



**Written Submission of International Civil Aviation Organization (ICAO)  
to the third Session of the Ad Hoc Working Group on Long-term Cooperative  
Action under the Convention (AWG-LCA)  
(Accra, 21 - 27 August 2008)**

### **Executive Summary**

Despite the relatively small level of the contribution of international aviation emissions to the total CO<sub>2</sub> emissions generated by anthropogenic activities (approximately 1.3%) the continuous growth of the sector (forecast to increase at an average annual rate of 4.6% between 2005 and 2025) raises questions on the future contributions of this activity to climate change and on the most effective way of addressing those emissions in a future climate agreement.

Although emissions from domestic aviation can be considered using the same approach applied to emissions from other activities situated within a State, international aviation emissions differ as they are not contained within a single State, and may occur within the territory of other States or in areas such as the upper atmosphere and over the high seas. International aviation also operates within a specific legal framework, established under the Convention on International Civil Aviation - the “Chicago Convention” - in 1944 and now ratified by 190 States.

With that background, the Kyoto Protocol established that the limitation or reduction of greenhouse gases from international aviation should be pursued working through ICAO, while action on domestic aviation emissions should use the same approach as emissions from other domestic activities.

The aviation industry has a very good environmental record. Standards and Policies to address the impact of aviation on the environment were established by ICAO in the early 70’s. Aircraft today are 70 per cent more fuel efficient than the first generation of aircraft. Operational measures can deliver substantial savings with regard to fuel burn (around 12%) and the Organization has been instrumental in facilitating States action in this area. ICAO is also exploring various market based measures to address aviation emissions.

The 36th Session of the ICAO Assembly in 2007 established the Group on International Aviation and Climate Change (GIACC) consisting of 15 high-level government officials from States that are geographically representative of developed and developing countries alike. Their collective mandate is to develop and recommend to ICAO an aggressive programme of action for international aviation and climate change to be considered by the Organization under a timeline that takes into account the 15th Conference of the Parties to the UNFCCC in Copenhagen, at the end of 2009. In July, GIACC held its second meeting and discussed the possible establishment of short, medium and long term goals for fuel burn. They also formed smaller working groups to expedite work on goals, measures and means to evaluate progress to reduce aviation GHG.

Cooperation with other UN bodies and in particular with the UNFCCC process is paramount to achieving a sound and effective solution for addressing aviation emissions. While this ongoing dialogue is certainly a prerequisite to effective and lasting progress, it is not sufficient by itself. It is also critical that States’ representatives taking part in meetings within the UNFCCC and ICAO align their respective views and positions to ensure that emissions from international aviation will be considered in the most effective way under the upcoming climate agreement.

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## **Introduction**

The International Civil Aviation Organization (ICAO) is a United Nations (UN) specialized agency responsible for aviation matters. This paper presents the main activities undertaken by the Organization in the field of environmental protection in particular in addressing aviation greenhouse gases (GHG). It is intended to provide a basis for discussions related to international aviation, to the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) under the topic cooperative sectoral approaches and sector-specific actions, in order to enhance implementation of Article 4, paragraph 1(c) under the Convention.

The Convention on International Civil Aviation (also known as the Chicago Convention), was signed on 7 December 1944 and currently has 190 Contracting States. ICAO was established as an organization to secure international cooperation with the highest possible degree of uniformity in regulations and Standards regarding international civil aviation matters. Air transport is one of the safest forms of transport due mainly to the existence of global Standards and policy implemented in a harmonized manner by States within the ICAO framework. Principles of the Chicago Convention have been regulated through international Standards and recommended practices (SARPs) contained in the 18 Annexes to the Convention.

The 96 articles of the Chicago Convention establish the privileges and restrictions of all Contracting States. The Convention accepts the principle that every State has complete and exclusive sovereignty over the airspace above its territory and provides that no scheduled international air service may operate over or into the territory of a Contracting State without its previous consent.

ICAO has a sovereign body, the Assembly, and a governing body, the Council. The Assembly meets at least once every three years and is convened by the Council. Each Contracting State is entitled to one vote, and decisions of the Assembly are taken by a majority of the votes cast except when otherwise provided for in the Convention. At these meetings, the complete work of the Organization in the technical, economic, legal and technical cooperation fields is reviewed in detail, and guidance is given to the other bodies of ICAO for their future work.

The council of ICAO is comprised of states categorised into three “parts”: Part I - States of chief importance to air transport, Part II - States which make the largest contribution to the provision of facilities for international and Part III - ensuring geographic representation.

## **1. ICAO’s work on environmental protection**

In December 2004, the Council of ICAO approved six Strategic Objectives for the period 2005-2010, Safety, Security and Environmental Protection being the core ones. Specifically for Environmental Protection three goals have been adopted:

- a) limit or reduce the number of people affected by significant aircraft noise;
- b) limit or reduce the impact of aviation emissions on local air quality; and
- c) limit or reduce the impact of aviation greenhouse gas emissions on the global climate.

Annex 16 - *Environmental Protection* sets the Standards and Recommended Practices relating to environmental protection. Volume I for aircraft noise and Volume II for aircraft engine emissions. ICAO has also developed studies, guidance and policies to reduce aviation emissions based on three approaches: reduction of emissions at source through technological innovation (cleaner and more efficient engines and airframes); reduction of emissions through operational measures (e.g. more efficient air traffic management); and through market based measures.

## **1.1 Aircraft engine emissions framework**

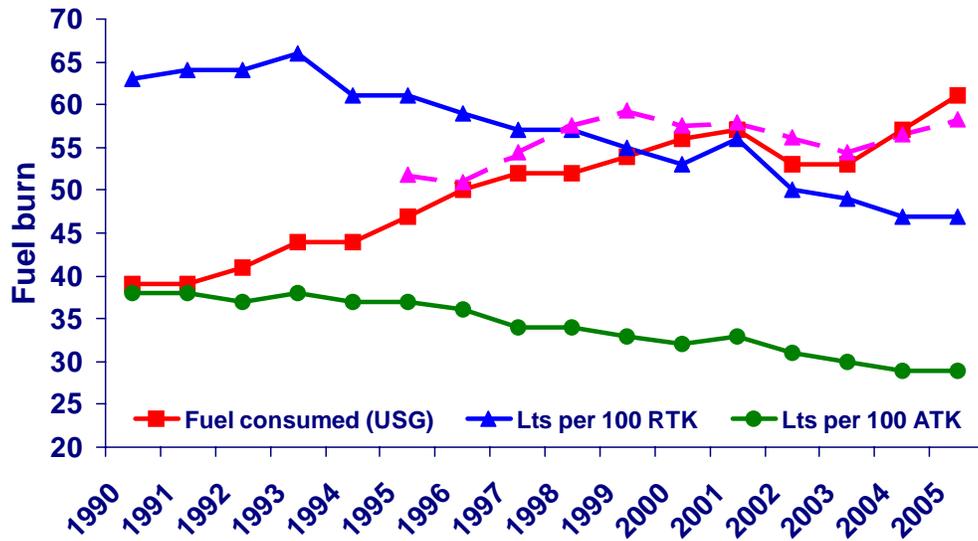
The Kyoto Protocol includes binding emission reduction targets for developed countries (Annex I parties), for the period 2008-2012. Emissions from domestic aviation are included in the total emissions reported and subject to the above targets. Emissions from international aviation, due to the methodological and legal issues involved (including provisions under the Chicago Convention) were included under Art. 2.2 of the Kyoto Protocol, which reads: *“The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively”*.

### ***1.1.1 Key facts and figures: current/future***

Aviation is a major catalyst of economic development. Around 2.2 billion passengers are transported by air every year. International traffic represents almost 60% of the total scheduled passenger traffic and about 83% of freight air traffic. Total scheduled passenger traffic worldwide is forecast to increase at an average annual rate of 4.6% (2005–2025).

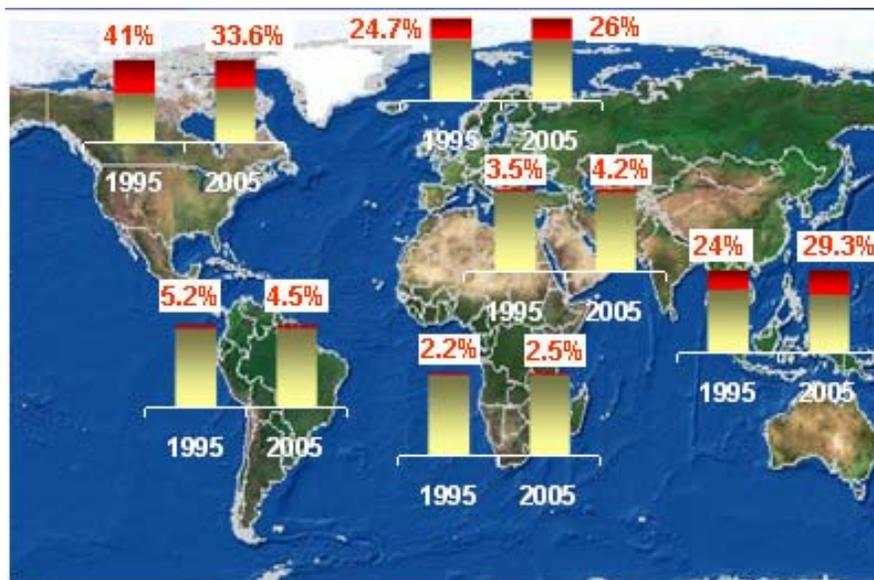
ICAO conducts studies and analyses of regional differences in international airline operating economics with the aim of estimating and comparing airline costs in different regions of the world. As part of these analyses, fuel consumption is estimated from information of each airline’s scheduled operations obtained from the Official Airline Guide (OAG), using a fuel consumption formula specific to each aircraft type. From these fuel consumption figures, it is possible to estimate emissions for any airline on each scheduled flight sector flown by taking into account the aircraft type operating the flight. ICAO has modelled data to estimate fuel consumption (CO<sub>2</sub> emissions) on an annual basis, either by equipment type (aircraft model, jet/non-jet, passenger or cargo), by service category (international or domestic) or by origin/destination (route group, country or city) broken down at different levels such as, country of departure, country pair or country of airline registration.

ICAO has estimated that around 229 134 million litres (187 890 million tonnes) of jet fuel were consumed in the year 2005 – 83 742 million litres (68 668 million tonnes) in total by domestic aircraft (passenger and cargo) and 145 391 million litres (119 221 million tonnes) by aircraft used for international operations (passenger and cargo). This represents approximately 519 511 million tonnes of CO<sub>2</sub>, 189 868 million tonnes and 329 643 million tonnes of which can be attributed to domestic and international operations respectively.



**Figure 1 - Fuel consumption vs capacity evolution**

AAGR – Average Annual Growth Rate; ATK - Average tonnes km; RTK – Revenue tonnes km



Source: ICAO based on OAG timetable

\*By region of registration

**Figure 2 - Regional fuel consumption as percentage of the global**

	Country of departure	Fuel*		Country of departure	Fuel*
1.	United States	74 584	11.	United Arab Emirates	4 038
2.	China	18 282	12.	Korea	4 037
3.	United Kingdom	11 804	13.	Netherlands	3 983
4.	Japan	11 678	14.	Italy	3 974
5.	Germany	8 611	15.	Thailand	3 966
6.	France	6 715	16.	Singapore	3 889
7.	Australia	5 354	17.	Brazil	3 642
8.	Canada	5 121	18.	India	3 556
9.	Spain	4 953	19.	Mexico	3 054
10.	Russia	4 635	20.	Malaysia	2 374

\*Fuel consumption expressed in million liters

Figure 3 - Fuel consumption by top twenty countries of departure

		PASSENGER SERVICES			
Cargo Services	Fuel*	International-	Fuel*	Domestic	Fuel*
1. United States	7 750	1. United States	20 220	1. United States	46 613
2. China	2 956	2. United Kingdom	10 611	2. China	6 979
3. United Arab Emirates	1 611	3. China	8 346	3. Japan	3 910
4. Korea	1 111	4. Germany	7 088	4. Russia	3 006
5. Japan	994	5. Japan	6 774	5. Australia	1 930
6. Germany	812	6. France	5 412	6. Canada	1 918
7. Netherlands	725	7. Spain	3 693	7. Brazil	1 672
8. France	605	8. Singapore	3 531	8. Indonesia	1 257
9. India	481	9. Thailand	3 255	9. Mexico	1 232
10. Luxemburg	457	10. Netherland	3 249	10. Spain	1 209

\*Fuel consumption expressed in million liters  
 Source: ICAO based on OAG timetable +Including Domestic legs of International Services

Figure 4 - Fuel consumption for the top 10 countries by category of service (by country of departure)

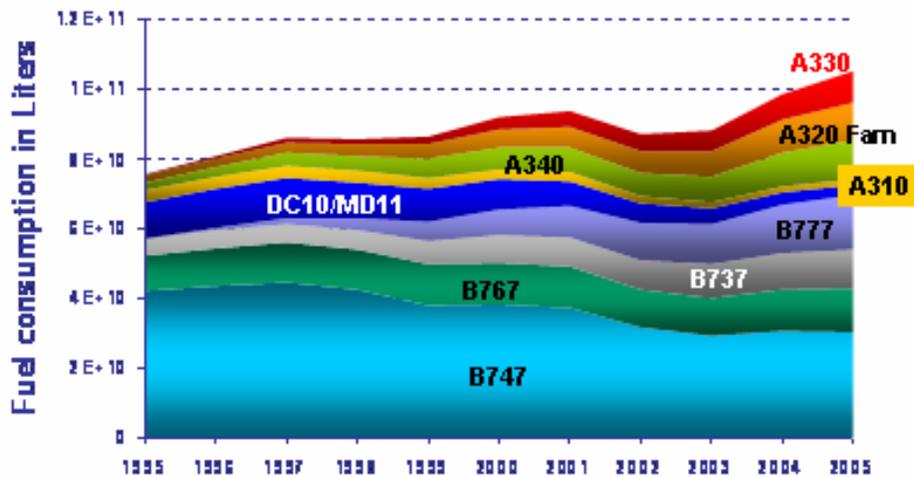
	AIRLINE	Fuel*
1.	American Airlines	11 490
2.	United Airlines	9 086
3.	Delta Airlines	8 465
4.	British Airways	7 172
5.	Northwest Airline	6 731
6.	Lufthansa	6 565
7.	Air France	6 167
8.	Southwest	5 412
9.	Singapore Airline	5 386
10.	Continental	5 263

\*Fuel consumption expressed in millions liters

Source: ICAO based on OAG timetable  
Air Transport Bureau

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Figure 5 - Fuel consumption by top ten airlines



10 aircraft types services represent **more than 80%** of global fuel consumption through 1995 to 2005 for Passenger International services

Source: ICAO based on OAG timetable  
Air Transport Bureau

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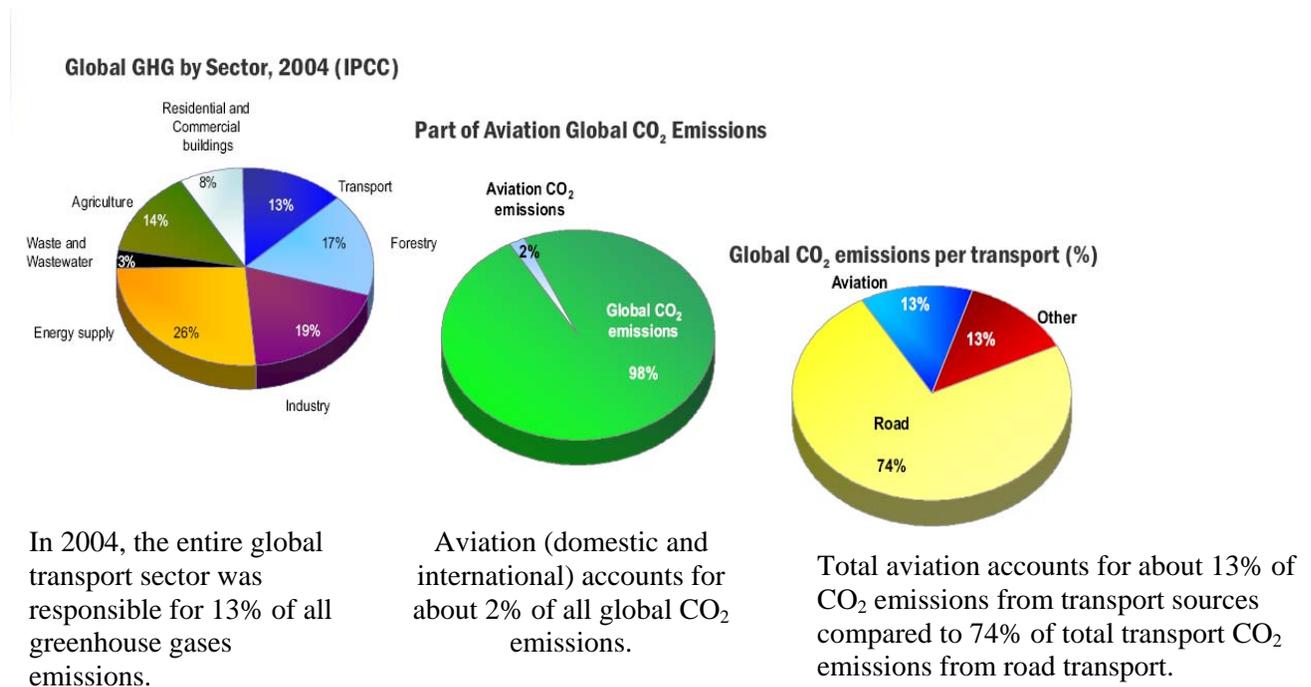
Figure 6 - Fuel consumption evolution by major aircraft type on international Passenger Services

### 1.1.2 Key aviation and climate change figures

The most comprehensive assessment to-date concerning aviation's impact on the upper atmosphere is contained in the Intergovernmental Panel on Climate Change (IPCC) Special Report on Aviation and the Global Atmosphere (1999). The emissions considered in that report were: carbon dioxide, water vapour, carbon monoxide, hydrocarbons, particles, oxides of nitrogen, and sulphur compounds. The base year for the study was 1992 and it contained forecasts for 2015 and projected scenarios for 2050.

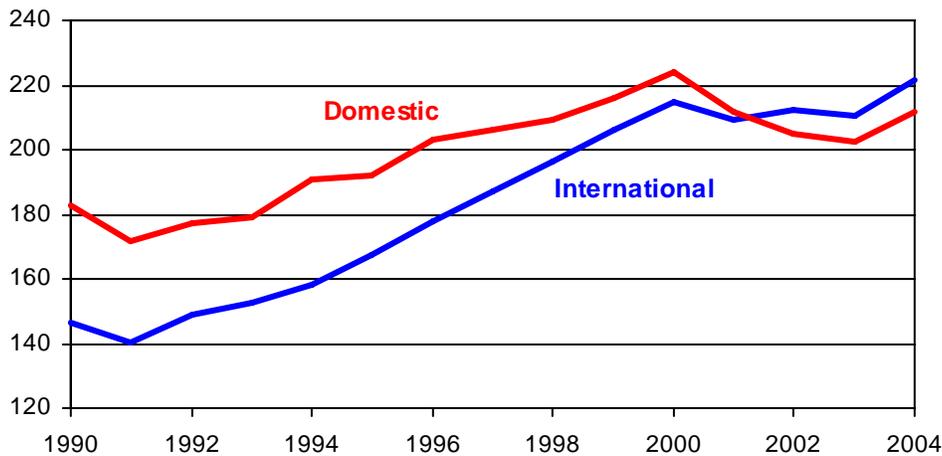
The IPCC AR4 revision of 2007 includes an update of the main finding of the Special Report as well as new findings related to aviation emissions, including influence of contrails and aerosols on cirrus clouds and the climate impact of oxides of nitrogen and methane. In addition, a range of technological options were examined by IPCC showing possible progress through substantive reductions in fuel usage that could arise from the introduction of more radical technologies. New findings related to aviation emissions *inter alia* are the following:

- Total aviation CO<sub>2</sub> emissions is approximately 2 percent of CO<sub>2</sub> emissions;
- The amount of CO<sub>2</sub> emissions from aviation is projected to grow around 3 to 4 percent per year; and
- Medium-term mitigation for CO<sub>2</sub> emissions from the aviation sector potentially can come from improved fuel efficiency. However, such improvements are expected to only partially offset the growth of aviation CO<sub>2</sub> emissions.



**Figure 7 - Global CO<sub>2</sub> emissions and global Green House Gases (GHG) per sector** Source - IPCC

Regarding the assessment of aviation cloudiness, for 2005 aircraft operations, persistent contrails added about 0.01 W m<sup>-2</sup>, with about a factor-of-three uncertainty, to climate forcing from human activities. This is less than 1% of the climate contribution from CO<sub>2</sub> increases and of the total anthropogenic radiative forcing. The contrail contribution has been revised downward by about a factor of two from the 1999 IPCC assessment due to improved estimates of contrail cover and cloud radiative effects. Contrail cirrus is an additional radiative forcing component, but currently has no best estimate. Aviation soot aerosol is expected to have increased the number of atmosphere particles in the upper atmosphere, which can potentially change cirrus cloud properties.



**Figure 8 – Annex I Parties - International and domestic aviation emissions CO<sub>2</sub> growth**  
Source: UNFCCC (data excludes the Russian Federation)

## 1.2 Why is international aviation currently addressed differently under the UNFCCC Kyoto Protocol

Several key characteristics of international aviation led to its inclusion in Article 2.2 of the Kyoto Protocol, and should be considered in defining a post 2012 agreement. One of them is the complexity of monitoring and collecting information and assigning emissions of a mobile nature. An international aircraft route might include the overfly of different sovereign States and the high seas, and there is currently a debate over the allocation of these emissions.

Air transport is a fast, reliable mode of transport with no comparative alternative for long distance travel. Actions on international air transport taken by a State might have direct impact on the operations in another State. In order to collect the required data and put in place effective measures to address international aviation emissions, global, harmonized, and regulated actions need to be taken.

## 2. ICAO initiatives to address aviation emissions

The Committee on Aviation Environmental Protection (CAEP), a technical committee of the ICAO Council, addresses aviation environmental aspects, updating and developing ICAO's Standards and Recommended Practices as well as related guidance material for both aircraft noise and aircraft engine emissions.

Aircraft engine emissions are directly linked to fuel consumption. Overall fuel efficiency for civil aviation can be improved through a variety of methods for example, by increasing aircraft efficiency through technology, improved operations and efficient air traffic management. ICAO's work on environmental protection began as far back as the 70's. In 2001, the ICAO Assembly requested the Council to continue studying policy options to limit or reduce the environmental impact of aircraft engine emissions calling for special emphasis to be placed on the use of technical solutions, while continuing consideration of market-based measures, and taking into account potential implications for developing and as well as developed states.

The 36th Session of the ICAO Assembly was held in September 2007 and all contracting States agreed on a comprehensive plan of action comprised of four major elements:



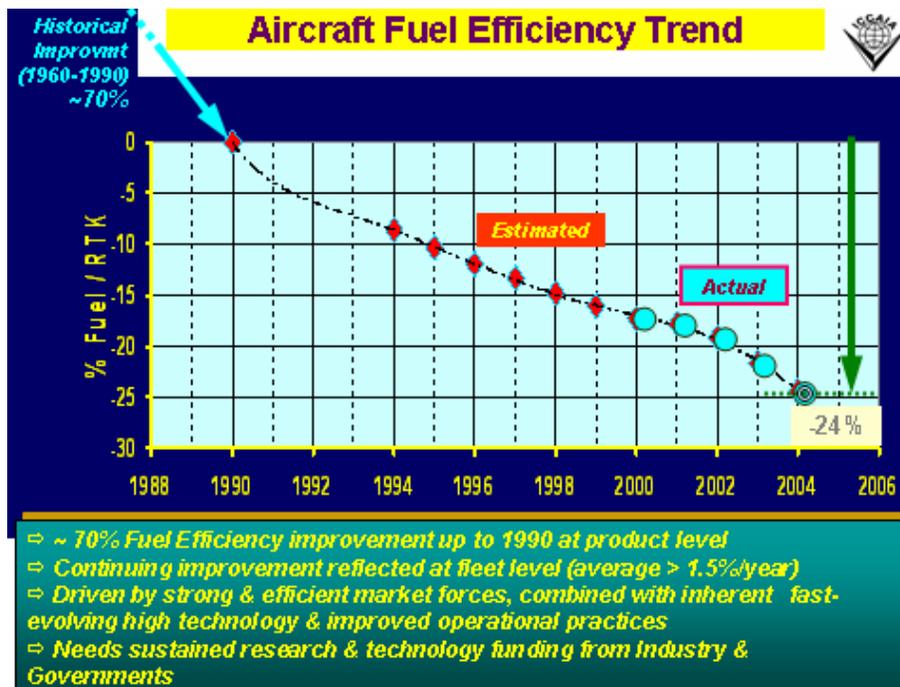


Figure 10 – Fuel Efficiency Trends by Generation of Engine Source: ICCAIA

There has been a notable increase in NO<sub>x</sub> stringency translating into a reduction in allowed NO<sub>x</sub> levels, of about 40 percent beyond the original ICAO standard for NO<sub>x</sub> adopted in 1981 (applicable in 1986), as shown in Figure 11. Although NO<sub>x</sub> Standards were initially intended to address local air quality, they also contribute to reduce the impact of aviation on climate, as NO<sub>x</sub> may be a precursor of ozone formation.

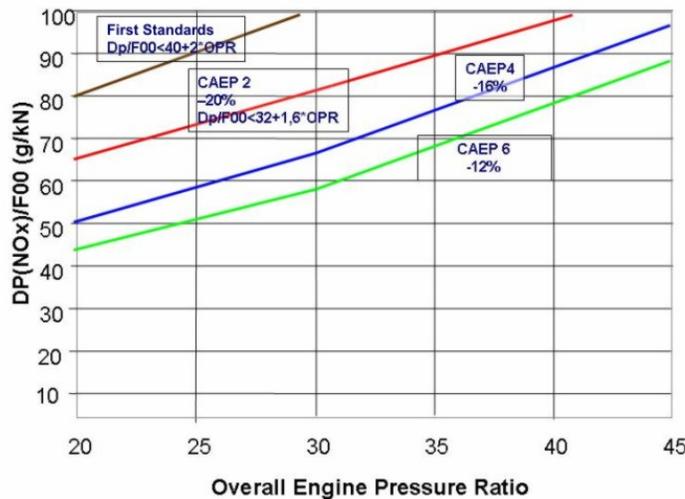


Figure 11 – ICAO NO<sub>x</sub> Emissions Stringency Trends Source: ICAO

Successful initiatives have led to substantive reductions in worldwide passenger air traffic fuel consumption (litres per passenger per 100 kms). Aircraft in the 1970s consumed about 12 litres of fuel to carry one passenger over a distance of 100 kilometres. Figure 12 illustrates technological improvements in the world passenger fleet. Fuel consumption averaged 8 litres per passenger/100 km in 1985, 5 litres per passenger/100 km in 2005, and is projected to come down to 3 litres per passenger/100 km in 2025.

The A-380 has a fuel efficiency of 2.9 litres per passenger/100 km in 2005 (20 years ahead of the projected fuel efficiency average for the world fleet). It therefore generates CO<sub>2</sub> emissions as low as 80g per passenger kilometre. It is noteworthy that this is comparable to the level of fuel efficiency for a mid-sized diesel car. Current regulatory proposals for the car industry aim at 140g of CO<sub>2</sub> per kilometre in 2009 and 120g in 2012. Boeing's new B-787 Dreamliner aircraft is estimated to be 20 percent more fuel efficient than comparable size aircraft.

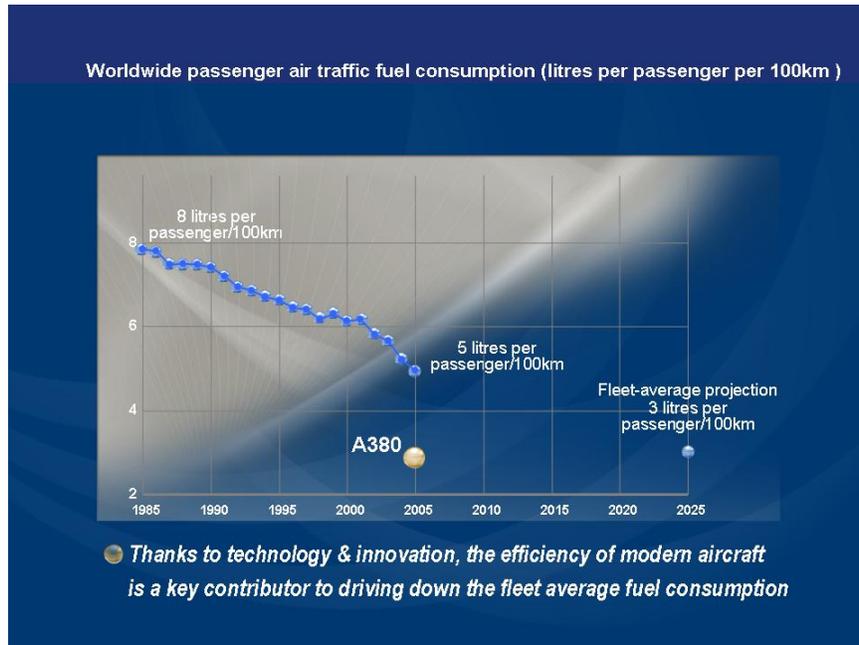


Figure 12 - Changes in Aircraft Fuel Efficiency - Source: Airbus.

### 2.1.1 Main achievements in technology

The introduction of ICAO Standards has contributed to the introduction of new technologies in the in-service fleet and to substantial reductions of NO<sub>x</sub>, HC and CO<sub>2</sub> and continued improvement is expected. Mandatory certification of new aircraft according to ICAO Standards has resulted in more efficient and cleaner aircraft.

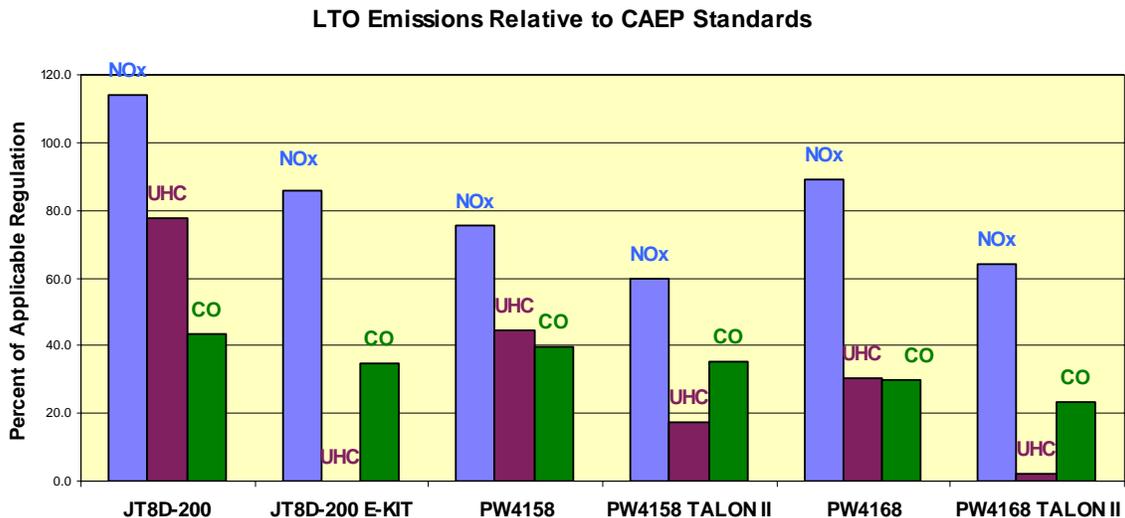


Figure 13 – Relative Reductions in Pollutants from Aviation by Engine Type Source: Pratt & Whitney.

Figure 13 shows examples of relative reductions in emissions levels from landings and take-off (LTO) before and after implementation of ICAO's Standards. For example, in the first comparison from left to right for the Pratt & Whitney JT8D-200 engines, emissions levels for NO<sub>x</sub>, UHC, and CO are at their highest. However, after compliance with ICAO's Standards from P&W JT8D-200 E-Kit, the overall levels of emissions dropped significantly. In fact, unburned hydrocarbons have been virtually eliminated. Similar examples exist for aircraft engines from other manufacturers.

### ***2.1.2 Future work***

CAEP is currently studying the possibility of having medium and long term fuel burn technology goals, including the study of the potential use of alternative fuels and the development of a new environmental technical manual for aircraft engine emissions. Future work also includes the possible development of CO<sub>2</sub>/fuel efficiency metrics and parameters. The possibility of using alternative fuels is also being researched by the major aircraft manufacturers, as described in the following paragraphs, and it is foreseen that ICAO will play a crucial role by assisting with the development of the regulatory framework.

### ***Alternative Fuels***

Currently, most civil aviation aircraft around the world use kerosene based on crude oil. This fuel provides a good balance of properties required for aviation. However, concerns over rising fuel costs, energy supply security and the environment, have led to the need to investigate the development of alternative fuels. A viable alternative aviation fuel could offer important benefits such as stabilizing world fuel prices and reducing the uncertainty and vulnerability that comes from too much reliance on petroleum as the main fuel source. In addition, alternative fuels could increase the environmental performance of air transport, allowing it to substantially reduce CO<sub>2</sub> emissions.

Aircraft and engine manufacturers are currently investigating synthetic jet fuels (e.g. from coal, natural gas, or other hydrocarbon feedstock) as well as bio-fuels. The type of fuel that is of immediate interest to aviation is termed a "drop-in" fuel, (i.e. a direct substitute fuel) that can be used without any substantial modification to engine or aircraft.

## **2.2 Operational measures**

A significant way of achieving reduction in emissions is to shorten flight times and hence fuel consumption through improvements to the air traffic management (ATM) system. Such improvements have the potential to provide more direct routings for aircraft, as well as reducing the time spent in holding patterns waiting to land or queuing while waiting to depart.

According to the 1999 IPCC Special Report, improvements in ATM operational procedures could reduce aviation fuel burn by between 6 and 18%. A further 2 to 6% could come from improvements in other operational measures.

ICAO's main focus for operational measures is on the Global Air Navigation Plan. This plan requires environmental aspects to be taken into account right from the outset, when designing, developing and operating ATM systems. Emissions-related aspects of the plan include the flexible use of airspace; air traffic flow management; dynamic and flexible route management; terminal area design and management; aerodrome design and management; and performance based navigation.

### ***2.2.1 Main achievements in operational measures***

The aviation community has been working on ATM operational improvements for decades. The work accelerated with the onset of Communication/Navigation/Surveillance and ATM systems (CNS/ATM). Technology development has been more rapid in recent years and improvements are now coming about

even quicker. A major operational improvement was the implementation of Reduced Vertical Separation Minima (RVSM), which brought significant operational benefits to aircraft operators in terms of reduced fuel burn, availability of optimal flight levels, and increase in capacity, while also benefiting the environment.

ICAO supported the development of RVSM, which was first implemented in 1997. RVSM has led to significant environmental benefits and will soon cover all airspace around the world. Studies<sup>1</sup> in the European regions have shown that RVSM leads to a reduction of NOx emissions, sulphur oxide emissions, and the reduction of total fuel burn (average of 80 kg fuel saving per flight).

Additional ICAO guidance to achieve fuel efficiency through operational measures is provided in Circular 303 - Operational Opportunities to Minimize Fuel Use and Reduce Emissions. That document identifies and reviews various operational opportunities and techniques for minimizing fuel consumption, and therefore emissions, in civil aviation operations. Operations covered in the guidance are: aircraft ground-level and in-flight operations, ground service equipment (GSE) and auxiliary power units (APUs), with potential actions to facilitate their broader application.

### **2.2.2 Future work**

ICAO has a central role to play in planning for the implementation of operational improvements. In addition to developing the necessary standards and guidance material, ICAO has developed a global ATM Operational Concept that was widely endorsed and used as the basis for planning. ICAO also provides the planning framework through the Global Air Navigation Plan and several other documents and tools that support planning and implementation efforts.

Every ICAO region has identified performance objectives and has developed work programmes to bring near and medium term benefits, while integrating those programmes with the extensive work already accomplished.

Work is also under way to define operational goals for fuel burn, to update Circular 303 and on new guidance material on Continuous Descent Approach.

### **2.3 Market based measures**

Market-based measures are policy tools designed to achieve environmental goals at a lower cost and in a more flexible manner than traditional command and control regulatory measures. ICAO has developed policies and guidance material and has been collecting information on three market-based measures to reduce emissions: voluntary measures; levies and emissions trading. The Organization is also exploring the potential use of carbon offsets for aviation.

In order to facilitate the exchange of information on voluntary activities aimed at reducing the impact of greenhouse gases (GHG) from aviation on climate, ICAO has collected information on voluntary actions by States and aviation stakeholders and has placed it on the ICAO website. Sharing the information will help entities to initiate environmental protection measures or improve their current activities. A template agreement for voluntary measures was developed and is available to States.

ICAO has also published guidance on local emission-related levies (*Guidance on Aircraft Emissions Charges Related to Local Air Quality* (Doc 9884). It also has long-standing policies covering charges in general and has developed separate policy guidance to States on taxation (*ICAO's Policies on Taxation in the Field of International Air Transport*, Doc 9082).

Nevertheless, the current focus of ICAO work in market-based measures to address aviation emissions is

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<sup>1</sup> EUROCONTROL January 2002.

emissions trading. ICAO has developed guidance for use by States for incorporating international aviation emissions into trading schemes. The guidance focuses on aviation-specific issues, identifies options and offers potential solutions among which that:

- Aircraft operators be the accountable international aviation entity for purposes of emissions trading;
- Obligations be based upon total aggregated emissions from all covered flights performed by each aircraft operator included in the scheme;
- States, in applying an inclusion threshold, consider aggregate air transport activity (e.g. CO<sub>2</sub> emissions) and/or aircraft weight as the basis for inclusion;
- States start with an emissions trading scheme that includes CO<sub>2</sub> alone;
- States apply the Inter-governmental Panel on Climate Change definition of international and domestic emissions for the purpose of accounting for greenhouse gas emissions as applied to civil aviation;
- States will need to put in place an accounting arrangement that ensures that emissions from international aviation are counted separately and not against the specific reduction targets that States may have under the Kyoto Protocol;
- Regarding trading units, States will need to consider economic efficiency, environmental integrity, and equity and competitiveness when making a choice.

On the question of geographic scope the guidance recommends that : *“States that wish to incorporate emissions from international aviation into their emissions trading schemes consistent with ICAO A36-2 (Appendix L) should not implement an emissions trading system on other Contracting States’ aircraft operators except on the basis of mutual agreement between those States”*.

The last ICAO Assembly agreed on the importance of emissions trading as a major tool, together with the reduction of emissions at source and operational measures, for controlling the impact of aviation emissions on the environment. A main point of discussions was how to reconcile the concept of common but differentiated responsibilities contained in the Framework Convention with the concept of non-discrimination contained in the Convention on International Civil Aviation. Of particular concern among the majority of States was the inclusion of operators from other States providing services to a State or region, in an emissions trading scheme being operated by that State or region, which would be applied to all emissions from the flight, even those emissions that were created outside the boundaries of that State or region. These States considered that participation in an emissions trading scheme should only be on the basis of mutual consent. An Assembly Resolution (A36-22) was consequently developed which contained this element of mutual consent. Forty-two European States (which comprise approximately 20% of ICAO’s member States) reserved their position regarding this aspect of the resolution.

CAEP is now addressing the main issues related to linking GHG emissions trading schemes including aviation. It is also addressing the potential for emissions offset measures to mitigate effects of aviation on climate change and on the potential for using emissions trading and offsets to address local air quality.

### **2.3.2 ICAO Carbon Calculator**

ICAO has developed a carbon calculator and methodology for the calculation of carbon dioxide emissions attributable to air travel. Officially launched in July 2008, the Calculator makes it possible to estimate the emissions attributed to their air travel. It is simple to use and requires only a limited amount of information from the user. The methodology applies the best publicly available industry data to account for various factors such as aircraft types, route specific data, passenger load factors and cargo carried. The ICAO Calculator is universal, neutral and transparent. The feedback so far from Contracting States, industry and users is very positive and ICAO intends to apply suggestions received to continually improve the Carbon Calculator.

## **2.4 Cooperation with other UN agencies**

ICAO, as the UN specialized agency for civil aviation, is collaborating with its UN sister organizations in the global effort to limit or reduce emissions from international civil aviation and it is determined to provide the world with the leadership and guidance required to move towards a sustainable global air transport system, in an environmental-friendly manner.

During the past years ICAO participated in numerous UN high-level environmental events and provided technical advice to UN panels, notably the UNFCCC and the IPCC. ICAO also cooperates with a number of other UN bodies including a) the United Nations Environment Programme (UNEP); b) the Montreal Protocol on Substances that Deplete the Ozone Layer; c) the UN Commission on Sustainable Development (CSD); d) the UN Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution; e) the World Health Organization (WHO); f) the International Maritime Organization (IMO); and g) the World Meteorological Organization (WMO) and most recently with the h) World Tourism Organization (UNWTO).

## **3. Main developments in ICAO since the Bonn Climate Change Talks**

Since ICAO last reported in Bonn, two major events haven taken place in Montreal. ICAO organized a workshop on aviation and carbon markets in June and GIACC held its second meeting in July. An update is also presented below, on the ICAO Carbon Calculator developments.

### **3.1 Aviation and Carbon Markets Workshop**

In the context of providing timely information, ICAO organized in Montréal, in June 2008, a Workshop on aviation and carbon markets. The keynote speaker at this event was Mr. Yvo de Boer, Executive Secretary of the UNFCCC via video conference. The objective of the event was to familiarize participants with key issues related to aviation emissions and carbon markets. A variety of approaches including emissions trading and carbon offset programmes were addressed, together with a broad discussion on other Kyoto flexible mechanisms and the opportunities for a global aviation carbon market. The workshop programme included presentations on emerging discussions on possible funding mechanisms for mitigation and adaptation. It is worthy of note that several ICAO Contracting States have already initiated voluntary initiatives on aviation based on ICAO guidance in this area. More information on this event, including copies of presentations, may be found on the ICAO website at [www.icao.int/2008/wacm](http://www.icao.int/2008/wacm).

### **3.2 Developments in the GIACC**

In July, GIACC held its second meeting and discussed the possible establishment of short, medium and long term goals for fuel burn. Three smaller working groups were formed to expedite work on goals, measures and means to evaluate progress to reduce aviation GHG. The next meeting will take place in February 2009 and the recommendations of GIACC are to be submitted to ICAO at a time which would take into account COP 15, in December 2009.

### **3.3 Carbon Calculator future development**

ICAO is now in the phase of disseminating the methodology and promoting the use of the tool by other entities. Several airlines and other UN agencies have shown interest in using the ICAO calculator on their web sites and several suggestions have been received via the online suggestions forum.

Frequent requests for guidance regarding the use of non-CO<sub>2</sub> multipliers have also been received from the public and ICAO has asked the IPCC to provide guidance on the appropriateness of multipliers. Therefore, the inclusion of a multiplier for the consideration of non-CO<sub>2</sub> gases will be evaluated when the scientific community reaches agreement on the issue.

ICAO is also considering the best way to link the tool to offset programmes. This is exploratory work and more information will be available at the beginning of next year.

#### **4. Next steps and concluding remarks**

International aviation's contribution to the total CO<sub>2</sub> emissions generated by anthropogenic activities is relatively small compared to other energy and transport sectors, but it is growing. While domestic emissions can be treated similarly to other sectors, emissions from international aviation are, by definition, global in nature and cannot be circumscribed to national or recognized geographic boundaries. Assigning international emissions is an extremely complex task at best and difficult to implement or enforce.

ICAO has developed policies, standards and guidance on aircraft engine emissions for the use of parties in their national policies to reduce emissions. This has led to 70% more fuel efficient aircraft today than the first generation of jet aircraft. General improvements are to be expected when the ICAO Global Air Traffic Management Plan is implemented worldwide. Furthermore several ICAO Contracting States, like Japan and Canada, have already initiated voluntary initiatives based on ICAO guidance.

Regarding the specificities of developed and developing countries, ICAO has already considered different treatment of States and Regions such as for example the Policy on aircraft noise. The differential phase out of Chapter 2 aircraft, adopted in ICAO, is an example of success in environmental guidance and policies considering a special treatment for developed and developing countries in the implementation of ICAO policy. It should also be noted that, for the first time last year, the Principle of Common but Differentiated Responsibilities (CBDR) was included in the Assembly Resolution, and GIACC's programme of action, to be presented in 2009, is also taking this principle into consideration.

To be able to clearly assess the effectiveness of global measures and to monitor progress, a clear baseline to which the measures to reduce emissions can be compared and an objective and timelines for future emissions reduction still need to be defined. Availability of timely data on the current and future growth prospects of aviation emissions is paramount to enable Parties to include international aviation emission reductions into their overall greenhouse gases reduction objectives.

ICAO provides an official, unbiased and effective international forum that has demonstrated its effectiveness in developing globally harmonized environmental standards that have substantially increased the energy efficiency of air transport worldwide.

ICAO is also in the best position to ensure optimum compatibility between environmental sustainability and the safety, security and efficiency of the global air transport system, without which the continued integrity of air operations could be compromised. That is to say that an environmentally-friendly mode of transportation must also be a safe, secure and efficient one. ICAO believes that an effective solution for aviation emissions will involve a global framework encompassing a basket of measures of a technological, operational and market-based nature and tailored to the specific realities of States and regions. This basket of measures is being considered by the GIACC and will be part of the Programme of Action to be presented to COP15 in 2009.

This is particularly important given that air transport is a driver of economic activity and, as such, a key contributor to achieving the United Nations Millennium Development Goals, particularly in less-developed, landlocked countries which depend on air travel to reach international markets for their goods and for attracting business and tourist travel.

While direct cooperation between the UNFCCC and the ICAO processes is essential, effective

collaboration must also be encouraged within each of the respective Contracting States. In many cases, for example, there should be more communication between government authorities responsible for the environment and those responsible for civil aviation, so that the positions and proposals of Contracting States in international gatherings of ICAO and UNFCCC are better aligned so as to allow a more complete view of a State's policies and programmes. This will ultimately result in a true reflection of the will of the Parties to these processes.

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## **ANNEX 1**

### **A36-22 - Consolidated Statement of continuing policies and practices related to environmental protection**

*Whereas* in Resolution A35-5 the Assembly resolved to continue to adopt at each ordinary Session a consolidated statement of continuing ICAO policies and practices related to environmental protection;

*Whereas* Resolution A35-5 consists of an introductory text and a number of Appendices concerning specific but interrelated subjects;

*Considering* the need to reflect developments that have taken place since the 35th Session of the Assembly in the field of aircraft noise and engine emissions, including new ICAO guidance material on market-based measures to limit or reduce emissions from aviation; and

*Considering* the need to define specific appendices to reflect ICAO's policy to address aviation's impact on local air quality (Appendix H) and global climate (Appendices I, J, K and L);

*The Assembly:*

1. *Resolves* that the Appendices attached to this Resolution and listed below constitute the consolidated statement of continuing ICAO policies and practices related to environmental protection, as these policies exist at the close of the 36th Session of the Assembly:

Appendix A — General

Appendix B — Development of Standards, Recommended Practices and Procedures and/or guidance material relating to the quality of the environment

Appendix C — Policies and programmes based on a “balanced approach” to aircraft noise management

Appendix D — Phase-out of subsonic jet aircraft which exceed the noise levels in Volume I of Annex 16

Appendix E — Local noise-related operating restrictions at airports

Appendix F — Land-use planning and management

Appendix G — Supersonic aircraft — The problem of sonic boom

Appendix H — Aviation impact on local air quality

Appendix I — Aviation impact on global climate — Scientific understanding

Appendix J — Aviation impact on global climate — Cooperation with UN and other bodies

Appendix K — ICAO Programme of Action on international aviation and climate change

Appendix L — Market-based measures, including emissions trading

2. Requests the Council to submit at each ordinary session of the Assembly for review a consolidated statement of continuing ICAO policies and practices related to environmental protection; and
3. Declares that this resolution supersedes Resolution A35-5.

## APPENDIX A

### General

*Whereas* the preamble to the *Convention on International Civil Aviation* states that “the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world . . .” and Article 44 of that Convention states that ICAO should “develop the principles and techniques of international air navigation and . . . foster the planning and development of international air transport so as to . . . meet the needs of the peoples of the world for safe, regular, efficient and economical air transport”;

*Whereas* many of the adverse environmental effects of civil aviation activity can be reduced by the application of comprehensive measures embracing technological improvements, more efficient air traffic management and operational procedures and the appropriate use of airport planning, land-use planning and management and market based measures;

*Whereas* all ICAO Contracting States agreed to continue to pursue all aviation matters related to the environment and also maintain the initiative in developing policy guidance on these matters, and not leave such initiatives to other organizations;

*Whereas* other international organizations are emphasising the importance of environmental policies affecting air transport;

*Whereas* the sustainable growth of aviation is important for future economic growth and development, trade and commerce, cultural exchange and understanding among peoples and nations; therefore prompt action must be taken to ensure that it is compatible with the quality of the environment and develops in ways that alleviate adverse impacts;

*Whereas* reliable and best available information on the environmental effects of aviation is essential for the development of policy by ICAO and its Contracting States;

*Whereas* as far as there are recognized interdependencies of the environmental effects from aviation, such as noise and engine emissions, they need to be considered when defining source control and operational mitigation policies;

*Whereas* airspace management and design can play a role in addressing the impacts of aviation greenhouse gas emissions on the global climate, and the related economic and institutional issues need to be addressed by States, either individually or collectively on a regional basis;

*Whereas* cooperation with other international organizations is important to progress the understanding of aviation’s impacts on the environment and in order to develop the appropriate policies to address these impacts;

*Recognizing* the importance of research and development in fuel efficiency and alternative fuels for aviation that will enable international air transport operations with a lower environmental impact;

*The Assembly:*

1. *Declares* that ICAO, as the lead United Nations Agency in matters involving international civil aviation, is conscious of and will continue to address the adverse environmental impacts that may be related to civil aviation activity and acknowledges its responsibility and that of its Contracting States to achieve maximum compatibility between the safe and orderly development of civil aviation and the quality of the environment. In carrying out its responsibilities, ICAO and its Contracting States will strive to:

- a) limit or reduce the number of people affected by significant aircraft noise;
- b) limit or reduce the impact of aviation emissions on local air quality; and
- c) limit or reduce the impact of aviation greenhouse gas emissions on the global climate;

2. *Emphasizes* the importance of ICAO continuing to demonstrate its leadership role on all international civil aviation matters related to the environment and *requests* the Council to maintain the initiative in developing policy guidance on these matters, which recognises the seriousness of the challenges which the sector faces;

3. *Requests* the Council to assess regularly the present and future impact of aircraft noise and aircraft engine emissions and to continue to develop tools for this purpose;

4. *Requests* the Council to maintain and update knowledge of the interdependencies and trade-offs related to measures to mitigate the impact of aviation on the environment so as to optimise decision making;

5. *Requests* the Council to establish a set of aviation environmental indicators which States could use to evaluate the performance of aviation operations and the effectiveness of standards, policies and measures to mitigate aviation's impacts on the environment;

6. *Requests* the Council to disseminate information on the present and future impact of aircraft noise and aircraft engine emissions and on ICAO policy and guidance material in the environmental field, in an appropriate manner, such as through regular reporting and workshops;

7. *Invites* States to continue their active support for ICAO's environment-related activities, and urges Contracting States to support activities not foreseen in the budget by providing a reasonable level of voluntary contributions;

8. *Invites* States and international organizations to provide the necessary scientific information to enable ICAO to substantiate its work in this field;

9. *Encourages* the Council to continue to cooperate closely with international organizations and other UN bodies on the understanding of aviation impacts on the environment and on the establishment of policies to address such impacts; and

10. *Urges* States to refrain from environmental measures that would adversely affect the orderly and sustainable development of international civil aviation.

## APPENDIX B

### **Development of Standards, Recommended Practices and Procedures and/or guidance material relating to the quality of the environment**

*Whereas* the problem of aircraft noise in the vicinity of many of the world's airports, which continues to arouse public concern and limit airport infrastructure development, requires appropriate action;

*Whereas* the Council has adopted Annex 16, Volume I — *Aircraft Noise*, which comprises noise certification standards for subsonic aircraft (except Short Take Off and Landing /Vertical Take Off and Landing) and has notified Contracting States of this action;

*Recognizing* noise and Local Air Quality -related charges are in use at some airports and ICAO policy guidance exists on this subject (*ICAO's Policies on Charges for Airports and Air Navigation Services*, Doc 9082);

*Whereas* aircraft engine emissions have an environmental impact at both the local and global levels which, while not fully understood, is a cause of concern;

*Whereas* the Council has adopted Annex 16, Volume II — *Aircraft Engine Emissions*, which comprises emissions certification standards for new aircraft engines and has notified States of this action;

*Whereas* the Council has established a Committee on Aviation Environmental Protection (CAEP) for the purpose of assisting in the further development of Standards, Recommended Practices and Procedures and/or guidance material on aircraft noise and aircraft engine emissions; and

*Noting* Resolution A35-14 (Appendix Q), drawing the attention of aircraft manufacturers and operators to the need for future generations of aircraft to be designed so that they are capable of being operated efficiently, and with the least possible environmental disturbance, from aerodromes used for the operation of present-day jet aircraft;

*The Assembly:*

1. *Welcomes* the adoption by the Council in June 2001 of the new, more stringent aircraft noise standard in Annex 16, Volume I, Chapter 4 and the new, more stringent standards for emissions of oxides of nitrogen to be implemented on 1 January 2008;
2. *Requests* the Council, with the assistance and cooperation of other bodies of the Organization and of other international organizations, to continue with vigour the work related to the development of Standards, Recommended Practices and Procedures and/or guidance material dealing with the impact of aviation on the environment;
3. *Welcomes* the adoption by the Council in March 2007 of the medium- and long-term technology goals for Nitrogen Oxides (NO<sub>x</sub>);
4. *Requests* the Council, with the assistance and cooperation of other bodies of the Organization and of other international organizations, to establish medium and long term technology and operational goals related to noise and fuel burn, in addition to the recent development of NO<sub>x</sub> goals;
5. *Requests* the Council to ensure that its Committee on Aviation Environmental Protection (CAEP) pursues its work programme in the noise and emissions fields expeditiously in order that

appropriate solutions can be developed as quickly as possible, and that the necessary resources are made available to do so;

6. *Urges* Contracting States from regions of the world that are currently under-represented in CAEP to participate in the Committee's work;

7. *Requests* the Council to provide States and International Organizations information on available measures to reduce the impact of aviation operations on the environment so that action can be taken using the appropriate measures;

8. *Urges* Contracting States to follow, where appropriate, the ICAO provisions developed pursuant to Clause 2 of this Appendix; and

9. *Requests* the Council to continue the work on developing and employing scenarios for assessing the future environmental impact of aviation emissions and to cooperate with the IPCC in this area.

## APPENDIX C

### **Policies and programmes based on a “balanced approach” to aircraft noise management**

*Whereas* a goal of ICAO is to promote the highest practicable degree of consistency in international civil aviation, including environmental regulations;

*Whereas* the uncoordinated development of national and regional policies and programmes for the alleviation of aircraft noise could hinder the role of civil aviation in economic development;

*Whereas* the severity of the aircraft noise problem at many airports has given rise to measures which limit aircraft operations and has provoked vigorous opposition to the expansion of existing airports or construction of new airports;

*Whereas* ICAO has accepted full responsibility for pursuing a course aimed at achieving maximum compatibility between the safe, economically effective and orderly development of civil aviation and the quality of the environment, and is actively pursuing the concept of a “balanced approach” for the reduction of aircraft noise and guidance on how States might apply such an approach;

*Whereas* the balanced approach to noise management developed by ICAO consists of identifying the noise problem at an airport and then analysing the various measures available to reduce noise through the exploration of four principal elements, namely reduction at source, land-use planning and management, noise abatement operational procedures and operating restrictions, with the goal of addressing the noise problem in the most cost-effective manner;

*Whereas* the assessment of present and future impact of aviation noise is an essential tool for the development of policy by ICAO and its Contracting States;

*Whereas* the process for implementation and decisions between elements of the balanced approach is for Contracting States and it is ultimately the responsibility of individual States to develop appropriate solutions to the noise problems at their airports, with due regard to ICAO rules and policies;

*Whereas*, the ICAO guidance developed to assist States in implementing the balanced approach (*Guidance on the Balanced Approach to Aircraft Noise Management* (Doc 9829)) has been subsequently

updated;

*Recognizing* that solutions to noise problems need to be tailored to the specific characteristics of the airport concerned, which calls for an airport-by-airport approach, and that similar solutions could be applied if similar noise problems are identified at airports;

*Recognizing* that measures to address noise may have significant cost implications for operators and other stakeholders, particularly those from developing countries;

*Recognizing* that States have relevant legal obligations, existing agreements, current laws and established policies which may influence their implementation of the ICAO “balanced approach”;

*Recognizing* that some States may also have wider policies on noise management; and

*Considering* that the improvements in the noise climate achieved at many airports through the replacement of Chapter 2 compliant aircraft (aircraft which comply with the noise certification standards in Volume I, Chapter 2 of Annex 16 but which exceed the noise levels in Volume I, Chapter 3 of Annex 16) by quieter aircraft should be safeguarded by taking account of the sustainability of future growth and should not be eroded by incompatible urban encroachment around airports;

*The Assembly:*

1. *Calls upon* all ICAO Contracting States and international organizations to recognize the leading role of ICAO *in dealing with the problems of aircraft noise*;

2. *Urges* States to:

- a) adopt a balanced approach to noise management, taking full account of ICAO guidance (Doc 9829), relevant legal obligations, existing agreements, current laws and established policies, when addressing noise problems at their international airports;
- b) institute or oversee a transparent process when considering measures to alleviate noise, including:
  - 1) assessment of the noise problem at the airport concerned based on objective, measurable criteria and other relevant factors;
  - 2) evaluation of the likely costs and benefits of the various measures available and, based on that evaluation, selection of measures with the goal to achieve maximum environmental benefit most cost-effectively; and
  - 3) provision for dissemination of the evaluation results, for consultation with stakeholders and for dispute resolution;

3. *Encourages* States to:

- a) promote and support studies, research and technology programmes aimed at reducing noise at source or by other means;
- b) apply land-use planning and management policies to limit the encroachment of incompatible development into noise-sensitive areas and mitigation measures for areas affected by noise, consistent with Appendix F to this Resolution;

- c) apply noise abatement operational procedures, to the extent possible without affecting safety; and
  - d) not apply operating restrictions as a first resort but only after consideration of the benefits to be gained from other elements of the balanced approach and in a manner which is consistent with Appendix E to this Resolution and taking into account the possible impact of such restrictions at other airports;
4. *Requests* States to:
- a) work closely together to ensure the harmonization of programmes, plans and policies to the extent possible;
  - b) ensure that the application of any measures to alleviate noise are consistent with the non-discrimination principle in Article 15 of the Chicago Convention; and
  - c) take into consideration the particular economic conditions of developing countries;
5. *Invites* States to keep the Council informed of their policies and programmes to alleviate the problem of aircraft noise in international civil aviation;
6. *Requests* the Council to:
- a) assess continuously the evolution of the impact of aircraft noise;
  - b) ensure that the guidance on the balanced approach in Doc 9829 is current and responsive to the requirements of States; and
  - c) promote the use of the balanced approach, for example through workshops; and
7. *Calls upon* States to provide appropriate support for this work on ICAO guidance and any additional work on methodologies, and for the assessment of the impact or effectiveness of measures under the balanced approach as necessary.

## APPENDIX D

### **Phase-out of subsonic jet aircraft which exceed the noise levels in Volume I of Annex 16**

*Whereas* certification standards for subsonic jet aircraft noise levels are specified in Volume I of Annex 16;

*Whereas* for the purpose of this Appendix, a phase-out is defined as withdrawal of a noise-based category of aircraft from international operations at all airports in one or more States;

*Whereas* the Committee on Aviation Environmental Protection has concluded that a general phase-out of Chapter 3 aircraft operations by all the countries which imposed a phase-out on operations of Chapter 2 aircraft is not supported on cost-benefit grounds;

*Whereas* some States have implemented or initiated phase-outs of aircraft which exceed the noise levels in Volume I, Chapter 3 of Annex 16, or are considering so doing;

*Recognizing* that the noise standards in Annex 16 are not intended to introduce operating restrictions on aircraft;

*Recognizing* that operating restrictions on existing aircraft may increase the costs of airlines and could impose a heavy economic burden, particularly on aircraft operators which may not have the financial resources to re-equip their fleets, such as those from developing countries; and

*Considering* that resolution of problems due to aircraft noise must be based on the mutual recognition of the difficulties encountered by States and a balance among their different concerns;

*The Assembly:*

1. *Urges* States not to introduce any phase-outs of aircraft which exceed the noise levels in Volume I, Chapter 3 of Annex 16 before considering:
  - a) whether the normal attrition of existing fleets of such aircraft will provide the necessary protection of noise climates around their airports;
  - b) whether the necessary protection can be achieved by regulations preventing their operators from adding such aircraft to their fleets through either purchase, or lease/charter/interchange, or alternatively by incentives to accelerate fleet modernization;
  - c) whether the necessary protection can be achieved through restrictions limited to airports and runways the use of which has been identified and declared by them as generating noise problems and limited to time periods when greater noise disturbance is caused; and
  - d) the implications of any restrictions for other States concerned, consulting these States and giving them reasonable notice of intention;
2. *Urges* States which, despite the considerations in Resolving Clause 1 above, decide to phase out aircraft which comply with the noise certification standards in Volume I, Chapter 2 of Annex 16 but which exceed the noise levels in Volume I, Chapter 3 of Annex 16:
  - a) to frame any restrictions so that Chapter 2 compliant aircraft of an individual operator which are presently operating to their territories may be withdrawn from these operations

gradually over a period of not less than 7 years;

- b) not to restrict before the end of the above period the operations of any aircraft less than 25 years after the date of issue of its first individual certificate of airworthiness;
- c) not to restrict before the end of the period the operations of any presently existing wide-body aircraft or of any fitted with engines that have a by-pass ratio higher than 2 to 1; and
- d) to inform ICAO, as well as the other States concerned, of all restrictions imposed;

3. *Strongly encourages* States to continue to cooperate bilaterally, regionally and inter-regionally with a view to:

- a) alleviating the noise burden on communities around airports without imposing severe economic hardship on aircraft operators; and
- b) taking into account the problems of operators of developing countries with regard to Chapter 2 aircraft presently on their register, where they cannot be replaced before the end of the phase-out period, provided that there is proof of a purchase order or leasing contract placed for a replacement Chapter 3 compliant aircraft and the first date of delivery of the aircraft has been accepted;

4. *Urges* States not to introduce measures to phase out aircraft which comply, through original certification or recertification, with the noise certification standards in Volume I, Chapters 3 or 4 of Annex 16;

5. *Urges* States not to impose any operating restrictions on Chapter 3 compliant aircraft, except as part of the balanced approach to noise management developed by ICAO and in accordance with Appendices C and E to this Resolution; and

6. *Urges* States to assist aircraft operators in their efforts to accelerate fleet modernization and thereby prevent obstacles and permit all States to have access to lease or purchase aircraft compliant with Chapter 3, including the provision of multilateral technical assistance where appropriate.

## APPENDIX E

### Local noise-related operating restrictions at airports

*Whereas* certification standards for subsonic jet aircraft noise are specified in Volume I of Annex 16;

*Whereas* for the purposes of this Appendix an operating restriction is defined as any noise-related action that limits or reduces an aircraft's access to an airport;

*Whereas* Appendix C to this Resolution calls for States to adopt a balanced approach to noise management when addressing noise problems at their international airports;

*Whereas* the scope for further reductions in noise at source is limited in that past improvements in noise reduction technology are being gradually assimilated into the fleet but no significant breakthroughs in technology are anticipated in the foreseeable future;

*Whereas* at many airports, land-use planning and management and noise abatement operational procedures are already being used and other noise mitigation measures are in place, although urban encroachment continues in certain cases;

*Whereas* implementation of the phase-out of aircraft which comply with the noise certification standards in Volume I, Chapter 2 of Annex 16 but which exceed the noise levels in Volume I, Chapter 3 of Annex 16 (as provided for in Appendix D to this Resolution) has been completed in some States and, assuming continued growth in aviation activity, without further action the number of people exposed to aircraft noise at some airports in those States may increase;

*Whereas* there are significant regional differences in the extent to which aircraft noise is expected to be a problem over the next two decades and some States have consequently been considering placing operating restrictions on certain aircraft which comply with the noise certification standards in Volume I, Chapter 3 of Annex 16;

*Whereas* if operating restrictions on Chapter 3 aircraft are introduced at certain airports, this should be based on the balanced approach and relevant ICAO guidance (Doc 9829) and should be tailored to the specific requirements of the airport concerned;

*Whereas* these restrictions could have a significant economic impact on fleet investments of aircraft operators from States other than those in which the restrictions are imposed;

*Recognizing* that these restrictions go beyond the policy established in Appendix D to this Resolution and other relevant policy guidance developed by ICAO;

*Recognizing* that ICAO places no obligation on States to impose operating restrictions on Chapter 3 aircraft;

*Recognizing* that the noise standards in Annex 16 were not intended to introduce operating restrictions on aircraft and, specifically, that the new standard contained in Annex 16, Volume I, Chapter 4 is based on the understanding that it is for certification purposes only; and

*Recognizing* in particular that States have legal obligations, laws, existing arrangements and established policies which may govern the management of noise problems at their airports and could affect the implementation of this Appendix;

*The Assembly:*

1. *Urges* States to ensure, wherever possible, that any operating restrictions be adopted only where such action is supported by a prior assessment of anticipated benefits and of possible adverse impacts;

2. *Urges* States not to introduce any operating restrictions at any airport on aircraft which comply with Volume I, Chapter 3 of Annex 16 before:

- a) completing the phase-out of aircraft which exceed the noise levels in Volume I, Chapter 3 of Annex 16, at the airport concerned; and
- b) fully assessing available measures to address the noise problem at the airport concerned in accordance with the balanced approach described in Appendix C;

3. *Urges* States which, despite the considerations in Resolving Clause 2 above, permit the introduction of restrictions at an airport on the operations of aircraft which comply, either through original certification or recertification, with Volume I, Chapter 3 of Annex 16:

- a) to base such restrictions on the noise performance of the aircraft, as determined by the certification procedure conducted consistent with Annex 16, Volume I;
- b) to tailor such restrictions to the noise problem of the airport concerned in accordance with the balanced approach;
- c) to limit such restrictions to those of a partial nature wherever possible, rather than the complete withdrawal of operations at an airport;
- d) to take into account possible consequences for air transport services for which there are no suitable alternatives (for example, long-haul services);
- e) to consider the special circumstances of operators from developing countries, in order to avoid undue hardship for such operators, by granting exemptions;
- f) to introduce such restrictions gradually over time, where possible, in order to take into account the economic impact on operators of the affected aircraft;
- g) to give operators a reasonable period of advance notice;
- h) to take account of the economic and environmental impact on civil aviation; and
- i) to inform ICAO, as well as the other States concerned, of all such restrictions imposed; and

4. *Further urges* States not to permit the introduction of any operating restrictions aimed at the withdrawal of aircraft that comply, through either original certification or recertification, with the noise standards in Volume I, Chapter 4 of Annex 16.

## APPENDIX F

### Land-use planning and management

*Whereas* land-use planning and management is one of the four principal elements of the balanced approach to noise management;

*Whereas* the number of people affected by aircraft noise is dependent on the way in which the use of land surrounding an airport is planned and managed, and in particular the extent to which residential development and other noise sensitive activities are controlled;

*Whereas* activity may increase significantly at most airports and there is a risk that future growth may be constrained by inappropriate land use near airports;

*Whereas* the phase-out of subsonic jet aircraft which comply with the noise certification standards in Volume I, Chapter 2 of Annex 16 but which exceed the noise levels in Volume I, Chapter 3 of Annex 16 has succeeded at many airports in reducing the size of the noise contours depicting the areas where people are exposed to unacceptable noise levels as well as in reducing the total number of people exposed to noise;

*Considering* it essential that these improvements should be preserved to the greatest extent practicable for the benefit of local communities;

*Whereas* it is also expected that the new standard contained in Annex 16, Volume I, Chapter 4 will increase the opportunities for operators to replace aircraft in their fleets by quieter aircraft;

*Recognizing* that while land-use management includes planning activities that may primarily be the responsibility of local authorities, it nevertheless affects airport capacity, which in turn has implications for civil aviation; and

*Whereas* guidance material on appropriate land-use planning and noise mitigation measures is included in the Airport Planning Manual (Doc 9184), Part 2 — Land Use and Environmental Control, which has recently been updated;

*The Assembly:*

1. *Urges* States that have phased out operations of Chapter 2 aircraft at their airports as provided for in Appendix D to this Resolution, whilst preserving the benefits for local communities to the greatest extent practicable, to avoid inappropriate land use or encroachment whenever possible in areas where reductions in noise levels have been achieved;

2. *Urges* States to ensure that the potential reductions in noise levels to be gained from the introduction of quieter aircraft, particularly those complying with the new Chapter 4 standard, are also not avoidably compromised by inappropriate land use or encroachment;

3. *Urges* States, where the opportunity still exists to minimize aircraft noise problems through preventive measures, to:

- a) locate new airports at an appropriate place, such as away from noise-sensitive areas;
- b) take the appropriate measures so that land-use planning is taken fully into account at the initial stage of any new airport or of development at an existing airport;

- c) define zones around airports associated with different noise levels taking into account population levels and growth as well as forecasts of traffic growth and establish criteria for the appropriate use of such land, taking account of ICAO guidance;
  - d) enact legislation, establish guidance or other appropriate means to achieve compliance with those criteria for land use; and
  - e) ensure that reader-friendly information on aircraft operations and their environmental effects is available to communities near airports; and
4. *Requests* the Council to:
- a) ensure that the guidance on land use in Doc 9184 is current and responsive to the requirements of States; and
  - b) consider what steps might be taken to promote land-use management, particularly in those parts of the world where the opportunity may exist to avoid aircraft noise problems in the future.

## APPENDIX G

### Supersonic aircraft — The problem of sonic boom

*Whereas* since the introduction of supersonic aircraft in commercial service action has been taken to avoid creating unacceptable situations for the public due to sonic boom, such as interference with sleep and injurious effects to persons and property on land and at sea caused by the magnification of the sonic boom; and

*Whereas* the States involved in the manufacture of such supersonic aircraft, as well as other States, continue to carry out research into the physical, physiological and sociological effects of sonic boom;

*The Assembly:*

1. *Reaffirms* the importance it attaches to ensuring that no unacceptable situation for the public is created by sonic boom from supersonic aircraft in commercial service;
2. *Instructs* the Council, in the light of the available information and availing itself of the appropriate machinery, to review the Annexes and other relevant documents, so as to ensure that they take due account of the problems which the operation of supersonic aircraft may create for the public and, in particular, as regards sonic boom, to take action to achieve international agreement on measurement of the sonic boom, the definition in quantitative or qualitative terms of the expression “unacceptable situations for the public” and the establishment of the corresponding limits; and
3. *Invites* the States involved in the manufacture of supersonic aircraft to furnish ICAO in due course with proposals on the manner in which any specifications established by ICAO could be met.

## APPENDIX H

### Aviation impact on local air quality

*Whereas* there are growing concerns about the impact of aviation on the atmosphere with respect to local air quality and the associated human health and welfare impacts;

*Whereas* many pollutants affecting local and regional air quality from aircraft engines have declined dramatically over the last few decades;

*Whereas* the impacts of aviation emissions of NO<sub>x</sub> (nitrogen oxides), PM (particulate matter), and other gaseous emissions need to be further assessed and understood;

*Whereas* the impacts of aviation emissions on local and regional air quality is part of the total emissions in the affected area and should be considered in the broader context of all sources that contribute to the air quality concerns;

*Whereas* the actual local air quality and health impacts of aviation emissions depend on a series of factors among which are the contribution to the total concentrations and the number of people exposed in the area being considered;

*Whereas* ICAO has established technical standards and fostered the development of operational procedures that have reduced significantly local air quality pollution from aircraft;

*Whereas* Article 15 of the *Convention on International Civil Aviation* contains provisions regarding airport and similar charges, including the principle of non-discrimination, and ICAO has developed policy guidance for Contracting States regarding charges (*ICAO's Policies on Charges for Airports and Air Navigation Services*, Doc 9082) including specific guidance on noise-related charges and emissions-related charges for local air quality;

*Whereas* the ICAO Council had adopted on 9 December 1996 a policy statement of an interim nature on emission-related charges and taxes in the form of a resolution wherein the Council strongly recommends that any such 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;

*Whereas* such charges should be based on the costs of mitigating the environmental impact of aircraft engine emissions to the extent that such costs can be properly identified and directly attributed to air transport;

*Whereas* the ICAO Council has adopted policy and guidance material related to the use of emission-related charges to address the impact of aircraft engine emissions at or around airports; and

*Noting* that the Council has agreed that it would be useful to develop a report that would consider the application of all measures relating to local air quality emissions, using technological, operational and market-based approaches and that ICAO is currently working on this issue;

*The Assembly:*

1. *Requests* the Council to monitor and develop its knowledge of, in cooperation with other relevant international bodies such as WHO, the effects of aviation emissions of particulate matter, nitrogen oxides and other gases on human welfare and health, and to disseminate information in this regard;
2. *Requests* the Council to continue its work to develop technologically feasible, environmentally beneficial and economically reasonable standards to further reduce the impact of local air pollution from aircraft;
3. *Requests* the Council continue its work to develop long-term technology and operational goals with respect to aviation environmental issues, including nitrogen oxides from aircraft;
4. *Requests* the Council continue to foster operational and air traffic improvements that reduce the impact of local air pollution from aircraft;
5. *Encourages* action by Contracting States, and other parties involved, to limit or reduce international aviation emissions affecting local air quality through voluntary measures and to keep ICAO informed;
6. *Welcomes* the development and promotion of guidance material on issues related to the assessment of airport-related air quality and requests the Council to actively pursue this activity, aiming for the completion of the Airport Air Quality guidance in 2010;
7. *Requests* the Council to work with States and stakeholders in promoting and sharing best practices applied at airports in reducing the adverse effects of aviation emissions on local air quality;
8. *Welcomes* the development of the guidance on emission charges related to local air quality and *requests* the Council to keep up-to-date such guidance and *urges* Contracting States to share information on the implementation of such charges; and
9. *Urges* Contracting States to ensure the highest practical level of consistency and take due account of ICAO policies and guidance on emissions charges related to local air quality.

## APPENDIX I

### **Aviation impact on global climate - Scientific understanding**

*Whereas* a comprehensive assessment of aviation's impact on the atmosphere is contained in the special report on *Aviation and the Global Atmosphere*, published in 1999, which was prepared at ICAO's request by the Intergovernmental Panel on Climate Change (IPCC) in collaboration with the Scientific Assessment Panel to the Montreal Protocol on Substances that Deplete the Ozone Layer;

*Whereas* the IPCC special report recognized that the effects of some types of aircraft emissions are well understood, it revealed that the effects of others are not, and identified a number of key areas of scientific uncertainty that limit the ability to project aviation's full impacts on climate and ozone;

*Whereas* ICAO requested that the IPCC include an update of the main findings of the special report in its Fourth Assessment Report, published in 2007;

*The Assembly:*

1. *Requests* the Council to:

- a) continue to take initiatives to promote information on scientific understanding of aviation's impact and action undertaken to address aviation emissions and continue to provide the forum to facilitate discussions on solutions to address aviation emissions; and
- b) continue to cooperate closely with the IPCC and other organizations involved in the assessment of aviation's contribution to environmental impacts on the atmosphere.

2. *Urges* States to:

promote scientific research aimed at continuing to address the uncertainties identified in the IPCC special report on Aviation and the Global Atmosphere and in the recently released Fourth Assessment report; and

ensure that future international assessments of climate change undertaken by IPCC and other relevant United Nations bodies include updated information on aircraft-induced effects on the atmosphere;

3. *Encourages* the Council to promote improved understanding of the potential use, and the related emissions impacts, of alternative aviation fuels; and

4. *Encourages* the Council and States to keep up to date and cooperate in the development of predictive analytical models for the assessment of aviation impacts.

## **APPENDIX J**

### **Aviation impact on global climate - Cooperation with UN and other bodies**

*Whereas* the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC) is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system;

*Acknowledging* the principles of non-discrimination and equal and fair opportunities to develop international civil aviation set forth in the Chicago Convention, as well as the principles and provisions on common but differentiated responsibilities and respective capabilities under the UNFCCC and the Kyoto Protocol;

*Whereas* the Kyoto Protocol, which was adopted by the Conference of the Parties to the UNFCCC in December 1997 and entered into force on 16 February 2005, calls for developed countries (Annex I parties) to pursue limitation or reduction of greenhouse gases from "aviation bunker fuels" (international aviation) working through ICAO (Article 2.2);

*Whereas* the Kyoto Protocol provides for different flexible instruments (such as the Clean Development Mechanism – CDM) which would benefit projects involving developing States;

*Whereas* the first commitment period of the Kyoto Protocol expires in 2012 and discussions on

the follow up to this instrument are being undertaken and ICAO will need to continue to address its responsibility and demonstrate leadership to limit or reduce GHG emissions from international civil aviation;

*Whereas* all stakeholders expect ICAO to demonstrate leadership in mitigating the negative effects of GHG emissions by aviation, and to develop a vision to integrate these environmental objectives into ICAO's Business Plan and other ICAO programmes;

*Recognizing*, the relevance of climate change and economic development in the context of the UN Millennium Development Goals (MDGs) and the role of aviation in helping achieve these goals;

*Noting* it is important to address aircraft emissions without losing sight of their proper context in assessing overall GHG emissions from aviation, the transportation sector, and general economic activity; and

*Noting* that different regions of the world are experiencing wide differences in absolute levels of aviation emissions and aviation emissions growth rates both internationally and domestically;

*The Assembly:*

1. *Requests* the Council to:

- a) ensure that ICAO exercise continuous leadership on environmental issues relating to international civil aviation, including GHG emissions;
- b) continue to study policy options to limit or reduce the environmental impact of aircraft engine emissions and to develop concrete proposals and provide advice as soon as possible to the Conference of the Parties of the UNFCCC, encompassing technical solutions and market-based measures, and taking into account potential implications of such measures for developing as well as developed countries; and
- c) continue to cooperate with organizations involved in policy-making in this field, notably with the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) and its Subsidiary Body for Scientific and Technological Advice (SBSTA);

## **APPENDIX K**

### **ICAO Programme of Action on international aviation and climate change**

*Whereas* ICAO and its Contracting States recognize the critical importance of providing continuous leadership to international civil aviation in limiting or reducing its emissions that contribute to global climate change;

*Whereas* the rapid growth of civil aviation, has generally increased the aviation industry's contribution to greenhouse gas emissions;

*Acknowledging* the principles of non-discrimination and equal and fair opportunities to develop international civil aviation set forth in the Chicago Convention, as well as the principles and provisions on common but differentiated responsibilities and respective capabilities under the UNFCCC and the Kyoto

Protocol;

*Whereas* the ICAO Council has developed policy options to limit or reduce the environmental impact of aircraft engine emissions from civil aviation and work is in progress on technology and standards, on operational measures and on market-based measures to reduce emissions;

*Noting* that, to promote sustainable growth of aviation, a comprehensive approach, consisting of work on technology and standards, and on operational and market-based measures to reduce emissions is necessary;

*Noting* that emphasis should be on those policy options that will reduce aircraft engine emissions without negatively impacting the growth of air transport especially in developing economies;

*Acknowledging* the significant progress made in the aviation sector, with aircraft produced today being about 70 percent more fuel efficient per passenger kilometre than 40 years ago, with airlines of some Contracting States achieving net reductions in emissions over the past several years despite a simultaneous increase in operations, and with the commitment of the international airline industry to achieving a further 25 percent fuel efficiency improvement between 2005 and 2020;

*Noting* that the next generation of aircraft technology and modernization of air traffic systems are expected to deliver additional improvements in flight and fuel efficiency that can be encouraged by ICAO through its Global Air Navigation Plan;

*Recognizing* that ICAO Standards and goals for NO<sub>x</sub>, although intended to address local air quality, will also help reduce the impact of aviation on the climate;

*The Assembly:*

1. *Requests* that the Council facilitate action by States by vigorously developing policy options to limit or reduce the environmental impact of aircraft engine emissions, developing concrete proposals and providing advice as soon as possible to the Conference of the Parties of the UNFCCC, encompassing technical solutions and market-based measures, while taking into account potential implications of such measures for developing as well as developed countries;

2. *Requests* the Council to:

a) form a new Group on International Aviation and Climate Change composed of senior government officials representative of all ICAO regions, with the equitable participation of developing and developed countries, with technical support provided by the Committee on Aviation Environmental Protection, for the purpose of developing and recommending to the Council an aggressive Programme of Action on International Aviation and Climate Change, based on consensus, and reflecting the shared vision and strong will of all Contracting States, including:

1) an implementation framework consisting of economically efficient and technologically feasible strategies and measures that Contracting States can use to achieve emissions reductions, encompassing *inter alia*:

— voluntary measures (e.g. offsetting);

- effective dissemination of technological advances both in aircraft and in ground based equipment;
- more efficient operational measures;
- improvements in air traffic management;
- positive economic incentives; and
- market-based measures;

- 2) identification of means by which progress can be measured;
- 3) identification of possible global aspirational goals in the form of fuel efficiency for international aviation and possible options for their implementation; and
- 4) reporting progress resulting from the actions implemented by Contracting States and Stakeholders;

- b) convene at an appropriate time, taking into account the fact that the fifteenth meeting of the Conference of the Parties (COP15) of the UNFCCC will be held in December 2009, a high-level meeting to review the Programme of Action recommended by the Group;

3. *Requests* that the Council, working through the Committee on Aviation Environmental Protection, continue to develop and keep up-to-date the guidance for Contracting States on the application of measures aimed at reducing or limiting the environmental impact of aircraft engine emissions and to conduct further studies with respect to mitigating the impact of aviation and climate change;

4. *Encourages* Contracting States and the Council, taking into account the interests of all parties concerned, including potential impacts on the developing world, to evaluate or continue evaluating the costs and benefits of the various measures, including existing measures, with the goal of addressing aircraft engine emissions in the most cost-effective manner;

5. *Requests* that the Council provide the necessary guidance and direction to ICAO's Regional Offices to assist Contracting States with studies, evaluations and development of procedures, in collaboration with other States in the region, to limit or reduce GHG emissions on a global basis and work together collaboratively to optimize the environmental benefits that can be achieved through their various programmes;

6. *Requests* States to encourage the industry to establish challenging goals to constantly improve its performance in aviation emissions reduction;

7. *Requests* Contracting States to accelerate investments on research and development to bring to market even more efficient technology by 2020;

8. *Requests* States to elaborate and report on a set of actions and plans to reduce by 2020 airspace congestion that is contributing to delays and unnecessary fuel burn;

9. *Request* States to encourage airport operators to improve efficiency of airside operations and to implement ground side efficiency measures to reduce carbon intensity;

10. *Requests* that the Council, working through the Committee on Aviation Environmental Protection:

- a) report on an annual basis on the progress achieved in average in-service fleet fuel efficiency and the aggregate annual amount of fuel burned in international civil aviation working in close cooperation with the industry;
- b) forecast the overall potential for aviation emissions reduction in the in-service fleet; and
- c) evaluate and quantify further reduction opportunities for consideration by the upcoming session of the Assembly;

11. *Requests* the Council to undertake the necessary action in support of the ICAO emissions initiative, including the pursuit of the ICAO objectives to limit or reduce the impact of aircraft emissions, to foster collaboration among its Contracting States, and to monitor and report on progress made in this area. In particular, the Council should:

- a) explore relevant parameters and develop medium and long term technology goals for aircraft fuel burn and report back by the next Assembly;
- b) continue to develop the necessary tools to assess the benefits associated with ATM improvements, and to promote the use of the operational measures outlined in ICAO guidance (Cir 303) as a means of limiting or reducing the environmental impact of aircraft engine emissions;
- c) implement an emphasis on increasing fuel efficiency in all aspects the ICAO's Global Air Navigation Plan;
- d) foster, as appropriate, regional, inter-regional and global initiatives with Contracting States to enhance air traffic efficiencies to reduce fuel consumption;
- e) encourage Contracting States to improve air traffic efficiency, which leads to emissions savings and to report on progress in this area;
- f) request Contracting States to submit an inventory of actions they are taking to reduce aviation emissions in their respective countries; and
- g) promote the use of new procedures and technologies that have a potential to provide environmental benefits on the operation of aircraft;

12. *Requests* the Council to encourage States and stakeholders in promoting and sharing best practices applied at airports in reducing the adverse effects of GHG emissions of civil aviation;

13. *Requests* the Council to encourage States and stakeholders to develop models of flow control and air traffic management that optimize environmental benefits;

14. *Requests* States to:

- a) encourage the necessary research and development to provide more environmentally efficient engine and aircraft designs;

- b) accelerate the development and implementation of fuel efficient routings and procedures to reduce aviation emissions;
- c) accelerate efforts to achieve environmental benefits through the application of satellite-based technologies that improve the efficiency of air navigation and work with ICAO to bring these benefits to all regions and States;
- d) promote effective coordination between their authorities involved in aviation in designing more environmentally beneficial air routes and improved operational procedures for international civil aviation;
- e) reduce legal, security, economic and other institutional barriers to enable implementation of the new ATM operating concepts for the environmentally efficient use of airspace; and
- f) cooperate in the development of a regional measurement and monitoring capability in order to allow for the assessment of the environmental benefits accrued from the measures above;

15. *Encourages* action by Contracting States, and other parties involved, to limit or reduce international aviation emissions through voluntary measures, and to keep ICAO informed, and *requests* the Council to instruct the Secretary General to keep up-to-date guidelines that ICAO has developed for such measures, including a template voluntary agreement, and to make available such experience to all parties concerned.

## APPENDIX L

### **Market-based measures, including emissions trading**

*Whereas* market-based measures, including the use of emissions trading, are policy tools that are designed to achieve environmental goals at a lower cost and in a more flexible manner than traditional regulatory measures;

*Recognizing* that Contracting States are responsible for making decisions regarding the goals and most appropriate measures to address aviation's greenhouse gas emissions taking into account ICAO's guidance;

*Acknowledging* the principles of non-discrimination and equal and fair opportunities to develop international civil aviation set forth in the Chicago Convention, as well as the principles and provisions on common but differentiated responsibilities and respective capabilities under the UNFCCC and the Kyoto Protocol;

*Recognizing* that the majority of the Contracting States endorses the application of emissions trading for international aviation only on the basis of mutual agreement between States, and that other Contracting States consider that any open emissions trading system should be established in accordance with the principle of non-discrimination;

*Recognizing* the need to engage constructively to achieve a large degree of harmony on the measures which are being taken and which are planned to provide an appropriate response to the challenge of aviation and climate change while respecting the principles above;

*Whereas* ICAO policies make a conceptual distinction between a charge and a tax, in that “a charge is a levy that is designed and applied specifically to recover the costs of providing facilities and services for civil aviation, and a tax is a levy that is designed to raise national or local government revenues which are generally not applied to civil aviation in their entirety or on a cost-specific basis”;

*Whereas* ICAO has developed policy guidance to Contracting States on taxation (*ICAO’s Policies on Taxation in the Field of International Air Transport*, Doc 8632), which recommends *inter alia* the reciprocal exemption from all taxes levied on fuel taken on board by aircraft in connection with international air services, a policy implemented in practice through bilateral air services agreements, and also calls on Contracting States to the fullest practicable extent to reduce or eliminate taxes related to the sale or use of international air transport;

*Whereas* the ICAO Council had adopted on 9 December 1996 a policy statement of an interim nature on emission-related charges and taxes in the form of a resolution wherein the Council strongly recommends that any such 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;

*Whereas* such charges should be based on the costs of mitigating the environmental impact of aircraft engine emissions to the extent that such costs can be properly identified and directly attributed to air transport;

*Noting* that there remains a number of issues of a legal and policy nature regarding the implementation of GHG charges and the integration of aviation into existing emissions trading systems that have not been resolved;

*Noting* that ICAO has issued *Draft Guidance on the Use of Emissions Trading for Aviation* (Doc 9885);

*Whereas* Contracting States have legal obligations, existing agreements, current laws and established policies; and

*Whereas* the establishment of carbon offset schemes has helped to raise public awareness of climate change, and may contribute to emissions reductions in the short term;

*The Assembly:*

1. *Encourages* Contracting States and the Council to adopt measures consistent with the framework outlined below:

a) Emission-related charges and taxes

- 1) *Affirms* the continuing validity of Council’s Resolution of 9 December 1996 regarding emission-related levies;
- 2) *Recognizes* that existing ICAO guidance is not sufficient at present to implement greenhouse gas emissions charges internationally, although implementation of such charges by mutual agreement of States members of a regional economic integration organization on operators of those States is not precluded; and
- 3) *Urges* Contracting States to refrain from unilateral implementation of greenhouse gas emissions charges;

b) Emissions trading

- 1) *Urges* 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;
- 2) *Requests* States to report on new developments, results and experiences in this area; and
- 3) *Requests* the Council to:
  - a) finalize and keep up-to-date for use by Contracting States, as appropriate, and consistent with this and subsequent Resolutions, the guidance developed by ICAO for incorporating emissions from international aviation into Contracting States' emissions trading schemes consistent with the UNFCCC process; and
  - b) conduct further studies, as appropriate, on various aspects of the implementation of emissions trading systems and evaluate the cost effectiveness of any systems put in place, taking into account the effect on aviation and its growth in developing economies in line with the principles stated above;
  - c) conduct an economic analysis of the financial impact of including international aviation in existing trading schemes and undertake literature review of cost-benefit analysis of existing trading systems with a special emphasis on how they have been applied to other sectors in order to draw some pertinent lessons learned for the aviation sector;

c) Carbon offsets

- 1) *Requests* the Council to examine the potential for carbon offset mechanisms as a further means of mitigating the effect of aviation emissions on local air quality and climate change; and
- 2) *Requests* the Council to collect and disseminate information on the results of carbon-offset programmes implemented by States and other Organizations regarding aviation emissions;

d) Clean Development Mechanism (CDM)

- 1) *Invites* Contracting States to explore the use of the Clean Development Mechanism (CDM) related to international aviation.