

THE PROPOSED MULTILATERAL CONVENTION ON NOISE & SONIC BOOM.

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ABSTRACT

This dissertation attempts broadly to analyze the problems of aircraft noise and its relationship to the "human environment." Chapter I is a general discussion of the considerable effects on the environment of aeronautical activities.

Chapter II explores the historical developments of this problem and the analysis of the physiological and psychological effects is covered in Chapter III.

Chapters IV, V, VI and VII, deal with the measures, scope and legal implications of national and international noise regulations. The ramifications of the introduction of supersonic aircraft in commercial transportation are examined in Chapter VIII.

The final part of the thesis deals with the Proposed Multilateral Convention on Noise and Sonic Boom and the failure of the Legal Subcommittee of ICAO to draft a suitable aircraft noise treaty. In parts of the main text and the summation some suggestions are made on how to resolve these problems.

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Le problème général de cette analyse est le problème du bruit et ses rapports avec l'environnement humain. Ainsi, le premier chapitre traite sur un plan général des dommages que causent les activités aéronautiques à l'environment.

RES/UME

Le chapitre II analyse l'évolution historique de ce problème et le chapitre III traite des effets physiologiques et psychologiques.

Ensuite, dans les chapitres IV, V, VI et VII on examine les mesures adoptées ainsi que la portée et les incidences juridiques des règlements nationaux et internationaux portant sur le bruit. Le chapitre VIII traite des incidences de la mise en service des avions supersoniques de transport commercial.

La dernière partie de la thèse traite de la convention multilatérale sur le bruit et la détonation balistique qui avait été envisagée et de l'échec de la tentative du Souscomité juridique de l'OACI de rédiger un traité acceptable sur le bruit. Le corps du texte et le résumé comportent diverses suggestions quant à la façon de résoudre ces

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PREFACE

Nature has not endowed the male scorpion with the qualities and discretion so bestowed to mankind. When the breeding season sets in, so the legend goes, the helpless creature is haunted by an incessant death knell. In mating with a female, sooner or later, the male must succumb to the poisonous stings of its partner. In attempting to attain the ultimate in hope and pleasure it spells out the ancient mariner's curse for slaying an albatross: death!

Man is able, though, to predetermine and control his fate including that of his environment, his hopes and pleasure. He derives pleasure through his own creativity: music booming at a concert hall; hunting with explosive devices; propelling noisy machines and playthings; the result of ever increasing technological achievement.

It may well be for a good cause that the scorpion must die, for indeed procreation is as natural as the animal instinct, and for that matter an honourable cause. But man's creativity has gradually led to hazardous effects upon health through the products of technology, both to himself and his environment. Noise and sonic boom, if excessive, invariably lead to illnesses and particularly loss of hearing, in a process so gradual and deluding that everything begins unnoticed. To the extent that society suffers in various ways due to a degraded human environment, activities that perpetuate and enhance environmental damage must not be disregarded. The control of noise producing activities is feasible both legally and technically.

In the last two years the subject of noise and sonic boom has received prominence on the agenda of the Legal Committee of ICAO. In April, 1975, a Subcommittee established to draw up a text or alternative texts of a noise and sonic boom convention reached a stalemate. A number of reasons were given for its failure. In brief, the Subcommittee majority felt that technical data was not sufficient, and that national laws adequately dealt with noise claims.

However, in such matters, rules of international law are preferred, insofar as they are able to ensure consistency and effectiveness in protecting the environment. International action is imperative in view of the universal and financial aspects of environmental problems.

In this thesis an attempt is made to show that an international convention to control noise and sonic boom is desirable. Medical findings are also referred to, to cast doubt on the general belief that, apart from causing annoyance or physical disturbance, aircraft noise has negligible or no adverse physiological effects.

Item 4 of the Agenda of the 22 Session of the Legal

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Committee of ICAO (Montreal 19th October - 12th November, 1976) deals with the study of the Rome Convention (1952) and of a Separate Instrument on The Liability for Damage caused by Noise and Sonic Boom.¹

It is considered that attention of the Legal Committee should be drawn to the importance of noise as an environmental problem and that other aeronautical environmental questions, in particular atmospheric emissions, ought to be dealt with in the near future.

From the viewpoint of airlines, the question of an international regulation of the carrier's liability in the field of noise and sonic boom is regarded with utmost concern.²

ICAO Doc LC/Working Draft No. 851 18th March, 1976.
ICAO LC/Working Draft No. 851-2, 13th September, 1976.

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CHAPTER I

THE SCOPE OF THE PROBLEM

(a) Noise and Sonic Boom in the Context of the Human Environment

The numerous environmental disturbances that interfere with the basic qualities of life include loud noises¹ that abound in "the human environment." All the non-natural interferences for which man is responsible² are caused either intentionally or inadvertently, usually as by-products of after-effects of other activities.³

The expression "human environment" embraces both natural and man-made elements, including urban and rural poverty, atmospheric pollution⁴ caused by automobiles, industry, and

¹ The term noise will be used throughout, to include sonic boom.

² Ward & Dubos, <u>Only One Earth</u>, 1972, p. XIII, Introduction.

³ Kay & Skolnikoff, <u>World Eco Crisis</u>, pp. 4-5.

⁴ The definition of pollution is subjective. It relates to the concept of human use and policy decision on how to use the environment in the best public interest. One definition is that pollutants consist of substances which interfere with the use of air, water or soil for socially desired purposes, (The wrong thing, in the wrong place, at the

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aircraft noise and emissions. The diversity of "the human environment" includes air, water, soil, the method by which food production can be increased and the study of harmful agriculture and practice.⁵

Webster's dictionary defines "environment" as "the complex of climatic, edaphic and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival."⁶ This definition covers a wide range of subjects. It ranges, for example, from the state of environmental decay of the river Rhine,⁷ to the impact of aeronautical activities on "the human environment." Likewise, it depicts the extent to which modern

wrong time depending on one's point of view). This may include telephone poles, dirty streets, apartment buildings, litter, flouridation, old automobiles, <u>music</u>, <u>noise</u>, dirty air, dirty water and advertisement.

Davies III, The Politics of Pollution, pp. 18-19.

⁵ Kay & Skolnikoff, <u>World Eco Crisis</u>, 1972, p. 4.

⁶ Webster's Seventh New Collegiate Dictionary 278 (1965).

⁷ Angelo, "Protection of the Human Environment," International Law, 1970, Vol. 5, p. 511, in which appears the limerick:

"The River Rhine it is well known; Doth wash your city of Cologne; But tell me Nymphs, What power divine, Shall henceforth wash the River Rhine?"

technology, increased population,⁸ large scale urbanization and industrialization, largely account for environmental deterioration. Enhanced consumption by society coupled with leisure and wealth are aspirations whose achievement require excessive use of resources and materials.⁹ Increased demand causes more pollution, increased population in the cities, more highway traffic, more junkyards and more noise.

Although man-made environmental disturbances were known since ancient times,¹⁰ for even the Romans were familiar with the health hazards of contaminated air,¹¹ what

⁸ Green, "Policy On the Environment," University of Toronto Law Journal Vol. 21, 1971, p. 242. The author produces an estimate that in the year ONE the world population was approximately 200 million people. In mid-nineteenth century world population rose to nearly ONE billion; by 1965, 3½ billion and by the year 2000 it is estimated to be 6 billion. See also Ward & Dubos, <u>Only One Earth</u>, 1972, p. 6-12.

⁹ Man's consumption of water is 200 times more than his requirement and that of primary energy is 50 times more than his caloric intake. The solid waste by-products are approximately 2 kg per head, per day and man travels nearly 20,000 km by mechanical means in one year. Lloyd, "The Aeroplane as a Threat to the Environment," Aeronautical Journal, October, 1972, p. 599.

¹⁰ Ward, <u>Man and His Environment</u>, 1968, pp. 79-80. The Royal Proclamation of 1306 curtailed the burning of coal in London. Its infingement was punishable by death.

¹¹ In 61 A.D. Seneca remarked"

"As soon as I had gotten out of the heavy air of Rome and from the stink of the smokey chimneys thereof, which being stirred, poured forth whatever pestilential vapours and soot they had enclosed in them, I felt and alteration in my disposition."

gives rise to concern today is the high proportion environmental damage has reached with modern technological, economic and social transformation. Every small increase to this degree of harm deserves close and careful scrutiny.¹²

(b) Global Concern on "The Human Environment"

Environmental problems are global in character, considering the nature of the earth's resources like water and air masses. These are shared resources, either because they are res communis, or they transcend national boundaries and cannot be confined within one state, or are needed for man's existence.

The atmosphere acts as a channel for airborne pollution to pass from its source to other places on the earth's surface. The water masses transport deposits and wastes all around the earth.¹³

Man is chiefly concerned with the usable form of these and other resources which are essential for the sustenance of life on earth, Human activities are increasingly causing

· ¹² Ward & Dubos <u>Only One Earth</u>, 1972, pp. 191-208.

¹³ It generally takes from 15-25 days for air pollutants to travel around the earth in the middle latitudes. Nuclear bomb radiation fall out from China reached Long Island, New York in 9-14 days. Yannacone & Cohen, Environmental Rights & Remedies, 1972, p. 121.

adverse interference to such resources. As a result lakes, rivers and oceans are under threat of untreated waste, and the burning of fossil fuels is increasing with unforeseeable consequences for the earth's climates and atmosphere.¹⁴

Other living organisms, upon which man depends for survival, are at the mercy of man's retrograde behaviour. Depletion or damage to the basic resources would threaten lower forms of life, plants and animals, thereby pausing danger to man's own survival. "Everything is connected to everything else."¹⁵

At the 1975 American Bar Association Annual Meeting in Montreal, the Section of International Law drafted a recommendation calling the ABA to recognize the growing interdependence of nations and take an active role in working toward solutions of the problems of an interdependent world.¹⁶

As business and transportation intergrate on an international level, all environmental problems, including noise,

¹⁴ For details see Ward & Dubos, <u>Only One Earth</u>, 1972, pp. 1-12, and also pp. 191-208.

¹⁵ For details see Commoner, <u>The Closing Circle</u>, 1972, pp. 29-35.

¹⁶ American Bar Association News Letter July, 1975, p. 6.

air and water pollution, become problems of international control.¹⁷ The new world economic order, social interdependence and modern transport systems can best develop with closer international co-operation.¹⁸

New technologies are global in nature and application of existing technology leads to transmational repercussions.

(c) The United Nations and the Environment

Measures undertaken by the United Nations, intergovernmen_al and non-governmental international bodies, underscore the universality of environmental problems. United Nations agencies have actively engaged in investigating and pursuing programmes for improving the quality of the human environment and resources. These various bodies have initiated diversified programmes for research and co-operation in the areas of atmospheric pollution, marine pollution, water resources development and pollution, urban environmental problems and the control of selected pollutants. Mostly within the

¹⁷ Yannacone & Cohen, <u>Environmental Rights & Remedies</u>, 1972, p. 442.
¹⁸ Commercial civil air transport acquired international stature

from the early days of its inception.

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United Nations system, ¹⁹ approximately two dozens intergovernmental organizations, ⁴ and nearly the same number of nongovernmental international organizations carry out environmental work. Outstanding among the non-governmental international organizations are the International Council of Scientific Unions (ICSU), which has established a Scientific Committee on Problems of the Environment (SCOPE), and the International Union for the Conservation of Nature and 4 Natural Resources (UCNNR). The ICSU has at least twenty affiliated specialized international scientific organizations concerned with advancement of research related to preservation of the environment.²⁰

The United Nations first major step was the decision of the General Assembly to convene a United Nations Conference on the Human Environment in Stockholm, Sweden, in June, 1972.

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10	Examples:	World Meteorological Organization (W.M.O)
	-	(air pollution monitoring and standardization. of
		national data)
	*	World Health Organization (W.H.O)
•	•	(effect of pollution on health)
	*	Food & Agricultural Organization (F.A.O)
	0	(food standards and level of additives and pesticide
	•	residues)
		Intergovernmental Maritime Committee (IMCO)
	÷	(sea pollution)
	2	International Civil Aviation Organization (ICAO)
		(aircraft noise abatement)
		1

²⁰ Johnson, "The United Nations System and the Human Environment," 1971, ISIO First Series Number 5 - Monographs, Institute for the Study of International Organizations, University of Susser, pp. 2-3.

.Two General Assembly Resolutions pertain to this decision, Resolution No. 2398 (XXII) of December 3, 1968 and Resolution No. 2581 (XXIV) of December 15, 1969. The first Resolution, entitled "Problems of the Human Environment" noted "the continuing and accelerating impairment of the quality of the s human environment caused by such factors as air and water pollution, erosion and other forms of soil deterioration, waste, noise and the secondary effects of biocides, which are accentuated by rapidly increasing population and accelerating urbanization. The need for intensified national, regional and international action to limit or eliminate impairment of the human environment was also shown. The second, "Resolution Calling for a 1972 Conference on the Human Environment," affirmed that it was the purpose of the Conference to provide quidelines for action by Governments and international organizations designed to protect and improve the human environment and to remedy and prevent its " impairment, by means of international co-operation, bearing in mind the particular importance of enabling developing countries to forestall the occurrence of such problems. This Resolution also dealt with the financial and management aspect of the Conference and established a Preparatory Committee.²¹

²¹ Barros & Johnston, <u>The International Law of Pollution</u>, 1974, pp. 294-298.

The Stockholm conference proclaimed a Declaration on the Human Environment, setting forth principles for its preservation and enhancement, and produced an international action plan. The United Nations General Assembly adopted the text of this Declaration on December 15, 1972, as Resolution 2994, by a large majority, without dissent.²² A Governing Council of the United Nations Environment Programme was established, together with an Environment Secretariat, headed by the Executive Director of the United Nations Environment Programme, the Environment? Fund and the Environment Co-ordination Board.²³

The Governing Council consists of 58 members elected by the United Nations General Assembly, whose specific functions and responsibilities entail environmental policy

²² While[[] these global measures may have come at an opportune time, their implementation is another matter. However, experts seem to agree that there is time to control environmental activities. Ward & Dubos, Only One Earth, 1972, Introduction.

See Appendix I hereto, U.N. Declaration on the Human Environment and Principles.

Also for text of the Declaration of the United Nations Conference on the Human Environment see Vlasic & Holland, <u>Environment and the Law</u> (Cases and Materials for an Intróductory Study), 1976, pp. 2-5, also see Barros & Johnson, The International Law of Pollution, 1974, pp. 299-303.

²³ The United Nations Year Book, 1972, pp. 324-325. The Environment Secretariat is located in Nairobi, Kenya, headed by an Executive Director.

matters and guidance.²⁴ The Secretariat serves as a focal point for environmental action and co-ordination within the United Nations system in such a way as to ensure a high degree of effective management. It provides substantive support to the Governing Council by co-ordinating and implementing programmes under guidance of the Council, and gives advice to the Governing Council, and intergovernmental bodies of the United Nations system on the formulation and implementation of environmental programmes. Generally, it provides liaison with scientific and professional bodies as well as giving advice on international co-operation in the field of the environment. The Secretariat is responsible to the Governing Council to which it reports environmental matters and performs such other functions as may be referred to it by the Council. The Environment Fund is administered by the Secretariat under the authority and policy guidance of the ∼ Governing Council.²⁵

²⁴ See Appendix II hereto, "The Constitution of the United Nations Governing Council for Environmental Programmes." `See also Barros & Johston, The International Law of Pollution, 1974, pp. 328-329.

²⁵ Barros & Johston, <u>The International Law of Pollution</u>, 1974, pp. 329-331.

(d) <u>Environmental Harm Caused by Aeronautical</u> Activities

Modern aeronautical activities cause a variety of environmental harm and disturbances. Besides engine noise, aircraft engines emit visible and non-visible chemical substances. These include the visible hydrocarbon particles, or smoke and grit, as well as the non-visible unburnt hydrocarbons, oxides of nitrogen and carbon monoxide.²⁶ Aircraft emissions are largely the same type as those emitted by motor vehicles.²⁷

Carbon monoxides and hydrocarbons are significantly produced during idling, take off and landing, when the rate of combustion is reduced. Noticeable quantities of nitrogen oxides are caused by high temperature in the combustor at various phases of maximum thrust, including take off, climb and cruise.²⁸

Oxides of nitrogen are toxic and harmful to kiving

²⁶ ICAO Bulletin, "The Role of Civil Aviation in the Relationship Between Technological Advancement and The Human Environment, Vol. 27-No. 4, pp. 11-16 at 15.

²⁷ U.S. Congress House Committee on Interstate Commerce (Sub-Committee on Public Health & Welfare), Air Pollution Control, Research into Fuels and Motor Vehicles, 1970, p. 6.

²⁸ Pianko, "Air Transport and Atmoshperic Pollution," ICAO Bulletin, August, 1976, p. 15-18 at 16.

organisms and contribute to the formation of fog.²⁹ Oxides which do not reach the surface of the earth may contribute to diminishing the layer of atmospheric ozone gas.³⁰

Carbon and smoke are inaesthetic rather than dangerous, but they cause annoyance and discomfort due to their ground surface proximity.

Aeronautical activities contribute to air pollution alongside numerous other sources, both man-made and natural, suc' as dust storms, ocean spray, forest fires, volcanoes and pollen spores.³¹

Atmospheric contamination is known to contribute in large measure to present day human death and disease. Various substances introduced in the air are linked to increased cardiovascular disease, strokes, cancer,

²⁹ Ibid., p. 16. See also infra p. 13 fatal results.

³⁰ See p. 108-110 infra, <u>Stratospheric Impact</u>. Ozone is a protective layer of gas that protects the earth from ultra violet rays of the sun. Exposure may increase cases of skin cander.

³¹ Natural pollutants tend to be simpler chemically and their sources more easily identifiable than man-created air pollution, many of which are chemically complex and unstable in the atmosphere after leaving the emitting sources. The major sources of man-made air pollution are industrial operations, power plants, fuel used for heating, refuse incineration and automobile exhausts.

Yannacone & Cohen, Environmental Rights & Remedies, 1972, p. 117.

(particularly bronchogenic cancer), bronchitis and amphysema. Recorded instances of deaths, resulting from emissions of high technology include the Belgium Meuse Valley (1930), Donora, Pennsylvania (1948), London (1952, 1959, 1962), and • New York City (1953, 1962, 1966; 1970), ³² Cancer death rates in the United States have been rising from 18.4 deaths per 100,000 in 1950; to 39.1 deaths per 100,000 in 1965, an increase of 113 per cent in 15 years.³³

Aircraft noise causes more annoyance to the public and perhaps produces equally fatal results in the long run.³⁴ A great deal of noise is confined to areas surrounding major airports, mainly disturbing communities which have close to these areas. People living below air corridors or aircraft. paths are also affected by the noise at take off and landing. However at high altitudes en-route aircraft emit minimal

Airline contribution to environmental harm is globally

³² Weisburg, <u>Beyond Repair - The Ecology of Capitalism</u>, 1971, p. 63-64. Also The Economist, January 17th, 1976, p. 24, quoting Cmnd 6371 HMSO Report revealing that in the London smog of 1952, 4000 people died prematurely. Photochemical smog is formed by hydrocarbons from exhaust emissions in the presence of sunlight--ICAO Bulletin, June, 1975, p. 24.

³³ Cancer is only one of many illnesses caused by environmental degradation, Weisburg; Beyond Repair - <u>The Ecology of Capitalism</u>, 1971, pp. 8-10.

³⁴ See Part III, p. 25, Effects of Aircraft Noise.

small,³⁵ though it may be significant in specific localities with heavy aeroplane concentration. Equally, the more highly industrialized countries, having higher populations and heavy air traffic movements, suffer more environmental disturbances than the less developed nations.³⁶

For example, in the United States, the noisiest and largest aviation country, aviation pollution consists of 3.3 per cent of the total and this comes from all aviation activities comprising of airline aircraft, military aircraft and general aviation aircraft. Out of a total of 2,120, the small airline aircraft using gas turbine engines contribute 24 lbs of pollution per individual. This gas turbine engine is being considered as a replacement for piston motor vehicle engines in an effort to reduce road motor traffic emissions. Osmun, "Jet Air Pollution Declines Steadily" ICAO Bulletin, April 1972, p. 22.

³⁶ Ramsden, "Concorde and the Environment," Flight International November 27th, 1975, 778-782 at 782.

CHAPTER II

C.

THE PROBLEMS OF AIRCRAFT NOISE: HISTORICAL BACKGROUND

(a) The Definition and Source of Aircraft Noise and Sonic Boom

(i) Noise

Noise is sound.³⁷ Sound is a wave motion in an elastic medium or the sensation of hearing produced by the wave motion. Air is a common elastic medium through which wave motions producing sound are transmitted. While a precise definition of sound is feasible, no particular definition of noise is satisfactory to everyone on all occasions.³⁸ This is due to the subjective value of noise, which depends on the psychological and behavioral reaction of individuals, varying with personal attitudes and situations.³⁹ One approach is to define noise in many ways, each definition being limited to the scope of a particular frame of

³⁷ Taylor, <u>Noise</u>, a Pelican Original, 1970, p. 253.

³⁸ Yannacone & Cohen, <u>Environmental Rights & Remedies</u>, 1975 Supplement, vol. 2, p. 63.

³⁹ See infra, pp.28 -29(c) and pp. 33 - 34

reference.40

While recognizing the futility of a precise definition of noise, generally noise can be defined as sound unwanted by the listener, disruptive, meaningless, random sound, or sound without value.⁴¹

The Special Meeting on Aircraft Noise 42 and the ICAO Committee on Aircraft Noise 43 have technically described noise at various levels without attempting any comprehensive definition. Similarly Annex 16⁴⁴ of the technical annexes of ICAO on aircraft Noise follows the same procedure, without altering or contradicting the generally acceptable meaning attached to noise, which is simply "unwanted disruptive <u>sound</u>."

⁴⁰ Example: Sound which interferes with sleep sound which interferes with speech at home, in the office or courtroom or public ceremony; sound which interferes with concentration at work or in the library, classroom or at home; sound which interferes with rest and tranquility at a nursing home or at a remote vacation place.

⁴¹ Rupert Taylor (<u>NOISE</u> a Pelican Original, 1970, p. 253.

⁴² ICAO Doc. 8852, Noise (1969), Montreal, November 25 - December 17, 1969.

⁴³ Ecology Law Quarterly, 1974, vol. 4: 93 p. 109.

44 See pp. 109-441 infra.

In acoustics, ⁴⁵ noise is determined to be "any undesired sound." Hence, the sound made by 'tinkling bells' may be music to some and noise to others. The 'tinkling bell' may actually be defined in two ways: one that of the reaction of the observer, the sensations received from listening and secondly, the physical disturbance of the air.

Noise disturbance from aircraft is derived from the engine jet exhaust and its rotating machinery. This enginegenerated noise is a strongly resented and widespread environmental disturbance, whose origins and effects are more complex and harder to treat than chemical pollution.⁴⁶

There are two broad categories of aircraft engine noise, namely, jet noise and fan noise. In the past the major source of noise has been the jet exhaust and rotating machinery which were predominant in the early turbo-fan or fan jet engines. In recent years, as higher and higher by-pass ratio turbo fan engines were introduced, the fan (the rotating machinery) has started to become the principal source " of nome and this is associated with the "approach" regime..

⁴⁵ Acoustic means having properties or characteristics affecting or connected with sound, Taylor, NQISE, a Pelican Original 1970, p. 249.

⁴⁶ Cornell & Bahr, "The Higher Bypass Jet Engine Designed for fuel and environmental conservation," ICAO Bulletin, June, 1975, p. 22.

The jet exhaust noise was associated with the "take off" regime. 4^{7}

The jet noise results from the interaction of the main exhaust flow from the engine with the surrounding air and is a stream of noise stretching out behind the engine, diminishing in intensity as the exhaust flow mixes with the surrounding air. Fan noise originates basically from the tips of the fan blades and it is easier to pin point.

The turbo-fan or fan-jet engine produces less jet noise than the turbo-jet because it extracts energy from the high 'velocity jet core to drive a highly efficient fan. This increases the engine air flow and surrounds the lower velocity cold air expelled by the fan. This fan air serves to reduce the exhaust stream noise while increasing the thrust of the engine. In the turbo-jet engine, there is no fan producing cooler air surrounding or cushioning the hot. exhaust gases as they leave the core jet engine and thus the loud "shearing" noise is produced, typical of early generation turbo-jet engines.⁴⁸

⁴⁷ Glenn "The Impact of Jet Aircraft on the Environment", p. 1-2, an address to McGill students of Air & Space Law, April 19th, 1975.

⁴⁸ Cornell & Bahr, "The Higher Bypass Hot Engine: Designed for fuel and environmental conservation", ICAO Bulletin June, 1975, p. 22.

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(ii) Sonic Boom

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The Sonic Boom Committee of ICAO gave's simple generic definition of the term "Sonic Boom", incorporating the definition made by the International Organization for Standardization (ISO), 2249.⁴⁹ The ISO defined sonic boom as "the acoustic event which is a manifestation of the shock wave system generated by the aircraft when it flies at a speed greater than the local sound velocity."⁵⁰ ICAO's Sonic Boom Panel⁵¹ gave the following description of the sonic boom phenomenon:

The sonic boom is a phenomenon peculiar to the supersonic flight. It is caused by the mach waves that an aircraft inevitably generates aerodynamiccally 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 stem separated by expansion waves. The compression waves coalesce and form steep rises in pressure which are called shock 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 show as the boat

⁴⁹ ICAO Doc. No. 9064, SBC/2, Sonic Boom Committee Second Meeting Montreal 19-29 June 1973, p. 3-3, paragraph 3:25.

⁵⁰ Ibid. paragraph 3:2.6, p. 3-3.

⁵¹ ICAO SBP II DP/1 Draft Report on Agenda item I, October 13, 1970, p. A-4--which dealt with the development of an internationally acceptable practical method of describing and measuring sonic booms and a formulae of the cause and effect relationships. 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 propagation of these shock waves is a sonic boom.

At Appendix 'A' of the same Report, the Sonic Boom Panel defines sonic boom in terms of the ISO definition noted herein above. The sonic boom from a particular aircraft produces a sonic boom carpet which is the area on the earth's surface in which sonic boom is experienced from a particular supersonic flight, for instance, at the altitude of 56,000 ft. the sonic boom carpet is about 45 nautical miles or 80 kilometres and at 63,000 ft. the carpet is about 50 nautical miles or 95 kilometres.

There are no difficulties at law in treating sonic boom as a kind of noise for purposes of legal rules. ICAO's Sub-Committee on Noise and Sonic Boom which met in Montreal in April, 1975, indicated this possibility.

However, it seems without firm legal rules, a more <u>scientific</u> definition or description may be rejected by courts of law. Despite the scientific recognition of sonic boom as a type of explosion,⁵² the United States Supreme

⁵² Arkin, Burdick and Joyner "Sonic Boom - A Legal Nightmare", Oklahoma Law Review, 1966, Vol. 19, No. 3, p. 293. Also see supra p. 35

Court⁵³ was content with defining an explosion as what ordinary men "understood occurred at the⁵ time of the boom in the light of all the testimony." The question asked was whether it was an explosion in the ordinary and popular sense of the word. In South Carolina and Alabama the trial courts followed this notion, holding sonic booms not to be explosions. In this respect a multilateral convention on noise and sonic boom would ensure uniformity by adopting an acceptable scientific definition.

The 'sonic boom' is a unique noise phenomenon associated with an object which travels at a speed greater than that of sound.⁵⁴ The first ever recorded, 'sonic boom' was caused on 14th October, 1947, by U.S. Airforce test pilot Major Charles E. Yeager, who flew Airforce plane XS-1 at Mach 1.06 (700 mph) at 43,000 feet, a speed faster than that of sound. Yeager dived through the so-called "sound barrier" and for want of a better name, the airmen labelled the thunder clap "sonic boom".⁵⁵

The term "sound barrier" is a misnomer whose non-

53 <u>Mitchel vs. Potomac Ins. Co.</u> 183 U.S. 42, 22 Sup. Court 22, 46 L.Ed. 74 (1908)

⁵⁴ Hallion, Supersonic Flight, 1972, pp. 108-109.°

⁵⁵ Arkin, Burdick & Joyner, "Sonic Boom - A Legal Nightmare," Oklahoma Law Review, 1966, Vol. 19, No. 3, p. 292.

scientific origin is obscure. There is no physical entity corresponding to the layman's notion of the "sound barrier". It was probably a journalists' description of the technical barrier of the unknown which existed in connection with flight near the speed of sound. It relates to the mystery which confronted scientists when an aircraft faced a rapid rise of drag during flight transition from subsonic to supersonic speed. In accordance with classical laws of motion, there must be a balance between thrust and drag in order to maintain a steady forward speed. The amount of thrust must be exactly equal to that of drag and acting in exactly opposite direction. If the forward thrust produced by the power plant (propellers or jet exhausts) were to exceed drag, the aircraft would accelerate. The rapid rise in drag caused by approach to supersonic speed is due to the resistance to forward motion caused by compressed air, forming patterns similar to waves of a fast-moving ship. In the result tremendous thrust power is needed to balance the forces at this stage, and thereafter, when the aircraft has passed the speed of sound, and obtained a steady air flow, the rapid rise in drag discontinues. The air flow attained differs from that of an aircraft flying at subsonic speed. The "sound barrier" was therefore a description of this outstanding increase in drag.⁵⁶

⁵⁶ Caplan, "The Sound Barrier: aircraft noise and insurers", Journal of the Chartered Insurance Institute - (1956), Vol. 53, pp. 13-14.

To the ordinary man in the street the "sonic boom" phenomenon is no more than a sharp noise clap reminiscent of a thunder clap or a kind of explosion. This peculiar type of noise is emitted by aircraft which cruise at a speed faster than the speed of sound, in common parlance known as supersonic aircraft.

The "boom" occurs when shock waves set up by any mass travelling through the air at a speed greater than 760 miles per hour, strike the ground or something else in its path at standard atmospheric conditions at sea level. The minimum speed of sound is subject to atmospheric variables such as temperature and barometric pressure. The sonic boom noise is heard when the shock waves energy, which trails off the nose of the aircraft, is disrupted.⁵⁷

(b) ' Aircraft Noise from the Early Days

In many countries major airports grew from military installations where little regard had been given to the environmentalimpact of these sites on the surrounding communities. After the mid 1950s, when civil jet powered aircraft were extensively used, it became apparent that, manufacturers, airport operators and government agencies had to increase their efforts to constrain the growth of noise.

⁵⁷ Ibid., page 293.

Aircraft noise had been an increasingly serious community problem for many years long before the large jet aircraft were commercially used. Even though the public expected jets to be noisier, propeller aircraft or aircraft with piston engines were already noisy. As early as 1939, a Committee on the Control of Flying in the United Kingdom considered the noise as a social problem. The history of aircraft noise started with the operation of military aircraft, both bombers and fighters. It was then that serious complaints were voiced by the public, especially in populous Therefore the introduction of larger commercial jet areas. aircraft in the early 1950s merely aggravated the problem, at a time when more people lived closer to airports, more and larger airports were developed and the volume of air travellers increased. Under these circumstances, the level of noise affected a higher percentage of the population than before.⁵⁸ The airport neighbours, mainly well to do and influential suburban dwellers, exerted pressure on government agencies to take action to curb noise.59

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⁵⁸ Large, "The Control of Aircraft Noise", Aircraft Engineering, July 1975, p. 5.

⁵⁹ Aircraft Noise Problems, Cong. Hearings before the Subcommittee of the Committee of Interstate and Foreign Commerce, House of Representatives, Eighty Sixth and Eighty Seventh Congress September 7th 1959, February 23rd, April 20th, 21st, 1960, April 12th 1961, July 17th, 18th, December 4th, 5th and 6th 1962, p. 5.

CHAPTER III

EFFECTS OF NOISE

Much controversy prevails over the extent to which noise generally, and aircraft noise in particular can cause injury to human health. Some have argued that aircraft noise per se does not have adverse health effects. Others have asserted that noise from various sources in urban areas causes serious damage to health.⁶⁰

Admittedly scientific studies are not all conclusive on this subject, but some evidence indicative of the multivariant physiological effects of noise on health can be adduced. Dr. Henry J. Ilecki, the head of speech and hearing division of the Institute of Otolargyngology at the Royal Victoria Hospital (Montreal), pointed out that loud noise is a common cause of deafness. The gradual loss of hearing often experienced from middle age onwards is usually attributed to noise. Exposure to damaging noise reduces the ability to hear sounds at lower frequencies such as 2,000 to 3,000 cycles. The range of ordinary conversation also deteriorates. Once this ability is lost it cannot be

60 Yannacone Jr. & Cohen, <u>Environmental Rights & Remedies</u>, 1972, p. 379.
retrieved.⁶¹

Concern over aircraft noise is primarily related to the following factors: fear, relaxation, economic loss, sleep, hearing and health. Noise disturbs speech communication, work or relaxation. It causes temporary changes in the neurological and physiological functions of the body, indicative of stress. Additionally, exposure to noise can be linked with psychological effects, general anxiety, irritability or annoyance, physical fatigue, unsociability and inefficiency in the performance of hard work.⁶²

To the extent that areas of damage can be shown, ICAO's conclusions on the effect of noise to health care are of somewhat limited purpose. Studies which ICAO sponsored on aircraft noise within the vicinity of airports indicate that so far aircraft noise exposure in the vicinity of airports has not been demonstrated as being harmful to health or to

- ⁰¹ Example testimony of Dr. Henry J. Ilecki, head of speech and hearing division, Institute of Otolargyngology, Royal Victoria Hospital and assistant professor at McGill University--The Mantreal Star, Tuesday, May 11th 1976, "Dad's gunshots, not rock music, deafened Steve" Section BP.B1.

⁶² Hauel, "Toward the Comprehensive Abatement of Noise Pollution", Ecology Law Quarterly, 1974, Vol. 4, pp. 109-144 at 110-114,

hearing.⁶³ These findings appear controvertible in two broad respects. On one hand no account is taken of the cumulative effects of noise. One example is the cross cultural comparison of people who are exposed to noise pollution and the Maabans in the Sudan, a people with the quietest community yet monitored, which showed that the Maabans, because of the silence of their environment, have the best hearing of all tested groups. At the age of 75 they hear as well as an ordinary American at the age of 25.⁶⁴

While loud noises registering 150 decibels and above can permanently damage the ear in a shorttime, it seems repeated lower noises of about 80 decibels or less, have similar effects over an extended duration.⁶⁵ Therefore aircraft noise, normally producing on the average above 80 decibels, can build up to produce the same effect as a single

⁶³ Report of the Special Meeting on Aircraft Noise, Doc. 8857 (NOISE) 1969.

⁶⁴ 3 Environmental Crisis Bull. No. 26, p. 1, (1972), quoted in Ecology Quarterly Law, 1974, vol. 4:109, p. 110 footnote No. 5. This factor may be of interest to developing nations whose communities have more quieter environment than that of highly industrialized countries. Also see Hatfield, "Noise, The Gathering Field", Environmental Law, 1970, Vol. I, No. I, p. 33; it is shown the U.S. is the noisiest country in " the world.

⁶⁵ Hatfield, "Noise--The Gathering Crisis", Environmental Law, Vol. No. 1, 1970, p. 33-35.

louder noise of more than 150 decibels. More significantly, repeated noise is the only type of a shattering explosion, that produces permanent hearing loss.⁶⁶ Airport neighbours are all frequently subjected to repeated aircraft noise. Consequently, public attention should be drawn not only to the intensity of noise, but also to such factors as duration of exposure, distance from the source and frequency of the noise.⁶⁷

On the other hand, ICAO's findings appear to emphasize psychological rather than physiological reactions of the hearing mechanism. The distinction between these two phenomena is based on the measure of annoyance rather than the extent of injury to health. There can be no scientific correlation between these factors to warrant a finding of the extent of harm people can suffer from noise pollution. Firstly, annovance is subjective and as such is dependent on a number of variables. Even when the sound level meter indicates the same number of decibels for two different sources, human reaction would differ for each, showing more annoyance for high pitched noise than for rumbling. Physiological damage or injury to health relates to the degree of

66 Ibid., p. 35.

short of

Yannacone & Cohen, Environmental Rights and Remedies, 1972,

mechanical disturbance of air molecules and may even result from rumbling noise.⁶⁸ While psychologically people "can learn to live with noise," the human ear will still remain vulnerable to external forces of high level noise.

The degree of damage to the health of airport neighbours is usually proportional to the frequency of aircraft movements. While jet engine can cause profound, irreversible and lifetime deafness in a matter of minutes, this tragedy is often compounded by the public's unawareness of gradual hearing loss until it is too late.⁶⁹

(i) Physiological Effects of Noise

Noise can damage hearing in many ways, the most severe of which is the loss or impairment of hearing. Usually, excessive noise causes inner ear, perceptive or neurosensory deafness, known as nerve deafness. The occurrence of this is due to the depressed sensory nerve function when noise damages the hearing mechanism.⁷⁰ Acoustical trauma or blast

⁶⁸ Studies of Noise Characteristics of the Boeing 707-120 Jet Airliner and of Large Conventional Propeller Driven Airlines Prepared by Bolt Beranek & Neuman Inc., 50 Moulton Street, Mass., Oct. 1958, for the Port Authority of New York, p. 3.

⁶⁹ Hatfield, "Noise The Gathering Field", Environmental Law, 1970, vol. 1, No. 1, p. 161-162.

⁷⁰ Iannacone & Cohen, "<u>Environmental Rights & Remedies</u>", 1972, p. 379.

trauma, though exceptional, may also result from a sudden burst-noise like gunfire, which ruptures the eardrum or disrupts the chain of small bones that transmit the sound within the ear to the auditory nerve. Similarly, explosive noise may produce permanent nerve deafness by affecting the inner ear, producing choclea damage.⁷¹ Physicians have reported a **causal** relationship between exposure to excessive noise by adults and the incidence of heart disease and cardiovascular dysfunction, migraine headaches, gastrointestinal disorders and allergies, as well as endocrine and metabolic effects.⁷²

(ii) Psychological and Behavioural Effects of Noise

What makes a sound noise is a matter of psychology rather than acoustics, insofar as annoyance is a function of individual response, varying with persons and situations.⁷³ A sound which we associate with something more pleasurable is far less likely to be considered as a noise than one with

⁷¹ Yannacone & Cohen, <u>Environmental Rights & Remedies</u>, 1972, p. 380.
 ⁷² Ibid., p. 381.

⁷³ Ibid., p. 383. The degree of annoyance is often associated with subjective factors such as familiarity and personal attitudes. Due to psychological and behavioural reaction there is no objective method of measuring annoyance without generalizing. unwelcome connotations. Very loud music may be considered beautiful by an appreciative listener, whereas even minute scratching and extremely weak sounds can be a disturbing noise. Interference with speech communication is the best understood non-auditory effects of noise.

Psychiatrists and psychologists have recently linked mental disorders with excessive undesired noise.⁷⁴

Suggestions have been made by doctors that loss of hearing may prove the least serious phenomenon, considering the tension caused and contributed by noise, including its aggravation of all the diseases associated with tension like stomach ulcers, neuroses, mental illness, allergies, cardiovascular and circulatory diseases, dilation of pupils, dry mucous membranes, skin paleness, intestinal spasms and glandular secretions.⁷⁵ To the extreme side murder and suicide attempts have been attributed to excessive noise.⁷⁶

⁷⁴ Ibid., p. 385.

⁷⁵ Ibid., p. 385-386.

⁷⁶ Ibid., p. 386. Also see Hatfield, "Noise--The Gathering Crisis", Environmental Law, 1970, vol. 1, no. 1, p. 35, pointing out possible association of noise with other phenomenon such as criminal tendency, as in the case of the murder of the son of Roy Innis, the prominent Negro leader, shot dead by a night worker who was allegedly aroused in his sleep by the noise of boys playing during the day.

Persons exposed to loud noise easily become irritable and unsociable. Noise effect on the efficiency, performance and concentration of factory and office employees has been demonstrated.⁷⁷ As well as being deleterious to the welfare of individuals, noise is economically counter-productive.⁷⁸

Loss of sleep due to noise may result in tinnitus, a ringing sensation in the ears brought by prior exposure to excessive noise. This lack of sleep, prejudicial to physical and mental health, may occur irrespective of the peace and quiet of the bedroom.⁷⁹

Inaudible or infrasonic sound, produced at a pitch or frequency below 30 cycles, is likewise capable of causing harm to the human organism. Industrial cities abound in infrasound generated by motors, machines that turn at slow

⁷⁷ Yannacone & Cohen, <u>Environmental Rights & Remedies</u>, 1972, p. 387. Astronauts subjected to a 145 decibel sound of a jet engine at full thrust experienced difficulty in carrying out simple arithmetical operations and tend to put down any answer in order to end the experiment. In many cases people working in a noisy environment make more mistake: and their thinking gets slow and fuzzy.

⁷⁸ Ibid., p. 387--In the U.S. the cost resulting from lowered efficiency and increased errors (due to noise) have been estimated to result in an annual loss of \$4 billion to the industry.

'⁹ Ibid., p. 387-388.

rate and aeroplanes. Infrasound penetrates buildings and houses, causing fatigue and dizziness to the occupants. This kind of sound affects airplane passengers and for this reason most airlines cancel out or 'mask' such infrasound with music while the engines are idling.⁸⁰ The interference of noise with intellectual activity cannot be disputed.⁸¹

The noise problem is complicated by various degrees of exposures and sensitivity of the human ear. In this regard, considering the psychological aspects of the problem, no solution can be reached to the entire satisfaction of the general public.⁸² Sound pressure level, as conventionally calibrated in decibels, does not necessarily denote the

80 Yinnacone Jr. & Cohen, Environmental Rights,

& Remedies, p. 388. Infrasound produces physiological effects similar to those of low frequency mechanical vibrations and malaise like vertigo, nausea, resonances of internal organs and visual disturbances. Ultrasound has the same effect as infrasound.

⁸¹ Ibid., p. 388. See also p. 374 quoting Schopenhauer, On Noise, in 2 the World as Will and Idea 199 (H. Haldana and J. Penp trans. 18¹⁴):

> "I have long held the opinion that the amount of noise anyone can bear undisturbed stands in inverse proportion to his mental capacity and may therefore be regarded as a pretty fair measure of it--Noise is a torture to all intellectual people."

⁸² Glenn, "The Impact of Jet Aircraft on the Environment", an address to McGill Air & Space Law students, April 19th, 1975, p. 12.

psychological annoyance value. The decibels merely indicate the output of sound in terms of energy. Therefore highpitched noise of equal sound pressure level to low-pitched noise might prove more annoying to the listener. In that event a jet measuring 100 decibels of noise would sound much louder to the human ear than the sound of piston engine aircraft rating 100 decibels of noise.⁸³

The formula used to measure the human ear perception of aircraft noise is determined by applying a correction factor to the decibel reading. The figure arrived at approximately measures the annoyance value of noise to the human being. The relative value as judged by the ear, compared to the "naked" decibel meter measurement, are termed "perceived noise decibels" (PNdB). This new concept of noise measurement meant that a jet plane in order to be rated equal to a piston engine plane in perceived noise decibels, or húman rating, would actually have to be a number of decibels lower in its actual noise output than the piston engine aircraft.⁸⁴

⁸³ Aircraft Noise Problems, Cong. Hearings before the Subcommittee of the Committee of Interstate and Foreign Commerce, House of Representatives, Eighty Sixth and Eighty Seventh Congress, September 7th, 1959, February 23rd, April 20th, 21st, 1960, April 12th, 1961, July 17th, 18th, December 4th, 5th and 6th, 1962, p. 6.

⁸⁴ Ibid., p. 6. Also Glenn "The Impact of Jet Aircraft on the Human Environment", p. 2, an address to students of Air & Space Law, McGill, Aoril 19th, 1975.

The perceived noise is dependent on the proximity of the measuring point of the observer to the source. Noise follows the inverse square law, producing about one quarter of its intensity at twice the distance from the source.⁸⁵ Noise is also dependent on the aircraft type and aircraft mission. It does not however depend on airplane size and engine thrust. For example, a 747 whose gross weight is twice that of a DC 8 and about $2\frac{1}{2}$ times the engine thrust, has a noise contour of about 1/3 the size of the DC 8 contour. Similarly the DC 9 whose gross weight is $\frac{1}{2}$ the gross weight of an L-1011 and whose total engine thrust is also $\frac{1}{2}$, has about the same size of noise contour.⁸⁶

(iii) Effects of Aircraft Noise

Notwithstanding the uncertainty of the past, recent research work shows that <u>aircraft</u> noise has definite medical consequences in the human body.⁸⁷ Results indicate that serious health impairment may be caused by long term exposure to aircraft noise and that the legal restrictions based on

⁸⁵ Ibid: Glenn.

⁸⁶ Ibid., pp. 3-4.

⁸⁷ A Doctoral thesis on "Medical Consequences of Aircraft Noise", carried out by Paul Gerald KNIPSCHILD at the Coronel Laboratory of the University of Amsterdam (1976). a fixed noise level are inadequate.⁸⁸

Theoretically it seems improbable that long term exposure would induce hearing loss, but aircraft noise, in an intensity which by itself does not induce hearing loss, may be compounded by exposure to other sources of noise like industrial and road traffic sources.⁸⁹

There are also non-auditory effects of aircraft noise, as indicated by experimental epidemiological studies, which show higher admission rate in mental hospitals in areas with a great deal of aircraft noise, like the United Kingdom. More people use hypnotics and sedations and present noise problems to their doctors (Switzerland). In Russia there is a higher incidence of otorhinolaryngological, cardiovascular, nervous and gastrointestinal diseases in areas located near airports.⁹⁰

The following conclusions were arrived at in surveys conducted in The Netherlands:⁹¹

88 İbid., p. 129.

⁸⁹ Ibid., p. 127.

⁹⁰ Ibid., p. 127. Reference is made to the thesis of MOSSOV (1976) on non-auditory effects and the few available logical studies.

⁹¹ Ibid., p. 128, (Knipschild's thesis).

Population survey: The Central Office of Medical (a) Examinations screened 6,000 men and women aged 35-64 to trace the beginnings of cardioyascular diseases, dividing the participants in two groups of those living in areas with more aircraft noise and those who did not. More aircraft noise was linked with heart trouble, hypertension and especially women, the patients took cardiovascular drugs. There were also more high blood pressure and pathological heart shape cases. None of these discrepancies were attributed to age, sex/smoking habits, height/weight and socioeconomic differences. In areas with aircraft noise B40-60 (B NN1) compared to B20-40 roughly 50% more people had cardiovascular impairment. In areas with B 45 compared to B 20 in six years the prevalence of hypertension had redoubled.92

(b) <u>General practitioner survey</u>: In areas impacted by B40-50 noise level doctors were consulted 2-3 times more often than in those below B20 noise level. Serious psychological problems were observed as well as psychosomatic symptoms such as low back

⁹² NN1 = 1 PNdb. See above p. 34

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pain and irritable colon. For the total number of doctor-patient contacts in areas with more aircraft noise the use of sedatives and hypnotics, and for female patients also the use of antihypertensive agents, was higher.

Drug survey: A survey of drug purchases in two (C) villages near an airport was made between 1967 and. 1974. One of the villages had no serious problem with aircraft noise; the other initially had no aircraft noise, but much aircraft noise from 1969 (B35-55) and in 1973-1974 aircraft noise only during day time and practically none in the night. The drugs studies were hypnotics, sedatives antiacids and cardiovascular drugs. In the control village, there was no noticeable increase of drug purchases. In the noisy village more hypnotics and sedatives were bought after the beginning of aircraft noise, but when the number of night flights were diminished the rate of purchases decreased. Twice the initial number of anti-acids were bought in six years and the increase continued even when aircraft noise at night had ceased. As the purchase of antihypertensive drugs doubled, it was followed at the same rate by cardiovascular drugs.

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The similarity of results in these findings affirms the view that the prevalence of aircraft noise around airports seriously affects public health in a variety of ways, including inducement or aggravation of psychological problems, somatic complaints and diseases.⁹³

(iv) Particular Effects of Sonic Boom

While effects of sonic boom are similar to those of ordinary noise, ⁹⁴ booms may additionally cause damage to animals and property, especially where old and weak structures exist, depending on the angle and strength of the shock waves, atmospheric conditions, the size and speed of the aircraft, topography and flight level attitude.⁹⁵ The Sonic

93 Ibid., p. 129. The author also suggests that aircraft noise should not exceed B.20.

94 Arkin, Burdick and Joyner, "Sonic Boom--A Legal Nightmare". Oklahoma Law Review vol. 19, August, 1966, No. 3, p. 295.

⁹⁵ Ibid., p. 294. In 1953 a test pilot at Palmdale, California broke windows and cracked beams on the door frames of the Airport Administration Buildings; in 1956 at Oklahoma City much glass was broken in a sonic boom demonstration show; in 1961 the U.S. Air Force received 2,304 complaints of sonic boom damage from Strategic Air Command exercises over the city of St. Louis. The U.S. Air Force believed that the sonic booms were dangerous but considered them equal to any other danger like atomic bombs, airplanes and even automobiles if uncontrolled. The danger has been reduced through the restrictions of USAF supersonic flights to safe altitudes and areas. Boom Panel of ICAO, at the Montreal Conference of October 12th, 1970, considered and analyzed the effects of sonic boom on four parameters: (a) human beings; (b) property; (c) the animal kingdom and (d) terrain.⁹⁶ The results showed that due to startle, persons were physically injured by falling objects such as glass, animals suffered injury in a stampede giving rise to premature birth, death by trampling and broken legs. The female mink underwent a killing frenzy, cast their litters prematurely and lost their fur. Psychologically rattling and noise caused annoyance and distruption.

Generally, the boom noise causes the rate of breathing, heartbeat and blood pressure of animals to rise. These, together with a lessened flow of gastric juice quickly subdue when the boom ceases. At an intensity of 150-160 decibels, certain animals suffer from burns, spasms and paralysis before dying. There is a probability sport fish are hypersensitive to sound and guinea pigs exposed to high but tolerable noise develop swollen inner ear membranes and damaged auditory hair.⁹⁷

⁹⁶ Sonic Boom Panel ICAO Doc. 8894 SPB/11/ICAO Second Meeting (12) October 21, 1970, p. 1-1. Also The Aeronautical Research of Sweden Memorandum P.E.--19, The Menace of Sonic Boom to Society and Civil Aviation.

⁹⁷ Yannacone Cohen, <u>Environmental Rights & Remedies</u>, 1972, vol. 2, p. 1972, p. 389.

Rats exposed to prolonged excessive noise lose fertility, turn homosexual, eat their young and eventually die of heart failure at the noise intensity of 150 decibels.⁹⁸

Non-domesticated and wild animals probably have high sensitivity to noise because of their usually quiet natural environment. For this reason if game parks and animal habitats are subjected to frequent noise and booms, the life patterns, procreation and breeding cycles of animal species may be jeopardized.⁹⁹ This may add to the many causes of disappearance of the varied and rare animal species in certain parts of the world.

In the report of the Sonic Boom Panel of ICAO 1970 movement of unstable terrain such as chiffs and loose earth due to sonic boom was also noticed.¹⁰⁰

ICAO's Sonic Boom Panel concluded that no <u>major</u> effects of boom either to the health of persons or to the three other elements of the environment were noticeable.¹⁰¹ The

98 Ibid., p. 390.

⁹⁹ Injury to living organisms does not depend solely on the intensity or level of disturbance, but also to frequency and duration of the noise: See pp. 27-23.

¹⁰⁰ See note 83.

¹⁰¹ Sonic Boom Panel Doc. 8894/11/ICAO Second Meeting (12), October 21st, 1970, p. 1-1.

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findings of this Panel must be taken on the basis of the special circumstances and the facts then presented before it.

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At high altitudes, even with large aircraft flying supersonic, controlled flights are likely to produce less severe sonic booms, closely resembling distant rumbles or thunder claps. To the extent that governments will restrict supersonic flights over populated areas or the land mass, the problem of sonic booms will probably be secondary to that of noise simpliciter.¹⁰²

¹⁰² IATA Legal Information Bulletin No. 36, December, 1975, p. 6. Supersonic aircraft are prohibited over land in India, West Germany, the United States and Scandinavian countries.

CHAPTER, IV

NATIONAL AND INTERNATIONAL MEASURES OF REDUCING AIRCRAFT NOISE

(a) Governmental Action

THE PARTY OF

Noise control is the technology of achieving an acceptable noise environment consistent with economic and operational considerations.¹⁰³

In relation to the control of air and water pollution, aircraft noise control is a fairly recent phynomenon and the least regulated. Current efforts to deal with noise problems generally are partly due to the recent increase in traffic noise, the increase in aircraft operations¹⁰⁴, and the number of operating motor vehicles, particularly in urban areas. For example the figure of motor vehicle increase in the United States is expected to reach 15 million annually

¹⁰³ Yannacone Jr. & Cohen, 1972, <u>Environmental Rights and Remedies</u>, p. 391.

¹⁰⁴ In 1973 passenger volume at JFK, Newark and Laguardia Airports was 42 million with 875,000 aircraft movements out of which 700,000 were airline movements. Aircraft Noise Abatement Hearings Before the Subcommittee on Aeronautics And Space Technology of the Committee on Science And Astronauts--U.S. House of Representatives 93rd Congress, 3rd Session, 24th & 25th July, 1974, No. 44, p. 21.

by the end of 1970s. In 1972 there were more than 89 million cars and 8 million trucks and buses.¹⁰⁵

--65 In the advent of the commerical jet age, a number of scientific studies were conducted in the United States of America, the United Kingdom and France to find out ways of reducing aircraft noise.¹⁰⁶ One of these studies were carried out by the acoustical engineering firm of Bolt, Beranek and Newman of Cambridge, Massachusetts, retained by the New York Port Authority in 1955 to devise methods of measuring and evaluating aircraft noise. This firm investigated the noise characteristic of Boeing 707 and Comet 4 as compared to conventional propeller driven aircraft. The findings provided scientific basis upon which the Port Authority determined the noise levels of aircraft when the airlines sought landing permission. 107

105 Jannacone & Cohen, <u>Environmental Rights & Remedies</u>, 1972, p. 375.

¹⁰⁶ Studies of the Noise Characteristics of the Boeing 707-120, Jet Airliner and of Larger Conventional Propeller-Driven Airliners prepared by Bolt, Beranek & Neuman Inc., 50 Moulton Street, Cambridge 38, Mass., Oct. 1958, for the Port of N.Y. Authority, p. 2 & B2.

¹⁰⁷ The Port Authority uses the concept of perceived noise decibels (PNdB) to determine aircraft noise levels. This is a weighting curve which approximates the subjective annoyance of jet aircraft noise. Noise Certification regulations introduced in 1968 require that jet noise at take off should not exceed 112 PNdB. The United Kingdom adopted similar measures to control the noise of new aircraft. For details see ICAO Bulletin, January 1975, pp. 23-24 and Aeronautical Journal, May 1972, p. 286.

As the general populace expressed displeasure over increasing noise, government agencies took steps to impose restrictions on jet flights. Thus in 1951, when the first generation of jets were being designed, the New York Port Authority adopted a regulation prohibiting jets or turboprop aircraft from landing or taking off at an air terminal without permission. 108 This regulation was deemed necessary on the basis of the noise history of military jets. On October 4th 1958, the Port Authority issued specific condi-___ tions upon which the Boeing 707 and Comet jets would operate without subjecting neighbouring communities to intolerable . Airlines were required to install noise suppressors noise. and to comply with certain flight procedures.¹⁰⁹ A curfew was imposed on jet operations flying over communities or populated areas between 10:00 p.m. and 7:00 a.m. in the morning.

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Similar action was taken by airport operators elsewhere

¹⁰⁸ Aircraft Noise Problems, Cong. Hearings before the Subcommittee of Interstate and Foreign Commerce, House of Representatives, Eighty Sixth and Eighty Seventh Congress, September 7th, 1959, February 23rd, April 20th, 21st, 1960, April 12th, 1961, July 17th, 18th, December 4th, 5th and 6th, 1962, p. 4-5.

¹⁰⁹ Ibid., pp. 4-5. In 1958, BOAC, PAN-AM, United Airlines and Delta were permitted to operate jets on specific runways without exceeding 112 perceived noise decibels and were disallowed to fly over communities between the hours of 10:00 p.m. at night and 7:00 a.m. in the morning. in the world.¹¹⁰ This resulted in airlings demanding certain noise standards from manufacturers. The United Kingdom and United States manufacturers, in particular Boeing and Douglas, launched extensive research programmes to develop suppressors for jet engines to reduce the external noise output.

Progressively the level of noise was kept low in comparison to that experienced from older generations of aircraft, such as the Lockheed Constellation 1049G, the Stratocruiser and the DC6B.

Initiative towards an intergovernmental consensus on noise control was first taken by the British Minister of Aviation, Roy Jenkins, who in 1966 called a conference of countries engaged in civil aviation to discuss the problem of aircraft noise and its limitation.¹¹¹

After several years of negotiations amongst the main aircraft producing countries, Britain, U.S.A. and France, with the participation of other interested parties,

Aircraft Noise Problems, Cong. Hearings before the Subcommittee of the Committee of Interstate and Foreign Commerce, House of Representatives, Eightý Sixth and Eighty Seventh Congress, September 7th, 1959, February 23rd, April 20th, 21st, 1960, April 12th, 1961, July 17th, 18th, December 4th, 5th and 6th, 1962, p. 6.

111 Lloyd, "The Aeroplane as a Threat to the Environment", Aeronautical Journal, October 1972, p. 603.

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substantial agreement was reached, culminating in the first international meeting under the auspices of ICAO, held in Montreal in 1969.¹¹² The meeting agreed on the noise standards and their scope, and recommended the adoption of a new Annex to the Chicago Convention to define the certification standards.¹¹³

Domestic regulations¹¹⁴ in a number of countries deal with the level of aircraft noise and introduce measures of minimizing noise effects. These standards are enforced by authorities responsible for implementing noise regulations, including airport operators, and air transport control authorities. Amongst the measures taken the following have been widely used:

 Allocating flight paths over less densely populated areas;

(2) Power cut back/at take-off;

¹¹² Report of the Special Meeting on Aircraft Noise in the Vicinity of Aerodrome. ICAO Doc. 8857, NOISE (1969). See also Annex 16--AIRCRAFT NOISE.

¹¹³ See pp. 109-111.

¹¹⁴ The U.S.A., Canada, France, Federal Republic of Germany, United Kingdom and Japan are amongst countries with such noise standards. See Appendix IV, Domestic Noise Regulations in Selected Countries.

(3) Limitation of gross weight; 🧓

(4) Night curfews; and

(5) Procedural noise control (ATC) procedures.

Compliance is ensured by use of monitoring devices at various points around most international airports and along the boundary of populated areas.¹¹⁵

In November, 1969, the U.S. Federal Aviation Administration issued noise regulations (FAR-36) requiring that new commercial aircraft produce no more than 108 EPN^{dB} at three measuring points: on approach at point 1 nautical mile from the end of the runway and at an altitude of 350 feet; on take-off at point 3½ nautical miles from brake release, regardless of altitude; and at point 0.25 nautical miles for two and three engine jet aircraft and 0.35 nautical miles for four engine jets to the side of the runway centre line (side line noise). The value of the EPN^{dB} level depends . on the take-off gross weight.

In 1971, the U.S. Government stipulated that by December 1, 1973, all jet aircraft in excess of 75,000 lbs.

¹¹⁵ Today's internationally accepted unit of describing noise is the EPN^{dB} , a unit which ties together the response of the human being to noise level, character and duration. Limitations are being set internationally in terms of this unit.

delivered to U.S. operators would have to meet FAR-36 and in March 1974, a retrofit rule was proposed which would require all jet aircraft operating within and into the U.S. to meet FAR-36 by 1978. This would oblige airlines to accoustically treat or re-engine all the older aircraft which did not meet the noise criteria of FAR-36.¹¹⁶

The Canadián Ministry of Transport proposed a set of regulations (an Air Navigation Order) which would require by 1980 at prescribed airports and on prescribed runways, all aircraft either meet FAR-36, or not use these runways.

In Japan, the Ministry of Transport plans to levy a special landing fee or noise surcharge on airlines to partially recoup noise abatement costs, estimated at \$1,130 million. The carriers have been informed that they may put a surcharge of \$2 on the tickets of all passengers on jet aircraft to cover noise charges.¹¹⁷

The American regulations Part 36 of the Federal Aviation Requirements ante-date the ICAO scheme on noise described in pages 109-111 and so does the United Kingdom Order in

¹¹⁶ Glenn, "The Impact of Jet Aircraft on the Environment"--a paper presented to students of Air & Space Law McGill, on April 19, 1975, pp. 10-15.

¹¹⁷ IATA Legal Information Bulletin, Number Thirty-Six, December, 1975, p. 7.

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Council of March 1970, introducing a scheme of noise certification requiring that aircraft shall not land or take off in the country unless there is an appropriate noise certificate in force for that aircraft, issued by the Board of Trade or by the competent authority of the country of registration. Part 36 of the FAA regulations are slightly more stringent that ICAO rules in one or two respects that aircraft which conform to FAR-36 would satisfy Annex 16 rules of ICAO.

Europe and other countries such as Russia and Japan have for sometime had strictly enforced noise abatement laws, including zoning and construction measures. National councils like the Swiss Anti Noise Commission deal with the basic medical, acoustic and technical questions of road, rail and water traffic, aircraft noise, noise in industry, building construction homes and legal questions. In 1952 the Doolittle Report in the United States recommended the continuation of positive efforts by both government and industry to reduce or control aircraft noise nuisance to people on the ground. This Report also pointed out that substantial reduction of such noise is practicable.

In a recent comparative survey of national laws conducted by ICAO with regard to the preparation of a new instrument on liability for damage caused by noise and sonic

boom, a number of countries indicated that in one way or another their domestic law dealt with noise damage.¹¹⁸ Here are some of the results obtained from the survey.

The Aeronautical Code of the Republic of Argentina, Article 155, provides for restitution for all damage sustained by third parties on the surface, including damage due to abnormal aircraft noise, through application of the principles of strict liability.¹¹⁹

There are no enactments in Australia that pertain to liability for aircraft noise or sonic boom, and no jurisprudence relating to this matter, but some settlements have been made for compensation for damages allegedly caused by sonic boom from military aircraft.

In Austrian law, the liability for the aircraft holder is governed by the Air Traffic Act of August 21, 1936 and by

¹¹⁸ ICAO Legal Committee, 22nd Session, LC/Working Draft No. 854-2, ⁻1976, pp. 1-19; at p. 1 para 1(b) the Secretary General's request to Contracting States on:

> "all relevant information which could assist the Legal Committee with the regard to the preparation of a new instrument on liability for damage caused by noise and sonic boom."

¹¹⁹ Ibid., p. 2.

120 Ibid., p. 11.

the Civil Code. Sections 19-29 of the Air Traffic Act establish liability only for damage caused by an accident which is defined as a "sudden damaging event occurring from outside." Continuous damaging effects characteristic of air traffic are not regarded as "accident". Liability for noise and sonic boom is therefore established on [y if the damage arises out of a single sudden event. However, in view of Section 1293 of the Austrian Civil Code, continuous damage gives rise to compensation if the operation itself is unlawful. In practice unlawful air traffic operations are difficult to establish.¹²¹

The Aeronautics Act of Canada (Air Regulations Amendment P.C. 1972-1813) provides:

- I. Subsection (2) of section 515 of The Air Regulations is revoked and the following substituted therefore:
 - (2) Subject to subsection (3), no person shall fly an aircraft in such a manner as to create a shock wave or sonic boom, the effect of which may imperil the safety of other aircraft, be injurious to persons or animals or cause damage to property.
 - (3) The Minister may make orders or directions with respect to the operation of aircraft in sonic or supersonic flight.¹²²

Under Chilean law, the liability for damage caused by '

121 Ibid., p. 12.
122 Ibid., p. 13.

noise and sonic boom is covered by Decree No. 221 of 1931 which stipulates that "for all damage caused by aircraft to persons or things, the owner of the aircraft or the lessee, the commander and the person causing the damage shall be jointly liable (Article 52). Article 53 stipulates three months as the time limit within which a suit must be brought, subsequent to the date the cause of action arose. Elability is strictly construed.¹²³

Danish law contains penal provisions for violation of noise rules made under the Aviation Statute of 1960 (as amended in 1974), under which the Minister of Transport may establish rules with regard to air traffic in the airports and in the air, with references to the prevention of inconveniences caused by noise (Articles 70-82). Pursuant to Article 9 of the Statute, the Minister may attach noise requirements to conditions relating to aircraft registration. The Statute on Civil Supersonic Aircraft 1972 prohibits supersonic cruise over Danish territory (Article 1).¹²⁴

The Law on Protection Against Aircraft Noise (30 March, 1971) in the Federal Republic of Germany, contains the

123 Ibid., pp. 14-15.
124 Ibid., pp. 15-16.

following provisions:

Article 29.(b)

(1) Airport operators, aircraft operators and pilots shall be responsible for preventing, in connection with the operation of aircraft both in the air and on the ground, avoidable noise and for limiting the omission of unavoidable noise to a minimum if this is necessary to protect the population from dangers, appreciable harrassment due to noise. Consideration shall particularly be given to the night rest hours of the population.

(2) The aviation authorities shall undertake to assure the protection of the population with respect to unreasonable aircraft noise.¹²⁵

The Norwegian Statute on Relations Between Neighbours of 16th June 1961, no. 15 (Sections 2 and 9) provides a basis. for aircraft noise claims. Norwegian jurisprudence shows that liability caused by noise damage has been established at take off and landing, and during overflight. In the cases involving landing and take off the airport authority has always been the defendant. In the cases of overflight the operator of the aircraft has been held responsible, particularly in respect of fox and mink farms, where the overflight has caused the animals to whelp too early or to kill their brood.¹²⁶

¹²⁵ Ibid., pp. 15-16.

126 Ibid., pp. 16-18.

In the absence of specific noise legislation, in Pakistan general principles of tort and common law are applicable 'for the recovery of damages arising out of noise and sonic boom.¹²⁷

Thailand has an instrument dealing with liability for damage caused by noise and sonic boom, The Civil and Commerçfal Code, Book II, Title V, Wrongful Acts.¹²⁸

The Law in Uruguay contains the following provisions:

Aeronautical Code (Law No. 14.305 of 29 November 1974)

Article 8.0 (Limitation of the right of ownership). No one may, by virtue of right of ownership on the surface, oppose the overflight of aircraft, provided it is performed in accordance with current legal standards. Notwithstanding, any damage resulting from a lawful overflight shall, according to the case, give rise to liability.

Article 166. (Principle). Damage caused on the surface gives entitlement to compensation in accordance with the provisions of this Chapter, the sole requirement being that the said damage shall be established as originating from an aircraft in flight or fallen object or object ejected from an aircraft.

Liability shall devolve upon the operator of the aircraft.

127. Ibid., p. 18.

¹²⁸ Ibid., p. 19.

There shall be no entitlement to conpensation if the damage was not a direct consequence of the occurrence which gave rise to it, or it it was due to the mere fact of the flight of the aircraft, performed in accordance with the applicable regulations.

For the purposes of this Chapter, an aircraft shall be considered to be in flight from the moment when engine power is applied for purposes of flight until the moment when, having completed the flight, the aircraft stops moving by its own methos. A light-than-air aircraft or a glider shall be considered to be in flight from the time it ceases being attached to the surface until it is once again attached to the surface.¹²⁹

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¹²⁹ Ibid., p. 19.

(b) <u>Measures Taken by the International Civil Aviation</u> Organization (ICAO)

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The International Civil Aviation Organization (ICAO) has been taking measures at an international level, to deal with environmental problems caused by civil aircraft.¹³⁰ The first formal ICAO policy was promulgated at the 18th Assembly in 1971, in recognition of the adverse effects on the environment caused by advances in modern civil aviation. The ICAO position for the human environment conference in Stockholm (June 1972) was established by the Assembly in Resolution A 18-11, which was unanimously adopted. The operative clauses of this Resolution reads:

> The ASSEMBLY RESOLVES that the United Nations. Conference on the Problems of the Human Environment be informed that:

> > the Convention on International Civil Aviation places on ICAO the responsibility to guide the development of international civil aviation in such a manner as to benefit the peoples of the world;

> > (2) in fulfitting this role, ICAO is conscious of the adverse environmental impacts that may be related to aircraft activity and of its responsibility and that of its member states to achieve maximum compatibility between the safe and orderly development of civil aviation and the quality of the human environment;

¹³⁰ ICAO Assembly Resolutions A 16-3, A 18-11, A 18-12, A 21-19.

(3) in discharging its responsibility ICAO is already assisting and will continue to assist States by all available means in order that they may increasingly reap the benefits of the potential which civil aviation offers for improving living conditions.

THE ASSEMBLY FURTHER RESOLVES to invite Contracting States to support at the United Nations Conference on the Problems of the Human Environment, the position established in this Resolution.

In a second Resolution (A 18-12), the 18th Assembly requested the Council of ICAO to press vigorously efforts underway in the development of Standards, Recommended Practices and Procedures and guidance material related thereto.

ICAO's efforts to reduce the level of noise within the vicinity of airports started several years prior to the United Nations Conference on the Human Environment which took place in Stockholm. The Sixteenth Assembly Session in Buenos Aires in September, 1968, specifically dealt with the noise question in Resolution A 16-3, entitled Aircraft Noise in the Vicinity of Airports. This Resolution followed recommendations of ICAO's Fifth Air Naviation Conference held in Montreal in November, 1967 and several other measures taken by the Council of ICAO.¹³¹ Resolution A 16-3 reads:

Annex 16 - Aircraft Noise Annex to the Convention On International Civil Aviation First Ed. 1971; p. 5, Forward. requires urgent solution;

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Whereas the Fifth Air Navigation Conference of ICAO held in Montreal in November 1967 made certain recommendations, based on the principal conclusions of the International Conference on the Reduction of Noise and Disturbance Caused by Civil Aircraft ("The London Noise Conference") held in London in November 1966, with the object

through the machinery of ICAO and;

Whereas the Assembly has noted the action being taken by the Council in consultation with States and the appropriate international organizations, to give effect to the recommendations of the Fifth Air Navigation Conference as reported to the Assembly by the Secretary General;

of reaching international solutions to the problem

THE ASSEMBLY RESOLVES to instruct the Council:

- (1) to call an international conference within the machinery of ICAO as soon as practicable, bearing in mind the need for adequate preparation, to consider the problem of aircraft noise in the vicinity of airports;
- (2) to establish international specifications and associated guidance material relating to aircraft noise;
- (3) to include, in appropriate existing Annexes and other relevant ICAO documents and possibly in a separate Annex on noise, such material as the description and method of measurement of aircraft noise and suitable limitations on the noise caused by aircraft that is of concern to communities in the vicinity of airports and;

Whereas the problem of aircraft noise is so

Whereas the introduction of future aircraft

serious in the vicinity of many of the world's airports that public reaction is mounting to a degree that gives cause for great concern and

types could increase and aggravate this noise unless action is taken to alleviate the situation; to publish such material on a progressive basis, commencing at the earliest possible time.

A special Meeting on Aircraft Noise in the Vicinity of Aerodromes was convened at the end of 1969 to give effect to the requirements of Resolution A 16-3 and examined these aspects of aircraft noise:

(a) procedure 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.

These measures led to the adoption of draft International Standards and Recommended Practices for Aircraft Noise which the Council of ICAO adopted on April 1971 to form the text of Annex 16 on Aircraft Noise.¹³² The Annex

¹³² Annex 16 to the Convention on International Civil Aviation, February, 1975, No. 2. See also pp. 109-111 infra.

has since then become effective. Subsequently, the Council of ICAO established the Committee on Aircraft Noise at its meeting of February 3, 1970 (LXIX-2) to continue work on the further reduction of aircraft noise. The Committee on Aircraft Noise has had several meetings¹³³ during which amendments to Annex 16 were adopted to cover various classes of aircraft and suggestions were put forward to retrofit the existing generation of aircraft not covered by Annex 16. Other noise reduction methods considered by the Committee included land-use planning and operational factors relevant to the aircraft noise problem.' Since then very little has emerged from the work of the Committee, aimed at establishing a uniform world wide noise agreement or standards.

Though the development of noise certification requirements for supersonic aircraft is being pursued by ICAO,¹³⁴ so far no tangible results have been reached.

A study to devise internationally applicable rules to protect states from adverse effects of sonic boom was conducted by the Sonic Boom Committee of ICAO which, at its

133 Committee on Aircraft Noise, Second Meeting, Doc. 8993, CAN/11 (1971); Committee on Aircraft Noise (1973) Third Meeting Doc. 9063, CAN/3; Committee on Aircraft Noise Fourth Meeting Doc. 9133, CAN/4 (1975).

¹³⁴ Annex 16 to the Convention on International Civil Aviation, February 27, 1975, No. 2, p. 5, (Applicability). See also pp.**109 -1**11 infra.

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Second Meeting in Montreal, June 19-29, 1973, proposed recommendations to the Council to amend either Annex 2 (Rules of the Air) or Annex 6 (Operation of Aircraft) to include the following paragraph:

> All appropriate measures shall be taken by the operator of the aeroplane to ensure that, when it is flying over the sea adjacent to the land areas of a State which has decided and has duly published its decision to protect such area and its immediate vicinity from adverse effects of the sonic boom, it is flown in a manner that will , not cause such adverse effects.

A similar paragraph is reproduced with the substitution of the phrase "operator of the aeroplane" with the phrase the "pilot in command", specifically placing the legal obligation to the pilot in command. This proposal does not seem to have met with success.

The Council did not adopt this recommendation presumably on the understanding that it was necessary to develop supporting guidance material relating to the sonic boom phenomenon, such as meteorological data typical of specific localities in different parts of the world.¹³⁵ The Council's action was, therefore, limited to requesting the Secretary General to refer to States the proposed amendments to the

135 ICAO Doc. 9064, SBC/2, Sonic Boom Committee Second Meeting, p. 3-4 to 3-4, paragraphs 3:2.7-3:4.1.

Annexes and International Organizations for comment and expression of preference, taking into account the legal aspects.136 In considering state protection from effects of sonic boom in the context of public law the First Meeting of the Sonic Boom Committee concluded that states have the power to regulate, including prohibition, 137 supersonic flights over their territory but that they have no power to prohibit such flights outside their territory. Article 2(4) of the Geneva Convention on the High Seas 1958, partly on the basis of which the Committee reached this conclusion, provides for the freedom of flights over the high seas without necessarily affecting regulation short of prohibition. This supports the theory of 'occasional' exercise of national authority over the air space above the high seas beyond the state's sovereign airspace and appears to conform to rules of international law. 138

While direct authority is lacking on the right of a -, state to prevent the effects of sonic boom when there is no actual aircraft intrusion into the sovereign airspace, ICAO has authority to promulgate rules over the High Seas. 139

136 ICAO Doc. 9064, SBC/2 Supplement (1 page).

¹³⁷ Pursuant to Article I of the Chicago Convention each contracting state retains exclusive sovereignty in the airspace above its territory.

¹³⁸ See pp. 98-99

¹³⁹ See p. 110 infra.

However a state may on the basis of occasional exercise of authority, acquire a right to prevent the effect of sonic boom over its territory by controlling the approaching and adjacently flying supersonic aircraft.¹⁴⁰

(c) Efforts Made at a Regional Level

At a regional level the member states of ECAC (The European Civil Aviation Conference) discussed noise abatement proposals incorporating a unified set of rules within Europe.¹⁴¹ Clause A, 3 of the initial draft recommendation prepared by an informal meeting of experts on the Abatement of Noise Caused by Air Transport (ANCAT) on 15th-16th January, 1976, called upon member states to nominate an early date after which the only subsonic jet aircraft added

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141 Europe Civil Aviation Conference ECAC/9-WP/14 10th June, 1976, p. 1-2, Nineth Triennial Session. Strasbourg 21-26 June, 1976. Agenda Item 8.

¹⁴⁰ Pursuant to the Canadian/United States Air Defense Identification Zones (pp. **98** - **99** infra), aircraft headed for these countries are required to report their positions to designated stations at the flight time of 1-2 hours from the reporting station. This would mean that a British Airways or Air France supersonic Concorde would be required to identify itself approximately 1300 miles from the U.S.A. or Canada while flying over the high seas.

to national fleets for international operations will be those certificated in accordance with Annex 16 (First Edition August 1971). The group of experts also proposed 1st July, ---1977, as the effective date for this regulation.

Certain ECAC members felt that the proposed date of implementation did not give sufficient notice to airlines for adjustment of their medium and short-term planning. It was further considered that a proper economic study is needed to select a date which will be suitable to all the European airlines concerned.¹⁴² To ensure that pressure is not applied inequitably to some airlines, recommendations were sought concerning the possibility of exemptions in some areas, such as where leasing arrangements exist or where transfers are made of the older aircraft between airlines on the same national register, or where aircraft are capable of being retrofitted. Two advanced dates were proposed, 1st July 1983 or 1st July 1986 as alternatives to 1st July 1977.

The following main points emerged at the ECAC conference:

¹⁴² Ibid. Amendment to the Draft Recommendations on Aircraft Noise Abatement presented by the United Kingdom. For the text of the proposal as amended by the United Kingdom, see Appendix III, The Draft Recommendation on Aircraft Noise Abatement as Amended by the United Kingdom.

- (i) The determination of EÇAC States to take practical measures to reduce the disturbance caused to people
 living in the vicinity of airports.
- (ii) The fact that Annex 16 of ICAO only reflects for subsonic jet aircraft the levels which has been shown to be <u>technically feasible</u> and <u>economically</u>
 ^o <u>reasonable</u> at the time of their adoption. These standards being subject to periodic revision to reflect advances in technology. As Annex 16 does not define an "acceptable" level of airce aft noise, standards are <u>not</u> being used as demarcation line between what is acceptable to the public and what is not.

(iii) Noise experienced in the vicinity of airports
 depends not only on the noise emissions of air craft but partly on other factors such as oper ational procedures and weather conditions.

(iv) Retrofit measures are not preferred due to the relative poor cost/effectiveness of such measures.

(v) ECAC noise abatement measures would be in accordance with technical feasibility and economic reasonableness.¹⁴³

¹⁴³ European Civil Aviation Conference, ECAC/9-WP/14, 10 June, 1976 (Appendix).

(d) \downarrow The views of airport operators and airlines

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Airport operators strongly support efforts to reduce the level of aircraft noise in order to avoid noise law suits and public complaints. So far in the U.S. courts only airport operators and municipalities are held responsible for noise damages.¹⁴⁴ The courts disallow attempts to join airlines as co-defendants in such cases.¹⁴⁵ Efforts by airport authorities to enforce stringent noise rules have met with Federal resistance, and in some cases have resulted in court injunctions.¹⁴⁶ The conflict arises mainly due to policy decisions at the Federal level and the

¹⁴⁴ However, air-carriers in the end contribute to such recoveries through higher lease payments and landing fees.

145 Claims for indemnification by airport operators failed in the case of <u>CITY OF LOS ANGELES v. JAPAN AIRLINES</u> ii6 Cal. Rptr. 69, 41, CA 3d. 416.

146 In the case of Lockheed Air Terminal v. City of Burbank 318 F. Supp. 914 11 Av. Cas. 17850 (C.D. Cal. 1970), the court held that curfews and restrictions provided by municipal ordinances were unconstitutional because that area is pre-empted by the Federal Government and that the Federal Aviation Act 1958 (s.1108) gives the Federal Government complete and exclusive national sovereignty in the airspace of the United States. In a recent application to Court by Air France and British Airways against Port of New York Authority, March, 1976 Federal Lawyers considered entering the suit as "amicus curae" or as co-plaintiff. vesting of final authority in the Federal Aviation Administration in noise rule-making. The powers of the operators in this area have not been clarified. Consequently the airlines are also using the theory of pre-emption to avoid stringent noise rules promulgated by states and municipalities.¹⁴⁷ The economic interests of the airlines are in this respect opposed to those of the airport operators.

In France the prevalent view is that the polluters must pay,¹⁴⁸ and if need be those who benefit from the industry as well. Most people who are disturbed by aircraft movement⁴ do not derive direct advantage from commerical aviation.

On the other hand airlines are not too pleased with far-reaching noise restrictions for economic reasons.¹⁴⁹ The problem is of particular financial significance to charter operators because the carriers use older planes which are much poisier.

147 <u>Air Transport Association, et al v. Crotti</u>, Civil No. C-72-2189 WTS (N.D. Cal.)

¹⁴⁸ Guillemin, "The Environment, The Airport Operator's Viewpoint," speech presented at the 11th IATA Public Relations Conference, London, March, 1972, p. 2.

¹⁴⁹ See pp. **76-80** infra:

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(e) The Issue'of Retrofit

The retrofit proposal is intended to introduce a mandatory reduction of the noise level of aircraft which have not been granted noise certificates. This entails the acoustic treatment of aircraft engines. The retrofit programme has been subject of public discussion in the United States where the FAA has introduced Notice of Proposed Rulemaking 74-14.¹⁵⁰

The question of retrofit came before ICAO's Committee on Aircraft Noise (Third Meeting) in March, 1975, which recommended to the Council the adoption of an international retrofit scheme to be fully operative by 1980.¹⁵¹ However, the Council rejected the Committee's recommendations and instead requested each manufacturing state to determine the technical feasibility of noise reduction and each State of Registry to decide on its own if it wishes to introduce a

¹⁵⁰ Comments of ATA on FAA Notice No. 74-14. Docket No. 13582--Proposed Retrofit Rule--p. 1. The rule would require that after June 30th, 1978 "no person" would be allowed to operate the aircraft covered by the proposed rule unless those aircraft meet Part 36, i.e. all turbo jet aircraft must comply with Part 36.

¹⁵¹ ICAO Committee on Aircraft Noise--Third Meeting Montreal.5-23 March, 1973, Report Doc. No. 9063, CAN/3, p. 1-7, 1.10. mandatory retrofit programme.¹⁵² This removed the early possibility of obtaining unified international standards.

Retrofit proposals are presently retarded by economic and policy constraints.¹⁵³ Pursuant to the Report of the Third Meeting of ICAO's Committee on Aircraft Noise, retrofit would have brought considerable reduction in aircraft noise by 1980.¹⁵⁴

The United States air carriers have strongly criticized the FAA proposed retrofit programme contained in Notice No. 74-14.¹⁵⁵ The main objective of carriers is to avoid further expenditure on noise reduction for what they consider an achievement of little social benefit. The airlines' preference is to maintain the status quo until the non-

152 ICAO Committee on Aircraft Noise--Fourth Meeting, Montreal 27th January - 14th February, 1975, Report Doc. No. 9133 CAN/4; p. 7-1.

153 Comments of Air Transport Association On FAA Notice No. 74-14, Docket No. 13582, June 28, 1974--"Financing of Retrofit", p. 23. Also see ICAO Council decision on retrofit--Committee on Aircraft Noise--Fourth Meeting Do., 9133 CAN/4 p. 7-1. The same subject came before the 21st session of the ECAO Assembly in 1974 (author taking part) and many girlines felt unhappy with retrofit proposals.

¹⁵⁴ Committee on Aircraft Noise--Third Meeting, p. 1-7, para. 7.1. ICAO Doc. 9063 CAN/3, 1973.

155 Comments of Air Transport Association on FAA Notice No. 74-14, Docket No. 13582, June 28, 1974, "Retrofit is inherently Objectionable", pp. 6-13. certificated aircraft have been phased out and new technologies have been fully developed.¹⁵⁶ Retrofit would affect payload, fuel consumption, range and probably the safety margin; all adding up to operational costs and increased rates. The airlines also consider it unfair that the governments should apply the new standards retroactively, after the aircraft have been built, tested, approved, issued with "type certificates" and introduced into service by the airlines.

(f) The Problem of Military Aircraft

If noise control is to make sense, military aircraft should also be subjected to stringent noise regulations. Military jet aircraft are the noisiest of all aircraft and they contribute substantially to the aircraft noise problem.¹⁵⁷

If they continue to enjoy exemption from environmental regulation, military aircraft are likely to cause more

156 Ibid., p. 6.

¹⁵⁷ McNight & Jourmans, "Sounding Brass: Military Aircraft Noise Pollution", Ecology Law Quarterly, 1972, vol. 2:159, pp. 161-162.

Ibid., The U.S. military owns 20% of the American Aircraft and is exempted from noise abatement regulations at both Federal and local level, p. 160.

problems to the public than civil aircraft. The reluctance to control these aircraft is largely due to national defence policies, which seek to exercise a more liberal approach . for security reasons. Therefore both domestic law and existing international agreements place military aircraft. and vessels in a special category.¹⁵⁹ The Chicago Convention is itself limited to civil aircraft (Article 3), thereby rendering any environmental regulations that may be made under it ineffectual to military aircraft.

A number of aircraft carriers ply the oceans carrying jets that fly at supersonic speed, with the capacity to cause environmental disturbances without restriction.

It seems possible to apply some form of environmental control to military aircraft, albeit on a limited basis. The Brussels Convention on The Liabilfty of Operators of Nuclear Ships (1962) serves as a precedent. Under Article X of that convention the liability of operators of nuclear ships applies, mutatis mutandis, to warships and other state owned aircraft or state operated ships on non-commercial service, except that such ships are not liable to arrest, attachment or seizure, and jurisdiction over them is confined

159 Example: The International Convention for the Prevention of Pollution from Ships, Nov. 1973, Article 3(3), 12 INT LEGAL MATERIALS, 1319 (1973).

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(g) The Attitude of East Africa and Other Developing Countries

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Developing countries seem to have focussed very little attention on environmental noise problems, especially within the context of aeronautical activities.¹⁶¹ In East Africa, the primary concern is that of securing the regional airline from economic loss¹⁶² arising out of noise litigation in international flights, and the eventual consequences of having to retrofit the operating fleet at a prohibitive cost.¹⁶³

The overall approach of developing nations on environmental issues may be deduced from the results of the Stockholm Conference in 1972. The theme of that Conference, highly influenced by the numerical strength of third world countries,

160 Barros & Johnston, <u>The International Law of Pollution</u>, 1974, -pp. 433-438.

¹⁶¹ See differences in the level of disturbance, p. 12, supra.

162 Interview with East African Representative on ICAO Council, Montreal, October, 1976; with reference to official notification CRS/ IATA/1.2 dated 14th February, 1976.

163 See pp. 69 - 72, "The Issue of Retrofit".

vividly stresses on the economic and technological aspirations of developing countries.¹⁶⁴ Prima facie this relates to faster industrial and economic growth, through more viable and cheaper methods, which tend to yield much higher environmental risks. It is therefore likely that in most places and for many years, environmental quality will be subordinated to development goals.¹⁶⁵

- Many countries which are in the early stages of industrialization are aware of the environmental risks involved, but see it as the only means of attaining higher and better living standards. In this way environmental priorities of the more industrialized nations will tend to contradict immediate development goals of developing countries.

(h) Suggested Solutions

An idealistic solution to the problem of lowering the level of environmental damage forthwith is to reject technology altogether and return to simple agrarian life. This is akin to a "no growth" economy which some economists advocate as a means of curbing pollution. It is not,

¹⁶⁴ Principles 11, 23, Recommendations 102, 103, 106 and 108 of the Stockholm Declaration, 1972, Appendix I, pp. **185** - **192** and also para. 6 of the Proclamation contained in the Declaration.

¹⁶⁵ Ward & Dubos, <u>Only One Earth</u>, 1972, Introduction, p. XIII-XVI. See also p. 169 infra.

however, an alternative the world would opt for, since there exists a possibility of reconciling economic progress with environmental preservation; we cannot simply ground all aircraft. As Morrison observed, 166 "economic growth is to a certain extent necessary and may be unavoidable. The basic assumption underlying the 'no growth' position is that environmental degradation is an inescapable product of rising affluence. Though increasing GNP is tied to expanding output, consumption, and investment, economic growth per se does not cause pollution; rather it is the particular methods and patterns of individual consumption, investment and industrial output. Therefore if consumption and investment patterns are redirected toward non-polluting type output, economic growth will no longer mean additional environmental deterioration."

Proposals have been made to resolve the problem of aircraft noise by legal means at an international level. '" Such regulations would be made on the basis of existing aeronautical facilities, economic realities and technical feasibility. This consideration gives rise to the alternative suggestion that more emphasis be placed on land use methods and technological means, since these touch on the core of

¹⁶⁶ Morrison, "Economics & The Environment: Can the Spoils of Success be Controlled", Environmental Law Symposium--Wayne Law Review, 1972, Vol. 19, No. I, pp. 181-219.

the noise problem and are more suitable measures of reducing the noise effect to populations in large cities. In this regard improvements on land use methods, engineering and technical solutions to the noise problem deserve priority. Technically, the feasibility of producing low noise level aircraft engines does exist, and manufacturers are working on building environmentally acceptable aircraft for the future.¹⁶⁷

Three non-engineering solutions have so far been put

(1) 'Zoning or land management;

(2) Curfew or the closing of airports during certain hours of the day and/or night;

(3) Operational procedures requiring the pilot to conduct certain on-flight manouvres outside the original design scope of the airplane.

Zoning entails the restriction and control of land use in noise sensitive areas close to airports. Restrictions imposed by zoning laws would prevent population growth within

¹⁶⁷ Smith, "Today's New Jet Engines are Reducing the Noise Problems," ICAO Bulletin, October 1972, pp. 29-33.

a given noise "foot print"¹⁶⁸ and specify the type of buildings and developments permissible within the controlled area. The curfew limits the hours of operation at international airports, a practice already common over much of Europe and the Far East. In most countries with curfews flights are restricted beyond a certain hour of the night.

These solutions have been subjected to criticism on the grounds that none of them reduce noise enough to warrant their imposition and that all would lower the current safety level. There are also economic, planning and problems relating to surface transport to cover increased distances between population centres and the zoned out airports. Land management requires a sizable capital outlay to acquire large parcels of land for zoning, preferably in open areas or sparcely populated areas.¹⁶⁹ This in turn calls for an extended infrastructure of a new and efficient surface transport to connect the distant airport and the central parts of the city. These expenses are eventually passed on

¹⁶⁸ The noise "footprint" is the area on the ground underneath the aeroplane's flight path exposed to noise of a given intensity or greater.

169 Example of the Mirabel Airport in Canada. Government expropriated 90,000 acres of land affecting a population of 9,000 people, Levesseur, "Landuse planning protects airport and Community," ICAO #Bulletin; April 1972, pp. 18-19.

to the consumer and the general public. Similarly, the curfew has economic disadvantages due to reduced night operations. In some airports cheaper flights are offered at night and freighters operate in the hours of darkness when traffic is least dense, thereby moving cargo more efficiently and economically. The Operational Flight Procedure introducing the two segment approach has been especially criticized for its alleged constraint on safety.¹⁷⁰

Changes in technology usually results in environmental difficulties whose solution require time and practical experience. The controversy over the introduction of super-sonic commercial planes is indicative of both the awareness of environmental difficulties and the introduction of a novel scientific change.¹⁷¹

Technological implications notwithstanding, attendant to measures of abating noise are economic repercussions as well. Control measures prescribed by authorities cannot be

¹⁷⁰ Aircraft Noise Abatement--Hearings Sub-Committee On Aeronautics & Space Technology, July 24, 25, 1974, Ninety-Third Congress, pp. 190-191.

171 Ramsden, "Concorde & the Environment", Flight International, November 27th, 1975, p. 779. Also see Kozicharow, "Concorde Legal Questions Raised", Aviation Week & Space Technology, January 12th, 1979, p. 12.

imposed independent of economic considerations, especially when existing fleets of aircraft in operation are affected. As noise becomes more of a threat to the public, restrictions would be expected to increase. To enable industry to adjust both in finance and technology, control measures must be staggered over a period of time, to allow a breathing space. Even with a projected world-wide retrofit plan of six years,¹⁷² an extended period may be required in certain cases.¹⁷³ In particular, the period of industrial relief is more significant to nations with meager financial resources, most of whom own the air carriers directly. At the 1974 price, treated airplane nacelles would cost \$24,050 for each engine fun duct kit. The entire retrofit with SAM kits would cost \$600-\$800 million for JT 3D and JT 8D aircraft fleet in the/ United States. By 1977 a B 707 would cost \$1.18 million/ Similarly, land use and a DC 9 \$.21 million to retrofit. programmes are costly as evidenced by the 1970 estimates of \$1.2 billion at Kennedy Airport.¹⁷⁴ United States systemwise

¹⁷² U.S. House of Rep. Ninety-Third Congress Sccond Session--Aircraft Noise Abatement Hearings--Sub-Committee on Aeronautics & Space Technology of the Committee on Science & Aeronautics, July 24, 25, 1974, Doc. No. 44, p. 63.

¹⁷³ See pp. 69-72, "The Issue of Retrofit".

¹⁷⁴ U.S. House of Rep. Ninety-Third Congress Second Session, July 24, 25; 1974, Hearings before the Subcommittee on Aeronautics & Space Technology of the Committee on Science and Astronautics Doc. No. 44, pp. 557, 63, and 25.

estimates for a two segment approach show a requirement of \$150 million. This measure however, is most cost effective, promising for 1977 in the United States a 57% reduction in the area impacted by 90 EPNdB approach noise. Approach noise level would be cut from 5-15 EPNdB depending on aircraft type, with substantial noise relief provided from three to eight miles along the approach path.¹⁷⁵

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Sound proofing of buildings likewise has an obvious financial implication to property owners.¹⁷⁶

The overall high abatement costs will substantially increase the consumer bill. Consequently, regulatory standards must be such that they correspond to the benefits of noise reduction and the prevailing economic realities.

While improvements are sought in areas directly related to the source of noise, authorities should investigate and encourage research in other fields compatible to noise

¹⁷⁵ *Ibid.*, p. 13.

⁻¹⁷⁶ S.I. No. 916 of 1975 - The Gatwick Airport - London Noise Insulation Grants Scheme 1975 and S.I. No. 917 of 1975 - The Heathbrow Airport London Noise Insulation Grants Scheme.

¹⁷⁷ Canadian scientists are investigating the effectiveness of various trees as buffers against aircraft sound. Descending sound is diverted to some extent by tall, leafy trees and becomes a cone that is further absorbed by growth at lower levels. Lateral sound at ground level is also dissipated by trees, but whether it is practical to provide forests sufficiently large to absorb sound completely remains to be seen. Wardwell, "Will Trees Buffer The Sound of Jet Operations", The Montreal Star, Saturday, June 19, 1976, p. A-14.

abatement measures. 177

CHAPTER V

THE PRESENT STATE OF INTERNATIONAL ENVIRONMENTAL LAW: A GENERAL SURVEY

(a) General Rules of International Law

General international law or international customary law contains no rules or standards related to the protection of the environment as such. 178

The doctrine of international responsibility has largely developed within the confines of state responsibility for injury caused to aliens on its territory. The most widely acclaimed principle applicable to environmental questions is the rule that international law prevents state activity that causes direct and obvious harm across an international border.¹⁷⁹ The nature of the liability is similar to that of vicarious or enterprise liability in common law tort doctrine, namely, the corporate body's responsibility for the acts or omissions of its servants or agents acting within

178 Brownlie, "A Survey of International Customary Rules of Environmental Protection," Natural Resources Journal, 1973, April, Vol. 13, pp. 179-189 at 179.

pp. 74-76.

the scope of their actual or apparent authority.¹⁸⁰ The doctrine of nuisance established in the case of <u>Reylands vs.</u> <u>Fletcher</u>¹⁸¹ also seems to apply, mutatis mutandis, to cases where a state permits use of its territory in a manner which causes unreasonable interference with a neighbouring country's use of its own land.

There are three decisions on state responsibility for transnational environmental injury, the only ones so far, which affirm the application of this rule of general international law.

In the first case, The Corfu Channel Case, ¹⁸² two British war ships passing through the Corfu Strait in Albanian territorial waters in 1946 struck a mine field, resulting in a large number of deaths and personal injuries to the British sea men, as well as substantial destruction of one vessel and serious damage to the other. The International Court of Justice found for Britian on the ground, inter alia, of "every state's obligation not to allow 4

180 Ibid., p. 18. Also see Brownlie, "A Survey of International Customary Rules of Environmental Protection", National Resources Journal, 1973, April, Vol. 13, p. 180.

181 Rylands vs. Fletcher, All E.R. (Reprint) [1861-73], p. I.

182 Barros & Johnston, The International Law of Pollution, 1974, pp. 76-77.

knowingly its territory to be used for acts contrary to the rights of other states". On the basis of this ruling it has been asserted that states have obligation under international law, not to permit transnational environmental injury. The Corfu Channel Case establishes what is in effect a prima facie liability for the harmful effects of - conditions created even by trespassers of which the territorial sovereign has knowledge or means of knowledge. This together with the practice concerning state responsibility for supporting or harbouring armed bands whose activities affect other States provide a firm basis for claims relating to other nuisances. 183 Unauthorized acts of officials and other situations not involving acts of officials but which a normal government would be expected to control are covered.

The second case, the only one directly dealing with the problem of transnational environmental degradation, is the Trail Smelter Arbitration of 1941,¹⁸⁴ in which a private

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¹⁸³ Brownlec, "A Survey of International Customary Rules of Environmental Protection", Natural Resources Journal, April, 1973, p. 180.

¹⁸⁴ Ibid., p. 180. Also see Barros & Johnston, <u>The International</u> <u>Law of Pollution</u>, 1974, pp. 69-76; also pp. 177-195. For a more detailed discussion of the cases see Bleicher, "An Overview of International Environmental Regulation", Ecology Law Quarterly, 1972, Vol. 2, No. 1, pp. 1-90.

corporation located in Trail, British Columbia (Canada), emitted sulphur dioxide fumes causing substantial damage to privately owned agricultural and timber land in the State of Washington.

In settling the dispute, an ad hoc arbitral tribunal set up by the United States and Canada in 1935, decided the case on the basis of existing principles of international law and practice, concluding that under the principles of international law, to which the United States law conforms, no State has a right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties of persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.

The third case is the Lake Lanoux Arbitration (1957)¹⁸⁵ involving France and Spain. In this case Spain objected to the French plan to direct the waters of Lake Lanoux into the basin of the Ariege River to generate hydro electric power. Although the decision favoured France, since no injury was shown, the tribunal was prepared to scrutinize

¹⁸⁵ Bleicher, "An Overview of International Environmental Regulation", Ecology Law Quarterly, 1972, Vol. 2, No. 1, pp. 25-28.

the French project to ensure that the plan would not adversely affect Spanish interests.¹⁸⁶

Another matter of general interest is the result of nuclear bomb tests conducted by the United States in the Pacific in 1958. On 14th February, 1958, the United States Atomic Energy Commission issued a public notice of the danger area to be established on 5th April in connection with a series of nuclear bomb tests to be conducted at the Eniwetok Proving Ground in the Marshal Islands. The area comprised roughly 390,000 nautical miles. The danger area was subsequently "disestablished" on 8 September, 1958. In February, 1958, the Japanese Government protested (in part) in the following terms:¹⁸⁷

> The United States Government states that every possible precaution will be taken to prevent damage and injury to human lives and property in the danger zone and that there is no probability of any accidents outside the danger zone. Whatever precaution is taken, however, the Japanese Government is greatly concerned over conducting nuclear tests and establishment of a danger zone for that purpose in view of the fact that the said zone is near to routes of Japanese merchant marine and to fishing grounds of Japanish fishing boats.

186 Ibid., pp. 27-28.

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187 Brownlie, "A Survey of International Customary Rules of Environmental Protection, Natural Resources Journal, 1973, Vol. 13, pp. 180-182.

Accordingly the Japanese Government would like to make clear its view that in the event the United States Government conducts nuclear tests in defiance of the request of the Japanese Government, the United States Government has the responsibility of compensating for economic losses that may be caused by the establishment of a danger zone and for all losses and damages that may be inflicted on Japan and the Japanese people as a result of the nuclear tests. The Japanese Government wishes to reserve the right to demand complete compensation for such losses and damages.

The reply of the United States Government included the following passages:

Finally, as the United States has previously indicated, it cannot be regarded as established on the basis of present information that substantial economic losses will result from the establishment of the danger area. Moreover in view of the precautions which will be observed during the tests and existing public information with respect to maximum permissible levels of radiation, the United States Government anticipates no economic losses from radioactive contamination of marine life.

However, if after the test series has ended, any evidence is officially presented that substantial economic losses for Japan or Japanese nationals have been incurred as a result of establishment of the danger area and the tests, the United States is prepared in the interest of the fullest understanding and co-operation between the two countries to give consideration in the light of such evidence.

Certain general principles seem to be asserted or admitted by the two Governments. First the taking of precautions does not preclude responsibility if the risks are foreseeably high at the outset and damage is in fact

Secondly, harm caused by contamination of resources caused. may ground a claim based upon deprivation of access to resources in the closed or danger area. Generally a State may claim in respect of economic losses caused to its nationals as a contingent sum rather than in respect of specific claims of individuals or corporations. These principles relate to the concept of contamination of peripatetic resources to which others have a legitimate claim, generally applying to cases in which State territory and airspace are used for purposes which cause, or which may reasonably be expected to cause, contamination of the aspects of the environment which are 'naturally intra-territorial, viz airstream, rainfall, percolating water resources, glacial material which is mobile, and soil and sand distributed by natural drainage systems or wind action prevalent in a particular region.¹⁸⁸

Another source of the general principle of State responsibility for extraterritorial injury might be traced by analogy with the doctrine of equitable utilization applied to international rivers and lakes, as enunciated in the Unofficial Helsinki Rules¹⁸⁹ adopted by the non-governmental

¹⁸⁸ Ibid., p. 182.

189 Articles IV & V, Barros & Johnston, <u>The International Law of</u> Pollution, 1974, p. 75.

International, Law Association in 1966, which introduced the "reasonable man test" for determining what is a lawful share in the beneficial uses of the waters of an international drainage basin.¹⁹⁰

In sum these developments indicate that in the context of environmental protection, States have a responsibility for the processes carried on both by private enterprise and by public corporations or quasi-governmental entities. State activities which only create a risk of injury or the capability to cause injury do not per se give rise to State responsibility: The doctrine of strict or absolute liability is inoperative (or rather relative), outside a few areas designated by treaty, under arrangement for allocation of risks associated with extremely dangerous activities.¹⁹¹

However, these developments seem to dispense with the requirement of exhaustion of local remedies and the requirement of continuity of nationality, where injury is caused to private interests. Furthermore, the principles extend beyond the traditional substantive principles of nuisance, which would allow a balancing of the benefits of the defendant's activities, against the damage suffered by the

¹⁹⁰ Ibid., p. 75.

¹⁹¹ Ibid., p. 74.

plaintiff, and the general principles of the law of state responsibility to aliens, which take account of state controlled activities and require exhaustion of local remedies, as well as continuity of the nationality of individual claims.

Customary rules are limited as means of protecting the environment. Therefore there arises a need to develop new institutions, standards and localized regimes to deal with environmental matters

One weakness is the variation of the standard of care with the nature of the activity causing pollution, which customary law tolerates by recognizing the concept of "ordinary user", thereby admitting certain levels of contamination.¹⁹² /Questions of jurisdiction are not resolved over extraterritorial events.¹⁹³ Characteristically the process of degradation of the atmosphere, the high seas, and the hydrologic cycle in general is gradual and dispersed. As such processes are cumulative, involving difficulties of

¹⁹² Brownlie, "A Survey of International Customary Rules of Environmental Protection", Natural Resources Journal, 1973, Vol. 13, p. 180: When pollution is intended, the presumption is against reasonableness of user.

¹⁹⁵ Ibid., p. 186, in ordinary circumstances, pollution activities by merchant vessels are the object of control and jurisdiction by the flag State alone.

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identifying tortfeasors and establishing evidence of causation and of remoteness of damage, this weakness is inherent in the liability approach to environmental protection.¹⁹⁴ Generally, international law, within the terms of Article 38(1)(c) of the Statute of the International Court, the poverty of a tortfeasor is a ground for reduction of damage.

(b) International Agreements and Treaties

Multilateral conventions and resolutions of the General Assembly of the United Nations, together with governmental views evidenced by diplomatic exchanges and notes, constitute emergence or existence of principles of international law.

On the premise that environmental damage is a by-product of activities that are basically viewed as socially desirable, governmental action has only been ex-post facto and confined to specifics. The reaction relates to serious or hazardous degradation. Environmental treaty law is therefore evolving on this post-crisis basis, concentrating on measures to check

194 Ibid., p. 182.

damage caused to oceans, rivers and inland waters.¹⁹⁵ Environmental law in the area of the seas is more developed partly because of the nature of the high seas as a shared resource, in the sense of "res communis". Developments in outer space appear to have come about in a similar way, by treating that resource as 'res communis'. The 1967 Outer Space Treaty recognizes the common interest of all mankind in outer space.¹⁹⁶ This treaty provides (Article 9) that States parties to it "shall pursue studies of the Outer Space including the moon, and other celestial bodies and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of

¹⁹⁵ Bleicher, "An Overview of International Environmental Regulation", Ecology Law Quarterly, 1972, Vol. 2, No. 1, pp. 1-9. Also see Barros & Johnston, <u>The International Law of Pollution</u>, 1974, p. 72. Also see pp. 200-262 listing a number of marine pollution treaties, which fall into three categories, namely, marine pollution by oil, agreement on the prohibition and regulation of dumping practices of ships at sea and lastly, the elaboration of general principles and guidelines for the preservation of marine environment.

196 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies; Barros & Johnston, <u>The International Law of Pollution</u>, 1974, pp. 368-371. See also Revised Single Negotiating Text of the United Nations Third Conference on the Law of the Sea (3rd August-17th September, 1976). Report by Chairman of the Third Committee, 16 September, 1976, A/CON. 62/L. 18, "Protection & Preservation of Marine Environment," Articles 21, 27, 28, 30 (1-7).

the earth resulting from the introduction of extraterritorial matter and when necessary shall adopt appropriate measures for this purpose." This establishes the principle of responsibility for environmental damage to outer space.

There are no international agreements in the general problem of environmental harm to the air space, partly because of the non-recognition of it as a shared resource.¹⁹⁷ To date no steps are being taken to regulate total emissions of air pollutants or other forms of global damage.

Treaties pertaining to the law of the sea, outer space and others, though touching upon environmental aspects, **do not** mainly deal with the protection of the environment as a primary objective. The Nuclear Test Ban, Treaty 1963 for example, deals with disarmament as a principle aim, ¹⁹⁸ but the parties also "desired to put an end to the contamination of man's environment by radioactive substances," by banning nuclear weapon tests in the atmosphere, in the outer space

⁴ ¹⁹⁷ Barros & Johnston, The International Law of Pollution, 1974, pp. 69-76, and also Bleicher, "An Overview of International Environmental REgulation", Ecology Law Quarterly, 1072, Vol. 2, No. 1, pp. 51-76.

198 Ibid., pp. 351-388. Also see Prohibition of Ecocidal Weapons. and Weapons of Mass Destruction, pp. 379-400. The existence of such weapons represents a threat to the environment and their use is a genuine example of pollution.

and under water. Similarly the Antarctic Treaty,¹⁹⁹ intended to designate Antarctica exclusively for peaceful purposes, places emphasis on certain aspects of the environment by banning nuclear explosions and the disposal of radioactive wastes in that region. The Agreement on the Rescue and Return of Astronauts²⁰⁰ contains provisions to the effect that if a party discovers an object believed to be of a hazardous or deliterious nature it may notify the launching authority which shall then take immediate effective steps, under the party's direction and control to eliminate the possible danger or harm.

All these treaties and agreements deal with limited specific instances of atmospheric environmental harm.

(c) <u>Resolutions and Recommendations of International</u> <u>Bodies</u>.

Considerable importance is to be attached to United Nations resolutions and declarations, a number of which have

¹⁹⁹ Ibid., pp. 351-354. For text of The Antarctic Treaty, 1959, see pp. 363-366.

200 Ibid., pp. 351-354. For text of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968), see pp. 371-372.

recently preceded the adoption of formal treaties.²⁰¹ The international legal principles of environmental responsibility are likely to emerge chiefly from international decTarations and resolutions and from the express commitment and implied assumptions common to a growing variety of international environmental agreements of limited scope.²⁰²

States will continue to resort to resolutions to plug legal gaps and provide guiding principles in the absence of formal treaties, despite the legal lacunae of their nonbinding character. The recommendatory nature of such resolutions, particularly the more important declarations, bears significant moral force, especially when little or no dissent has been expressed in their adoption.²⁰³ In this way, it may be argued, they express newly emergent rules of customary

²⁰¹ The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 1967, (610 UNTS 205), was preceded by Resolutions No. 1721 (XVI), Dec. 20, 1961, and No. 1962 (XVIII), Dec. 13, 1963, the former was a Resolution on International Co-operation in the Peaceful Uses of Outer Space and latter was a Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space.

202 Barros & Johnston, <u>The International Law of Pollution</u>, 1974, p. 74.

²⁰³ The U.S.S.R. and France, while doubting the legal force of U.N. Resolutions in the context of Outer Space expressed willingness to comply. See Matte, Aerospace Law, 1969, pp. 277-285. law, irrespective of their recent existence. 204

One example is the adoption by the General Assembly in 1970 of a resolution containing a Declaration of Principles Governing the Sea-bed and the Ocean Floor, and the Sub-soil Thereof, Beyond the Limits of National Jurisdiction.²⁰⁵ States have generally observed this Declaration as though it were a formal treaty.

Of more significance to environmental law is the Declaration on the Human Environment proclaimed by the United Nations Conference on the Human Environment in Stockholm, Sweden, 1972.²⁰⁶ In this Declaration, containing principles that treat particular pollution issues with a much larger context, the need to adopt a global environmental approach on many forms of international pollution was accepted.

One of the most important results of the Stockholm Conference is the general acceptance in Principles 21 and 22 of the doctrine of State responsibility for environmental

204 Brownlie, "A Survey of International Customary Rules of Environmental Protection", Natural Resources Journal, 1973, Vol. 13, pp. 186-189.

²⁰⁵ Ibid., p. 187.

²⁰⁶ Ibid., p. 188. See also Appendix I, The United Nations Declaration on the Human Environment and Principles.

damage, extending beyond territorial limits, enunciated by the Trail Smelter case, and the selected recommendations directly relevant to the emerging international law of pollution. The Conference also approved the Ottawa Guidelines and Principles for the Preservation of the Marine Environment.²⁰⁷ Additionally, the participating governments endorsed the idea that it is incumbent upon all co-adjacent States in international river basins to develop appropriate regimes for the prevention and control of pollution.²⁰⁸

Some delegations at the Stockholm Conference made more positive statements describing the Declaration, which was adopted by acclamation, as "a first step toward the development of international environmental law."²⁰⁹ Principles 1, 7 and 21 of the Declaration come very close to legal drafting.²¹⁰

207 Barros & Johnston, <u>The International Law of Pollution</u>, 1974, p. 73.

²⁰⁸ Ibid., p. 70.

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209 The Declaration was adopted by Resolution 2994 of the General Assembly by 112 votes to none with 10 abstantions; UN Doc A/PV 2112 at 6 (1972). See also Brownlie, "A Survey of International Customary Rules of Environmental Protection," National Resources Journal, 1973, p. 188. See also hote 190 supra.

²¹⁰ See Appendix I, The United Nations Declaration on the Human Environment and Principles.
(d) <u>Unilateral State Action</u>

International law seems to recognize the notion of occasional competence accorded States for purposes of security on the high seas,²¹¹ and also for purposes of enforcing regulations relating to customs, immigration, fiscal and anti-smuggling measures, as expressly provided in Article 24 of the Convention on the Territorial Sea and Contiguous Zone.²¹² The creation of contiguous zones for reasons of enforcing these regulations might be held to accomodate measures to prevent pollution.

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Considerations of security prompted the United States to establish the Air Defense Indentification Zones (AD1Z)²¹³ in 1950, and on the same premise Canada promulgated the Canadian Air Defense Identification Zones in 1951.²¹⁴ France established the Zone of Special Responsibility in

²¹¹ For details see McDougal, Lasswell & Vlasic, <u>Law and Public</u> <u>Order in Space</u>, 1963, pp. 193-359.

²¹² Leech, Oliver & Sweeney, <u>The International Legal System</u>, Cases & Materials, 1973, pp. 150-157 at p. 156.

²¹³ Federal Aviation Agency, Regulations of the Administrator, Security Control of Air Traffic Part 620 .3, November 16, 1961.

²¹⁴ Canada, Department of Transport, Air Services Branch 22/55, Rules for the Security Control of Air Traffic (NOTAM 221955), 1.1.

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1961 extending 80 miles off the coast of Algeria, in many ways similar to the American and Canadian measures.²¹⁵ In the last twenty-five years more than twenty countries have taken the American and Canadian approach of occasional competence. Although the danger to security in most of these cases may have dissipated, or rendered non-existent by modern technological devices, the regulatory measures remain firmly entrenched. These rules now appear, arguably, to have evolved into general rules of international law.²¹⁶

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By the Arctic Waters Pollution Prevention Act 1970, Canada has established a special belt of jurisdiction, one hundred miles in breadth, on her Arctic seaboard.²¹⁷ Canada's official justification for extending her jurisdiction on the high seas is that existing international law is inadequate in face of the threat to the ecology of the Arctic posed by tanker traffic. It is possible that, like the original Proclamation of the United States President concerning the

²¹⁵ McDougal, Lasswell & Vlasic, Law and Public Order in Space, 1963, 2963, p. 307.

216 See, Eg, ed at 306 - 310; 317 - 318.

Continental Shelf in 1945, the Canadian measure will launch a new development in State practice.²¹⁷ There are several examples of coastal States desparately claiming exclusive jurisdiction over marine areas in order to foaster and protect economic and other particular interests vital to their needs.²¹⁸

Although the Sonic Boom Committee of ICAO come to the conclusion that "States have no power to prohibit supersonic flights of foreign aircraft outside their territory", on the basis of Article 2(4) of the Geneva Convention on the High Seas (1958), which proclaims freedom of flight over the high seas, ²¹⁹ there is nothing to suggest that regulation short of flight prohibition was illegal. Therefore the findings of the Committee cannot be viewed in contradistinction

217 Brownlie, "A Survey of International Customary Rules of Environmental Protection", Natural Resources Journal, 1973, Vol. 13, p. 185-186.

218 For details see Head, "International Law and Contiguous Air Space", Alberta Law Review, 1964, Vol. 3, pp. 182-196. Ecuador, Panama, Peru produced a draft at the 3rd Law of the Sea Conference extending sovereignty over the air space above the economic zone. In 1966 Argentina enacted legislation extending her soverignty (as opposed to jursidiction) 200 miles into the high seas. See also note 196; the Third Law of the Sea Conference discussed States powers to regulate environmental aspects in economic zones. For Latin American extensions see UNGA Joc A/AC/138 Isc II L. 27, 13, July, 1975.

²¹⁹ ICAO Sonic Boom Committee, Second Meeting, Montreal 19-29, June 1973, Report on the Legal & Operational Aspects, ICAO Doc. 9064 at 3-4 (1973). to the theory of occasional claim of authority. 220

Article 24 of the Geneva Convention on the High Seas may be interpreted as according each State the authority to enforce its sanitary and anti-pollution regulations in "a zone of the high seas contiguous to its territorial sea," also against offending aircraft.²²¹

(e) The Legal Status of the International Air Space

Adequate coverage of international environmental law requires examination of the status of the legal regime of the atmosphere. The international air space is as much vulnerable to claims of nationality as the high seas. Given its fragmentary and uncertain legal status, the air space has very little by way of legal order. The normal incidents of sovereignty passe an obstacle to effective international treatment in this area.²²² Contrary to the perceived need of states to have freedom to navigate the high seas and to

²²⁰ Larsen & Faggen, "Regulation of Stratospheric Flights In Order to Control Adverse Environmental Effects," Journal of Air Law & Commerce, 1974, Vol. 40, pp. 259-297 at 281-284.

²²¹ McDougal, Lasswell & Vlasic, <u>Law and Public Order in Space</u>, 1963, p. 308.

222 Barros & Johnston, <u>The International Law of Pollution</u>, 1974, p. 353.

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explore outer space,²²³ the legal principles of the air space were framed to emphasize the sovereign rights of States. Thus Article I of the Chicago Convention (the most import air law treaty), provides that, "the Contracting States recognize that every State has complete and exclusive sovereignty over the air space above its territory."224

Freedom of the air space is shown in the various maritime conventions to be above the high seas.²²⁵ This freedom is also exercisable over the Arctic and Antarctic regions, 226 although several States maintain territorial claims to parts of Antarctic.²²⁷ As maritime space is now affected by coastal States claiming economic zones of 200 miles, there are chances

See pp. 91-94. See also the Convention on International Civil Aviation signed at Chicago 1944, 15 UNTS 389 and Article 2 of The Convention on the Territorial Sea and the Contiguous Zone, April 29, 1958, Leech, Oliver & Sweeney, The International Legal System, Cases & Materials, 1973, pp. 150-157 at 150.

²²⁴ 15 UNTS 389.

225 Convention on the High Seas, 1958, Articles 1 & 2(4), 450 UNTS 82, Convention on the Continental Shelf, 1958, Article 3 499 UNTS 311, Convention on the Territorial Sea and Contiguous Zone, 1958, Articles 1 & 2, Leech, Oliver & Sweeney, The International Legal System, Cases & Materials, 1973, pp. 150-157 at p. 150.

226 The Antarctic Treaty, Preamble and Articles I & VI; Barros & Johnston, The International Law of Pollution, 1974, pp. 363-365.

²²⁷ Barros & Johnston, <u>The International Law of Pollution</u>, 1974, p. 353.

that the free air space will likewise progressively diminish.²²⁸ The status of economic zones, either as high seas or part of the territorial waters has not been resolved. While the right of innocent passage is accorded to vessels and ships, no such right has been granted to aircraft.

Article 3 of the Convention on the Continental Shelf²²⁹ stipulates that "the rights of the coastal State over the continental shelf do not affect the legal status of the superadjacent waters as high seas or that of the air space above those waters." However, under Article 5(2), States may establish safety zones to protect marine installations, and ships of all nationalities (and aircraft) are required to observe those zones.

The Chicago Convention on International Civil Aviation (1944) does not contain any reference to the legal status of the air space above the high seas. Article 12 of the Convention merely delegates authority to ICAO to establish flight rules over the high seas.

According to the Chicago Convention the air space is divided into flight information regions over land areas and

²²⁸ See p. 9^e, note 212. ²²⁹ See page 100, note 219. the high seas. States are assigned these flight information regions not as part of their territory over which they have sovereignty, but for reasons of safety of aeronautical operations and efficacy. However in the past few years there seems to have grown a tendency to regard these regions as part of the territory over which they have sovereign rights.²³⁰

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Flight Information Regions are designated under Annex 11. Under Article 5 of the Chicago Convention aircraft of Contracting States are given overflight rights, (subject of the overall sovereign rights of the territorial State). However, the use of the atmosphere for telecommunication purposes is fully internationalized. Bleicher, "An Overview of International Environmental Regulation", Ecology Law Quarterly, 1972, Vol. 2, No. pp. 66-67.

CHAPTER VI

AIRCRAFT NOISE CONTROL UNDER INTERNATIONAL LAW

(a) The Chicago Convention, The International Air Transit Agreement and Bilateral Air Services Agreements

The legal basis upon which noise and other environmental standards may be set is founded on the Chicago Convention (including the Annexes made under it), the Air Transit Agreement and the bilateral air services agreements.²³¹ These are the basic international agreements containing grants of rights of the air to aircraft of a contracting party, subject to certain retained authority of the territorial State over the use of its air space. There are no general rules of air law applicable to noise.

Under these treaties, the territorial State has reserved

²³¹ The Convention on Internationa Civil Aviation signed at Chicago, 1944, ICAO Doc 7300/4, 1969; The International Air Services Transit Agreement, 1944, Doc 7500 (ICAO).

The bilateral air services agreements are the only agreements between States by means of which air routes and traffic rights are acquired for commercial scheduled air services, in terms of Article 6 of the Chicago Convention. Article 6 provides that "no scheduled international air service may be operated over or into the territory of a contracting State, except with the special permission or other authorization of that State, and in accordance with the terms of such permission or authorization."

authority to prescribe rules and regulations governing the operation and navigation of foreign aircraft within its territory. No limitation is imposed on the form in which operating or navigational rules are cast, nor are the purposes for which they may be adopted restricted. Consequently national regulatory agencies may establish noise limits or environmental standards affecting foreign aircraft without necessarily violating rules of international law.²³²

The more relevant parts of the Chicago Convention are Articles 1, 5, 6, 11, 15, and 17-21. Article I of the Convention contains the overriding principle of the sovereignty of a State over its air space and calls upon contracting States to "recognize that every State has complete sovereignty over the air space above its territory." Although under Article 5 each contracting State binds itself to allow aircraft of other contracting States to make nonscheduled entry or non-stop transit flights across its territory, and to stop for non-traffic purposes without the necessity of obtaining prior permission, this grant of air rights to non-scheduled services is expressly "<u>subject to</u> the observance of the terms of this Convention."

²³² These rules would however be set at the expense of uniformity, a matter of fundamental concern to ICAO. See Articles 37, 54(L) and 90 of the Chicago Convention, Doc 7300/4, 1969.

4.

Scheduled international air services are subject to special permission or authorization of a contracting State which may specify terms of such permission or authorization as provided in Article 6.

The most important part of the Chicago Convention relevant to noise regulation is Article II which provides:

> Subject to the provisions of this Convention, the laws and regulations of a contracting State relating to admission to or departure from its territory of aircraft engaged in international air navigation, or to the operation and navigation of such aircraft while within its territory, shall be applied to the aircraft of all contracting States without distinction as to nationality, and shall be complied with by such aircraft upon entering or departing from or while within the territory of that State.

So long therefore, as the domestic authorities, in virtue of Article 15 of the Convention, impose conditions which are uniform to the aircraft of all the other contracting States at every airport open to public use, provisions of the Convention would not be violated.

Pursuant to Articles 17-21 of the Convention, States have authority to prohibit or regulate flights of aircraft of their own nationality wherever they may be located. They may also attach noise and other environmental conditions to the grant of registration or nationality.

The foreign provisions are applicable as well to the

activities under the Air Transit Agreement, since the latter is expressly subject to the provisions of the Chicago Con-/ vention (Article 2 of the International Air Transit Agreement).

Bilateral air services agreements concluded between States for the grant of commercial traffic rights may reserve authority similar to that contained in Article II of the Convention.²³³ They may also contain specific reference to noise rules, as in the case of the Agreement between the Government of the United Kingdom and Northern Ireland and the Government of the Union of Soviet Socialist Republic Concerning Air Services and Amendments.²³⁴

233 Article 5 of the United States standard bilateral air services agreement contains such reservation of authority, quoting verbatim the language of Article II of the Convention.

234 Cheng, The Law of International Air Transport, 1962, pp. 581-588 at 588."

Aircraft Noise

- 18. The airlines designated by either Contracting Party shall, if as a result of noise measurements carried out by aeronautical authorities of the other Contracting Party these measures are required to reduce the aircraft noise to an acceptable level:
 - (a) carry out any modification that may be necessary for this purpose to the aircraft to be used on the agreed services;

(b) provide any mufflers or other devices required for this purpose for use during the ground running at airports in the territory of the other Contracting Party to which the aircraft are operated regularly;

(b) The Provisions of Annex 16 to the Chicago Convention

The Chicago Convention Annexes are adopted by the ICAO Council pursuant to Articles 37, 54(6) and 90 of the Convention, establishing for the most part, International Standards and Recommended Practices, which apply to States on a "contracting out" basis. If, by the date of applicability of an annex or an amendment thereto a State has not announced, under Article 38 of the Convention, any differences to the standards in the annex, it is bound to implement them.²³⁵ Upon these collateral factors, the annexes acquire the status of a binding legal instrument, although basically they are ipso facto non-binding.

Annex 16 to the Chicago Convention contains, inter alia, -noise certification requirements, evaluation measures and noise measurement points, flight test procedures and noise abatement operating procedures. These noise regulations do not apply to supersonic aircraft, ²³⁶ but are applicable,

> (c) employ such operating techniques or procedures as may be reasonably required by the other Contracting Party.

²³⁵ Fitzgerald, "Aircraft Noise in the Vicinity of Aerodromes and Sonic Boom," University of Toronto Law Journal, 1971, Vol. 21, pp. 226-240.

²³⁶ Annex 16 to the Chicago Convention, First Edition 1971, August, p. 8, paragraph 2.1--Applicability. See also Gursahaney, "Much Tighter Aircraft Noise Limitation to be Imposed," ICAO Bulletin, August, 1976, pp. 12-14.

with some exceptions, to all subsonic aircraft for which a certificate of airworthiness was sought after. January 1st,

1969.

As annex regulations are applied subject to several contingencies and variations in State practice, the noise rules in Annex 16 are potentially short of providing a basis for uniform international noise standards.

However, uniform noise rules over the high seas may be promulgated by ICAO under Article 12 of the Chicago Convention, by which contracting States have agreed to apply the ICAO rules over the high seas and to prosecute violators of such rules. Article 12 provides:

> Over the high seas, the rules in force shall be those established under the Convention. Each contracting State undertakes to insure the prosecution of all persons violating the regulations applicable.

> > .1.

Doubts may be expressed on the propriety of adopting Annex 16 on Noise under Article 37 of the Chicago Convention as its legal base. Even in a wide sense, the noise question cannot fall into the category of matters concerned with the safety, regularity and efficiency of air navigation, having regard to the class of subject-matters enumerated in subparagraphs (a)-(k) of Article 37.²³⁷ No provision of the Convention appears relevant to issues which are purely environmental and which can provide scope for enacting a noise annex.

Noise is an appropriate subject of the "human environment" hitherto unrelated to provisions of Article 37 of the Chicago Convention in its present form. It does not relate to the same kind of things designated under Article 37, and nothing can be construed in them to show that a wider sense was intended.

(c) Some Aspects of Noise Regulation in the United States

While the United States regulatory agencies may legally establish noise rules affecting international flights,²³⁸ a contrario assertion has been made that on the basis of

²³⁷ For details of rules of interpretation, see Langan, <u>Maxwell On</u> <u>the Interpretation of Statutes</u>, 1969, 12. Edition pp. 289-306. Where two or mote words which are susceptible to analogous meaning are coupled together (noscunter a sociis), they are understood to be used in their cognate sense. They take colour from each other, the meaning of the more general being restricted to a sense analogous to that of the less general. One application to this general principle is the ejusdem generis rule.

²³⁸ Larsen & Faggen, "Regulation of Stratospheric Flights In Order to Control Adverse Environmental Effects", Journal of Air Law & Commerce, 1974, Vol. 40, pp. 259-297. the route schedules attached to bilateral agreements, the freedom to regulate foreign aircraft may be limited. In particular, the matter arose with respect to the applications of France and Britain to operate the Concorde supersonic airliner into the United States.

The route schedules attached to the bilateral agreements of France and the United Kingdom, concluded separately with the United States, make no mention of specific aircraft types, albeit the Concorde. For this reason, all other requirements under the law having been met, the United States has obligation to permit the Concorde operation. Furthermore, it is argued that the airworthiness certificates are strictly meant to deal with the safety aspects of aircraft and cannot be construed to embrace aspects of noise and sonic boom.

When the two countries, France and United Kingdom, certified Concorde as airworthy, their standards being equal to international minimum requirements, the United States had obligation, by virtue of Article 33 of the Convention, to accept their findings. And in practice no State has so far refused to endorse the airworthiness certificate of another State, a party to the Chicago Convention.

However, supersonic aircraft have emerged as a recent technological innovation, in many ways influencing and changing the character of commercial air transport. The multifaceted

ramifications of this new mode may be said to have brought about a fundamental change of circumstances, hitherto unforeseen. In terms of Article 62 of the Vienna Convention on the Law of Treaties,²³⁹ the principle of fundamental change is applicable. This doctrine of international law (clausula rebus sic stantibus), is recognizable in modern international law.²⁴⁰ Furthermore, Article 26 of the Vienna Convention on the Law of Treaties evokes the doctrine of "good faith" (pacta sunt servanda), according to which parties must perform their obligations under a treaty. Therefore the bilateral agreements, it may be argued, when concluded prior to the coming into service of supersonic aircraft, cannot ipso facto govern such aircraft.

Another issue which arose in the United States is the extent to which Executive Agreements or the Federal Aviation Act can take precedent over inconsistent state or local legislation in dealing with foreign commercial services. For instance can the Port of New York Authority (PONYA)

239 Vienna Convention on the Law of Treaties, A/CONF. 39/27, 23 May, 1969. VI. 69-1380. Dist. General.

240 Haraszti, <u>Some Fundamental Problems of the Law of Treaties</u>, 1973, pp. 327-362.

promulgate rules that contradict Executive Agreements?²⁴¹

In terms of Article 18 of the Compact establishing PONYA the Authority has power to make rules and regulations subject to constitutional limitations and State or Congressional powers. In the event of a conflict with the Constitution of the United States and Federal legislation, the PONYA promulgated regulations would be overridden. Therefore Federal international bilateral and multilateral obligations prevail over PONYA regulations. Additionally the Federal Constitution established Federal powers "to regulate commerce with foreign nations" pursuant to Article 1(8)(3) and Article 6(2).

Under the joint executive--legislative constitutional powers, the United States is equally bound by "executive agreements" as it is by "treaties". Therefore the existence of either a "treaty" or an "executive agreement" is within the exclusive domain of the Federal Government. "Executive agreement" means "an international agreement made by the President of the United States, or his authorized delegate, without the advice and consent of the Senate requisite for

²⁴¹ The Vienna Convention on The Law of Treaties precludes a party from invoking the provisions of internal law as justification for its failure to perform a treaty. Article 27. See also Article -46.

the conclusion of a treaty under the Constitution.²⁴² Powers to conclude "executive agreements" are derived from legislative and executive authority contained in the Constitution. Presidential powers also originate from practice and congressional mandate.²⁴³

A "treaty" is a compact made between two or more independent nations with a view toward the public welfare.²⁴⁴ A treaty need not necessarily require approval of the Senate in every case.²⁴⁵ The Supreme Court has recognized and upheld the President's inherent authority to enter executive agreements with foreign nations without the consent of Congress.²⁴⁶ In 1938 Congress generally recognized the existence of "international agreements other than treaties

²⁴² U.S. Const. Article 2. The President "shall have power, by and with the Advice and Consent of the Senate to make Treaties provided two-thirds of the Senators present concur."

²⁴³ Example, the direction in 1792 that the Postmaster General enter into postal agreement with foreign countries. Also the Reciprocal Trade Agreements Act of 1934 provided for many agreements (48 Stat. 943).

244 2 Bouvier's Dictionary 11136.

245 <u>U.S. v. Belmont</u> 301 U.S. 324, 330 (1937); <u>Atlman & Co. v. United</u> <u>States</u> 224, US 583, 600 (1912); also 5 Moore, International Law Digest, 210-221.

²⁴⁶ U.S. v. Pink 315 US 203 (1942); <u>U.S. v. Belmont</u> 301 US 324 (1937); U.S. v. Curtiss-Wright Export Corp. 299 U.S. 304 (1936).

to which the United States is a party."247

Governmental power over internal affairs is distributed between Federal Government and the several states, but governmental powers over foreign affairs is vested exclusively in the Federal Government. This exclusive Federal power is consolidated in the Presidency.²⁴⁸ A state has no power to refuse enforcement of rights based on a Federal Power that is evidenced by an international compact or agreement.²⁴⁹ The power over United States foreign affairs is exerciseable without regard to state laws or policies.²⁵⁰ All treaties made under the authority of the United States^{*} become the supreme law of the land, including international

²⁴⁷ Congress provided publication of such agreements in the Statutes at Large, 52 Stat. 766, 1 USC No. 30.

²⁴⁸ U.S. v. Curtiss-Wright Export Corp. 299 US 304 (1936); per Justice Sutherland; "very delicate, plenary and exclusive power of the President as the sole organ of the Eederal Government in the field of international relations."

- 249 Co. 248. F. Supp. 903 (DC or 1965), p. 318.

²⁵⁰ <u>Hines v. Davidowitz 312 US 52</u> (1941), "international relations is the one aspect of our government that from the first has been most generally considered imperatively to demand broad national authority and any state power that may exist is restricted to the narrowest limits."

compacts and agreements. In relation to these, international negotiations, and foreign relations generally, state lines disappear.²⁵¹

(d) How Environmental Disputes may be Settled

International law requires States to settle their disputes in a peaceful manner, based on the fundamental objective of the Charter of the United Nations.²⁵² The responsibility of settling international disputes is specifically cast on the three principal organs of the United Nations, the Security Council, the General Assembly and the International Court of Justice.

Vide Articles 36 and 38 of the Charter, the Security Council has power to act in disputes which may endanger international peace or breach of the peace or acts of aggression. Under Article 14 the General Assembly may recommend measures for the peaceful adjustment of any situation, regardless of origin, which it deems likely to impair the general welfare of friendly relations among nations. As members of the United Nations, States are, ipso facto, parties

²⁵¹ U.S. v. Belmont 301, US 324, 331 (1937).

²⁵² Leech, Oliver and Sweeney, <u>Charter of the United Nations, Docu-</u> <u>mentary Supplement to Cases and Materials on the International Legal</u> <u>System</u>, p. 1.

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to the Statute of the International Court of Justice, the principal judicial organ of the United Nations. Disputes may be referred by States to the Court in respect of all matters specifically provided for in the Charter, or in the treaties and conventions in force.²⁵³ However, compulsory jurisdiction of the Court is not a matter of course, as it is subject to the acceptance of States on the basis of reciprocity, either generally or by special agreement.²⁵⁴

Politically, States are constrained to accepting the compulsory jurisdiction of the International Court of Justice, albeit conditionally. Procedural niceties and the length of time taken to pronounce decisions are additional points of disadvantage that inhibit regular use of the Court by States. As a result the institution of ad hoc tribunals or claims commissions represents an acceptable alternative and a means of disposing claims expeditiously, especially to developing nations to whom the opportunity presents itself to influence the selection of judges and the

²⁵³ Ibid., p. 33, Article 36(1) of the Statute of the International Court of Justice. A number of friendship commerce and navigation treaties give jurisdiction to the International Court of Justice over legal disputes. Example, The Antarctic Treaty, Article XI(I), XI(2), 54 AJ L 347-383, (1960); Treaty of Friendship, Commerce and Negotiation between U.S.A. and Japan, 2 April 1953, Article XXVI, 206 UNTS 143 (1955).

²⁵⁴ Ibid., p. 33, Article 36(2).

mode of procedure.

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While the Court has disposed of a sizable volume of judicial disputes, little enthusiasm has been shown to the endorsement of its compulsory jurisdiction or to submitting before it issues which are considered sensitive.²⁵⁵

There are several methods of settling disputes which have proven universally acceptable to States. The first is the requirement to prefer claims through diplomatic channels, as a preliminary stage, by means of which a political settlement may be reached. Negotiations of this type are conducted either directly or by means of a mediation or conciliation., Failure to reach agreement at this stage usually prompts the parties to resolve the dispute by means of adjudication, before an ad hoc tribunal or a claims commission.²⁵⁶

In the special circumstances of environmental disputes, the more agreeable formula seems to be a machinery set up by the parties outside the framework of the International Court

255 Valiant, "The Peaceful Settlement of Disputes," <u>Cambridge</u> Essays in International Law, pp. 173-177.

²⁵⁶ Kakka, <u>The Settlement of Disputes in International Civit</u> <u>Aviation</u>, a Thesis Submitted to the Faculty of Graduate Studies and <u>Research</u>, McGill University, 1968, pp. 10-20.

of Justice.²⁵⁷

This method would appear acceptable in view of the diversity and regionalized characteristics of environmental disputes, requiring special technical knowledge other than legal, and would circumvent the restrictions imposed by the Statute of the International Court of Justice, under which legal person's other than States have no locus standi.²⁵⁸ Environmental claims are more likely to involve private individuals, companies and other entities.²⁵⁹

²⁵⁷ Example, Articles XIV and XX of the Outer Space Liability Convention, Leech, Oliver and Sweeney, <u>The International Legal System</u>, <u>Cases and Materials</u>, pp. 181-183.

²⁵⁸ Leech, Oliver and Sweeney, <u>The International Legal System</u>, <u>Cases and Materials</u>, p. 32, Statute of the International Court of Justice, Article 34(1).

259 <u>The Trail Smelter Arbitration</u>, 1941, (a claim by a private company), <u>3 UNRIAA</u>, 1905, (1941).

CHAPTER VII

THE TREATMENT OF AIRCRAFT NOISE UNDER DOMESTIC LAW

(a) Legal Concepts

Since ancient times private law rights of ownership to the air above subjacent land were extended to the skies ad infinitum, with the individual claiming complete protection over the airspace above his land. Subsequently, as air traffic developed it became necessary to delimit private and public rights over the airspace and individual states sought to assert airspace sovereignty, thereby rendering obsolete the maxim, 'cojus est solumn ejus est usque ad coelum'.²⁶⁰ While complete sovereignty over national airspace is now recognized in international law, full proprietary rights of private persons above their land is not

²⁶⁰ McNair, The Law of the Air, 1964, 3pd. ed. pp. 31-36; at p. 34.

It is suggested that in deciding whether or not any particular use by a stranger of the airspace superincumbent over a person's land is actionable, either as a trespass or as a nuisance, the common law will, as in other circumstances in the past, pay due regard to the convenience of mankind and . to the fact that as the world's population increases and man's conquest of nature develops, the exclusive enjoyment of all the amenities arising from the ownership of land is continuously and inevitably decreasing. recognized.²⁶¹

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Nuisance, trespass and negligence are the original legal concepts upon which noise tort claims are now based.²⁶²

Nuisance is either private or public. A private nuisance is generally some unauthorized interference with the use or enjoyment of the land of another. A public nuisance is an act which injuriously affects the health, safety or liberty of the public. It is actionable at the suit of a private individual only if it has caused him some substantial injury beyond that which it causes to the public generally.²⁶³

"Trespass is defined as every unlawful entry by one person on land in the possession of another for which action lies although no actual damage is done. A person trespasses upon land if he wrongfully sets foot on or drives or rides over it or takes possession of it or expels the person in possession or pulls or destroys anything permanently fixed

261 Keenan, Lester & Martin, <u>Shawcross and Beaumont on Air Law</u>, 1966, Vol. I, Third Ed., p. 517.

262 Lemhoefer, "The Federal Noise Control Act of 1972 And Aviation Noise", <u>Beiträge Zum Luft und Weltraumrecht Festschrift Eu Ehren Von</u> <u>Alex Meyer</u>, 1975, pp. 153-160.

^{26.5} Keenan, Lester & Martin, <u>Shawcross and Beaumont on Air Law</u>, 1966, Vol. I, Third Ed., pp. 540-546.

to it or wrongfully takes the minerals from it or places or fixes anything on it or in it or <u>it seems</u> if 'he erects or suffers to continue on his own land anything which invades the airspace of another or if he discharges water upon another's land or sends filth or any injurious substance which has been collected by him on his own land on to another's land. Where there is no act of direct intrusion on another person's property, liability in trespass does not arise though liability may arise in nuisance or negligence. ...²⁶⁴

The majority of noise claims are founded on nuisance rather than trespass and negligence. However the concepts of nuisance and trespass are closely related in regard to private rights in airspace. Therefore the same act constituting a trespass may also constitute a nuisance, though a nuisance without direct physical interference does not become a trespass.

In relation to land, which in the wider context comprised of the air and sub soil, the notions of trespass and nuisance were applied with the intent of protecting private rights of ownership. But since proprietary claims over the

264 Halsbury's Laws of England, 3rd ed. vol. 38, pp. 739-741, para. 1205.

airspace are now relegated to mere "rights of user", difficulties arise in involving these traditional legal concepts to problems of aircraft operation.²⁶⁵ The overriding considerations seem to abound in "public interest".

The proximity of cause and effect in relation to damage caused by aircraft in flight is one criterion the courts use to invoke the doctrine of nuisance or trespass, but more so in the latter action. This subjective approach results in differing opinions on how the flight altitudes over land should be adjudged in order to determine physical violation, a fortiori to constitute the measure of determining trespass or nuisance. Some authors maintain that at common law it would be a trespass to fly over another man's land at a level within the height of ordinary buildings and it might be a nuisance to hover over a land even at great height.²⁶⁶

²⁶⁵ Effectively an injunction would be most appropriate to abate aircraft noise nuisance, but since remedy would result in closure of the airport, an enterprise of public utility, the absurdity of this solution is explicable. Therefore the normal laws of nuisance and trespass cannot strictly apply to aircraft operation--Richards "Putting a Value on Noise--The development of an index which is fair to both airport operators and the public." The Aeronautical Journal, May, 1976, p. 193.

266 McNair, The Law of the Air, 19754, 3rd ed., pp. 41-42.

On account of the difficulty of proving the necessary elements which constitute negligence, the issue of negligence in noise tort claims rarely arises.²⁶⁷ Whereas in action brought in nuisance or trespass no proof of actual damage is required.²⁶⁸

In the case of sonic boom it may be argued that the doctrine of 'res ipsa loquitur' would also apply if the boom phenomenon is considered a physical extension of supersonic aircraft. Elsewhere the physical characteristics and the definition of sonic boom have been discussed.²⁶⁹

The conceptual difficulties in private suits are compounded by much technical literature of aircraft operation and subjective complaints. Injunction or damages cannot be awarded by the court if most of the evidence

(a) That the defendant owed him a duty;
(b) that the defendant failed to discharge that duty;
(c) that the failure directly caused damage to the plaintiff.
<u>Halsbury's Laws of England</u>, 1959, Viscount Simond's Ed., Third Ed., Vol. 28, p. 73, paragraphs 75-77.

268 Halsburg's Laws of England, 1962, Viscount Simond's Ed., Third Ed., Vol. 38, p. 739, paragraph 1205.

²⁶⁹ Pages 19-23 supra.

appears /to be subjective. 270

Additionally the claimant or its insurance company would face certain evidentially problems relating to the exact time the damage occurred, the aircraft that cuased it at the material time, the manner in which the flight took place, the characteristics of the aircraft and the identity of the owner of such aircraft. Some of the essential information would only be obtained from third parties and experts, some of whom would have interest in the matter.

(d) Statutory Provisions

Statutory provisions in domestic law either restrict or provide the basis upon which private action may be brought to recover damages in noise tort claims. Currently in the United States recoveries are made upon the theory of inverse condemnation, though most aircraft noise actions also include other counts such as nuisance. Inverse condemnation or 'a taking' stems from the fifth amendment of the U.S. Constitution which states that property may not be taken for public use without just compensation. In the event of a taking the proprietor can recover for noise damage. This

270 Yannacone Jr., Cohen and Davison--<u>Environmental Rights &</u> <u>Remedies</u>--1975, Supplement, pp. 62-53.

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happens when the government takes only a portion of the landowner's property to construct a highway or aerodrome, in which case the property not taken is damaged by the noise source that the government wishes to construct on the land taken. Inverse condemnation may also occur where an easement is created by a noise source, thereby depreciating the value of the property directly below. Such action is maintenable against the airports which are responsible for direct overhead flights.²⁷¹ The courts require that in an action for a taking the plaintiffs substantiate the extent of injury to the property²⁷² or diminution of property value.

The various cases that have so far been litigated clarify the taking of easement by repeated overflight at low-level and settle the question of noise servitude in the neighbourhood of airports. These cases also indicate that to a large extent local or state control of aircraft noise is limited by Federal pre-emption.²⁷³ The courts have not

271 United States v. Causby, 328 U.S. 256 (1946): Griggs. v. County of Allegheny, 369 U.S. 84 (1962).

272 <u>Alevizos v. Metropolitan Airports Commission</u>, N.W., 2nd Minn., Sup. Ct., 1974.

273 See the cases of Lockheed Air Terminal v. City of Burbank, 457 F.2d. 667, 12 AV. Case 17,297 and <u>Cooley v. Board of Wardens</u>, 53 US (12 HOW), 299, (1851). Also U.S. Cong. House Committee on Interstate And Foreign Commerce. Sub-committee on Public Health and Environment, Third Annual Report of the Council of Environmental Quality (Hearing), 92nd Congress, August 16th, 1972, serial No. 92-111.

however entertained class actions on the grounds that the claims are specific to individual land parcels depending on unique sets of facts which outweigh and outnumber common questions of law and facts.

No recoveries for personal injury or damage to health caused by aircraft noise appear to have been made so far.²⁷⁴ Failure to prove specific personal injury should be a matter of concern in aircraft noise litigation. Other than the United States, elaborate jurisprudence on the question of noise is practically non-existent in many countries.

The French Code of Aviation provides protection to owners of private property if flights are conducted in a manner incompatible with the rights of the proprietor, but certain mitigating factors are acceptable. If the proprietor puts up a building in an area subjected to aircraft noise with the full knowledge of the circumstances, he will not be heard to complain.²⁷⁵

English statutes restrict the extent to which private claims may be preferred. Nuisance (or trespass) action

²⁷⁴ See also p. 126 supra.

275 <u>Societe ERVE v. Air France</u>. Cour de Cassation (Supreme Court) 2nd Civil Chamber--May 8th, 1968, 1968 2 Bull des Arrets de la Cour de Cassation 87 [1968] Dalloz jur 569. Lowenfield--Aviation Law, p. V-67, para. 2.5.

cannot be filed against aircraft operators who adhere to all appropriate regulations and fly at a reasonable height.²⁷⁶ Where the operator of an aircraft violates a regulation, the common law will determine liability for the nuisance of aircraft noise. Pursuant to Section 40(2) of Part IV of the Civil Aviation Act 1949, the liability of the operator is strictly construed.

Domestic regulations²⁷⁷ deal with the level of noise and introduce measures of minimizing noise effects. Authorities responsible for implementing noise regulations, include airport operators, and air transport control authorities.

276 Civil Aviation Act 1949, Part IV, Section 40(1), "No action shall lie in respect of trespass or in respect of nuisance by reason only of the flight of an aircraft over any property at a height above the ground, which having regard to wind, weather and all circumstances -of the case is reasonable or the ordinary incidents of such flight so long as the provisions of Part II and this part of this Act and any Order in Council or Order made under Part II of this Part of this Act are duly complied with.

277 The U.S.A., Canada, France, Federal Republic of Germany, United Kingdom and Japan are amongst countries with such noise standards.

CHAPTER VIII

THE IMPACT OF COMMERCIAL SUPERSONIC AIRCRAFT

(a) Economic and Political Aspects

Questions relating to environmental objections and the uncertainty of international control of noise and sonic boom apply to both subsonic and the recently introduced supersonic aircraft. The recent Concorde discussions are reminescent of the economic, social and political overtones, that have surfaced with the growing concern over environmental protection over recent years. This is demonstrated by the ever increasing number of organizations both international and domestic, particularly in the more industrially advanced countries where environmental damage is most strongly felt.

Britain and France were the first to develop plans to build commercial supersonic aircraft in 1956. Two government agencies, the British Aircraft Corporation and Sud Aviation of France (later known as Aerospatiale) developed designs for a long range and medium range aircraft respectively, before the Governments decided to undertake a joint project to develop a commercial supersonic aircraft in 1962. The Anglo/French Agreement, signed on November 29, 1962, contains the following provisions:

Article 1 specifying that there should be equal sharing of work and expenditures by the two governments who would share the proceeds of sales.

Article 4 providing for the setting up of integrated organizations of the airframe and engine firms.

Article 6 providing for the standing committee of British and French officials to supervise progress, report to their governments and make appropriate proposals.²⁷⁸

The aircraft configuration as it is today was developed after 1963 and application for airworthiness was made to the FAA in July, 1965, as well as to British and French authorities. The first Concorde commercial flight commenced on January 21, 1976, by British Airways from London to Bahrain and by Air France from Paris to Rio de Janeiro. The concorde development has taken 14 years of remarkable technological achievement.

According to one view, the joint Anglo/French project was intended to soften French opposition to Britain's application to join the European Common Market. Therefore appraisal of economic and environmental implications was not sufficient, consequent upon which the United Kingdom

²⁷⁸ For details of political, economic and technical issues, see Wilson, The Concorde Fiasco, 1974, A Penguine Special (Penguine Books). considered her withdrawal in 1964.²⁷⁹ However, the **C**oncorde agreement did not contain a right of either party to withdraw for any reason.²⁸⁰ Government prestige and technological leadership were also at stake as the Soviet Union and United States were developing supersonic cruise aircraft of their own.²⁸¹

The proponents of supersonic flights have considered technological advancement and speed as its basic attributes. The protagonists believe that these advantages were not worth so much investment so long as supersonic aircraft would benefit relatively few people and the development of supersonic technology was already undertaken by the military.

Perhaps the gain of flight time by SST of **c**oncorde will not have the same value as that of jet aircraft over piston aircraft. As the passenger is interested more in absolute

^{- 279} The development of concorde finally cost '3 billion dollars. The price of each aircraft is approximately \$65 million, compared with about \$20 million for B-747. The fare is 20% above the normal 1st class passenger fare. The original estimate of the project was 170 million--Flight International 17.6.76--Concorde Now Arriving, p. 8.

 280 It was estimated Britain would have paid damages to France close to **f**200 million. See also p. infra--the Agreement.

²⁸¹ The Soviet Union was building the TU 144 while the U.S.A. was designing the SST, which was later abandoned.

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time <u>in hours</u>, the reduction of 4 hours out of 8 hours by jet was much more important than saving another 2 hours out of 4 hours by **C**oncorde. The time "loss" can be used for meals and rest. Furthermore ground handling delays, traffic jams and fatigue add up to reduce the time value of SSTs. Many companies require their executives to have a full day's rest before commencing important negotiations.²⁸²

Nevertheless a new era of commercial aviation has begun and plans are already in hand to develop a second generation of supersonic aircraft with advanced technology. The United States is currently conducting Systems Integration Studies for supersonic cruise aircraft, with better environmental and economic qualities than the former US SST and the concorde.²⁸³ It is estimated a large potential market (350-1500 aircraft) will exist in the 1980-2000 timeframe.²⁸⁴ The United States intends to avoid losing leadership in the long haul aircraft market if the **É**oncorde proves

282 Lundberg, "Menace of Sonic Boom to Society and Civil Aviation," The Aeronautical Research of Sweden, Memorandum P.E.-19, 1966, p. 18-19.

²⁸³ Mascitti, Systems Integration Studies, NASA Technical Memorandum N. 76-12041 NASA IM x 72781, September, 1975, p. 1.

²⁸⁴ Ibid., p. 4.
economical.

Apart from political issues, the problems facing commercial supersonic aircraft mainly involve environmental questions. Sonic boom is an issue of less importance than noise per se, and pollution of the upper atmosphere. Even in the United States where serious objections were raised against concorde, the sonic boom phenomenon bears little relation to public complaint. Many countries, including the United States do not allow overland supersonic flights.285 Noise has been shown to cause more disturbance in the operation of concorde flights at take off and landing. Arguments on other environmental issues involving the concorde could not be ascertained on the basis of available scientific data, at the time the Anglo/French aeronautical authorities applied to introduce regular flights to the United States.

As a new technological step, supersonic commercial flights would require further improvement to meet satisfactory environmental standards, as has been the case with subsonic jets in the past decade.

285 See p. 36, note 89. Scandinavian countries, The United States, West Germany and India do not allow concorde overland flights.

(b) Some Technological Features of Concorde

Extensive engineering tests were conducted to remove aerodynamic obstacles of flying supersonic aircraft at a speed greater than that of sound. The principle obstacles included shock wave drag, rearward shift of the aerodynamic centre at transonic speed and heating of the structure caused by skin friction or kinetic heating of -57°C; 60,000 feet above sea level. The aerodynamic qualities that suit supersonic speed are not necessarily good for subsonic flight, for example the straight-edged slender delta wing is the best shape for Mach 2 speed, but compromises stability and efficiency at low speed, particularly on the approach and landing.²⁸⁶ The drooped nose gives a pilot a better view for landing during high speed approach. The wings which act as fuel tanks carry four engines each as big as a bus.

Above Mach 1 heating of the skin is noticeable, causing conventional aluminum alloys to soften at Mach 2.5. Special alloys of aluminum were used to provide good mechanical properties, and fatigue strength. The Concorde's four Rolls Royce/Snecma Olympus 593 turbo jet engines are built with

²⁸⁶ Flight International, "Concorde Now Arriving", Special Supplement, 17.1.76, pp. 1-29 at p. 8.

titanium and steel. As a cooling device, the fuel in the wing tanks is used to absorb some of the cruise heat, at the same time providing a centre of gravity balance. The transonic trimming is achieved by transferring fuel from a group of fuel tanks forward of the centre of gravity to a fuel tank in the rear of the fuselage. The reverse is done to restore the subsonic centre of gravity after supersonic speed.²⁸⁷ All the trim fuel is usable for propulsion.

The Concorde supersonic airliner is the world's most tested airliner, whose flying programme involved eight aircraft and a total of 5,500 hours, compared with about 1,500 hours for the jumbo jet. Other features²⁸⁸ include:

Capacity		123 seats		
Operating weight empty		175,000 lbs.		
Payload [‡]		25,000 lbs.		
Block fuel	- <u>#</u> -	160,000 lbs.		
Fuel for flight variations		10,000 lbs.		
(longer airways)		· `		
(strong headwinds)	ş	•		
(longer holding)				

²⁸⁷ Ibid., pp. 1-29 at p. 12.
²⁸⁸ Ibid., p. 12.

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Diversion fuel		9.000	lbs.	
Helding fuel	-	12.000	1%	-'
Holding fuel		13,000	lds.	(30 min.)
Reserve		8,000	lbs.	,
imum gross take-off weight		400,000	lbs.	

Maximum gross take-off weight

Dimensions:	1
Length	/203 ft. 9 in.
Span	83 ft. 10 in.
Height	37 ft. l in.
Fuselage Width (External)	9 ft. 5 in.

The United States and Commercial Supersonic (d) Aircraft

In 1963 President Kennedy authorized the National Supersonic Transport Programme at a spending ceiling of \$750 million. This was about the same time the **C**oncorde was being Three governmental agéncies were responsible for developed. administering the programme; the Federal Aviation Agency, the National Aeronautics and Space Administration and the Department of Defence whose principal representatives is the Air Force. Of the various designs presented for choice in 1966, the swing wing of Boeing 2707 was preferred to its competitor Lockheed. The Boeing 2707 was to be designed with a GE4 General Electric Engine for a seating capacity of 250-350 passengers with a cruising speed of Mach 2.7 and a range of 4,000 miles. No doubt the Boeing would have

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overshadowed concorde, whose capacity is only 128 passengers with the speed of Mach 2.05 and range is 3,800 miles. On 20th May, 1971, the United States Congress cancelled the American SST programme.

One of the major factors contributing to the failure of the SST was economic deficiencies due to marginal rangepayload characteristics.²⁸⁹ At the same time economically viable subsonic wide body aircraft began long haul operations.

The Presidential panel set up to mitigate the SST programme identified four principal problems:

(a) Sonic Boom

(b) Airport Noise

(c) Emissions in the atmosphere and

(d) Radiation exposure.

On the safety aspects the panel reported that if for [°] any reason cabin pressure was lost, exposure to toxic ozone gas would cause unconsciousness to all aboard in 15 seconds. Anti-SST sentiments were expressed by a wide cross-section

289 Mascitti, National Aeronautics And Space Administration, System Integration Studies For Supersonic Cruise Aircraft, Langley Research Centre, NASA Technical Memorandum TMX-72781. September, 1975.

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of the American public, amongst whom were Congressmen, economists, environmentalists and the press. Hence to some extent the controversy in the U.S. over Concorde is linked with the history and political background of the American SST.

Some economists think Concorde is too expensive. It cost the United Kingdom 50 million annually since 1962 and the price will exceed \$60 million dollars each. With spares it will cost airlines a total investment of close to \$75 million without insurance. Total maintenance costs on the London-New York route would average \$1,208 per hour. Including other expenses, total direct costs will be \$6,089 per hour. Indirect costs will amount to \$1943 per flying hour. With these results the total cost of operating the 108 seat Concorde on the London-New York route is \$8,032 per hour or \$28,112 per flight. This gives costs of \$7.94 per aircraft mile or 7.35 cents per available seat mile. The break-even load factor is between 47% and 51%.

Others believe that the investment was worthwhile compared with the amount of $f_{1,500}$ million people spend in British private motor industry. Concorde gives Europe

290 Flight International Supplement, 17th January, 1976, Concorde Mow Arriving, pp. 6-7.

technological leadership in the world, and concorde will pay on most business routes if allowed a:50% break-even load factor.²⁹¹

On the safety aspects, the Report of the Secretary of Transportation shows that Concorde complies with safety requirements.²⁹² The concorde utilizes a very sophisticated inertial navigation system providing accurate information on pilots flight instruments. Concorde's stability and handling qualities are excellent, with a much better delta wing turbulence response than the classical swept wing configuration. The high thrust required for supersonic cruise gives concorde a performance much superior to subsonic aircraft due to the large thrust to weight ratio at take-off. The workload requirement is relatively low during the take-off and initial climb. The aircraft geometry is such that the aircraft can be rotated to the desired pitch altitude prior to lift-off from the runway. There is time to commence a furn at 100 feet above the runway. There . _are no'additional routine actions required by the crew \searrow such as raising or moving aircraft flaps since the concorde has no flaps.

²⁹¹ Ibid., p. 7.

²⁹² The Secretary's Decision on Concorde Supersonic Transport; Department of Transportation, United States of America, Washington, D.C. February 4th, 1976; Appendix 11, p. 8. In case of emergency in the turn or at take-off the wings may be rolled at the level to obtain a straight climb, adding to the safety margin. Adequate flight crew procedures have been developed for emergency situations. The crew are equipped with cosmic radiation detectors and procedures of avoiding exposure have been developed. Concorde complied with recommended ICAO procedures outlined in the Organization's guidance material.²⁹³

The airworthiness standards of **C**oncorde on fuel reserves are higher than the fuel reserve requirement under U.S. FAR 91.21, which would be applicable to the Concorde.

To comply with this regulation Concorde would require approximately 4,600 lbs. of fuel to divert to an alternate * route and 16,000 lbs. to fly for 45 minutes at Mach 0.93, at 38,000 feet, with a gross weight of 230,000 pounds at the beginning of the diversion. The total reserve required under FAR 91.23 are approximately 20,600 lbs. To comply with the British and French reserve standards, the concorde will be required to carry approximately 30,000 lbs. of fuel.²⁹⁴

The prime environmental objections to concorde were based

²⁹³ Ibid., pp. 11-8 and 11-9.
²⁹⁴ Ibid., pp. 11-5 and 11-6.

on noise, emissions of carbon monoxide and unburned hydrocarbons both in the troposphere and the stratosphere, the climatic impact of these emissions and their influence on ozone, energy impact and safety. The Secretary of Transportation found that the air quality impact of Concorde is not significant for the purpose of deciding whether to permit Concorde to land in the United States. He also concluded that the possible effect of Concorde on climate was small and could not affect the temperature of the earth. The secretary also felt uncertain whether Concorde exhaust will significantly reduce ozone in the stratosphere, allowing ultraviolet radiation to reach the earth's surface and thereby causing an increase in the rate of non-fatal skin cancer.²⁹⁵ For these reasons Mr. Coleman permitted British Airways and Air France on February 4, 1976, to conduct limited scheduled commercial flights into the United States for a trial period not to exceed 16 months, in order to observe the impact of concorde on the environment.

L The following observations relate to the Report of the U.S. Secretary of Transportation on each aspect of Concorde's environmental impact:²⁹⁶

²⁹⁶ Ibid., pp. 27-50.

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²⁹⁵ Department of Transportation, United States of America, "The Secretary's Decision on Concorde Supersonic Transport," Washington, D.C., February 4, 1976, pp. 33-36.

Noise: Three broad areas were considered, namely, the nature and effect of the low frequency content of the Concorde noise, the way in which the noise of the Concorde should be described and compared to that of other aircraft, and the effect of Concorde noise on residents of the areas around JFK and Dulles. The effect of low frequency noise is to induce vibrations of structures such as homes and buildings near airports, thereby exposing these properties to damage. Low frequency noise travels' faster and does not dissipate rapidly and because Concorde has much greater low frequency noise content than subsonic jets, its noise would cover a wider area with greater intensity. The vibrational effect of Concorde noise will be five times more than that of subsonic jets because its low frequency content is five times higher. No evidence of structural damage was indicated from barely perceptible vibrations of walls and floors of buildings, and a few seconds rattling of hanging pictures, dishes and other items which might be standing loose on shelves. However, the possibility of annoyance arising out of these vibrations was shown. Structural damage to historical sites was minimal compared to the natural deterioration caused by weather.

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(i)

Four noise descriptors were used to describe four different aspects of the noise impact, namely FAR 36 measuring points, single event noise contours, the Noise Exposure Forecast (NEF) and the Aircraft Sound Description System (ASDS). The FAR 36 provides for measurements of noise under the approach path, the take-off path and at a point of maximum noise during take-off. . This method does not accurately show total noise impact but is used for aircraft noise certification procedures. The areas of land and numbers of people subjected to a certain noise intensity level at any take-off or landing is measured by single event noise contours. Thus the geographical extent of noise impact of one aircraft may be compared with another, by over-flying the contour of one on the contour of the other. Both the Noise Exposure Forecast and the Aircraft Sound Description System assess cumulative noise impact but the latter emphasizes total exposure to high noise levels which are presumably more irritating than the continual low noises. The Noise Exposure Forecast shows little or no such difference.

At the FAR 36 measuring points the Concorde is half again as loud as one of the noisiest subsonic jets, the Boeing 707 and more than twice as foud as the Boeing 747. On approach the Concorde is quieter than the Boeing 707 butalmost twice as loud as the Boeing 747.

Using the four noise measurement procedures, the Concorde is shown to be noisier than existing subsonic aircraft, except perhaps for the Boeing 707 and the DC-8 on landing. The B-707 and DC-8 are 27% of the United States commercial fleet.

When the Concorde takes off using the noise abatement procedures, compared to the B-707 and B-747, 47.6 square miles of land would be subjected to levels of noise at or above 100 EPNdB by concorde, while the B-707 and B-747 would affect 7.49 and 2.91 square miles respectively. The 100 EPNdB level of poise is approximately equal to heavy traffic in the city at a distance of 25 feet, although exposure to aircraft noise would last a few minutes.

The noise contours within 30 NEF and 40 NEF will cover approximately 485,000 and 112,000 residents respectively, around JFK airport by 1978. If the four concorde services are introduced, an additional 2,000 people on each contour will be affected, which constitutes an increase of 0.4 per cent within the 30 NEF area and about 2 per cent within NFF 40. The 487,000 residents would experience slightly greater total noise exposure, an additional of 0.3 NEF units. Compared to the existing level of noise this is relatively little, although JFK airport is already severely affected.

Due to sparcity of population around Dulles, only 1000 people will additionally suffer more noise within the NEF 30 and none in the NEF 40 area by 1978.

If additional noise abatement measures are taken to reduce the level of subsonic aircraft noise, for instance by retrofit, the incremental Concorde noise impact will alter.

As the impact of six additional Concorde flights would be small on the basis of available data and information on the subjective response was inadequate, Concorde flights could not be stopped because of noise.

(ii) <u>Air quality</u>: The absolute figures indicate that Concorde's emission of carbon monoxide is greater per landing/take-off cycle than existing subsonic jets, from two and a half to ten times as much. Emission of unburnt hydrocarbons is also greater, but less than that of carbon monoxide and emission of nitrogen oxides is greater than that of all subsonic aircraft except the Boeing 747. But the emission of particulates is less than that of all subsonic jets except the DC-10.

The Concorde's emission levels of carbon monoxide, unburnt hydrocarbons and the smoke number measuring emission of visible particulates exceed the EPA proposed standards

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that would apply to supersonic engines manufactured on or after January, 1st 1979. These rules have been proposed by EPA under Section 231 of the Clean Air Act, 1973. The level of nitrogen oxide would probably meet the proposed EPA standards.

Taking into account the number of flights, time of day and wind conditions, the effect of the proposed Concorde flights on ambient air quality is negligible. Whatever impact there may be will be confined within the boundaries of the airports. The measurable increase of pollutants due to Concorde off the JFK airport perimeters is .2 parts per million in carbon monoxide concentration. The total level is .7 per million, on a one hour average, as compared to a national standard established by EPA of 35 parts per million. The Dulles airport would not be significantly affected by Concorde emissions.

(iii) <u>Stratospheric impact</u>: This conerns the issue of the effect of Concorde flights on the mean surface temperature of the earth and the reduction of the density of the ozone layer and the resultant possibility of an increase in the incidence of non-fatal skin cancer. Scientists do not have a conclusive theory on what causes temperature changes on the surface of the earth, but aircraft emissions produce elements that may influence temperature. Sulphur dioxide combines with other elements in the stratosphere to form very fine droplets of sulphuric acid which block the sun's rays producing a cooling effect. On the other hand exhaust water vapour transmits ultraviolet radiation readily to the surface causing a warming effect by absorbing infrared radiation. Nitrogen oxides absorb the sun's radiation and have a cooling effect. But since nitrogen oxides reduce the amount of ozone which also absorbs the sun's radiation, the ozone reduction has a warming effect. These situations give rise to uncertainty which is partly due to the small magnitude of temperature changes which might be caused by man-made pollutants.

Theoretically if the six daily operations of Concorde carried out and a fleet of 40 aircraft is used over 20 years, the estimated cooling effect of the sulphur dioxide would be about .00027 degrees Centigrade, less than three ten thousandths of a degree. These figures allow an uncertainty factor of three to ten. On the basis of this data the Secretary of Transportation felt that the effect of Concorde on the climate is insignificant.

A further effect of the reduction of ozone is that the sun's ultraviolet radiation, normally screened off by ozone, would reach the surface of the earth thereby increasing the rate of non-fatal skin cancer.

The six flights daily would increase ultraviolet

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exposure by about .08 per cent. But skin cancer danger is dependent on prolonged exposure and the duration of Concorde operations. It is estimated an additional 200 cases of skin cancer would arise after a period of 30 years of continuous operation, given a correction factor of two to three. Currently there are 250,000 annual cases of nonfatal skin cancer in the U.S. However, the theory of ozone reduction cannot be scientifically proved. Scientists monitored an increase of ozone between 1960-1970 In one location while theoretically there should have been a decrease owing to pollutants from nuclear explosions and other sources. The aerosol sprays, which would have greater effect on the stratosphere than 40 Concordes operated worldwide, have not been banned in the United States due to insufficient data to prove ozone depletion. These facts coupled with the fact that Concorde's flight altitude of 17 Km is relatively low, the projected number of 30-50 Concordes would not have greater effect on ozone than natural causes.

CHAPTER IX

THE PROPOSED MULTILATERAL CONVENTION ON NOISE AND SONIC BOOM

The establishment of uniform law and standards is one of the principal objectives of the proposed convention on noise and sonic boom. Within the confines of public law, national regulatory procedures would only provide basis for non-uniform international standards. Even with the application and enforcement of appropriate ICAO standards and recommended practices, uniformity would be hard to achieve.²⁹⁷ As a result at present the position of international law on this aspect and other environmental issues remains uncertain.

The Rome Convention was considered inappropriate for amendment to include noise and sonic boom for several reasons. First because the Rome Convention has been ratified only by 27 states, which may indicate lack of support due to low limits of liability and the apparent ambiguity of its text. Secondly, Chapter III of the Convention is cumbersome and the single forum provisions of Article 20 do not allow jurisdiction in the state of registration of

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 297 See page 149, the scope of ICAO annexes.

the aircraft. Thirdly the Convention in its present form is of limited utility as a number of states have adequate domestic law dealing with the substance of the Rome Convention.²⁹⁸

When the subject of the Revision of the Rome Convention (1952) on the Damage Caused by Foreign Aircraft to Third Parties on the surface was discussed at the 21st Session of the Legal Committee of ICAO, 3-22 October 1974, a decision was made to establish a Sub-committee to prepare a text or alternative texts on the amendment of the Rome Convention and another text or alternative texts of an instrument, on the liability for damage caused by noise and sonic boom. 299 The Sub-committee' also discussed the ambiguity in Article 1(1) of the Rome Convention in relation to claims arising out of noise and sonic boom, particularly the latter. The question is one of interpretation of Article 1(1), whether the damage envisaged therein covered both noise and vibrations of the sonic boom type, or it

298 ICAO Doc. 9122 Lc/172, Part III, p. 59, and ICAO LC/SC Rome-Report 19/2/75, p. 5.

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²⁹⁹ ICAO Doc LC/SC Rome-NSB WD/1, February 19, 1975; The Sub-Committee met in Montreal from April 8-23, 1975. Also ICAO Doc. 9122 LC/172, Part III, p. 61, paras. 4.5 and 5.1.

was confined to the actual physical impact of an object falling from an aircraft or impact of the aircraft itself.

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It would appear from the original working drafts of the Rome Conference a narrow interpretation was intended.³⁰⁰ An attempt to enumerate the possible causes of damage excluded, inter alia, damage caused by extraordinary noise. However, as shown in the working drafts, the system of enumeration would have included damage caused by explosion, a factor which would have been linked or assimilated to the sonic boom phenomenon. The removal of this ambiguity is desirable to avoid the possibility of dual application of the 1952 Rome Convention and the proposed Noise and Sonic Boom Convention, giving rise to possibilities of a conflict.³⁰¹

(a) The System of Liability

In recent air law conventions the rule of strict liability has been followed. 302° It appears a number of

300 ICAO Doc. 7379-LC/34 Conference on Private Air Law, Rome Sept.-Oct. 1952, Vol. II, Doc. April 1953; Chapter I, Principles of Liability, p. 6. Also the question of noise and sonic boom particularly the latter was not envisaged in 1952.

301 ICAO Doc. LC/SC Rome NSB WD/1 8-23 April 1975, Report, p. 17, para. 54.

302 The Guatemala City Protocol, 1971, Article 20, and the Montreal Protocol No. 4, 1975, Article 18.

countries favour this principle to absorb the impact of double insurance, to reduce the cost and multiplicity of litigation by encouraging settlements out of court and to set up a limit of liability.

Following the Sub-committee's discussion, divergent views were expressed on whether there should be absolute or strict liability for noise and sonic boom damage and whether such liability, having regard to the pre-requisite establishment of fault or breach of applicable standards and regulations, should cover both physical and non-physical damage. Some delegations preferred to draw no distinction in the treatment of damage cuased by either noise or sonic boom.³⁰³

The terms of reference of the Sub-committee directed it to prepare a text or alternative texts of an instrument on the liability for damage caused by noise and sonic boom, having regard to the Legal Committee's discussions, IATA's specific proposals and decisions of the Sonic Boom Committee. ³⁰⁴ Pursuant to the indicative votes taken at its 21st Session, the Legal Committee decided that Liability

³⁰³ LC/SC Rome NSB Report, pp. 13-18.
 ³⁰⁴ ICAO Doc. 9122 LC/172, Part III, p. 64.

for noise damage should be based on non-compliance with the applicable regulations and sonic boom liability should be absolute. Furthermore, the Sub-committee was asked to analyze the nature of damage, whether physical damage or other types of damage.³⁰⁵

Three views seem to have emerged at the Sub-committee meeting. The first comprises of IATA's proposal that there should be a system of strict liability for damage caused by noise and sonic boom. The proposal draws a distinction between 'impact damage' or tangible physical damage, (whether to persons or property) and non-physical or moral / damage such as nuisance, trespass and inverse condemnation. As regards 'impact damage' the operator of the aircraft would be strictly liable if he violates the applicable standards and regulations. In the case of non-physical damage, his liability for breach of regulations would be limited to criminal or administrative fine or penalty. In either case a restricted number of defences would be avail -able, which would include involuntary breaches of regulations caused by meteorological conditions or reasons of safety of air navigation and situations of inadequacy of ground aids as a result of which the pilot is misled as 'to his

305 ICAO Doc. 9122, LC/172, Part III, p. 62, paras. 5.2-5.5.

position. However, these defences would apply only in cases of breaches of operational standards and would not cover cases in which the aircraft does not have a valid noise certificate. In such cases the operator would be liable for both physical and non-physical damages, in addition to criminal or administrative penalty.³⁰⁶

Secondly, two delegations felt that the aircraft operator should be liable if he causes physical damage although he complied with applicable regulations but that such liability should be restricted to cases like damage caused to farming, in particular to mink, fox, chicken, cattle and structural damage of a cumulative nature. On the other hand, in respect of non-physical damage the operator could avail himself of the defence that he complied with the applicable regulations with the burden of proof resting on the claimant if it is so desired.³⁰⁷

The third view was that the operator should not be liable for any damage (physical or other) caused by noise if he fully complied with the applicable standards but that in the case of sonic boom his liability for any damage

³⁰⁶ LC/SC Rome, April 1975. ICAO Report, pp. 14-15. ³⁰⁷ IATA's Report to its Legal Committee--file 3423-A 12/659, 31/24, dated May 6, 1975, p. 6.

should be absolute. 308

The Sub-committee did not come out with concrete results and failed to produce any acceptable text or alternative texts of a noise and sonic boom instrument. Its conclusion was that there was a general view in favour of compensating claimants for damage due to noise caused by ' flights performed in violation of air traffic regulations or by sonic boom, although there was no agreement as to the methods which might be employed to achieve these results. 309 The Sub-committee further considered ³¹⁰ that without additional information and studies, this problem could not adequately be analyzed for the purposes of drafting a new instrument on liability for damage caused by noise and sonic boom. It noted that it was not possible, at the Subcommittee level to reach an adequate consensus which would enable it to prepare a draft instrument or several alternative texts. The entire question was therefore referred back to the Legal Committee, which would review the matter and possibly make specific suggestions as to how ICAO should

308 See footnate no. 303.

³⁰⁹ LC/SC Rome, ICAO Report, April 1975, p. 17. ³¹⁰ LC/SC/Rome, ICAO Report, April 1975, p. 18.

resolve the noise and sonic boom problem.

The Legal Committee would, presumably, give priority to the consolidation of the Warsaw system or the amendment of the 1952 Rome Convention, a subject which IATA considers less important and of less interest to it and the carriers.³¹¹ States have been asked to provide more technical details, information and statistical data. In view of ICAO's own detailed studies on the subject of noise and sonic boom, very little would be accomplished by seeking information from states.³¹²

As it is socially desirable to compensate victims of noise and sonic boom,³¹³ the Hability for wrongful failure to observe operational regulations should be strict. On the assumption that supersonic aircraft will be regulated to avoid causing boom damage, a minimal level of booms could be tolerated pending further technological advances. The same applies to noise levels below 108 EPNdB,³¹⁴ or such other limit that may be technologically feasible. This would

³¹¹ IATA's Report to its Legal Committee file 3423-A (May[®]6, 1975), page 1-12/659, 31/24.

312 ICAO's Sonic Boom Panel, Doc. 8894/11 Sonic Boom Committee Doc. 9011/1; 9064/2 Noise Committee Docs. 8857 (NOISE 1969); 8893 CAN/11; 9063 CAN/3;9133 CAN/4.

³¹³ LC/SC Rome, April 1975, ICAO Report, p. 15, para. 50. ³¹⁴ Ibid., p. 30. compromise economic and technological factors, with the hope that continued improvement in the future will be possible. It would be undesirable to distinguish liability caused by noise from that caused by sonic boom damage because the effects of both noise and sonic boom are identical.³¹⁵ For economic reasons non-physical or psychological damage may be excluded. A limit of liability need not be introduced if this problem is unlikely to increase in the future.

An alternative solution would be to introduce a strict liability system for both physical and non-physical damage for wrongful failure to observe operational regulations, and an administrative or criminal penalty for invalid noise certificates. To reduce litigation and claim expenses a system of environmental insurance may be considered through which all claims would be channelled and for which the airlines and aiport authorities would contribute mandatory premiums. This mandatory environmental insurance may be centrally operated by IATA on behalf of its carriers. Under the circumstances airport operators and carriers will not be

³¹⁵ Similar suggestion was made by U.K. and Denmark to have both sonic boom and noise in one Convention. LC/SC Rome, April 1975; also U.S.S.R. delegation--IATA Report on ICAO Legal Sub-committee on Rome Convention 1952. Noise and Sonic Boom, Ref. 3423-A, p. 8, (6.575).

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subjected to civil liability in trespass, nuisance or inverse condemnation.

(b) Proposed Text of the Convention

At the ICAO Legal Sub-committee meeting on Noise and Sonic Boom in May, 1975, proposals were made to prepare a text incorporating the provisions of Chapter I of the Rome Convention (1952), modifying it as necessary.³¹⁶ Deletion of Article 7 from the Rome text was suggested since that Article does not relate to the noise and sonic boom question. Article 9 of the Rome text as redrafted and modified would read:

Article 9

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Neither the operator, the owner, any person liable under Article 3 or Article 4 nor their respective servants or agents shall be liable for damage resulting from noise and sonic boom otherwise than as expressly provided in this Convention. This rule shall not apply to any such person who is guilty of a deliberate act or omission done with intent to cause damage.

The basic change in this Article concerns the phrase

³¹⁰ IATA Report on ICAO Legal Sub-committee on Rome Convention; Noise and Sonic Boom--Ref. 3423-A; 6th May 1975, p. 10. Also see Chapter I of The Rome Convention (1952). "resulting from noise and sonic boom." The last sentence contains the words "with intent to cause damage", which requirement would negate the principle of strict liability, since a difficult burden of proof is cast on the claimant to show the carrier's or operator's intent to cause damage. It should suffice to relate the inference of a "deliberate act or ommission" only to the breach of operational procedures. This would be consistent with the provisions of Article I presented by the Chairman of the Sub-committee:

Article I

- Damage to third parties on the surface caused by noise produced by an aircraft in flight does not entitle a person to compensation unless the flight was not in conformity with existing regulations.
- 2. Damage caused by sonic boom produced by the flight of an aircraft entitles a person to compensation if it is established that the damage was due to sonic boom.
- 3. For purposes of this Convention an aircraft is considered to be in flight from the moment when power is applied for the purposes of actual take-off until the moment when the landing run ends. In the case of an aircraft lighter than air, the expression "in flight" relates to the period from the moment when it becomes detached from the surface until it becomes again attached thereto.

The liability provisions in Article I should not distinguish noise from sonic boom. Damages caused by both and the technical description of noise and sonic boom are closely linked.³¹⁷ Though in future supersonic cruise aircraft will increase in number, overland supersonic flights would not be permitted in many countries.³¹⁸ Therefore noise as such will remain a dominant cause of public complaint.

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The United Kingdom presented an alternative text to Article I covering broadly the necessary legal principles:³¹⁹

Article I

- A person shall be liable without proof of fault for damage caused by the noise or sonic boom of an aircraft operated by him.
- 2. It shall be a defence to an action in respect of damage not of a physical character if the operator proves that the aircraft flew in accordance with the applicable regulations.
- 3. Except as provided above, an action shall not be brought against a person in respect of noise or sonic boom of an aircraft operated by him.

Paragraph I covers the principle of strict liability * in the case of physical damage caused by noise or sonic boom.

317 See pp. 34-39; supra.

318 See p. 42, note 102.

³¹⁹ IATA Report on ICAO Legal Sub-committee on the Rome Convention--Noise & Sonic Boom, Ref. 3423-A. of 6th May, 1975, pp. 8-9. Under paragraph 2 non-physical damage is also actionable if the operator violates flight regulations. The question of limited defences such as meteorological and safety aspects necessitating a departure from the standards or operational rules would be dealt with in a separate provision. In general this proposal appears reasonable for purposes of establishing noise and sonic boom liability. The Soviet Union made an identical proposal for an alternative to Article I, but with a definition of damage as "a direct physical harm suffered by any person or property." ³²⁰

The question of defining terms such as "damage", "noise" and "sonic boom" was briefly considered by the Sub-committee but nothing substantial was done.³²¹ It is submitted a definition of these terms is needed to avoid divergent court interpretations and to give effectiveness to the objectives of the convention. Thus 'damage' may be defined as "direct physical harm caused to any person or property arising out of noise or sonic boom and for purposes of para. 2 of Article I it includes non-physical injury." For the definition of sonic boom the technical description contained

320 Ibid., p. 8.

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³²¹ Ibid., p. 8. See also possibility of court divergent interpretation, pp. 20-21 supra.

in ICAO's Sonic Boom Panel II may be incorporated.³²² Due to its subjective value, noise can only be defined in very broad terms.³²³

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The Position of ICAO

ICAO appears to hesitate taking firm legal action on noise and sonic boom due to policy and economic constraints. This is borne out by the Council's refusal to set up retrofit rules and its cautious approach towards standardized supersonic aircraft noise regulations.³²⁴ Developing countries have not been keen to acoustically treat their fleets with expensive retrofit kits, largely containing the older noise aircraft. Compounding the financial aspect is that noise has not reached a crisis proportion as in highly industrialized nations.³²⁵ Many of these countries, including some developed countries, would prefer a "phasing

³²² See supra pp. 19-20

323 See supra pp. 15-16

³²⁴ Doc. 9133, CAN/4 (SUPPLEMENT). Decision of the Council at 12th Meeting of its 48th Session on 26/3/75, Rec. 7/2. See also pp. 72-73, supra ICAO's refusal to endorse a retrofit programme internationally.

325 ICAO Doc. 9133 Committee on Aircraft Noise CAN/4, Fourth Meeting Feb., 1975, p. 6-1. out" period to retive their older noisy planes, rather than invest heavily in retrofit measures whose cost/effectiveness ratio is low.³²⁶ This helps to explain the attitude of ICAO towards noise abatement measures and retrofit.

In part ICAO shows more bias towards the technological advancement of civil aviation rather than environmental after effects.

Consequently, a convention on noise and sonic boom may be delayed even further in view of the Sub-committee's failure to reach meaningful results. Meanwhile it is hoped the climax of aircraft noise has been reached, and that in due course technological improvements will gradually scale it down.

(d) Is a Convention Needed

The question now, arising is whether a convention on noise and sonic boom is needed, and if so, what priority should it be given by the Legal Committee of ICAO. An essential pre-requisite is the willingness of states to take concerted action to reduce the level of noise, having

³²⁶ See pp. 70-71 supra.

recognized the seriousness of this problem.³²⁷ When the subject was referred to the Sub-committee for study, the need for an international convention was not in issue. The 21st Session of the Legal Committee gave a clear mandate to the Sub-committee to draft a treaty on noise and sonic boom.³²⁸ The terms of reference stated that "the Subcommittee <u>should</u> prepare a text or alternative texts of an instrucment on the liability for damage caused by noise and sonic boom, taking into account the discussions in the Committee, specific proposals made by IATA, decisions of the Sonic Boom Committee and the information that may be received from IAEA."

In failing to produce a draft text of the Convention on Noise and Sonic Boom, the Legal Sub-committee did not fulfil its mandate. It concluded that no agreement was reached on how to compensate victims of noise and sonic boom, caused by flights not in accordance with air traffic

"The need for an international convention was felt by a number of states even at the Sub-committee Session--(1975-March)--LC/SC Rome NSB WD/7 20/3/75. Greece held the view that problem was serious and needed international action. LC/SC Rome NSB WD/9 2/4/75.

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LC/SC Rome-NSB WD/1 19/2/75, p. 1-2.

regulations.³²⁹

The question of liability is linked to operational regulations and standards pertaining to noise and sonic boom. Presently national laws and standards are either absent or are divergent and dissimilar to the standards in Annex 16 of ICAO. The main point in issue is not how victims should seek redress, but whether air carriers should be held responsible for noise and sonic boom damage, if they comply with one or the other of these rules. IATA carriers have been held responsible in some states for damages on the basis of nuisance and 'trespass because of noise, even when operating in conformity with existing air traffic regulations.³³⁰ While under national law victims of noise and

³²⁹ ICAO LC/SC Rome-NSB WD/2, Sub-committee on Rome Convention (1952), Noise & Sonic Boom, April 1975, p. 17. Also see paragraph 57-notes 1-2, certain delegations considered that the reference to air traffic regulations includes the standards in Annex 16 and in national laws relating to noise. This is a potential source of conflict. One delegation felt dissatisfied with the Sub-committee results noting that the Sub-committee should only indicate what provisions the Convention shoull contain concerning liability of operators for noise and the Sub-committee should if possible, express some kind of preference for one or more of the proposals made to that effect during the meeting.

330 ICAO LC/SC Rome - NSB WD/2 Sub-committee on Rome Convention (1952), Noise & Sonic Boom, April 1975, p. 14, para. 45.

sonic boom would be compensated, air carriers do not know what regulations and standards they should follow to avoid liability. The situation is more uncertain to carriers operating international services.

• Annex 16 of the Chicago Convention on Noise does not define liability rules or operating procedures. A Convention on Noise and Sonic Boom would make provision for these deficiencies and enable the carriers to purchase liability insurance. An overall advantage would be the establishment of uniform international rules and guiding rules to manufacturers on what level of noise is not permissible in international law.

A convention on noise would also assist the United Nations Environmental Programme in improving the quality of the human environment.³⁻³¹ Furthermore it would help to clarify the status of the environmental air space over the high seas, when supersonic aircraft fly over national installations or economic zones of territorial states. The stage would have been set for the much wider question of the international legal protection of the air space from environmental damage, encampeing both noise and other emissions.

In the light of preceding remarks the question of noise

Nations Conference on the Human Environment to improve the quality of the human environment.

and sonic boom should be accorded priority in the work programme of the Legal Committee of ICAO. This matter deserves better treatment than the revision of the Rome Convention (1952) on Damage Caused by Foreign Aircraft to Third Partres on the Surface.

Annex 16 to the Chicago Convention represents rules of international law governing noise within the vicinity of aerodromes. But there are no internationally recognized standards for sonic boom or other atmospheric emissions from aircraft. The international aviation community should concern itself not only with the noise aspect of the environment but also with these other forms of aircraft pollutions.

Arguments against a noise and sonic boom convention take account of the technological aspects of the problem. One school of thought is that the problem is more technical than legal and that since the solution lies in technology, it is doubtful whether a treaty on noise and sonic boom ' would serve any useful purpose. Assertions have been made that domestic law adequately covers environmental issues and that boom effects are highly minimized by the prohibition of overland supersonic flights. However many issues would be left open, for instance, adjacent states bordering the high seas wishing to prevent supersonic flights, for the effects of such flights over their territorial waters and coastal belt, would need a solution to the problem beyond their national laws.³³²

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The sonic boom appears insignificant partly because there are a handful of commercial supersonic aircraft and there had been little need to cruise supersonic over land masses and populated areas. However, the future mode of long range air transport beyond 1980s will be predominantly supersonic. Some states may not prohibit overland supersonic cruise within their territories. Given the atmospheric variables, the boom parameters and the width of the sonic boom carpet, there are chances than an aircraft flying supersonic in one country may spread its boom carpet in a neighbouring or adjacent state which does not allow supersonic flights over its territory.

332 At the altitude of 56,000 ft. the Concorde boom carpet is about 45 nautical miles (80 Kmg.) and at 63,000 ft. the boom carpet is about 50 miles wide (5 Kms.)--ICAO Sonic Boom Panel, Doc. no. 8894, Chapter 2, pp. 1-23.
SUMMATION

Numerous man-made pollutants abound in the "human environment" and are now known to have adverse physiological, psychological and climatic effects. Noise and sonic boom are no exception. Barely a decade ago a handful of people or indeed. none, would entertain the theory of noise induced heart disease, blood pressure, mental illness and other serious health impediments. Beyond a certain limit, these may pose a definite threat to the very existence of mankind.

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The international community is concerned with environmental problems partly due to the harmful effects of pollution, and partly due to the universality of pollutants and their sources. The existing United Nations machinery for improving the quality of the environment must therefore be complemented by international law in every practicable field.

Noise abatement measures have been largely hindered by strong economuc arguments, without considering the extent of disamenity caused by noise to the public. No doubt airport neighbours derive benefits from its activities, materially, both in terms of trade and employment, and naturally, <u>guid pro quo</u>, those who gain must reciprocate by enduring a certain level of noise nuisance.

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But the airport also have value to the nation as a whole.³³³ Urgently needed goods and other commodities are rapidly transported to air saving time and labour. The passenger is able to fly to distant places at short notice

333 Richards, "Putting a Value on Noise," The Aeronautical Journal, May 1976, p. 194.

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within a few hours. The airport is a source of employment and government revenue.

Heathrow airport, for example, was estimated in 1970 to be worth an annual income of 300 million, of which only 15 per cent benefitted the airport neighbours in the form of trade and labour. Of these only a small fraction lived . in the noisy area. 334 In 1967 the number of people seriously annoyed by aircraft noise was 480,000. The minimum value disamenity suffered by these people consisted of the financial cost of moving from the noise-ridden area to a quiet place, together with the value of a new home.

Over a ten year period at Heathrow there was a house price deficiency of 33 million. Out of the United Kingdom population of 60 million, 3 million suffer noise disamenity at an estimated cost of 66 million, while deriving a benefit of not more than 15 million (1/20 of 300 million). The disamenity is four times what the airport is worth to them and significantly more than the airport worthwhileness to the whole neighbourhood.

Looking at Heathrow's national economic value as analyzed, a formula may be devised for utilization of part of such income to defray the cost of noise disamenity by disbursement of funds from the national treasury. As a result, airport operators, airlines and consumers need not

334 Ibid., p. 197.

necessarily incur additional expenses due to retrofit or other measures of noise abatement.

Neither bilateral agreements nor the restrictive provisions of the Chicago Convention recommend themselves as effective means of controlling aircraft noise, and other emissions.

At the Chicago Conference in 1944 the question of noise and sonic boom did not preoccupy the minds of those who participated in preparing the Convention. If the provisions of the Chicago Convention are used to restrict the commercial operations of foreign airlines, national and economic interests of those states would prompt retaliation in one way or another. Therefore, even though these measures may be legally justifiable it would be politically inexpedient to apply them. An acceptable multilateral agreement could eliminate this possibility. Additionally, the uniformity of aviation environmental standards, operating procedures and their general applicability will be ensured.

While the use of annexes to the Chicago Convention so far has not been extended to cover the sonic boom phenomenon, the provisions of Annex 16 on the technical aspects of noise fall short of prescribing operating procedures, albeit providing an answer on such issues as the liability of operators under private international air law.

For the present time national regulatory measures play a key and useful role in controlling noise within the vidinity of airports, 335 However, sonic boom is not as localized as noise, since it produces a boom carpet spreading . for many miles on the surface of the earth. 336 This might give rise to international repercussions. Therefore, even if supersonic flights were confined over the high seas, states wishing to prevent the effect of sonic boom carpets would be concerned, notwithstanding the fact that flights take place in the international navigable airspace. Moreover, as an increase of commercial supersonic aircraft is anticipated in the future.³³⁷ booms are likely to cause problems to states adjacent to the high seas and others, whose marine navigation and offshore installations are affected.

Consequently, the sonic boom problem will not remain insignificant when supersonic or even hypersonic aircraft

335 See pp. 47-56 supra:

³³⁶ See p. **20** supra.

³³⁷ The projected future production of Concorde is between 40-50 aircraft. The U.S. estimates a large potential market of 350-1500 supersonic aircraft between the year 1980-2000--NASA Technical Memorandum N76-12041.NASA BMX-72781--System Integration Studies for Supersonic Cruise Aircraft--Vincent Mascitti, September 1975, p. 4.

337(a) Aircraft capable of speeds between Mach 5 and Mach 10. are, introduced intorregular commercial air transport.

Related to noise and sonic boom is the subject of aircraft emissions, whose environmental impact is still little known and for which there is no international control. A noise and sonic boom treaty would be an important first step towards a wider international protection of the environmental airspace. Like the sonic boom phenomenon, aircraft emissions have international dimensions.

While it is hoped in the future technology would highly reduce noise levels, booms and engine emissions, in the meantime preventive legal means ought to be devised to protect society by preserving a more sanguine environment. This opportunity rests with ICAO.

The concern of airlines on liability for environmental damage ought to be considered as well. As IATA observed at the Sub-committee Session, 338 airlines have been held liable for damages on the basis of nuisance and trespass because of noise, irrespective of whether they operated in conformity with existing traffic regulations. IATA's anxiety would be the extent of removed if liability is known, defined and given an international content. Henceforth, noise and sonic boom could

³³⁸ ICAO LC/SC Rome April 1975, Report p. 14, para. 45. In the United States, aircraft operations continue to run the risk of legal action by private individuals.

become insurable, when the operator's liability is ascertainage, to the greatest advantage of the general public.

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APPENDIX I

THE UNITED NATIONS DECLARATION ON THE HUMAN ENVIRONMENT AND PRINCIPLES

A. THE ENVIRONMENTAL CRISIS: GLOBAL PERSPECTIVES

Declaration of the United Nations Conference on the Human Environment

(from <u>Conference on the Human Environment</u>, Report on Canada's Preparation. 1972, Info. Can., Ottawa)

THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT,

HAVING MET at Stockholm from 5 to 16 June 1972,

HAVING CONSIDERED the need for a common outlook and for common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment,

PROCLAIMS THAT:

1. Man is both creature and moulder of his environment, which gives him physical sustenance and affords him the opportunity for intellectual, moral, social and spiritual growth. In the long and tortuous evolution of the human race on this planet a stage has been reached when, through the rapid acceleration of science and technology, man has acquired the power to transform his environment in countless. ways and on an unprededented scale. Both aspects of man's environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights-even the right to life itself.

2. The projection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world; it is the urgent desire of the peoples of the whole world and the duty of all Governments.

3. Man has constantly to sum up experience and go on discovering, inventing, creating and advancing. In our time, man's capability to transform his surroundings, if used wisely, can bring to all peoples the benefits of development and the opportunity to enhance the quality of life. Wrongly or heedlessly applied, the same power can do

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incalculable harm to human beings and the human environment. We see around us growing evidence of man-made harm in many regions of the earth: dangerous levels of pollution in water, air, earth and living beings; major and undesirable disturbances to the ecological balance of the biosphere; destruction and depletion of irreplaceable resources; and gross deficiencies harmful to the physical, mental and social health of man, in the man-made environment, particularly in the living and working environment.

4. In the developing countries most of the environmental problems are caused by under-development. Millions continue to live far below the minimum levels required for abdecent human existence, deprived of adequate food and clothing, shelter and education, health and sanitation. Therefore, the developing countries must direct their efforts to development, bearing in mind their priorities and the need to safeguard and improve the environment. For the same purpose, the industrialized countries should make efforts to reduce the gap between themselves and the developing countries. In the indust/rialized countries, environmental problems are generally related to industrialization and technological development.

5. The natural growth of population continuously presents problems on the preservation of the environment, and adequate policies and measures should be adopted, as appropriate, to face these problems. Of all things in the world, people are the most precious. It is the people that propel social progress, create social wealth, develop science and technology and, through their hard work, continuously transform the human environment. Along with social progress and the advance of production, science and technology, the capability of man to improve the environment increases with each passing day.

6. A point has been reached in history when we must shape our actions throughout the world with a more prudent care for their environmental consequences. Through ignorance or indifference we can do massive and irreversible harm to the earthly environment on which our life and well-being depend. Conversely, through fuller knowledge and wiser action, we can achieve for ourselves and our posterity a better life in an environment more in keeping with human needs and hopes. There are broad vista for the enchancement of environmental quality and the creation of a good life. What is needed is an enthusiastic but calm state of mind and intense but orderly work. For the purpose of attaining freedom in the world of mature, man must use knowledge to build, in colaboration with nature, a better environment. To defend and improve the human environment for present and future generations has become an imperative goal for mankind--a goal to be pursued together with, and in harmony with, the established and fundamental goals of peace and of world-wide economic and social development.

7. To achieve this environmental goal will demand the acceptance of responsibility by citizens and communities and by enterprises and institutions at every level, all sharing equitably in common efforts. Individuals in all walks of life as well as organizations in many fields, by their values and the sum of their actions, will shape the world environment of the future. Local and national governments will bear the greatest burden for large-scale environmental policy and action within their jurisdictions. International co-operation is also needed in order to raise resources to support the developing countries in carrying out their responsibilities in this field. A growing class of environmental problems, because they are regional or global in extent or because they affect the common international realm, will require extensive co-operation among nations and action by international organizations in the common interest. The Conference calls upon Governments and peoples to exert common efforts for the preservation and improvement of the human environment, for the benefit of all the people and for their posterity.

STATES THE COMMON CONVICTION THAT:

PRINCIPLE 1

Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations. In this respect, policies promoting or perpetuating <u>apartheid</u>, racial segregation, discrimination, colonial and other forms of oppression and foreign domination stand condemned and must be eliminated.

PRINCIPLE 2

The natural resources of the earth including the air, water, land, flora and fauna and especially representative samples of natural ecosystems must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

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The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.

PRINCIPLE 4

Man has a special responsibility to sateguard and wisely manage the heritage of wildlife and its habitat which are now gravely imperilled by a combination of adverse factors. Nature conservation including wildlife must therefore receive importance in planning for economic development.

PRINCIPLE 5

The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind.

PRINCIPLE 6

The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of all countries against pollution should be supported.

PRINCIPLE 7

States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

PRINCIPLE 8

Economic and social development is essential for ensuring a favourable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life.

Environmental deficiencies generated by the conditions of underdevelopment and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required.

PRINCIPLE 10

For the developing countries, stability of prices and adequate earnings for primary commodities and raw material are essential to environmental management since economic factors as well as ecological processes must be taken, into account.

PRINCIPLE 11

The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries, nor should they hamper the attainment of better living conditions for all, and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.

PRINCIPLE 12

Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.

In order to achieve a more rational management of resources and thus to improve the environment, States should adopt an integrated and co-ordinated approach to their development planning so as to ensure that development is compatible with the need to protect and improve the human environment for the benefit of their population.

PRÍNCIPLE 14

Rational planning constitutes an essential tool for reconciling any conflict between the needs of development and the need to protect and improve the environment.

PRINCIPLE 15

Planning must be applied to human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all. In this respect projects which are designed for colonialist and racist domination must be abandoned.

PRINCIPLE 16

Demographic policies, which are without prejudice to basic human rights and which are deemed appropriate by Governments concerned, should be applied in those regions where the rate of population growth or excessive population concentrations are likely to have adverse effects on the environment or development, or where low population density may prevent improvement of the human environment and impede development.

PRINCIPLE 17

Appropriate national institutions must be entrusted with the task of planning, managing or controlling the environmental resources of States with the view to enhancing environmental quality.

Science and technology, as part of their contribution to economic and social development, must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems and for the common good of mankind.

PRINCIPLE 19

Education in environmental matters, for the younger deneration as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension. It is also essential that mass media of communications avoid contributing to the deterioration of the environment, but, on the contrary, disseminate information of an educational nature, on the need to protect and improve the environment in order to enable man to develop in every respect.

PRINCIPLE 20

Scientific research and development in the context of environmental problems, both national and multinational, must be promoted in all countries, especially the developing countries. In this connexion, the free flow of up-to-date scientific information and transfer of experience must be supported and assisted, to facilitate the solution of environmental problems; environmental technologies should be made available to developing countries on terms which would encourage their wide dissemination without constituting an economic burden on the developing countries.

PRINCIPLE 21

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and 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.

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States shall co-operate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction.

PRINCIPLE 23

Without prejudice to such criteria as may be agreed upon by the international community, or to standards which will have to be determined nationally, it will be essential in all cases to consider the systems of values prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for the developing countries.

PRINCIPLE 24

International matters concerning the protection and improvement of the environment should be handled in a co-operative spirit by all countries, big or small, on an equal footing. Co-operation through multilateral or bilateral arrangements or other appropriate means is essential to effectively control, prevent, reduce and eliminate adverse environmental effects resulting from activities conducted in all spheres, in such a way that due account is taken of the sovereignty and interests of all States.

PRINCIPLE 25

States shall ensure that international organizations play a co-ordinated, efficient and dynamic role for the protection and improvement of the environment.

PRINCIPLE 26

Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction. States must strive to reach prompt agreement, in the relevant international organs, on the elimination and complete destruction of such weapons.

APPENDIX II

THE CONSTITUTION OF THE UNITED NATIONS GOVERNING COUNCIL FOR ENVIRONMENTAL PROGRAMMES

Governing Council of Environmental Programmes

The General Assembly 339

1. Decides to establish the governing council for environmental programmes composed of 58 members elected by the United Nations General Assembly for three-year terms on the following basis:

- (a) Sixteen seats for African states;
- (b) Thirteen seats for Asian states;
- (c) Ten seats for Latin American states;
- (d) Thirteen seats for Western European and other states;
- (e) Six seats for Eastern European states;

2. Decides further that the Governing Council shall have the following main functions and responsibilities:

- (a) To promote international co-operation in the environment field and to recommend, as appropriate, policies to this end;
- (b) To provide general policy guidance for the direction and co-ordination of environmental programmes within the United Nations system;
- (c) To receive and review the periodic reports of
 the Executive Director, referred to in paragraph
 5 below, on the implementation of environmental programmes within the United Nations system;
- (d) To keep under review the world environmental situation in order to ensure that emerging environmental problems of wide international significance should receive appropriate and adequate consideration by Governments;
- (e) to promote the controbution of the relevant international scientific and other professional communities to the acquisition, assessment and

339 United Nations Resolution No. 2957 (XXVII), December 15, 1972.

exchange of environmental knowledge and information and, as appropriate, to the technical aspects of the formulation and implementation of environmental programmes within the United Nations system;

(f) To maintain under continuing review the impact of national and international environmental policies and measures on developing countries, as well as the problem of additional costs that might be incurred by developing countries in the implementation of environmental programmes and projects, to ensure that such programmes and projects shall be compatible with the development plans and priorities of those countries;

(g) To review and approve annually the programme of utilization of resources of the Environment Fund referred to in section III below:

3. Decides further that the Governing Council shall report annually to the General Assembly through the Economic and Social Council, which will transmit to the General Assembly such comments on the report as it may deem necessary, particularly with regard to questions of coordination and to the relationship of environment policies and programmes within the United Nations system to overall economic and social policies and priorities;

II

Environment Secretariat

4. ... Decides that a small secretariat shall be established in the United Nations to serve as a focal point for environmental action and co-ordination within the United Nations system in such a way as to ensure a high degree of effective management;

5. Decides further that the environment secretariat shall be headed by the Executive Director, who shall be elected

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by the General Assembly on the nomination of the Secretary-General for a term of four years and who shall be entrusted, inter alia, with the following responsibilities:

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- (a) To provide substantive support to the Governing Council;
- (b) To co-ordinate, under the guidance of the Governing Council, environment programmes within the United Nations system, to keep under review their implementation and to assess their effectiveness;
- (c) To advise, as appropriate and under the guidance of the Governing Council, intergovernmental bodies of the United Nations system on the formulation and implementation of environmental programmes;
- (d) To secure the effective co-operation of, and contribution from.

APPENDIX III

THE DRAFT RECOMMENDATION ON AIRCRAFT NOISE ABATEMENT , AS AMENDED BY THE UNITED KINGDOM³⁴⁰

WHEREAS ECAC States agree that all technically feasible and economically reasonable steps should be taken to reduce the disturbance suffered by people leaving near airports from the noise of aircraft operations;

WHEREAS the disturbance depends partly on the noise emissions of aircraft and partly on other factors such as operating procedures and weather conditions;

WHEREAS ECAC States agree that the most desirable way of reducing disturbance is to reduce the level of noise emissions from aircraft;

WHEREAS the standards now incorporated in Annex 16 of the Chicago Convention for the noise emission of new subsonic aircraft define the lowest noise levels which had been shown to be technically feasible and economically reasonable on this type of aircraft at the time they were agreed;

WHEREAS further reduction in these noise levels had been made possible by subsequent developments in technology and proposals are being considered to revise the standards accordingly;

WHEREAS subsequent revisions of the standards will be made, as advances in technology allow still lower noise levels to be attained;

WHEREAS the high costs and limited benefits of retrofitting older types of subsonic jet aircraft have been demonstrated by technical and financial data assembled by the group of experts on the abatement of noise caused by air transport set up by the SEventh Intermediate Session of ECAC;

340 ECAC/9-WP/14, 10 June 1976 (Appendix)

WHEREAS it is desirable that ECAC States should adopt at an early date a common attitude towards the problem of retrofitting;

THE CONFERENCE

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- A. RECOMMENDS that Member States:
- should continue to support ICAO's efforts to develop acceptable world-wide measures for abating aircraft noise;
- 2. should, instead of requiring the retrofit of all subsonic jet aircraft which do not have to comply with the standards of Annex 16 to the Chicago Convention, explore positive measures to promote the early retirement of older types of subsonic jet aircraft;
- 3. should, having regard to the results of further analysis, specify a date by which their operators shall not be permitted to use, on international flights beginning or ending in their territories, subsonic jet aircraft first entered on their registers after the specific date which are not certificated in accordance with Annex 16.
- should expedite the measures necessary to increase in their fleets the proportion of aircraft incorporating modern acoustic technology;
- 5. should pursue the abatement of aircraft noise by measures harmonized where possible within ECAC, and whenever possible in co-operation, with other states, preferably under the auspices of ICAO; and
- should work towards the adoption of a common method and unit for the purpose of assessment of hoise exposure; and

B. REQUESTS the President of ECAC to inform ICAO of the above.

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APPENDIX IV

DOMESTIC NOISE REGULATIONS IN SELECTED COUNTRIES

I. FRANCE

Code de l'Aviation civile

Décret no. 55-1590 du 30 novembre 1955 portant: codification des textes législatifs concernant l'aviation civile et commerciale.

Loi no. 53-515 du 28 mai 1963 relative à la procédure de codification des.textes législatifs concernant l'aviation civile et commerciale.

18 Le droit pour un aéronef de survoler les propriétés privées ne peut s'exercer dans les conditions telles qu'il entraverait l'exercice du driot du propriétaire.

36 L'exploitant d'un aéronef est responsable de plein driot des dommages causés par les évolutions de l'aéronef ou les objets qui s'en détacheraient aux personnes et aux biens situés à la surface.

Cette responsabilité ne peut être atténuée ou écarté que la preuve de la faute de la victime.

17 Les aéronefs peuvent circular librement au-dessus des territoires français. Toutefois les aéronefs de nationalité étrangère ne peuvent circular au-dessus du territoire français que si ce droit leur est accordé par une convention diplomatique ou s'ils reçoivent, à cet effet, une autorisation qui doit être spéciale et temporaire.

II. UNITED STATES OF AMERICA

Federal Aviation Act of 1958 Control and Abatement of Aircraft Noise and Sonic Boom

611(a) [13874 Rules and Regulations] In order to afford present and future relief and protection to the public from unnecessary aircraft noise and sonic boom, the Administrator of the Federal Aviation Administration, after consultation with the Secretary of Transportation, shall prescribe and

amend standards for the measurement of aircraft noise and sonic boom and shall prescribe and amend such rules and regulations as he may find necessary to provide for the control and abatement of aircraft noise and sonic boom, including the application of such standards, rules, and regulations in the issuance, amendment, modification, suspension, or revocation of any certificate authorized by this title.

(b) 1388: Criteria In prescribing and amending standards, rules, and regulations under this section, the Administrator shall:

- consider relevant available data relating to aircraft noise and sonic boom, including the results of research, development, testing, and evaluation activities conducted pursuant to this Act and the Department of Transportation Act;
- consult with such Federal, State, and interstate agencies as he deems appropriate;
- 3. consider whether any proposed standard, rule, or regulation is consistent with the highest degree of safety in air commerce or air transportation in the public interest;
- 4. consider whether any proposed standard, rule, or regulation is economically reasonable, technologically practicable, and appropriate for the particular type of aircraft, aircraft engine, appliance, or certificate to which it will apply; and
- 5. consider the extent to which such standard, rule, or regulation will contribute to varying out the purposes of this section.

(c) 1389: Notice and Appeal Rights In any action to amend, modify, suspend, or revoke a certificate in which violation of aircraft noise or sonic boom standards, rules, or regulations is at issue, the certificate holder shall have the same notice and appeal rights as are contained in section 609, and in any appeal to the National Transportation Safety Board, the Board may amend, modify or reverse the order of the Administrator if it finds that control or abatement of aircraft noise or sonic boom and the public interest do not require the affirmation of such order, or that such order is not consistent with safety in air commerce or air transportation. [Sec. 611 as added by Public Law 90-411, 90th Congress, 2nd Session; approved 21 July 1968, 82 Stat. 395.]

III. FEDERAL REPUBLIC OF GERMANY

(Air Laws and Treaties of the World (p. 753)) Law Concerning Air Navigation of January 10, 1959

2(1) German aircraft may navigate only when they are licensed for air traffic [Verkehsaulassung] and, insofar as provided for by regulation, registered in the register of German aircraft [Luftfahrzeugrolle]. An aircraft shall be licensed for navigation only when . . .

iv. the technical equipment of the aircraft is such that the noise caused by its operation does not exceed a level which cannot be reduced in view of technological developments at the time.

32(1) The federal minister of transportation, with the consent of the federal council [Bundesrat] shall make the regulations necessary for the application of this law concerning

i. acts in the airspace and on the ground, particularly preparations for flight, acts in taking off and landing, use of aerodromes and avoidance of excessive noise caused by aircraft in the air and on the ground.

IV. UNITED KINGDOM

Air Navigation Order 1960, S.I. 1960, No. 972 64 Noise and vibration caused by aircraft on Aemodromes

The Minister may prescribe the conditions under which noise and vibration may be caused by aircraft (including military aircraft) on Government aerodromes, licensed aerodromes or on aerodromes at which the manufacture, repair or maintenance of aircraft is carried out by persons carrying on business as manufacturers or repairers of aircraft, and sub-section (2) of section forty-one of the Act shall apply to any aerodrome in relation to which the Minister has prescribed conditions as aforesaid.

4. Air Naviation (Gen.) Regs. 1960 S.L. 1960, No. 1069

10 Noise and vibration caused by aircraft on aerodromes

With reference to Article 64 of the Order, the conditions under which noise and vibration may be caused by aircraft (including military aircraft) on Government aerodromes, licensed aerodromes or on aerodromes at which the manufacture, repair or maintenance of aircraft is carried out by persons carrying on business as manufacturers or repairers of aircraft, shall be as follows, that is to say, that, whether in the course of the manufacture of the aircraft or otherwise:

(a) the aircraft is taking off or landing, or

- (b) the aircraft is moving on the ground or water, or
 - (c) the engines are being operated in the aircraft:
 - (i) for the purpose of ensuring their satisfactory performance,
 - (ii) for the purpose of bringing them to a proper temperature in preparation for, or the end of, a flight, or
 - (iii) for the purpose of ensuring that the instruments, accessories or other components of the aircraft are in a satisfactory condition.

Civil Aviation Act, 1965; Airports Authority Act, 1965

14. Control of noise

Contractor and Research

The Authority shall take such measures as the Minister may direct for limiting noise and vibration or mitigating their effect and, in particular, for restricting the use of any aerodrome owned or managed by the Authority to aircraft and persons complying with the Minister's requirements in that behalf.

1. Civil Aviation Act, 1949

40. Liability of Aircraft in respect to trespass, nuisance and surface damage

- (1) No action shall lie in respect of trespass or in respect of nuisance, by reason only of the flight of an aircraft over any property at a height above the ground, which, having regard to wind, weather and all the circumstances of the case is reasonable, or the ordinary incidents of such flight so long as the provisions of Part II and this Part of this Act and any Order in Council or order made under Part II or this Part of this Act are duly complied with.
- (2) Where material loss or damage is caused to any person or property on land or water by, or by a person in, or an article or person falling from, an aircraft while in flight, taking off or landing, then unless the loss or damage was caused or contributed to by the negligence of the person by whom it was suffered, damages in respect of the loss or damage shall be recoverable without proof of negligence or intention or other cause of action, as if the loss or damage had been caused by the wilful act, neglect, or default of the owner of the aircraft:

Provided that where material loss or damage is caused as aforesaid in circumstances in which:

- (a) damages are recoverable in respect of the said loss or damage by virtue of the foregoing provisions of this subsection; and
- (b) a legal liability is created in some person other than the owner to pay damages in respect of the said loss or damage;

the owner shall be entitled to be indemnified by that other person against any claim in respect of the said loss or damage.

41. Nuisance caused by aircraft or aerodromes

- (1) An Order in Council winder section eight of this Act may provide for regulating the conditions under which noise and vibration may be caused by aircraft on aerodromes and may provide that subsection (2) of this section shall apply to any aerodrome as respects which provision as to noise and vibration caused by aircraft is so made.
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2) No action shall lie in respect of nuisance by reason only of the noise and vibration caused by aircraft on an aerodrome to which this subsection applies by virtue of an Order in Council under section eight of this Act, as long as the provisions of any such Order in Council are duly complied with.