

Aircraft Noise – Legal and Regulatory Issues and Trends

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Introduction

Aircraft noise is generated whenever the passage of air over the structure of the aircraft or flowing through its power plants causes fluctuating pressure disturbances which transform into auditory impulses in the human being.¹ Such impulses, called unwanted sound,² are measured using a logarithmic unit called the decibel (dB) in terms of pressure exerted on the ear.³ In the case of jet aircraft, two distinct kinds of engine noise adversely affect the human ear: the roar of the jet exhaust and the

whine of the compressor fan.⁴ The roar of the jet exhaust occurs mainly during take-off, when the engines are at maximum power to enable the aircraft to become airborne.⁵ The whine of the compressor occurs mainly during the approach and landing where the fan blades interact with turbulence, resulting in a high frequency whine in the compressor of the engine.⁶

Legal Issues

Pollution has been defined as:

the introduction by man, directly or indirectly, of substances or energy into the environment resulting in deleterious effects of such nature as to endanger human health, harm living resources and

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ecosystems, and impair or interface with amenities and other legitimate uses of the environment.⁷

This definition covers human health which has been a major concern of environmentalists for some time. It also accommodates the role played by the United Nations under its Charter. Article 1 of the United Nations Charter identifies, as one of the purposes of the United Nations, the achievement of international cooperation in solving international problems *inter alia* of a human character⁸ and charges the General Assembly of the United Nations with promoting international cooperation *inter alia* in the field of health.⁹ Article 55 of the Charter requires the United Nations to promote higher standards of living¹⁰ and arrive at solutions concerning *inter alia* health problems.¹¹ For this purpose of the Economic and Social Council of the United Nations (ECOSOC) may make or initiate studies and reports *inter alia* with respect to international health matters.¹² The role of the United Nations in preserving the environment is thereby clearly entrenched in its Charter. International regulations are but a corollary to this *status quo*.

The tort of nuisance is caused by an unprivileged interference by a person of another's enjoyment of his or her private property, causing discomfort to the latter, and invariably causing the property to diminish in value.¹³ There are two instances, however, where recovery against the tort of nuisance is not possible, namely, where a State can invoke sovereignty; and where the defence of preemption can be successfully claimed.¹⁴ In all other instances where nuisance is alleged to have been committed by aircraft noise, particularly where a State-run airport is held responsible, a successful legal approach for the plaintiff would lie in the theory of inverse condemnation. The principle of inverse condemnation has been identified as:

...the popular description of a cause against a governmental defendant to recover the value of property which has been taken in fact by the governmental defendant even though no formal exercise of the power of eminent domain has been attempted by taking the agency...¹⁵

This was brought to light by the seminal decision in the case of *United States v. Causby*,¹⁶ decided in 1946, which involved repeated flights over the plaintiff's property by military aircraft. The court held that there had been a compensable interference with property and consequent taking down of its value which was at variance with the Fifth Amendment of the United States Constitution.¹⁷

The 1962 case of *Thornburg v. Port of Portland*¹⁸ made a significant deviation from the usual principle that compensation for a nuisance caused by noise produced by aircraft could only be awarded if the aircraft was directly above the property concerned and ruled that a trespass resulting in nuisance could occur even if the noise was coming from an aircraft flying beside the property. The *Thornburg* principle was followed two years later in *Martin v. Port of Seattle*¹⁹ which rejected the rigidity of the principle that, in the words of the court, insisted upon "the

wingtip of the aircraft passing through some fraction of an inch of the airspace directly above the plaintiff's land".²⁰

Issues of Sovereignty

International responsibility of a State for transborder pollution caused by aircraft registered in that State or leased or chartered by an operator of that State cannot be denied merely on the strength of the claim of that State to sovereignty. Although Article 1 of the Chicago Convention stipulates that the contracting States recognize that every State has complete and exclusive sovereignty over the airspace above its territory, the effect of this provision cannot be extended to apply to State immunity from responsibility to other States. Professor Huber in the *Island of Palmas* case²¹ was of the view that:

Sovereignty in the relations between States signifies independence. Independence in regard to a portion of the globe is the right to exercise therein, to the exclusion of any other State, the functions of a State. Territorial sovereignty ... involves the exclusive right to display the activities of a State.²²

Professor Huber's definition, which is a simple statement of a State's rights, has been qualified by Starke as the residuum of power which a State possesses within the confines of international law.²³ If therefore, engine emissions of aircraft adversely affect the territories of States they fly over, the State in which such aircraft are registered, leased or chartered would incur legal liability at international law. Responsibility would also devolve upon a State in whose territory such emissions occur, to other States that are threatened by those emissions, to prevent them from permeating the latter States. The International Court of Justice (ICJ) recognized in the *Corfu Channel* Case:

...every State's obligation not to knowingly allow its territory to be used for acts contrary to the rights of other States.²⁴

Although this case related to the legal liability of a State carrying out mine-sweeping operations in the territorial waters of another without the latter's consent, it provides an analogy to the question of international pollution. Barros and Johnston are of the view that:

...some of the comments of the International Court of Justice in the *Corfu Channel* case (1949) can be interpreted as an important judicial affirmation of State responsibility from which one can infer the obligation of each State not to allow the nationals of other States to suffer pollution or damage that might reasonably be prevented and the liability of providing appropriate compensation to the injured party when the obligation is violated.²⁵

When the liability of a State for transborder pollution is identified, the question arises as to who could decide disputes on the issues. The International Court of Justice is empowered to apply the principles of international law *i.e.* international conventions, international custom (as evidence of general practice accepted as law), general prin-

ciples of law as recognized by civilized nations, and judicial decisions and teachings of jurists of various nations.²⁶ There are, however, no international conventions, custom or general principles of law governing pollution caused by international civil aviation. In this scenario, Dr. Sharon Williams offers four approaches:

- 1) the adoption of a multilateral pollution treaty;
- 2) the adoption of region treaties on pollution;
- 3) the creation of a special international tribunal to hear cases of environmental pollution; and,
- 4) the setting up of an institution which would be given the power and legal personality to enter into discussions with national and international agencies, individuals and industry.²⁷

Regulatory Issues

The Chicago Convention is the fundamental source which grants regulatory powers to the international community on matters relating to international civil aviation. The Convention in its Preamble proclaims that the governments that are parties to it agree on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner. Public safety is a feature of major concern to the Convention which requires that:

Each contracting State may, for reasons of military necessity or public safety, restrict or prohibit uniformly the aircraft of other States from flying over certain areas of its territory... Such prohibited areas shall be of reasonable extent and location so as not to interfere unnecessarily with air navigation. Descriptions of such prohibited areas in the territory of a contracting State, as well as any subsequent alterations therein, shall be communicated as soon as possible to the other contracting States and to the International Civil Aviation Organization.²⁸

The Convention also established the International Civil Aviation Organization (ICAO) which is required as one of its objectives to foster the planning and development



Preparing for take-off

of international air transport so as to ensure *inter alia* the safe and orderly growth of international civil aviation throughout the world,²⁹ meet the needs of the people of

the world for safe, regular, efficient and economic air transport,³⁰ promote safety of flight in international air navigation,³¹ and generally promote the development of all aspects of international civil aviation.³² To this end, ICAO is mandated by the Convention to adopt and amend from time to time, as may be necessary, international Standards and Recommended Practices and Procedures (SARPS) dealing with, *inter alia*, characteristics of airports and landing areas and such matters concerned with the safety, regularity and efficiency of air navigation as may from time to time be appropriate.³³ Each contracting State has undertaken to collaborate in securing the highest practicable degree of uniformity in the above regulations, standards and procedures of the Organization.

In order to carry out its policies in environmental issues related to civil aviation, ICAO established the Committee on Environmental Protection (CAEP) in 1983.³⁴ CAEP is a technical committee reporting to the ICAO Council and consisting of 14 members nominated by their States. The members are experts in the field of aviation and the environment. The Committee is charged with addressing the main environmental problem affecting civil aviation, which is pollution caused by aircraft engine emissions and aircraft noise. The three main approaches adopted by CAEP in its work on aircraft noise concern reduction of noise at source; use of noise abatement operating measures; and land use planning. One of the CAEP's positive contributions to ICAO's environmental programme has been the development of a new chapter for Volume 1 of Annex 16, which contains a noise certification scheme for light helicopters as well as a number of modifications to the technical specifications of the Annex. CAEP believes that although ICAO initiatives on Chapter 2 aircraft withdrawal will ameliorate the problem of noise near airports, it will be short-lived, as the rapidly increasing proportions of international air travel in the next few years will outweigh the benefits brought about by the initiative.

At its Fourth Meeting held in April 1998, CAEP focused *inter alia* on the subject of nuisance and noise from light aircraft and recommended that pilots and operators be aware of the nuisance their operations may cause and take steps to minimize noise levels of their aircraft.

In the light of developments concerning the phasing out of Chapter 2 aircraft wholly by Chapter 3 aircraft, CAEP has been charged with an extension to its mandate, to undertake additional work on reviewing Chapter 3 noise standards with a view to identifying a standard even more stringent than the Chapter 3 representation.³⁵ The Noise Scenarios Group was established within CAEP for the purpose of addressing increased options for possible aircraft noise restriction levels.³⁶

ICAO's active involvement in aviation-related envi-

ronmental issues is not without good reason, as witnessed by 9 of the 27 principles contained in the Declaration of the United Nations Conference on Environment and Development (UNCED) – also known as the Earth Summit – held in Rio de Janeiro in June 1992. They are:

1. “States have...the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction” (Principle 2).
2. “The special situation and needs of developing countries, particularly the least developed...shall be given special priority. International actions in the field of environment and development should also address the interests and needs of all countries” (Principle 6).
3. “...In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command” (Principle 7).
4. “To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption...” (Principle 8).
5. “States shall enact effective environmental legislation. Environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply. Standards applied by some countries may be inappropriate and of unwarranted economic and social cost to other countries, in particular developing countries” (Principle 11).
6. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus” (Principle 12).
7. “In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (Principle 15).
8. “National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution...” (Principle 16).
9. “Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority” (Principle 17).

Standards and Recommended Practices for aircraft noise were first adopted by ICAO on 2 April 1971 and designated as Annex 16 to the Convention. The development of the Annex originated in September 1968 at the

16th Session of the ICAO Assembly which adopted Resolution A 16-3 which recognized that the problem of aircraft noise was so serious in the vicinity of many of the world’s airports that public reaction was mounting to a degree that gave cause for great concern and required urgent solution. The Assembly also noted that noise concerned the public and civil aviation and was becoming a matter for concern with the increase in air traffic and that the introduction of future aircraft types could increase and aggravate the problem further unless action was taken to alleviate it. Accordingly, the Assembly resolved to instruct the ICAO Council to call an international conference within the machinery of ICAO as soon as possible; establish international specifications and associated guidance material relating to aircraft noise; and, to include, in the appropriate Annexes and other relevant ICAO documents and possibly in a separate Annex on noise, such material as the description and methods of measurement of aircraft noise and suitable limitations on the noise caused by aircraft that was of concern to communities in the vicinity of airports.

In response to the Assembly Resolution, a Special Meeting on Aircraft Noise in the Vicinity of Aerodromes was convened in Montreal in November–December 1969 to examine the following aspects related to the problems of aircraft noise:

- a) procedures for describing and measuring aircraft noise;
- b) human tolerance to aircraft noise;
- c) aircraft noise certification;
- d) criteria for establishment of aircraft noise abatement operating procedures;
- e) land use control; and,
- f) ground run-up noise abatement procedures.

Based on the recommendations of the Special Meeting on Aircraft Noise in the Vicinity of Aerodromes, draft International Standards and Recommended Practices for Aircraft Noise were developed and, after amendment following the usual consultation with the Contracting States of the Organization, were adopted by the Council to form the text of Annex 16.

With the development of Standards and Recommended Practices dealing with the control of aircraft engine emissions, it was felt that all provisions relating to environmental aspects of aviation should be included in a single document. Accordingly, Annex 16 was retitled as “Environmental Protection”. Volume I of the Annex contains the existing provisions relating to aircraft noise and Volume II contains the provisions related to aircraft engine emissions.³⁷ The much dreaded sonic boom³⁸ (see *ICAO Doc 8894*, SPB/11, at 1-5) caused by supersonic aircraft was broadly discussed during the Second Meeting of ICAO’s Sonic Boom Committee in Montreal in June 1973.³⁹ The Committee found that the sonic boom had no ill effects on the human eye and ear. As for psychological effects of the boom, it was noted by the Committee that it caused a startle reaction in the human being, in addition to a slight increase in heart rate which returned to normalcy within a very short period. It was also the Committee’s view that the startle effects of Concorde and TU-144

did not give rise to any significant circulatory effects. With regard to the sociological effects of the sonic boom, the Committee considered a study of the Concorde aircraft over Australia in June 1972 and concluded that this aspect be best studied as both a public and private law issue by the Legal Committee of ICAO.

The ICAO Assembly has, in addition, adopted several Resolutions concerning aviation and the environment. At its 22nd Assembly held in September/October 1977 the ICAO Assembly adopted Resolution A 22-12 which recognized, *inter alia*, the following:

- 1) advancing technology has caused aviation to become a significant influence in the environment;
- 2) many of the adverse environmental effects of civil aviation activity can be reduced by the application of integrated measures embracing technological improvements, appropriate noise abatement operating procedures, proper organization of air traffic and the appropriate use of airport planning and land use control mechanisms;
- 3) other international organizations are becoming involved in activities relating to noise abatement policies;
- 4) in fulfilling its role, ICAO strives to achieve a balance between the benefit accruing to the world community through civil aviation and the harm caused to the human environment in certain areas through the progressive advancement of civil aviation.

The Assembly therefore declared:

- 1) that ICAO is conscious of the adverse environmental impacts that may be related to aircraft activity and of 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 human environment;
- 2) that the Council Should maintain its vigilance in the pursuit of aviation interests related to the human environment, and also maintain the initiative in developing policy guidance on all aviation matters related to the human environment, and not leave such initiatives to other organizations.

The Assembly also invited States to continue their active support for ICAO's Action Programme Regarding the Environment on all appropriate occasions as their participation in civil aviation's contribution to the United Nations Environment Programme (UNEP) and authorized the ICAO Council, if and when it deemed this desirable, to enter into cooperative arrangements with the United Nations Environment Programme for the execution of environmental projects financed by the United Nations Environment Fund. The Assembly urged States to refrain from unilateral measures that would be harmful to the development of international civil aviation.

At the same Session, the Assembly adopted Resolution A 22-13 on airports and the environment, observing *inter alia* that:

- 1) compatibility between the airport and its environment was one of the elements to be taken into account in long-term systems planning;
- 2) the problem of aircraft noise in the vicinity of many of the world's airports continued to arouse public concern and required appropriate action; and
- 3) the introduction of future aircraft types could increase and aggravate this noise unless action was taken to alleviate the situation.

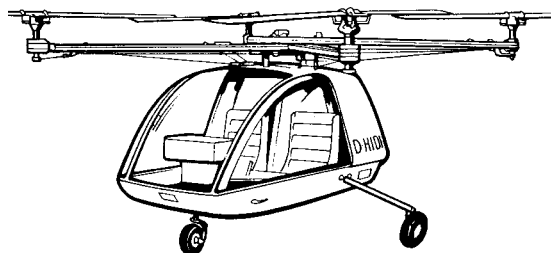
The Assembly therefore requested the council to continue its work on establishing Standards and Recommended Practices relating to the alleviation of the problem and urged contracting States to adopt, where appropriate, the applicable ICAO measures and procedures.

In the following Session (September/October 1980), the Assembly adopted Resolution A 23-10 on aircraft noise and engine emissions from subsonic aircraft, and requested contracting States not to allow the operation of

foreign registered subsonic jet planes that did not conform to ICAO's specifications on noise certification standards as specified in Annex 16 until 1 January 1988.⁴⁰ At the 28th Assembly Sessions held in October 1990, the ICAO Assembly observed that while certification standards for subsonic jet aircraft noise levels are specified in Volume 1, Chapter 2 and Chapter 3 of Annex 16 and that environmental problems due to aircraft noise continued to exist in the neighbourhood of many international airports, some States were consequently considering restrictions on the operations of aircraft which exceeded the noise levels in Volume I, Chapter 3 of Annex 16. The Assembly also recognized that the noise standards in Annex 16 were not intended to introduce operating restrictions on aircraft and that operating restrictions on existing aircraft would increase the costs of airlines and would impose a heavy economic burden, particularly on those airlines which did not have the financial resources to re-equip their fleets. Therefore, considering that the resolution of problems due to aircraft noise must be based on mutual recognition of the difficulties encountered by States and a balance among their different concerns, the Assembly, in Resolution A 28-3, urged States not to introduce any new operating restrictions on aircraft which exceed the noise levels in Volume I, Chapter 3 of Annex 16 before considering:

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- 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 either through purchase, 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.

The Assembly further urged States:

- 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 seven years;
- b) not to begin the above phase-in period for any restrictions before 1 April 1995;
- c) not to restrict before the end of the phase-in period the operations of any aircraft less than 25 years after the date of issue of its first individual certificate of airworthiness;
- d) not to restrict before the end of the phase-in period the operations of any presently existing wide-body aircraft or of any fitted with high by-pass ratio engines;
- e) to apply any restrictions consistently with the non-discrimination principle in Article 15 of the Chicago Convention so as to give foreign operators at least as favourable treatment as their own operators at the same airports; and,
- f) to inform ICAO, as well as the other States concerned, of all restrictions imposed.

The Assembly also strongly encouraged 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-in 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.

The Assembly, while urging States, if and when any new noise certification standards are introduced which are more stringent than those in Volume I, Chapter 3 of Annex 16, not to impose any operating restrictions on Chapter 3 compliant aircraft, urged the Council to promote and States to develop an integrated approach to the problem of aircraft noise, including land use planning procedures around international airports, so that any residential, industrial or other land use that might be adversely affected by aircraft noise is minimal. The Assembly further urged States to assist aircraft operators in their efforts to accel-

erate 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. This Resolution superseded Resolution A 23-10, which was discussed above.

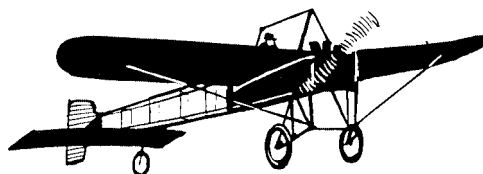
Resolution A 28-3 represents a cautious balance between the concerns of the aircraft manufacturers, the airline industry and developing States who do not wish to lose in the near future the services of Chapter 2 aircraft which are already in use and service. Although aircraft manufactured prior to October 1977 that are included in Chapter 2 of Annex 16 and called "Chapter 2 aircraft" are required to be phased out, the compromise in Resolution A 28-3 allows States that have noise problems at airports to start phasing out operations by Chapter 2 aircraft from 1995 and to have all of them withdrawn by 2002, with some exceptions. The Resolution envisages that by the year 2002 only aircraft manufactured after October 1977 and described in Chapter 3 of Annex 16 (called "Chapter 3 aircraft") would be in operation. Following this resolution, a number of developed States have already started to phase out Chapter 2 aircraft, while giving due recognition to the compromise reached in Resolution A 28-3.

At its 32nd Assembly, held in September 1998, Assembly Resolution A 32-8⁴¹ containing a consolidated statement of continuing ICAO policies and practices related to environmental protection was adopted, making current the regulatory policies relating to aviation and the environment. Appendix B to the Resolution cites Annex 16 Volume 1 as comprising, *inter alia*, noise certification standards for future subsonic aircraft and mentions that aircraft manufacturers and operators need to note that future generations of aircraft have to be so designed as to operate efficiently and with the least possible environmental disturbance. Appendix C calls upon Contracting States and international Organizations to recognize the leading role of ICAO in dealing with aircraft noise and requests the former to work closely together to ensure the greatest harmonization of work in the area of environmental protection as related to air transport. In Appendix G, which relates to the problem of sonic boom, the Assembly reaffirms the importance attached to ameliorating problems caused to the public by sonic boom as a result of supersonic flight, and invites States involved in the manufacture of supersonic aircraft to furnish ICAO with proposals that would meet specifications established by ICAO on the subject.

The most topical issue addressed by Resolution A 32-8 is in its Appendix D which, whilst reiterating the time limits specified for the phasing out of Chapter 2 Aircraft and related dates, strongly encourages States to continue to cooperate bilaterally, regionally and inter-regionally with a view to alleviating the noise burden on communities and also to take into account the problems that may be faced by some operators in phasing out their Chapter 2 aircraft before the end of the period specified. The Resolution also urges States, if and when any new noise certification standards are introduced which are more stringent than those in Volume 1, Chapter 3 of Annex 16, not

to impose any operating restrictions on Chapter 3 compliant aircraft. More importantly, States are urged to assist operators in their efforts of fleet modernization with a view to preventing obstacles and permit all States to have access to lease or purchase aircraft compliant with Chapter 3.

The qualification in Resolution A 32-8 seemingly admits that Chapter 2 aircraft which are converted to be compliant with Chapter 3 noise levels are being considered for operation at least until 1 April 2002. The Resolution urges States to consider the difficulties faced by operators of Chapter 2 aircraft who are unable to make them Chapter 3 compliant by the given date, implying that it would be in the economic interests of such operators to be given additional time in order to make the necessary replacements. Chapter 2 aircraft could be made Chapter 3 compliant whereby the aircraft can be recertified to Chapter 3 standards through re-engining or hush kitting. Chapter 2 aircraft which are likely to be re-engined or hush-kitted are Boeing 727s and 737s, DC-9s, BAC1-11s and some Boeing 747-100s (hush-kitting).



Conclusion

There seems to be little doubt that aircraft noise can be a nuisance. However, the dichotomy presented by the aircraft noise issue has to be viewed in the broader perspective of trade and the environment. The symbiosis of trade and the environment emerged as a critical issue for trade negotiators in the last stages of the Uruguay Round of discussions. At these discussions, the focus remained on two approaches to the issue. The first approach was from the essentially pro-environment groups, who considered that those involved in international trade are primarily interested in the movement of their goods and therefore were not concerned about the environmental implications of their trading activities. The second approach was based on the belief that increased trading activity enhanced possibilities of solving environmental problems. This trend of thinking leaned toward sanctions being introduced against environmentally detrimental trading activity, using GATT (later WTO) as a tool of implementation. The official statement issued in support of the latter approach, which was not supported initially by the majority of States at the Uruguay Round, stated:

...GATT Contracting Parties believe that the successful conclusion of the Uruguay Round was an important step towards creating the conditions for sustainable development. Trade liberalization and the maintenance of an open, non-discriminatory trading system are key elements of the follow-up to UNCED (United Nations Conference on the Environment).⁴²

Developing countries, however, were reluctant to embrace the idea of using trading sanctions towards environmental protection as their main priority was still develop-

ment, and they were not fully convinced that already scarce resources should be deployed for the purposes of protecting the environment. Being a new challenge and still esoteric, environmental protection was viewed in the context of trade liberalization by the developing States in the following manner:

For developing countries, where poverty is the number one policy preoccupation and the most important obstacle to better environmental protection, global trade liberalization, coupled with financial and technological transfers, is essential for promoting sustainable development.⁴³

Multilateral lending institutions such as the World Bank and the International Monetary Fund (IMF) are beginning to lay more emphasis on the environmental impact of projects funded by them. However, in the ultimate analysis, both international trade and environmental protection are key issues for development, and they should be viewed as tools that could result in a win-win situation for the parties concerned.



Notes:

¹ See Lord Rayleigh (1945) *The Theory of Sound*, 2nd ed, Dover: London, p. 21. For more recent discussions on aircraft noise see A.R. Frey and L.E. Kinsler (1982) *Fundamentals of Acoustics*, 3rd ed, Wiley: Chichester, p. 82 and *Transportation in Noise Reference Book* (1987) (P.M. Nelson ed) Butterworth: London, p. 321.

² K.D. Kryfer (1985) *The Effects of Noise on Man*, Academic Press: Toronto, p. 1.

³ D.V. Harper (1988) Regulation of Aircraft Noise at Major Airports: Past, Present and Future, *Transportation Law Journal* 17, 121.

⁴ *Id.*, p. 120.

⁵ J. Grey (1975) *Noise, Noise, Noise*, The Westminster Press: Philadelphia, p. 72.

⁶ *Ibid.*

⁷ *OECD and the Environment*, Paris: 1979 at 108. This definition has also been adopted by the Law of the Sea Conference. See Article 1(4), A/CONF.62/WP/10 Rev.3.

⁸ *Charter of the United Nations and Statute of the International Court of Justice*, United Nations: New York, Article 1.3.

⁹ *Id.* Article 13.1.b.

¹⁰ Article 55(a).

¹¹ Article 55(b).

¹² Article 62(1).

¹³ P. B. Stein (1991) The Price of Success: Mitigation and Litigation in Airport Growth, *Journal of Air Law and Commerce* 57, Winter, p. 555.

¹⁴ *Ibid.*

¹⁵ See *Thornburg v. Port of Portland* (1962) 233 Or. 178, 376 P.2d. 100 at 101, note 1.

¹⁶ 328 U.S. (1946), p. 256.

¹⁷ The Fifth Amendment provides that private property shall not be taken for public use without payment of compensation. See also the cases of *Griggs v. Allegheny County* (326 U.S. at 84 (1962)) and *Batten v. United States* (306 F.2d. 580 (10th Cir. 1962)) which awarded damages for diminishing of value of property under the United States Constitution.

¹⁸ *Supra.*

¹⁹ 391 P.2d. 540 (1964).

²⁰ *Id.* at p. 545. See also *Aaron v. City of Los Angeles* (40 Cal.App. 3d. 471, 115 Cal. Rptr. 162 (1974)) which held that compensation should be awarded to persons for property values affected by aircraft noise even though the property was not located within a direct flight path of the Los Angeles airport.

²¹ *The Island of Palmas Case* (1928) 11 U.N.R. I.A.A. at 829.

²² *Ibid.*

²³ J.G. Starke (1989) *Introduction to International Law*, 10th ed, Butterworths: London, p. 3.

²⁴ (1949) I.C.J.R.1, 22.

²⁵ J. Barros and D. Johnston (1974) *The International Law of Pollution*, The Free Press: New York, p. 69.

²⁶ *Charter of the United Nations and Statute of the International Court of Justice*, *supra*, note 861, Article 38(1).

²⁷ Sharon Williams (1984) Public International Law Governing Transborder Pollution 13 *University of Queensland Law Journal* 112, 136-137.

²⁸ Article 9.

²⁹ Article 44(a).

³⁰ Article 44(d).

³¹ Article 44(n).

³² Article 44(i).

³³ Article 37(b).

³⁴ For more details on CAEP see L.F. Mortimer A. (1992) Ambitious Programme of Future Work to be Undertaken by CAEP, *ICAO Journal*, August, p. 6. See also J. Crayston and J. Hupe (1999) ICAO facing complex and evolving challenges in the environmental field, *ICAO Journal*, September, p. 5.

³⁵ Only two aircraft that will meet standards beyond those prescribed in Chapter 3 of Annex 16 to the Chicago Convention will be in production after the year 2000, namely the Boeing 747-400 and the Airbus A321. It is expected that by the year 2007, more than 70% of the world airline fleet would meet the most stringent of the proposals under consideration by CAEP. See Chapter 3 ½ *The Avmark Aviation Economist*, January/February 1995, p. 10.

³⁶ See John Crayston and Jane Hupe, *supra*, note 34, p. 6.

³⁷ See *Annex 16 to the Convention on International Civil Aviation*, 2nd ed, 1988 Vol. I Foreword.

³⁸ Sonic boom was identified in 1970 as: "...a phenomenon peculiar to supersonic flight. It is caused by the mach waves that an aircraft inevitably generates aerodynamically when it flies at a speed greater than that of sound. Roughly speaking these waves take the form of compression waves from the bow and the stern separated by expansion waves ... these waves extend from the aircraft as an audible pattern of roughly conical shape, much as the water waves from a boat extend from it as a visible pattern of roughly v-shape, and just as the water waves from a boat cause a disturbance that often extends to and travels along a neighbouring shore as the boat passes by, so do these shock waves from an aircraft cause a disturbance that normally extends to and travels along the ground as the aircraft flies over. The passage of these shock waves is perceived as a sonic boom."

³⁹ See *ICAO Doc 9064, SBC/2*, at 4-1.

⁴⁰ See *Assembly Resolutions in Force* (as of 6 October 1989), ICAO Doc 9558 at II-18.

⁴¹ *Assembly Resolutions in Force* (as of 2 October 1998), ICAO Doc 9730, ICAO: Montreal, at I-36.

⁴² *Report of the GATT Secretariat to the Second Meeting on Sustainable Development*, 16-31 May 1994, Let/1873, 94-0438.

⁴³ *Note by the GATT Secretariat prepared for the Second Meeting of the Commission on Sustainable Development*, included in the Report cited *supra*, note 172.