necessarily result in an inflow of government revenue (e.g. if permits are grandfathered or acquired from another sector). Where permits are auctioned and the government receives money, the relevant activities have the hallmarks of a property transaction. The government receives funds in exchange for granting a statutory right to pollute a given amount of specified gases. The revenues received by the government are not designed to defray the costs of providing facilities and services, or damage remediation costs; putting the instrument outside of the realms of a charge. More importantly, the polluter receives a secure and transferable property right in consideration for the moneys paid. As a consequence, it is arguable that ETS permit requirements are neither a tax nor a charge. Rather they should be characterised as an economic measure that is not recognised under existing international aviation law.

If ETS requirements do not have a clear status under international aviation law, how should they be treated? One line of argument is based on the principle of state consent, which suggests that no state should be bound by rules it has not voluntarily accepted (Havel 2007). Accordingly, any attempt to impose ETS requirements on foreign aircraft should be done on the basis of mutual agreement, at least in relation to extraterritorial emissions. The alternative approach is to assert that because ETS requirements have no legal status, they can be unilaterally imposed on foreign aircraft, subject to any other applicable laws.

Wit *et al.* (2005, p. 177) adopt the latter position, arguing that that the 'Chicago Convention does not address the issue of emission trading'. They suggest that the EU ETS should be guided by the principles expressed in the preamble to the Convention (i.e. equality of opportunity and sound and economic operation) and, because the ETS requirements 'can be viewed' as falling within the scope of Article 11, it is necessary for the scheme to operate in a non-discriminatory manner (Wit *et al.* 2005, p. 176). Provided the measure is designed and administered in accordance with these requirements, Wit *et al.* (2005, p. 175)

¹¹ Wit *et al.* (2005), p. 174.

assert that it 'would not interfere with the sovereignty or territorial integrity of other states or have any other regulatory impact on other territories outside the EU'.

The majority of ICAO member states reject this position. Reiterating previous recommendations concerning the unilateral implementation of environment measures (ICAO 2001; 2004b), the 36th Session of the ICAO Assembly urged contracting states:

... not to implement an emissions trading system on other Contracting State's aircraft operators except on the basis of mutual agreement between those States (ICAO 2007b, Appendix L, p. 101).

The *Draft Guidance on the Use of Emissions Trading for Aviation* published by ICAO in 2007 makes specific mention of the disagreements about the question of geographic scope and reiterates the Assembly's calls for states to refrain from unilateral action (ICAO 2007d). There appears to be broad consensus amongst the majority of non-EU states that a country does not have the right to impose carbon pricing requirements on foreign aircraft, at least in relation to extraterritorial emissions.

Several other potential legal difficulties have been raised in the context of proposals to extend ETSs to international aviation. Andreas Hardeman, a legal officer at the International Air Transport Association (IATA), has argued that the proposed international aviation permit requirements under the EU ETS are 'best described as an operational standard of an environmental nature' and suggested that they may fall within the scope of Article 12 of the Chicago Convention (Hardeman 2007, p. 13). Wit *et al.* (2005) and Schwarze (2007) have expressed a contrary view, arguing that the EU ETS regulations will not activate Article 12 because they do not 'impose any requirements on the operation or the navigation of air carriers' (Wit *et al.* 2005, p. 173).

Article 12 relates to the 'rules of the air', which are rules and regulations concerning the 'flight and manoeuvre of aircraft'. Contracting states are required to adopt measures to ensure aircraft in their airspace and carrying their national mark comply with the applicable rules of the air. They are also required to keep their rules of the air uniform, 'to the greatest possible extent', with those established under the Convention.

Although there is ambiguity about the proper classification of carbon pricing requirements under international aviation law, there is a good argument that they do not fall within the scope of Article 12. The rules of the air are the equivalent of road rules. They lay down specific requirements in relation to the operation and navigation of aircraft in order to achieve safety and efficiency objectives. Both ETSs and emission charges merely provide an economic incentive to minimise fuel burn. No restrictions are placed on the operational or navigational activities of airlines, other than a need to pay for the resulting carbon emissions and, in the case of an ETS, to ensure operators relinquish sufficient permits to cover their emissions liabilities. Under a cap-and-trade ETS, there would effectively be an

absolute limit on flights. However, these restrictions are not concerned with relevant operational and navigational issues that fall within the scope of Article 12.

The potential for Articles 15 and 24 of the Chicago Convention to affect the implementation of the EU ETS has been discussed on a number of occasions (Wit *et al.* 2005; Schwarze 2007). Wit *et al.* (2005) argue that Article 15 would not apply to the proposed scheme because the Article is concerned solely with fees and charges for the use of airports and navigation facilities. They have also suggested that even if a broader interpretation was taken, Article 15 would merely require that the laws imposing the carbon price do not discriminate against foreign aircraft. Similarly, both Wit *et al.* (2005) and Schwarze (2007) argue that Article 24 would not apply because the ETS permit requirements 'do not in any way constitute a customs duty' (Schwarze 2007, p. 14).¹²

Overview

The main legal hurdles facing the introduction of carbon pricing mechanisms are the question of geographical scope, restrictions on the imposition of taxes and charges, and the treatment of ETS requirements.¹³ Due to these impediments, there is a persuasive argument that international aviation carbon pricing initiatives should not be unilaterally imposed on foreign aircraft, particularly in relation to extraterritorial emissions.

To get around the legal issues, a state could attempt to impose ETS requirements on foreign aircraft on the basis of fuel on board when the aircraft land, fuel uplifted in the state's jurisdiction (even where the fuel is burnt outside the jurisdiction) or emissions released in the territory of the state.¹⁴ Arguably, these schemes would not violate the territorial rights of other states because there is a sufficient legal nexus between the foreign aircraft and the state imposing the measure. The jurisdictional link is provided either by the acts of operating and landing aircraft in the airspace and territory of the state and/or acquiring carbon-based fuel in its jurisdiction. The restrictions on the imposition of taxes and charges are avoided because ETS requirements are neither a tax nor a charge. Unilateral schemes of this nature are likely to be opposed by most countries. From a practical perspective, their environmental effectiveness would be hampered by the fact that they would not capture all emissions from the aircraft servicing the relevant routes. Operators would also have an incentive to refuel in non-compliant

¹² See also Wit *et al.* (2005), p. 177

¹³ There has been an attempt in recent times to advance the international aviation liberalisation agenda through the World Trade Organization (WTO) and the General Agreement on Trade in Services (GATS). Currently, the Annex on Air Transport Services to GATS only applies to a limited range of services: aircraft repair and maintenance services, marketing air transport services, and computer reservation system services. If the Annex was extended to include traffic and other so-called 'hard' rights, it may affect the capacity of nations to impose carbon price mechanisms on foreign aircraft. The Council for Trade in Services conducted a periodic review of the operation of the Annex, which stretched from September 2000 to March 2002. During the review, some states expressed support for the Annex to be extended to include some soft and hard rights. However, in 2003 the WTO decided to alter the Annex. This could change in the future as the pressure for liberalisation mounts.

¹⁴ This analysis assumes the aircraft land in the state.

jurisdictions, thereby further reducing the schemes' effectiveness. In addition, the schemes could cause market distortions and potentially lead to carbon leakage, whereby demand is redirected to alternative non-compliant jurisdictions. To the extent that this occurs, the state imposing the measure would suffer economic harm and the environmental effectiveness of the schemes would be further undermined.

5. A proposal for addressing international aviation emissions

Overcoming the blockages to international aviation emissions abatement will be difficult. One possible solution may be the introduction of an emission charge on a mutually agreed basis through ICAO. The charge could have the following characteristics.

- It would be applied solely to CO₂ emissions. Aircraft emit a number of pollutants that have a significant impact on the earth's climate system, including CO₂, NO_x, water vapour (H₂O), sulphur oxides (SO_x) (which form sulphate particles) and soot (IPCC 1999). The most important of these are CO₂, NO_x and H₂O. Comparing the effects of aviation CO₂ and non-CO₂ emissions is difficult because the impacts of a number of non-CO₂ pollutants are highly uncertain and they can differ depending on when and where they are released. Due to these issues, setting a charge at an appropriate level for both CO₂ and non-CO₂ emissions would be difficult. The exclusion of non-CO₂ emissions from the scope of the scheme would reduce its environmental effectiveness, but limit the potential for disagreement between the parties.
- The charge would be set at a low level (for example, US\$5 - \$15/tCO₂) that is consistent with the conservative end of the spectrum of estimates of the global social cost of carbon (SCC) (i.e. the marginal damage associated with an additional tonne of carbon pollution). CAEP's Forecasting and Economic Analysis Subgroup (FESG) has suggested that estimates of the SCC range between US\$2 - \$127/tCO₂ (CAEP 2004, 2B-4). Other research indicates the range is wider; from less than \$0.50/tCO₂ to over \$410/tCO₂, which is a reflection of the methodological problems that plague SCC estimates (Downing *et al.* 2005; Yohe *et al.* 2007). Notwithstanding these flaws, the adoption of a low SCC as the basis for the charge would ensure it is consistent with existing ICAO policies concerning taxes and charges, whereby it is necessary for charges to be related to an identifiable damage cost.¹⁵

¹⁵ There is some ambiguity about how emission charges should be determined. The ICAO *Council Resolution on Environmental Charges and Taxes* states that the 'charges should be related to costs', suggesting that the charge should be set on the basis of the SCC or another similar estimate. Yet the resolutions of the ICAO Assembly suggest that 'such charges should be based on the costs of mitigating the environmental impact of aircraft engine emissions' (ICAO 2007b),

- The charge would be applied to 50 per cent of emissions from inbound and outbound flights, which is consistent with one of the options (Option 5) put forward by the UNFCCC's Subsidiary Body for Scientific and Technological Advice for international aviation emissions accounting (SBSTA 1996). This approach is simple and transparent. Provided it is done with the mutual consent of the relevant foreign states, the questions around geographic scope would not arise.
- The charge would be applied uniformly amongst participating developed countries (i.e. countries included in Annex B under the Kyoto Protocol). For non-Annex B countries, the charge could be indexed (e.g. on the basis of GDP per capita), at least during the initial stages of the scheme. The indexing of the charge would help accommodate developing country concerns about common but differentiated responsibilities. On the negative side, indexing could have adverse competitive effects, although these are likely to be minor because of the size of the charge.
- A proportion of the revenue would be directed to a global fund to assist in reducing emissions from land use, land use change and forestry (LULUCF) (including deforestation and degradation (REDD)), while the remainder would be retained by the levying state to cover administration costs and for use on domestic mitigation measures.

Global LULUCF emissions are currently estimated at approximately 1.5 – 1.6 GtC annually, or around 20 per cent of total anthropogenic carbon emissions. Significantly reducing emissions from LULUCF will require substantial ongoing funding from the international community. An international emission charge of just US\$5/tCO₂ would generate over US\$2 billion annually. A charge of this magnitude is unlikely to result in a significant reduction in international traffic, although it could help improve the emission intensity of the aviation task (Ribeiro *et al.* 2007). Further, the revenue stream could be put to effective uses in helping to address LULUCF issues. It would also be consistent with the decision of the Conference of the Parties to the UNFCCC that was made in Bali in late 2007, which invited 'Parties, in particular Parties included in Annex II to the Convention, to mobilize resources to support efforts' in relation to REDD (UNFCCC 2007). Additionally, by tying the revenue directly to a specific mitigation program, the measure would satisfy the requirement in ICAO policies that charges should be applied to mitigate the impact of aircraft engine emissions. Reforestation projects and those designed to prevent deforestation and degradation would protect and enhance sinks, thereby potentially offsetting the CO₂ emissions from aviation. Enabling the home state to retain a proportion of the revenue for domestic uses would provide an incentive to encourage the imposition and collection of the

indicating that charges should be based on the cost of abatement rather than the damage cost. Using a low figure should minimise the risk of disputes arising in relation to this issue, although it should be noted that some states are of the view that CO₂ emission charges can never be consistent with ICAO policies because the costs cannot be properly identified and attributed (see CAEP 2004)). Over time the charge could be increased if (or when) it gains wider acceptance.

charge. This domestic revenue could also be linked to specific mitigation projects to satisfy the ICAO requirements.

Müller and Hepburn (2006) have proposed a similar scheme; only the revenues from the levy (or the auctioning of emission permits) would be hypothecated for adaptation programs and it would not be indexed (i.e. ideally there would be a single global carbon price for international aviation). The International Air Travel Adaptation Levy (IATAL), as the authors called it, has many appealing aspects. Like the current proposal, it would target international air travel, which is predominantly the domain of the affluent, to provide a source of revenue for climate projects that are mainly in poorer countries. The scheme would also simultaneously reduce international aviation emissions while addressing associated impacts. In addition, provided the IATAL was set at an appropriate level, it would meet the requirements of ICAO's policies on taxes and charges as the levy would be applied to mitigate harm associated with aviation CO₂ emissions.

The benefit of tying an aviation charge to LULUCF projects rather than adaptation is that there is arguably greater uncertainty associated with the benefits of adaptation projects and there may be less of a direct link to the relevant environmental harm. Müller and Hepburn's (2006) proposal for a single global carbon price would generate more efficient outcomes than an indexed charge. However, indexing could help overcome political obstacles and lure politically important developing countries into the scheme.

6. Conclusion

Under business-as-usual conditions, international aviation greenhouse gas emissions will grow substantially over the next 20 to 30 years. The realisation of the likely trajectory of international aviation emissions has sparked debate about the future of aviation and existing governance and policy structures. To date, ICAO has been unable to respond effectively to the calls for greater abatement because of disagreements between member states over key policy and legal issues. The result has been policy stagnation. Only incremental change has occurred since responsibility for addressing international aviation emissions was formally vested in ICAO under the Kyoto Protocol.

Two main blockages have prevented the introduction of effective abatement measures: political differences over broader climate policy questions and legal issues pertaining to the rights of states to unilaterally impose carbon pricing mechanisms on foreign aircraft. There are no easy solutions to either problem. Despite the EU's claims to the contrary, there is a persuasive argument that states have limited rights to impose carbon pricing requirements on foreign aircraft, particularly in relation to extraterritorial emissions. For aviation carbon pricing mechanisms to progress legally and effectively, it must be done on the basis of mutual agreement. This requirement could act as a significant barrier to curbing emissions.

To advance the debate about how to overcome the current policy impasse, this paper has presented a proposal for an international aviation emission charge. ICAO member states have shown an aversion to emission charges in the past. Internal deliberations about CO₂ emission charges have been stalled since 2004. The prospect of attracting across-the-board support for such a scheme appears low. However, the scheme is designed to accommodate a number of the key concerns of states that have expressed reservations about abatement measures. The proposed carbon price would be low, responsibilities would be differentiated and a significant amount of the revenue would be directed to developing countries seeking assistance to reduce LULUCF emissions. The concessions may not be sufficient to attract widespread support. Notwithstanding this, the proposal may provide a basis for further negotiation and policy development.

References

Committee on Aviation Environmental Protection (CAEP) 2004, *Committee on Aviation Environmental Protection, Sixth Meeting, Montreal, 2 – 12 February 2004, Report*, ICAO, Canada.

Committee on Aviation Environmental Protection (CAEP) 2001, *Committee on Aviation Environmental Protection, Fifth Meeting, Montreal, 8 – 17 January 2001, Report*, ICAO, Canada.

Council of the European Union (CEU) 2007, *Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community*, Interinstitutional File 2006/0304 (COD), Doc. No. 16855/07, CEU, 21 December, Belgium.

Council Special Group on Legal Aspects of Emissions Charges 2005, *Report of Council Special Group on Legal Aspects of Emissions Charges*, ICAO Council 176th Session, Working Paper, Doc. C-WP/12530, 15 September, ICAO, Canada.

Downing, T., D. Anthoff, R. Butterfield, M. Ceronky, M. Grubb, J. Guo, C. Hepburn, C. Hope, A. Hunt, A. Li, A. Markandya, S. Moss, A. Nyong, R. Tol and P. Watkiss 2005, *Scoping uncertainty in the social cost of carbon, Final project report, Social Cost of Carbon: A Closer Look at Uncertainty (SCCU)*, Department of Environment, Food and Rural Affairs (DEFRA), United Kingdom.

European Federation for Transport and Environment (EFTE) 2007, *No flight plan: How the International Civil Aviation Organization (ICAO) has blocked progress on climate change for a decade*, EFTE, September, Belgium.

European Commission (EC) 2006, *Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community*, COM(2006) 818 Final, 2006/0304(COD), EC, Belgium.

European Commission (EC) 2005, *Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Reducing the Climate Change Impact of Aviation*, COM(2005) 459 Final, EC, Belgium.

Hardeman, A. 2007, 'A Common Approach to Aviation Emissions Trading', *Air and Space Law*, Vol. XXXII(1), pp. 3 – 18.

Havel, B. 2007, *Will Emissions Trading and Taxing Programs Achieve Sustainability*, Presentation at ICAO-McGill University Institute of Air and Space Law, Aviation Safety, Security and the Environment: The Way Forward Conference, September 14 – 16, Montreal, Quebec, Canada.

Intergovernmental Panel on Climate Change (IPCC) 2006, *2006 IPCC Guidelines for National Greenhouse Gas Inventories* [Eggleston, H., L. Buendia, K. Miwa, T. Ngara and K. Tanabe (eds)], Institute for Global Environmental Strategies, Japan.

Intergovernmental Panel on Climate Change (IPCC) 1999, *Aviation and the Global Atmosphere, A Special Report of IPCC Working Group I and III* [Penner, J., D. Lister, D. Griggs, D. Dokken, M. McFarland (eds.)], Cambridge University Press, United Kingdom and United States.

International Air Transport Association (IATA) 2000 – 2007, *World Air Transport Statistics*, IATA, Canada.

International Civil Aviation Organization (ICAO) 2008, 'International Civil Aviation Organization: Air Transport Bureau – Template Air Services Agreement', <<http://www.icao.int/icao/en/atb/epm/Ecp/Tasa.htm>> (12 April 2008).

International Civil Aviation Organization (ICAO) 2007a, *Annual Report of the Council 2006*, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2007b, *Resolutions Adopted by the Assembly, Assembly – 36th Session, Montreal, 18 – 28 September 2007*, Provisional Edition, ICAO, September, Canada.

International Civil Aviation Organization (ICAO) 2007c, *Report on Voluntary Emissions Trading for Aviation (VETS Report)*, Preliminary Edition, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2007d, *Draft Guidance on the Use of Emissions Trading for Aviation*, Provision Edition, Doc. 9885, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2007e, *ICAO Environmental Report 2007*, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2004a, *Operational Opportunities to Minimize Fuel Use and Reduce Emissions*, Circular 303, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2004b, *Assembly Resolutions in Force (as of 8 October 2004)*, Doc. 9848, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2004c, *Strategic Objectives of ICAO for 2005-2010, Consolidated Vision and Mission Statement*, ICAO, 17 December, Canada.

International Civil Aviation Organization (ICAO) 2003, *Declaration of Global Principles for the Liberalization of International Air Transport*, The Worldwide Air Transport Conference on Challenges and Opportunities of Liberalization, Montreal, 24 to 28 March, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2001, *Assembly Resolutions in Force (as of 5 October 2001)*, Doc. 9790, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2000a, *Annual Report of the Council 1999*, ICAO, Canada.

International Civil Aviation Organization (ICAO) 2000b, *ICAO's Policies on Taxation in the Field of International Air Transport*, 3rd Edition, Doc. 8632, ICAO, Canada.

International Civil Aviation Organization (ICAO) 1991 – 2007, *Annual Reports of the Council*, ICAO, Canada.

International Civil Aviation Organization (ICAO) Secretariat 2007, *Overview of Trends and Developments in International Air Transport*, ICAO, 2 August, Canada.

International Civil Aviation Organization (ICAO) Secretariat 2005, *ICAO Secretariat Study on the Safety and Security Aspects of Economic Liberalization*, Presented to the Council on 1 June 2005, ICAO, Canada.

Macintosh, A., L. Wallace 2008, *International aviation emissions to 2025: Can emissions be stabilized without restricting demand?*, Working Paper Series 2008/1, ANU Centre for Climate Law and Policy, ANU College of Law, The Australian National University.

Müller, B. and C. Hepburn 2006, *IATAL — an outline proposal for an International Air Travel Adaptation Levy*, Oxford Institute for Energy Studies, United Kingdom.

Ralph, M. 2007, *Report of the Independent Experts on the 2006 Review of NO_x Technologies and the Setting of Medium and Long Term Goals*, Presented to the Seventh Meeting of CAEP, Montreal, Canada.

Ribeiro, K., S. Kobayashi, M. Beuthe, J. Gasca, D. Greene, D. S. Lee, Y. Muromachi, P. J. Newton, S. Plotkin, D. Sperling, R. Wit, P. J. Zhou, '2007: Transport and its infrastructure', in IPCC, *Climate Change 2007: Mitigation, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, [Metz, B., O. Davidson, P. Bosch, R. Dave, L. Meyer (eds)], Cambridge University Press, United Kingdom and United States.

Schwarze, G. 2007, 'Including Aviation into the European Union's Emissions Trading Scheme', *European Environmental Law Review*, January, pp. 10 – 22.

Subsidiary Body for Scientific and Technological Advice (SBSTA) 1996, *Possible revisions to the guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Addendum, Methodological Issues*, FCCC/SBSTA/1996/9/Add.1, 25 June, UNFCCC Secretariat, Germany.

United Nations Framework Convention on Climate Change (UNFCCC) 2007, *Reducing emissions from deforestation in developing countries: approaches to stimulate action*, Decision - /CP.13, UNFCCC Secretariat, Germany (available at: http://unfccc.int/files/meetings/cop_13/application/pdf/cp_redd.pdf (12 April 2008)).

United States Department of Transportation (USDT) 2005, 'United States Questions European Aviation Emissions Trading Scheme', <<http://usinfo.state.gov/gi/Archive/2005/Dec/05-48743.html>> (8 April 2008).

Vreede, F. 2008, 'Frans Vreede on the Dutch Ticket Tax', <<http://lawprofessors.typepad.com/aviation/2008/week6/index.html>> (28 March 2008)

Wang, Y. 2001, *Airline Product Distribution Systems and the Regulatory Framework, Presentation by Yuanzheng Wang of ICAO at the World Trade Organization's Symposium on Tourism Services, Geneva, 22-23 February 2001*, ICAO, Canada.

Wit, R., B. Boon, A. Velzen, M. Cames, O. Deuber and D. Lee 2005, *Giving wings to emission trading: Inclusion of aviation into the European Emissions Trading System - design and impacts*, report for the European Commission, CE Delft, July, The Netherlands.

Yohe, G., R. Lasco, Q. Ahmad, N. Arnell, S. Cohen, C. Hope, A. Janetos and R. Perez 2007, Perspectives on climate change and sustainability', in IPCC, *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.)], Cambridge University Press, United Kingdom and United States.

Appendix A ICAO's main greenhouse gas emission achievements, mid-1990s to 2007

1993	ICAO tightens NO _x engine standards (first introduced in 1981). The standards were designed to address local air quality issues, but they also reduce NO _x -related effects on global warming.
December 1995	CAEP/3. Recommends that NO _x standards be tightened. A working group is established to investigate technical and regulatory aspects of greenhouse gas emission control. CAEP also appoints a Focal Point on Charges (FPC) and requests that the FCP investigate the costs and environmental benefits of emission charges.
September 1996	At the request of ICAO, the IPCC resolves to prepare a special report on aviation and the global atmosphere.
December 1996	The ICAO Council adopts the <i>Council Resolution on Environmental Charges and Taxes</i> . The resolution states: <ul style="list-style-type: none"> • because of differing views, an internationally agreed environmental charge or tax on air transport is not practical; and • any environmental levies should be in the form of charges not taxes and that the funds be applied in the first instance to mitigating the environmental impact of aircraft engine emissions.
March 1997	Council makes amendments to Annex 16, but refers CAEP/3 Recommendation 2/3 on NO _x emission limits back to CAEP for further consideration.
December 1997	Conference of the Parties to the UNFCCC adopts the Kyoto Protocol, which requires Annex B countries to pursue reductions in international aviation emissions through ICAO.
April 1998	CAEP/4. The Committee recommends the tightening of the NO _x emission standards. CAEP is also presented with a report by the FPC on emission charges and a resolution is passed to undertake further research on the issue. CAEP established a new working group to investigate ways of reducing fuel burn through operational measures and a study group to look at the role of market measures in controlling emissions.
October 1998	32 nd Session of the ICAO Assembly. The Assembly adopted resolutions that (<i>inter alia</i>): <ul style="list-style-type: none"> • requested the ICAO Council to continue to pursue all aviation matters related to the environment and to 'maintain the initiative in developing policy guidance on these matters, and not leave such initiatives to other organizations'; • urged states to refrain from unilaterally introducing environmental measures; and • called upon ICAO, working through the CAEP, to 'study policy options to limit or reduce the greenhouse gas emissions from civil aviation'.

February 1999	On basis of CAEP/4 recommendations, the Council tightens NO _x standards, which apply to engines newly certified from 31 December 2003.
April 1999	IPCC Working Groups I and II accept <i>Aviation and the Global Atmosphere</i> . The report is published later that year.
January 2001	<p>CAEP/5. The main developments in CAEP's three areas of interest were as follows.</p> <ul style="list-style-type: none"> • Technology and standards – The Committee decided it would not pursue an ICAO standard for limiting CO₂ emissions. The move was justified on three grounds: (a) the technical difficulty of devising an appropriate standard given the range of aircraft operations; (b) the aviation industry already faces considerable market pressure to improve fuel efficiency; and (c) there is a danger that a point-based certification system could undermine efforts to reduce overall emissions. • Operational measures – The Committee endorsed guidance material on ways of improving fuel efficiency and reducing emissions via operational means. It also called for the results of the work conducted by CAEP's Working Group 4 (WG/4) to be included in the <i>Plan for Global Air Navigation CNS/ATM Systems</i>. • Market measures – The Committee decided that a closed emissions trading scheme (ETS) for aviation (i.e. aviation only) was undesirable, called for further work on an open ETS (i.e. open to other sectors) and suggested that voluntary measures could be a good way of encouraging near-term action. It also suggested that environmental charges could be a useful short-term measure and recommended further study on their applications. <p>In addition, CAEP approved a CAEP Action Plan on Emissions, which acknowledged the need for emission targets for aviation and noted CAEP's work on NO_x standards and operational measures. It also noted that an open ETS is a cost effective way of reducing CO₂ missions, but stated that further consideration should be given to voluntary measures and environmental levies.</p>
October 2001	<p>33rd Session of the ICAO Assembly. The Assembly adopted resolutions that (<i>inter alia</i>):</p> <ul style="list-style-type: none"> • requested the Council to continue studying policy options to reduce emissions; • requested the Council to promote the use of operational measures to reduce emissions; • requested the Council to continue to develop guidance and the application of market-based measures; • encouraged states to take short-term actions to limit or reduce aviation emissions, particularly through voluntary measures; • urged states to refrain from unilaterally imposing environmental levies that were inconsistent with the Council's

	<p>resolution of December 1996; and</p> <ul style="list-style-type: none"> endorsed the development of an open ETS and requested the Council to develop guidelines on an open ETS for international aviation.
February 2004	<p>ICAO publishes <i>Operational Opportunities to Minimize Fuel Use and Reduce Emissions</i> (Circular 303), which provides information on ways of improving the fuel efficiency of the aviation industry.</p> <p>CAEP/6. WG/5 presented a draft <i>Framework for Guidance on Implementation of CO₂ Emission Charges</i>. However, the meeting failed to reach agreement on the framework. In relation to ETS, the Committee agreed not to pursue an approach requiring a new international legal instrument. It recommended that ICAO's work on ETS should pursue a voluntary scheme or the integration of international aviation into national ETS. CAEP also presented a draft template agreement – MOU that could be used by states when concluding voluntary emission agreements.</p>
May 2004	<p>ICAO Council took action on recommendations from CAEP/6 regarding the amendment of NO_x standards and procedures. The amendments applied to new engines from 2008.</p>
October 2004	<p>35th Session of the ICAO Assembly. The Assembly adopts resolutions that are similar to the environmental resolutions of the 33rd Session of the Assembly. The resolutions (<i>inter alia</i>):</p> <ul style="list-style-type: none"> encouraged states to limit or reduce the climate impacts of international aviation, particularly through voluntary measures; requested the Secretary General of ICAO to facilitate voluntary programs by publishing guidelines on voluntary measures; urged states to follow the 1996 resolution in relation to environmental charges and taxes and to refrain from unilaterally introducing greenhouse gas charges until the 36th Session of the Assembly in 2007; and endorsed an open ETS and requested the Council to focus on two approaches in its work on the subject: (a) a voluntary emissions trading scheme; and (b) ICAO providing guidance for states to follow when seeking to include international aviation emissions in national ETS.
February 2007	<p>CAEP/7. The main developments were as follows.</p> <ul style="list-style-type: none"> Technology and standards – A Panel of Independent Experts proposed the setting of medium term (2016) and long term (2026) goals of reducing NO_x emissions by 45% and 60% below the CAEP/6 standard levels respectively. CAEP recommended that ICAO establish medium and long-term NO_x goals. Market measures – A report on voluntary ETS was prepared by CAEP's Emission Trading Task Force (ETTF). CAEP

	<p>recommended the report be published on ICAO's website. The EETF also prepared guidance on the integration of international aviation into national ETS, which was subsequently published. Due to ongoing disputes about emission charges, further guidance on charges was only developed in relation to local air quality.</p>
<p>September 2007</p>	<p>ICAO releases its first environmental report, which provides information on aviation greenhouse gas emissions, technological developments and industry growth projections.</p> <p>36th Session of the ICAO Assembly. The Assembly adopts resolutions that are similar to those from the 35th session. The resolutions (<i>inter alia</i>):</p> <ul style="list-style-type: none"> • requested the Council to establish a new Group on International Aviation and Climate Change (GIACC) for the purpose of developing an 'aggressive' Programme of Action on International Aviation and Climate Change; • requested states to report on a set of actions and plans to reduce by 2020 airspace congestion that is contributing to delays and unnecessary fuel burn; • requested the Council to establish a set of environmental indicators that states could use to evaluate policy outcomes.

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