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TRANSPORT JET AIRCRAFT NOISE ABATEMENT IN FOREIGN COUNTRIES: GROWTH, STRUCTURE, IMPACT

Final Report
VOLUME II: PACIFIC BASIN
August, 1980

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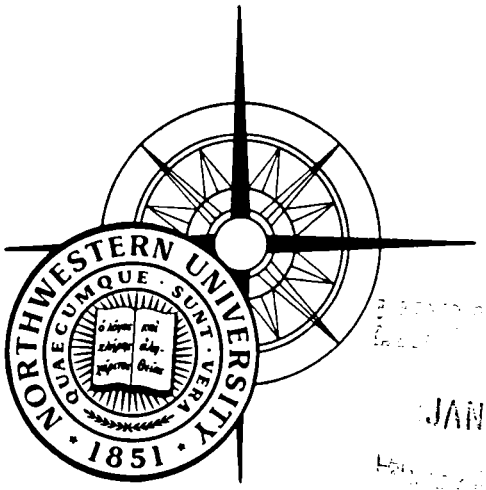

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TRANSPORT JET AIRCRAFT NOISE ABATEMENT IN FOREIGN COUNTRIES: GROWTH, STRUCTURE, IMPACT VOL. II - PACIFIC BASIN

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FOREWORD

The study, "Factors Affecting the Retirement of Commercial Transport Jet Aircraft" (NASA CR-152308), published in August 1979 by the Transportation Center of Northwestern University, found that growing complaints in the United States concerning aircraft noise had generated legislative countermeasures which would, if implemented, jeopardize the continued utilization of certain jet aircraft and force their retirement from U.S. fleets. Although the airlines and the aircraft manufacturers vigorously contested these proposals as being too restrictive, the environmentalists, aided by court decisions, were having some success with their claims that existing regulations were inadequate to protect the public.

The foregoing situation raised several questions. One, how did the noise situation in the United States compare with that in foreign countries? Also, could the U.S. carriers and manufacturers count on foreign air carriers to buy aircraft retired for noise reasons from them at a satisfactory price? On the first question, presentation made by IATA and ICAO representatives at U.S. noise hearings suggested that the foreign countries were having similar if not more serious noise problems. Evidence on the second question, while not entirely clear, pointed toward a drying up of the foreign market for used aircraft as quality of life and fuel considerations all over the world are accorded higher priorities in equipment decisions.

In the past, U.S. manufacturers have been major suppliers of transport jet aircraft outside of the U.S. However, if, because of the growing political power of environmentalists, aircraft noise in foreign countries was under even greater attack than in the U.S., and if foreign aircraft manufacturers with help from their governments were responding to the situation by increasing their efforts to produce quieter more efficient aircraft, the U.S. air transport manufacturing industry could very well lose its dominant position. The purchase of a foreign aircraft (Airbus A-300) with American engines (G.E.) by Eastern Airlines, and the purchase of a U.S. airplane (Lockheed L-1011) with foreign engines (Rolls Royce) by Pan American, became a matter of concern in Congress and to the U.S. aircraft manufacturing industry.

Accordingly, because U.S. airlines and U.S. aircraft and powerplant manufacturers must compete in the international marketplace with aircraft which must comply with the rules of each country served, and because the airlines and manufacturers in foreign countries were said to be subsidized by their governments in efforts to increase their share of the transport aircraft market, NASA commissioned a study to be made of the history, structure and impact of enacted or proposed noise regulations in the major noise sensitive countries of Europe, i.e., the United Kingdom, France, Switzerland, Germany, Sweden, Denmark and the Netherlands. The results were published July 31, 1980 under the title "Transport Jet Aircraft Noise Abatement in Foreign Countries: Growth Structure, Impact Volume I, Europe. It

carries the NASA identification number CR-152,356.

In a preliminary review of the European study, NASA noted complaints of European airlines that operations were constrained by noise regulations in the Pacific, a point half way around the world. Citing Australia and Japan as examples where logic was defeated by emotion, airline executives viewed with concern the possible addition of strict curfews elsewhere. American carriers in the Pacific had similar concerns. As a result, NASA authorized the European study of aircraft noise policies and regulations to be extended to cover certain Pacific Basin countries where noise problems had adversely affected international operations or threatened to do so. Hawaii, New Zealand, Australia, Hong Kong, Japan, and Singapore were the countries selected to be included in this second phase of examining aircraft noise problems in foreign countries.

This document, Volume II, Transport Jet Aircraft Noise Abatement in Foreign Countries: Pacific Basin, is the final report of the extended study.

Evanston, Illinois
August 1980

Frank A. Spencer

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One doesn't travel overseas for the U.S. Government without the necessary international coordination. Two people at NASA Headquarters, Ms. Lynne Hanold and Harold Broadhurst, provided excellent liaison with the State Department. Mr. Edward Olsen of the Office of Environmental Affairs of the U.S. State Department and the heads of the various international "Desks" arranged for accommodations, appointments, interviews, and translators. I am also indebted to the aviation liaison officers in each U.S. Embassy and Consulate of the countries I visited.

Further, my three research secretaries, Don Dayhoff, Barbara Paley, and Marjorie Krohn, are deserving of special thanks for producing a quality text from drafts of dubious quality.

Frank A. Spencer

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TRANSPORT JET AIRCRAFT NOISE ABATEMENT IN FOREIGN COUNTRIES: GROWTH, STRUCTURE, IMPACT

ABSTRACT

Introduction of jet transport aircraft in the late fifties led to increasing public pressure for relief from jet aircraft noise. The resulting litigation, legislation, plus proposed further legislation and regulations, have serious economic, political and social implications. Volume I, after surveying the different methods of aircraft noise measurements employed in various countries and after noting the various international organizations which have been established to deal with the problem, scrutinized the development and impact of noise abatement policies in seven European countries: U.K., France, Germany, Switzerland, Sweden, Denmark and The Netherlands. This volume, Volume II, studies noise control measures at the international airports of Hawaii, New Zealand, Australia, Hong Kong, Japan, and Singapore. These are key points in Pacific and Asian commerce.

Factors in noise control, such as government structure and cultural heritage, are examined. The increasing power of environmental agencies vis-a-vis aviation departments is noted. The following methods of dealing with aircraft noise are examined by type of control e.g., (1) Noise at the source control: noise certification, curfews, capacity limitations, operational procedures, and noise monitoring; (2) Noise immission controls: zoning, building codes, subsidies for relocation, insulation, loss in property values, and for TV, radio and telephone interference; and (3) Noise-related landing charges. Executives of the national airline of the country involved and appropriate governmental authorities concerned provided information for assessing the impact of aircraft noise policies on the type and quantity of aircraft purchased as well as on the outlook for the relaxation or tightening of noise controls.

EXECUTIVE SUMMARY

The development and implementation of aircraft noise control in foreign countries is often impacted by the form and structure of government. Likewise, the legal basis for noise damage lawsuits differs from country to country. Great Britain and several countries with English heritage have statutes stating that aircraft noise in the air cannot be a cause of legal action. In other countries enforcement of noise control is in a grey area. Some jurisdictions feel their only avenue is "friendly persuasion", while in others criminal penalties are considered possible.

Because of the international character of air transportation, sovereign states often leave the matter of aircraft noise emissions to international agreement through ICAO and then legislatively or administratively adopt those standards as their own. Such standards are spelled out in Annex 16 of the Civil Aviation Convention, and are slightly less restrictive than the U.S. rules under FAR 36 and 91-136. In Europe coordination is facilitated by the European Civil Aviation Conference (ECAC). Additionally, aircraft noise control holds a special attraction for a number of other international groups such as the Organization for Economic Cooperation and Development (OECD) and the European Economic Community (EEC).

Similarly, within each country, a growing number of agencies, departments and subdivisions of departments, claim their right to make inputs into the noise control arena or actually to participate in the formulation of the policies. Much to the annoyance of old line regulatory bodies, various environmental protection departments are seeking to excercise authority which old line bodies believe to be theirs. In the Pacific area, except for ICAO, there is an absence of specialized international noise agencies such as were found in Europe.

Airport noise control rules by means of special operating procedures for takeoff and landing, and also for departure and arrival routes, are almost universally applied. To check compliance with these procedures extensive systems of noise monitoring have been developed, particularly in Switzerland and Germany, and are being expanded to other countries. Noise monitoring has not proceeded as far in the Pacific. Technical problems stemming from the meteorological effects of cloud cover, humidity, wind, and sound reflection at different angles of bank raise problems of accuracy. Some suggest that radar monitoring tied in with transponders is a necessary supplement.

The failure of Annex 16, as it applies to current jet fleets, and the failure of noise abatement operating procedures to control

aircraft noise to acceptable limits has resulted in the growth of airport curfews. These range from a complete closure of the airport for the curfew period to limiting operations to aircraft whose noise emissions are below a specific level. International complications can arise where the airport of one country is situated so close to the borders of another that arrival or departure entails overflying the terrain of the latter state. Failure of ICAO to take action on noise abatement for the early production noisy jets has led to a program under ECAC in which each member state is to set a date for the elimination of these planes from service in international air transportation. Proposals to governments for terminating production of Annex 16, Chapter 2 aircraft have not, because of pressure from aircraft manufacturers successfully marketing these craft, been adopted.

An airline whose planes are perceived by airport neighbors to be noisy may find itself, irrespective of whether or not its planes meet Annex 16, in such difficulty with an airport authority as a consequence of citizen complaints that its equipment purchasing plans may be altered. In more than one case noise was the overriding consideration in the equipment selected, even though the size and operating costs favored the noisier plane. Airports with high concentrations of noise-sensitive people living nearby are threatened with restrictions which can harm the economy of their cities or regions. In Japan, limitations on the number of movements per day at Osaka and Tokyo have forced carriers into low frequency operations with jumbo aircraft.

Although airport neighbors seem pleased with the noise improvements demonstrated by widebodies with high-bypass engines, they are demonstrably disappointed with the lack of improvements in older low-bypass ratio planes which are the more frequent users of their airports. As a result, most airport authorities presently do not see a relaxation of curfews as additional quiet airplanes are introduced but only a possible arresting of the trend toward more severe curfews.

Countries in Europe and the Pacific area have recognized, albeit somewhat belatedly, that appropriate land-use planning in which construction of homes, schools, and various public buildings is banned in noise impacted areas, but is permitted, subject to mandatory insulation, in other areas, is another method for reducing noise complaints. Timely land-use planning can avoid belated and costly purchases of land on which buildings have been erected in noise sensitive areas as well as the expenses of demolishing or relocating such incompatible structures. Although most countries have or are about to have such land-use planning laws, conflicting interests between profit maximization for property owners and the heightened quality of life aspirations of the public, plus the lengthy procedure and expense of developing acceptable standards and projecting noise contours some years into the future, have delayed effective implementation of land-use planning. Land-use planning is further handicapped by conflicts

between various levels of government. National government efforts to impose nationally desired standards on state and local governments are viewed unsympathetically by the latter who not only face the loss of their tax base but also the ire of citizens who feel their property rights are violated. Japan is attempting to meet this problem by offering subsidies to prefectures and local governments who cooperate. As a means of avoiding further costly land purchases, the United Kingdom has recently substantially expanded its program of insulating homes.

Noise annoyance is found to be subjective and emotional. Thus no satisfactory quantitative and qualitative measures have been developed. The growing interest in the effects of air transport on quality of life has fostered the growth of environmental protection agencies around the world. There are strong indications that citizens will not be content with existing aircraft, widebodies excepted, which just technically meet Annex 16. Accordingly, airlines which purchase newly certificated aircraft meeting the lower noise levels of Annex 16, Chapter 3 will have a marked advantage over those who buy narrow-bodied low bypass aircraft which barely meet the less restrictive standards of Chapter 2 now applicable to them.

Finally, airport neighbor disappointment with progress in lowering noise emissions in narrow-body aircraft still in production suggests the need for accelerated research focused on quieter powerplants for this category aircraft. The reluctance of aircraft manufacturers to put their own resources into this type of development results from: (1) the diseconomies of building smaller aircraft as compared with larger, (2) a long history of growth of passenger traffic which has led to carriers "growing into" ever larger aircraft, (3) the practice internationally of controlling capacity by limiting frequency of schedules more than by limiting the size of aircraft which can be employed, and (4) the lack of resources to handle this task and develop the widebody at the same time.

Of the international airports surveyed in Europe, those in Switzerland, Germany and England have the most restrictive noise regulations. Sweden's Arlanda are the least restrictive. In the Pacific, Honolulu and Singapore share the honors for freedom from restrictions. Japan is clearly the world's leader in restrictive regulations.

VOLUME II

INTERNATIONAL AIRCRAFT NOISE ABATEMENT: PACIFIC BASIN

INTERNATIONAL AIRCRAFT NOISE ABATEMENT: PACIFIC BASIN

Chapter 1.
PACIFIC BASIN

1. Introduction

Several factors led to the expansion of the preceding foreign noise study to include the Pacific basin. First, preliminary reports of the European investigation suggested that any further growth of constraining regulations would pose a serious threat to the viability of long distance international operations particularly where curfews in one country resulted in reducing the operating "windows" 1/ to very few hours a day. Curfews at both ends of a flight can conceivably result in the discontinuance of the operation. Since the number of time zones crossed increases with distance thus aggravating the time differential problem, the long transpacific operations are more adversely affected than the transatlantic counterpart.

Further suggesting the need for extending the study to the Pacific were the extreme actions taken against jet transports by environmentalists in certain countries because of airport noise. The years of delay and the millions of dollars in property damage which took place in bringing Tokyo's new Narita airport into operation have been widely publicized. Less well-publicized have been the pressure for the complete closing of the Osaka airport (Japan's

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1/ The word "window" in aviation parlance refers to the time in which operations must be originated or terminated to comply with operational restrictions such as curfews. Because of the number of time zones involved in crossing from the U.S. to Europe, almost all subsonic transport flights leave the east coast of the U.S. late in the day to avoid European early morning curfews.

second largest city) and the lack of success in land-use planning both at Osaka and Narita. Additionally, in Osaka a legal proceeding of potential catastrophic financial consequence was won at the high court level by the homeowners and was pending before the Japanese Supreme Court.

International carriers, including Australia's own airline, Qantas, were complaining that Sydney's rigid curfew constituted an unreasonable economic burden with effects spreading far beyond Sydney to the U.S. and London. Hong Kong's Kai Tak airport required low approaches over a densely populated area and had been the subject of proposals to close and build a new airport on a nearby island. Finally, there were indications of some airport noise problems in New Zealand at the capital airport in Wellington and at the relatively new Auckland International Airport. Since a significant portion of international travel is in the Pacific, NASA decided to broaden the study to encompass the major problem areas.

2. Inclusion of Hawaii in the Study

A word of explanation is appropriate to explain the inclusion of Hawaii in a study dealing with noise regulations in foreign countries. As previously indicated, curfews at both ends of a long east-west route can reduce the size of the "operating window" and stifle traffic growth. Until the advent of the "special purpose" Boeing 747SP, Honolulu was the point of U.S. entry for transpacific

flights.[2] By 1979 a very limited number of operations overflying Honolulu were scheduled. About 25 percent of the international operations at Honolulu took place in what are often the curfew hours elsewhere i.e., 10:00 p.m. to 6:00 a.m.

Military tankers and heavy commercial jets at the Honolulu International Airport had caused enough noise disturbance to the inhabitants (and tourists) that noise annoyance was one of the reasons given for constructing the new "Reef" runway one mile further toward sea than the existing runway. Clearly the adoption of restrictions at Honolulu such as we have seen in Europe could have a serious impact not only on air transport companies around the world but on the economy of Hawaii as well. For the aforementioned reasons, Honolulu was included. Since the study is confined to international operations, it does not deal at all with other airports on the Hawaiian islands.

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[2] Exceptions, so few as to be hardly worth noting, were flights via Alaska.

Chapter 2.

HAWAII

HONOLULU INTERNATIONAL AIRPORT

1. Noise at Honolulu Airport

Honolulu International Airport (HNL) is in the fortunate position of having minimal, if any noise problems for international operations. However, if very substantial growth in aircraft movements, which some have predicted, should occur or if a solution cannot be found to annoyance of helicopters and some general aviation aircraft there could be a problem in the distant future. Nevertheless, HNL, relative to many international airports, is in a most favorable position. Noise is so minor that state pollution rules do not apply to aircraft noise.

This fortuitous situation stems from the location of the airport (adjacent to the ocean on one side) relative to population, plus normally light to moderate winds coming from directions which permit almost all landings to be made from the southwest over the water to runway 4 and a high percentage of takeoffs to be made heading east (Runways 8R and 8L) with a right turn to fly out over the water.

Such noise as has caused problems in the past came from two sources. First, takeoffs on Runway 8 by heavy transports, particularly military KC 135 tanker aircraft, proceeded over a residential area and posed a safety hazard as well as a noise problem. Operational procedures involving an immediate right turn out did alleviate the problem somewhat. Secondly, a large increase in traffic, including lighter aircraft which used intersection takeoffs and flew

locally over land routes added both congestion and noise.

2. The New Reef Runway

As a result of increasing aircraft movements and the initiation of noise complaints, a proposal was made in the late 1960s to build a new runway 8R, otherwise called the "Reef" runway, with over a mile lateral separation from 8L and away from population. This placement would enhance safety, reduce noise, and help relieve congestion. Oddly enough it was the environmentalists who delayed the project by objecting to the 1971 Environmental Impact Statement (EIS) on the ground that it was an ex post facto effort to justify the runway and, therefore, its authors were biased. Too little attention was paid, they averred, to effects on marine life. However, once the project was approved and completed efforts of the environmentalists, including those complaining of noise, subsided.

The use of the Reef runway has not been problem-free. The extra mile of taxiing uses valuable time and fuel thus increasing operating expenses. Further, for certain heavy aircraft, taxiing in hot weather caused the build-up of heat which was said to be a factor in two incidents involving tire blow outs during takeoff. Initially these incidents led to the discontinuance of use of the Reef runway by at least one carrier and a decrease in its use by pilots of other airlines. As a result, an increase in recorded noise occurred. However, the reduction in use was brief and, after some tire modifications, utilization of the "Reef" is back to normal.

Nevertheless, to reduce taxi time and precious and expensive fuel, various air carrier pilots report they are under some "suggestions" from management to use runway 8L when possible.

3. Noise Monitoring

To measure the impact of the new runway on the noise problem, the Hawaii Department of Transportation (DOT) installed noise monitoring equipment which, according to the DOT, demonstrated a 50% decrease in noise by the use of the Reef runway (chart).[3/] This monitoring system is being refined to measure any change in noise level in the future. Using 16 remote permanent sites, plus a mobile unit, the system is indexed to a preset level. When an "exceedence" occurs, the system automatically records for several minutes of the time various radio frequencies including tower, departure and arrival, Greenwich time, plus the noise level. Thus individual aircraft type and its operator can be identified. At present the system is used primarily for collecting data. No monthly reports are distributed internally or externally, as are done at some international airports.[4/]

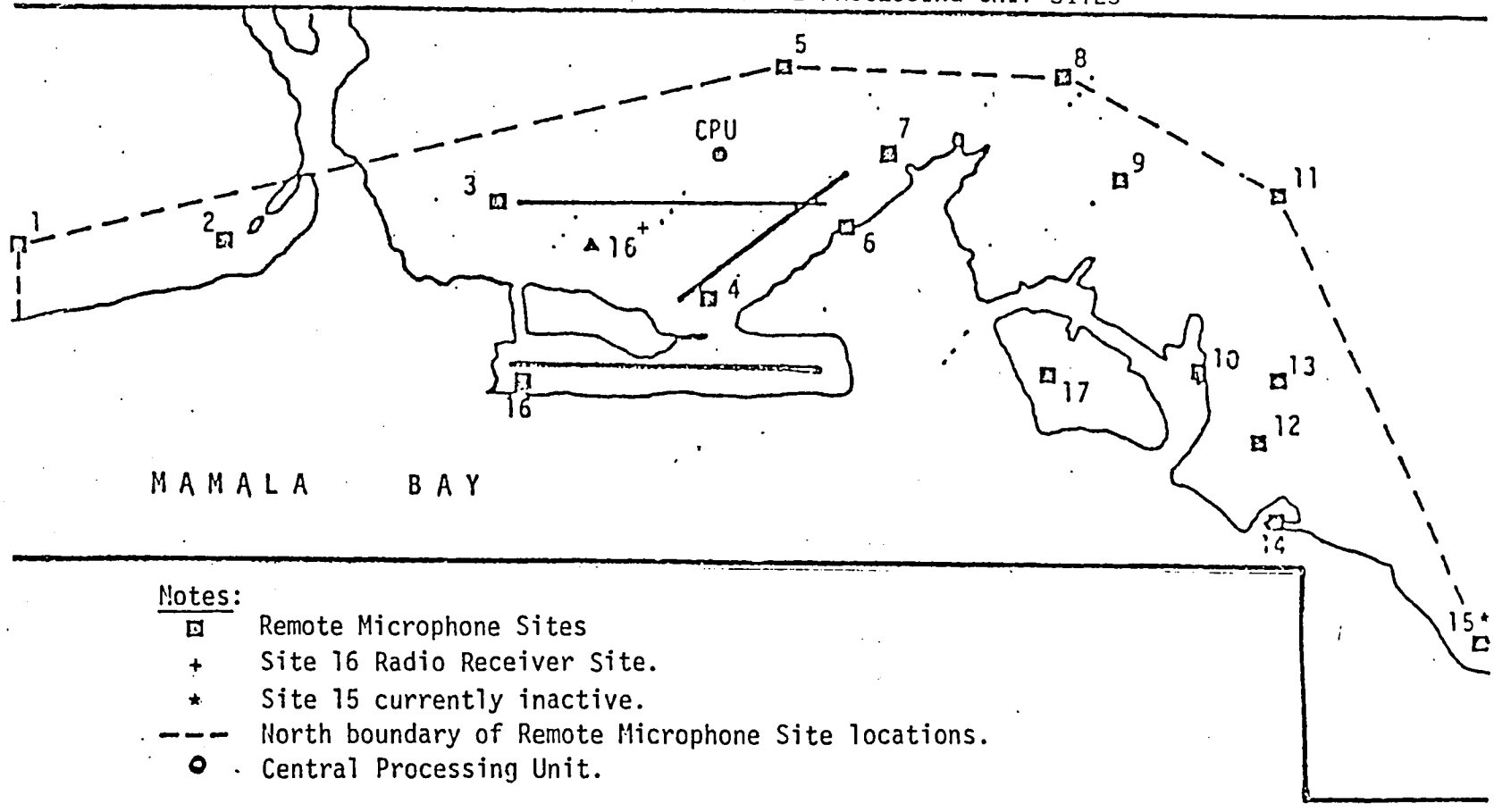
3/ For details see "Post Construction Study of Noise Attributable to Reef Runway Operations" a study by R.A. Darby and Associates, October 6, 1978 made for the Hawaii State Department of Transportation.

4/ Owen Miamoto, Chief, Air Transportation Facilities Division, Department of Transportation, State of Hawaii.

CHART 1

HONOLULU INTERNATIONAL AIRPORT

REMOTE MICROPHONE AND CENTRAL PROCESSING UNIT SITES



Notes:

- Remote Microphone Sites
- \+ Site 16 Radio Receiver Site.
- * Site 15 currently inactive.
- ——— North boundary of Remote Microphone Site locations.
- Central Processing Unit.

CHART 1
HONOLULU INTERNATIONAL AIRPORT
REMOTE MICROPHONE AND CENTRAL PROCESSING UNIT SITES

4. Operating Constraints

International air carriers and over ocean U.S. Domestic operators have virtually no real operating constraints at HNL. Absent are any curfews, control on APUs or reversing. A rather modest preferential runway system for landings and takeoffs of 3- and 4-engined aircraft plus a right turn on takeoffs from 8R and L are two of the three restrictions. No departures are allowed on 4R after 10 p.m. Since 4R is not normally used for departure, this is not a constraint.

5. Future at HNL

While commercial transports are usually labeled as villains where noise problems have developed, such is not the current situation at HNL. Oddly enough, commuter airline aircraft, helicopters and general aviation aircraft are the major source of noise complaints. There are still a few KC 135 military tankers making noise. HNL has about 1,000 to 1,200 operations (either a landing or a takeoff) per day of which but 400 are air carriers. Thus, there are only 200 transport departures. The mix of a large number of smaller, slower aircraft with air carrier aircraft has become HNL's main problem - not noise. The State Department of Transportation is currently having difficulty in finding a site for a reliever airport. If it attempts to site the airport as a place satisfactory from the noise standpoint, the aircraft owners and pilots claim they will not use the airport because it is too far from the city. If a close

site is picked, the environmentalists object to the noise.

The FAA indicated a new EIS would assist in bringing about more efficient traffic management to cope with increased traffic because the old EIS was designed without considering the decreased noise of the forthcoming wide bodies. Thus, it pointed to a greater use of 8R than would otherwise be the case. A new EIS would justify greater use of 8L by such aircraft because of their lower noise emissions and increased airport capacity.

6. Summary

In comparison with other international airports studied in Europe and the Pacific, the Honolulu Airport does not have a noise problem from air carrier aircraft. Most of its international movements are by widebodied aircraft departing and arriving over water and not crossing Oahu or other Hawaiian islands. The construction of the new Reef runway and the transfer of long distance air carrier aircraft to it have taken care of most of the noise problems. In early 1979 what noise problems there were stemmed from local service airlines, a large infusion of commuters, helicopter and general aviation aircraft. To solve this problem the State Department of Transportation is studying various sites for a reliever airport. Unfortunately the sites favored by the state are considered by airport users to be too far from the city to be utilized and the sites favored by users are objected to by environmentalists.

On a later visit in Nov. 1979 the airport authorities related

that the minor noise problems they had mentioned ten months previously had been minimized almost to zero by requiring all planes to operate on instrument flight plans and be transponder equipped. All departures and arrivals are now vectored to avoid sensitive noise areas around Honolulu.

Therefore, those close to the problem believe that there is now no noise problem for international operations at Honolulu nor is there likely to be one in the foreseeable future. Honolulu is expected to remain a 24 hour a day operation without even the more minor constraints on engine tester runup or reversing.

Chapter 3.

NEW ZEALAND

1. Introduction

The two islands, North Island and South Island, comprising the main area of New Zealand contain but three million people (and 70 million sheep) -- about one quarter of the population of Tokyo. This low population figure and the consequent relatively infrequent air service has, for the present, spared the country many of the noise problems common in more densely populated countries. Nevertheless, because of complaints about aircraft noise, the Government has prescribed some, but not very severe, noise abatement measures at several airports and established limited and flexible curfews at two of its three international airports. After these measures were taken, complaints on aircraft noise have all but disappeared, and the environmentalist groups have bcome quiescent or have disbanded. Some in the Government feel that noise will decrease in the future as new aircraft are introduced. On the other hand, other aviation authorities, such as airport planners, believe that the rising expectations of the populace coupled with increased flight frequencies may result in a revival of complaints.

2. Government and Legal Basis of Noise Control

To understand the current and probable future status of noise control in any country requires not only reading the words of the statute or regulation but also comprehension of the social, economic and political environment in which the written, or unwritten rules or suasion operate. Although ties with the United Kingdom

had been lessening for some time, it was noted until 1947 that New Zealand formally became a sovereign state. However, England's influence is still clearly present. As an example, the common law on nuisance has been absorbed. Many statutes and regulations are similar in content and wording to those found in Great Britain.

The structure of government consists of Governor-General, and a one house Parliament headed by the Prime Minister. Ministers (heads of departments) rely heavily on permanent civil service chiefs of their departments. Legislation is usually introduced by the Government. Bureaucracy is a way of life in New Zealand and the Government is that of welfare state. Air New Zealand, the national airline, is owned by the Government.

After the national government (referred to as the Government), since there are no states, the next level is that of the local authorities. Several of these, for planning purposes, sometimes have their own local planning districts or regional planning authorities. By and large the local authorities have very limited power in comparison with that of the Government. In most cases, airports are jointly owned and operated by the Government and the local authorities on a 50/50 basis. However, where national interests clearly exceed local interests, as is the case of the international airport at Auckland, the Government contribution may be as high as 80%.

The relevance of the above to the aircraft noise problem is that the absence of states and counties eliminates two layers of

jurisdictions which cause problems in the U.S., Australia, and elsewhere. Thus, there is a rather simple directness in formulating and implementing laws and regulations. Under the Ministry of Transport, the Director of Civil Aviation promulgates rules which go to airports (government owned) and operators directly. This makes for simple and swift action. Because of the Director's power to control conditions for the use of airports there is little problem of compliance.

Secondly, with the citizens accepting the concept of the welfare state, a heavy reliance is placed on the concept that the Government will take care of everything. This is manifest also by the absence of a large contingent of lawyers with a penchant for weaving their way around regulations. As a consequence, rules may be promulgated for which it is difficult to find precise statutory sanction. Sometimes this is later corrected by a statute granting the authority and validating previous regulations. Finally, since Air New Zealand is 100% government-owned and must obtain Government permission for such things as buying and selling aircraft, it is beholden to the Government and is not in a position to thwart Government policies or regulations even if they were not founded on a solid legislative base.

Aircraft noise in the air and on the ground and land-use planning for noise abatement is dealt with in six pieces of legislation:

1. Civil Aviation Act of 1964 as amended

2. Public Works Act of 1928 as amended (PWA)

3. Airport Authorities Act 1966

4. Town and Country Planning Act of 1977 (T&C)

5. Health Act of 1956

6. Hovercraft Act of 1971

Regulations establishing curfews come in the form of Civil Aviation Safety Order(s) headed "Operational Conditions Governing the Use of Civil Aerodromes" which are themselves authorized under regulations issued under the Civil Aviation Act of 1964.

Civil Aviation Act of 1964 Section 23, borrowing from the U.K., stipulates:

> "no action shall lie in respect of nuisance by reason only of noise and vibration caused by aircraft or aircraft engines on an aerodrome"

so long as regulations under Section 29 are complied with. Another paragraph outlaws action in respect of trespass, or nuisance by reason of flight over property and also contains the limitation that regulations must otherwise be complied with.

Section 29 provides a very broad grant of authority to promulgate regulations covering a wide range of subjects. However, aircraft noise is not one of the subjects specifically mentioned. Nevertheless, Section 29 (4) giving the Director of Operations power to issue orders for safety has been construed to be broad enough to be the basis for Regulation 190A involving noise on airports and a new Regulation 188 dealing with curfews and operating procedures.

At the present time, except for land-use planning, the Civil Aviation Division under the Minister of Transport is in firm control of aircraft noise matters. There is an Environment Agency but it has no influence. The Department of Health has, however, secured a piece of the turf.

Hovercraft Act of 1971. Worries about noise from hovercraft when and if they are introduced spawned the Hovercraft Act providing specifically for the control of noise. In this instance jurisdiction was not given to the aviation authorities but to the Ministry of Marine.

Health Act of 1956. This is the principal act governing public health and the Minister of Health has made some efforts to stretch the Act to include aircraft noise, particularly under the provision against "nuisances." The Health Act nowhere specifically mentions noise. However, the 1974 report previously referred to found: (1) that New Zealand laws did not cover noise adequately, (2) that old laws should be amended rather than a new statute passed, and (3) that in the case of noise caused by aircraft no residential development should be allowed in the single event 90 EPNdB noise contour.

3. Land-Use Planning

The Public Works Act of 1928 is the senior permanent act dealing with the authority to purchase land for the public purpose of building an airport. Outside the airport boundary it is possible

for local authorities to limit the height of trees and other obstructions for safety reasons under planning via the Town and Country Planning Act with either the Minister of Civil Aviation, or the Minister of Works and Development being involved. Of significance is the absence of specific authority to purchase land for noise abatement purposes where local authorities fail to initiate proper zoning. At present the only way around this omission is to purchase additional property on the basis that it is needed for airport expansion in some undefined time in the future and then control its use.

In theory, land-use under the Town and Country Planning Act of 1953 provided for zoning in the vicinity of airports which could include the purpose of noise abatement. However, the responsibility for this was on the local authorities who, of course, were subject to the conflict between obtaining an economic return from unrestricted use versus the lower return of limiting use by zoning. In 1966 a study by the Department of Scientific Research predicted a deteriorating of quiet near the new airport at Auckland would take place, as happened all over the world, unless positive steps were taken. The Government and the Auckland Airport Authority urged the neighboring cities to zone the area for rural use.

Some movement toward control was attempted when in 1971 under the Town and Country Planning Act an Airport Protection Zone was set up by the Airport on land planned for use as a second runway. Difficulties ensued because the town in which the airport was located, Manukau applied for variances. Variances were granted involving three small section which already had been compromised by pre-airport and Appeal Board Decisions.[5/]

A 1974 report under the Health Act of 1956 [6/] and a 1976 report by a Noise Advisory Committee [7/] pointed out that under the 1953 Town and Country Planning Act, noise abatement land-use planning was merely permissive for the local authorities and the committee therefore recommended amendments which could require the local authorities to zone for compatible uses. The 1977 Town and Country Act went part way by saying that the local authorities are required to plan. However, in the absence of complying, the Minister "may" take steps for compliance. Generally, the 1977 Act should bring about some improvement in noise abatement land-use

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5/ Report Airport Protection Area, Auckland. Auckland Regional Planning Division, Jan. 1975.

6/ NOISE. N.Z. Board of Health, Report Series 21, Wellington 1974.

7/ "Aircraft Noise in New Zealand," Report to Minister of Health by Noise Advisory Committee, 1976 (mimeo).

planning. Since the Town and Country Acts are reviewed every five years, their provisions lack the permanency of the Public Works Act.

The relation between the Amended Public Works Act and the Town and Country Act in aircraft noise control is not clear. Landowners whose interests are against zoning have successfully won law suits against the Government and airport authorities on the basis that the Public Works Act was the legislation under which to proceed. Moving under this law has two benefits for the landowners. First, they may receive compensation and, second, any action under the PWA requires a long cumbersome process which could delay the controls on their lands.

4. Noise at the Source--Annex 16--FAR 36

Although New Zealand is a member of ICAO and claims to support the requirements of Annex 16, the country has not formally adopted the Annex. Thus, its support of Annex 16 is largely hortatory. Since Air New Zealand's fleet consists largely of DC-10s and 737s both of which meet the standards, and only two DC-8-52s, which will be phased out, the question was asked as to why there were no formal noise standards in New Zealand? The reply may be paraphrased as follows: New Zealand is a small country and really cannot be effective in "making waves" on aircraft noise standards. No new aircraft now sold fail to meet the standard. Any future aircraft will have to meet even stricter standards promulgated by the U.S. or ICAO. Therefore, the answer went, it would be a needless

exercise to put such a rule on the books. Additionally, since the Government owns 100% of Air New Zealand, one telephone call from the Ministry of Transport could take care of any problem with that carrier. Finally, since noise complaints are now minimal in New Zealand, no useful purpose would be served.

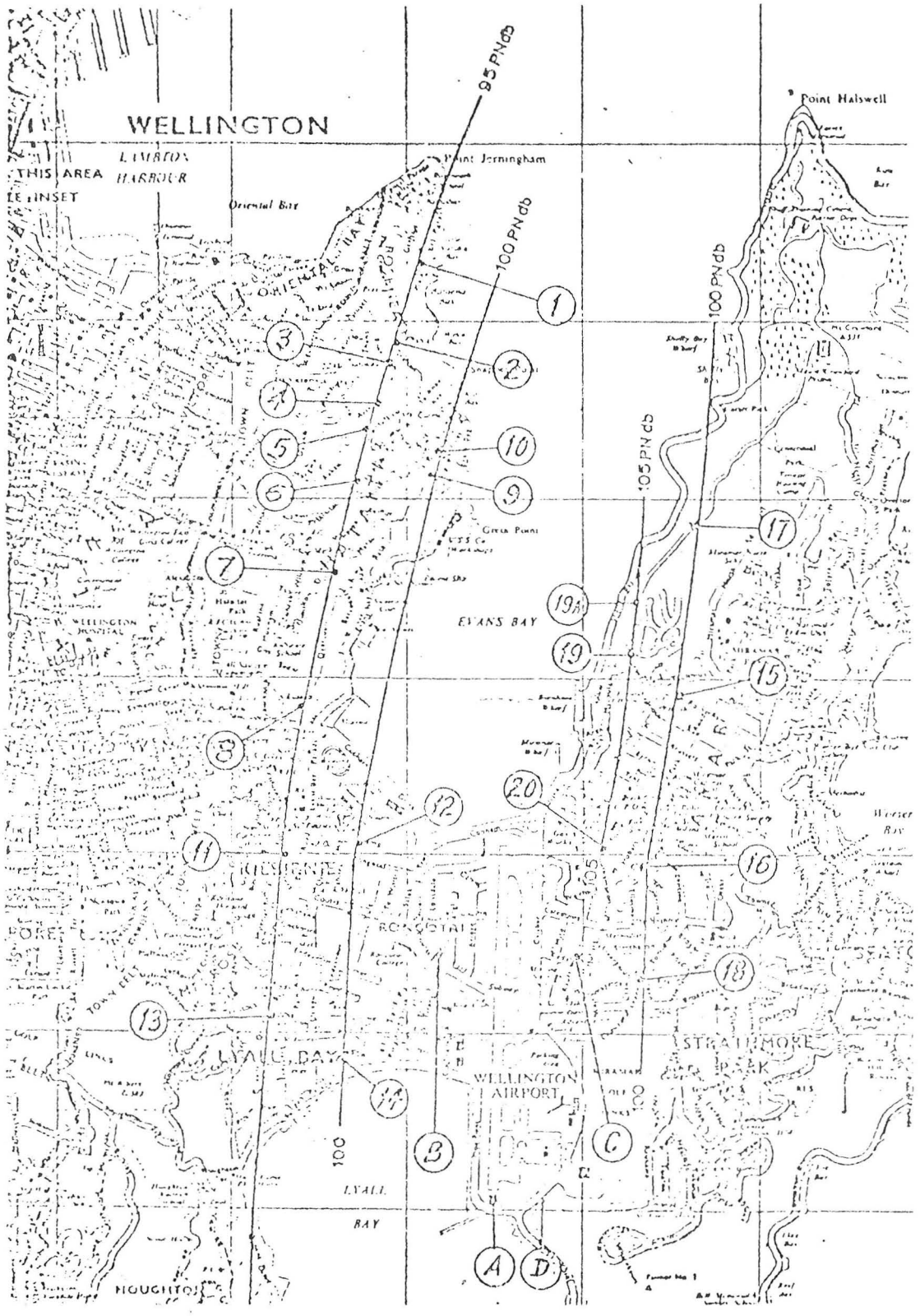
To summarize briefly: the structure of laws and regulations borrow much from the English heritage. Although not as precise as statutes elsewhere, given the acceptance by the people, the statutory framework appears to be reasonably satisfactory should the authorities live up to their responsibilities. In the absence of a statutory basis, regulations, or indeed informally expressed policies, have not been subject to a lack of compliance. The one exception is land-use planning which in the past was not mandatory.

5. Airport Operational Constraints on Noise

New Zealand has three international airports: Wellington, Auckland, and Christ Church. Christ Church, because of its location, terrain, and low frequency of service, has no noise problem and will not be discussed. However, noise problems and solutions at the capital, Wellington, at Auckland and at the old Wellington Airport of Paraparaumu will be treated.

Wellington International Airport has, technically, the most severe noise problem in New Zealand. The Wellington metropolitan area has a population of about 150,000, and the airport is four miles from the city center. As shown in the accompanying Chart

CHART 2
JET AIRCRAFT SOUND LEVEL MEASUREMENTS
WELLINGTON, NEW ZEALAND EASTERN SUBURBS 1970 AND 1974



Source: Phillips Report No. S3885

the airport contains but one runway whose approaches and landings are over water from the north or south but with a heavy concentration of dwellings on either side. Further, many of these dwellings are on hills which serve to bring them closer to the flight path thus accentuating the noise. Given the fact that 737s and DC-8-52s are in use, one might expect severe noise complaints including demands for closing the airport. However, such has not been the case. In fact, to the discomfiture of the Government, the local authorities still permit residences to be built on the hills where noise levels are high. The inhabitants are said to realize that if Wellington is to remain the capital and be a leading city, commercial access by air is a must. In the absence of alternative airport sites, residents must move or live with the noise. Housing has been in short supply so that moving not only is impractical but also would involve longer travel time to work in, and many cases, with the loss of the amenity provided by living on a bay. The authorities feel that the saving grace of the airport is that there are only three DC-8-52 flights a day which spaces the noise so that it is not repetitive.

Prior to arrival of the jets, which was not until October 1968, a group of citizens complained that aircraft noise reduced the value of their properties. A study by the Valuation Department found this not to be true.[8/] Introduction of the more noisy 737s spawned

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8/ Research Paper 67-1, Valuation Department, Wellington, New Zealand.

another report. It also found no diminution because of noise in home values between 1968 and 1970 despite the fact that the 737 was as much as 9.7 db (A) higher than the Fokker Friendship. However, the report referred to the housing shortage and to the fact that only 10% of the movements were 737s.[9/]

The added noise occasioned by the introduction of the DC-8 led to the formation of anti-noise groups, and in October 1975 the first curfew was established between midnight and 6:00 a.m. for ICAO noise standards planes, and between 11:00 p.m. and 6:00 a.m. for the balance. However, international operations were acceptable to 1:00 a.m. The curfew has little restrictive effect because New Zealanders are not late travelers. All the DC-8 and 737 operations are completed by 9:00 p.m. The curfew was softened by such qualifications as "shall normally be prohibited." There were additional exceptions for holidays, disrupted flights, and for use as an alternate. Also, the rule did not apply to existing turboprop or propeller aircraft. Finally, the Director of Civil Aviation could grant dispensation in other special cases. This, as we shall see, is quite different from Sydney, Australia where landings into the curfew time of 20 seconds have generated complaints. Supplementing the current curfew are three very mild noise abatement operating procedures which are little more than normal common sense prescriptions; for example, no turns below 1,000 feet.

[9/] Research Paper 71-3, Valuation Department, Wellington, New Zealand.

There is little likelihood of a decrease in aircraft noise levels at Wellington. The runway is too short for operations by widebodies with their quieter engines. Lengthening the runway is under "active consideration" but there are problems. Environmentalists will complain because of the effect on marine ecology. Lengthening the runway may bring more noise to some inhabitants. Given New Zealand's financial situation, other projects are likely to have a higher priority. A look at the Wellington Chart (Chart 3) shows that high noise levels, as indicated by the 105, 100, and 95 PNdB contours, exist in populated areas. It should be noted that Government reports indicate that noise levels of 90 PNdB or more are not compatible with residential construction. Nevertheless, it was represented to the writer by the Government and airline executives that the curfew and operating rules had solved the noise problem to the point that inhabitants accept the present situation. Contributing heavily to the acceptance of existing noise is the low level of operations. Wellington has but 130 movements a day of which only 6 are DC-8s.

Auckland International Airport is the main international airport for New Zealand. Its 10,800 foot runway readily accommodates the quieter 747, DC-10 and L-1011 widebodied aircraft. Fairly new, -- opened in 1965 -- the airport was constucted twelve miles from the city in what was at planning time a virtually uninhabited area, partly for noise reasons. Two suburbs, Papa Toe Toe and Mangere

are nearby. There are, in the 700,000 person metropolitan area, 22 cities which comprise the Auckland Regional Planning Authority (ARA).

Failure to implement adequate zoning under the Town and Country Act of 1953 permitted people to move near the airport. Later, the owners of the pocket of homes built to the northeast of the airport (Chart 3) formed anti-noise groups and complained to the government authorities, eventually taking their case to the Ombudsman.10/ The government authorities and the Ombudsman gave little sympathy to the complaints pointing out that the complainants had moved into the area, not only knowing that the airport was there and that traffic would increase, but, in some cases, moved because the airport was there. The Civil Aviation Division paid more attention to complaints concerning sporadic night training of flight crews the noise form which would suddenly awaken inhabitants. It also acted on noise resulting from transports flying low over the city on their approach to the airport.

Auckland's noise problems were then solved rather simply. First, a preferential runway system was established so that take-offs and landings would, within the limits of a 5 MPH downwind component, be over the water southwest of the airport. Secondly, noise

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10/ In New Zealand, the Ombudsman is a government official appointed to receive complaints against abuses or capricious actions by government officials.

CHART 3

AUCKLAND, NEW ZEALAND AIRPORT

abatement climb procedures were stipulated. Third, in 1976 5,000 feet was made the minimum altitude over the city, and fourth, night crew training between 2300 and 0600 local was prohibited unless absolutely necessary to maintain scheduled operations and only with permission from the Director of Civil Aviation himself (no delegation of authority). Finally, an informal "rubber" i.e., flexible curfew, was established. The Director of the Civil Aviation Division indicated to the airlines that he preferred no aircraft be scheduled after midnight and the airlines' scheduling committees copperated. However, officially there is no curfew.

As a result of the aforementioned measures, noise complaints all but disappeared and the environmental groups have either disbanded or become inactive. One of the Auckland groups has not had a meeting in three years. Of course, a significant reason for the satisfactory situation at Auckland is the limited number of aircraft movements. With only 200 movements a day (cf. Chicago with over 2,000) and a peak of three or four large aircraft an hour, it is no wonder that noise calculations are usually on a single event basis.

Seeing the problems resulting from the failure to purchase sufficient land, and seeing the failure of the Auckland Regional Planning Authority to engage in effective land-use planning around the Airport, the airport authorities want another 900 acres of land on which to construct a parallel runway to handle future expansion and would like the Regional Authority to purchase still another 900

acres for noise abatement. At present, because of the low 200 movement per day utilization figure and the Government's limited resources, the Government has not given an assent. Whether acquisition for noise abatement purposes will be any more successful under the Town and Country Act of 1977 than before, remains to be seen. The airport authorities argue that acquisition should be made now when the cost is less than that of a 747 (est. cost of property $50,000,000) rather than later when the cost of property has risen. On the other hand, the Government feels that priorities dictate other uses for the $50,000,000.

Paraparaumu. Somewhat surprisingly, the strictest regulations dealing with aircraft noise have been established at what was earlier the main Wellington airport, Paraparaumu, a small airport located 30 miles north of the city. The area consists of suburban beach homes and residences for retirees. Following the opening of the New International Airport at Wellington, homes continued to be built near the old airport which continued operations. As a result of noise complaints by some citizens, the airport was about to be closed completely. However, a new political party came into power on the promise of keeping the airport open but with constraints on the grounds that this facility was an asset to the community. Since the New Zealand Government owned and operated the airport, it was easy for the Government to establish conditions for use of the airport.

These conditions or constraints consist of an absolute curfew on all operations between 10:30 p.m. and 6:00 a.m. No aircraft bigger than a F-27 can operate at any time; and, no aircraft weighing over 5,000 pounds can operate from twilight in the evening to twilight in the morning. Finally, special limiting rules have been placed on helicopters for landing.

6. Litigation

No one has sought to test the validity of Section 23 of the Civil Aviation Act of 1964 which bars recovery for nuisance caused by aircraft noise on the ground and nuisance and trespass by reason of aircraft noise in flight. Nor have there been any legal challenges under Section 29 under which the Director of Civil Aviation has ordered curfews and noise abatement procedures.

Litigation is taking place over zoning attempts under the Town and Country Planning Act. The litigation concerns objections to limiting the type of construction (and hence the return on investment) and where the contour lines belong.

7. Helicopters and Crop Dusters - An Emerging Problem

Helicopter noise has been a source of growing concern to the Government. Although there are no scheduled helicopter runs, helicopter usage for commercial construction purposes is on the increase. At present these operations take place with the permission of the Office of the Director of Civil Aviation after he consults

with community representatives. About half of the requests for permits are disapproved and those that are approved usually are required to use the equipment on Saturday and Sunday only. This is quite the opposite of other countries where Saturday and Sunday often have more restrictive rules. Unless helicopter noise can be abated at the source, expanded use of this type will be jeopardized.

Crop Dusters. The Director of Civil Aviation reported citizen complaints of noise emissions by crop dusting aircraft. The complaints were based upon element of surprise and the fear that the noise would continue. A satisfactory solution to the problem is at hand by requiring that the operator alert the neighbors when and where and how long he will be spraying. Since New Zealand is largely agricultural, the need for the spraying is apparent and the approach now tried has been working well.

8. Noise Standards, Noise Monitoring and Sanctions for Non-Compliance

As has been noted, New Zealand, notwithstanding its ICAO membership, has not adopted any aircraft noise certification standards on the basis that there is no need. Since there are no standards, there are also no noise monitoring installations at any New Zealand airport. In the absence of standards and monitoring, there are, of course, no sanctions for violation. However, sanctions, for curfew violations, if needed, could be applied by the Director of Civil Aviation through his power to control conditions of operating at an airport.

9. Air New Zealand's View of the Noise Problem

Comments by executives of the national airline, Air New Zealand, indicated even less of a noise problem than did the interviews with the Director of Civil Aviation and his staff. Essentially the executives of the flag airline said, "There is no noise problem in New Zealand. Our problem is with curfews at Sydney, Hong Kong and other stations on our route. In some of those situations our "operating window" [8/] is only two hours and congestion prevents the proper positioning of aircraft." Additionally executives of the airline pointed out that people in New Zealand do not want to fly at night nor do the working staff wish to work late at night. Accordingly, all their DC-8 and 737 schedules are completed by 9:00 p.m.

Although Air New Zealand did inquire of Douglas about noise emissions when purchasing its DC-10-30s, it is so satisfied with the results that it no longer makes a point of noise in determining its equipment program. Thus, noise is not a factor in equipment plans but is a fall-out benefit from the desire for a modern fleet. The company feels that any purchases it makes for international operations will automatically meet FAR 36 and Annex 16 because of standards set for others and hence will be acceptable. As for domestic operations, although the DC-8s are admittedly noisy, as are some BAC 111s, the lack of current complaints indicate that Air New Zealand has no worries on its domestic routes.

10. New Zealand Government View

Neither Air New Zealand nor the Civil Aviation Division of the Ministry of Transport think that noise will be a problem in the future. New quieter airplanes will replace F-27s, and DC-8s and eventually the 737s. Such replacements would at least compensate for the increased number of movements. If replacement were by larger types of quiet aircraft, the noise annoyance might decrease. On the other hand, the airport authorities at Auckland questioned this reasoning on the grounds that it overlooked the rising aspirations as to the quality of life demanded by the population as a whole and airport neighbors in particular. Should these rising aspirations be confronted with added aircraft operating frequencies, some with non-FAR 36 aircraft, the situation could be less favorable.

11. Summary

New Zealand, with a population of only three million, has thus far been spared severe noise problems because of the combination of modest noise abatement operating procedures with relatively low frequency of air service. Land-use planning has been in the hands of local, district and regional authorities and has not been uniformly effective under the Town and Country Planning Act -- an act which has recently been modified. Otherwise, New Zealand's laws provide an adeuqate structure for further rules should they become necessary. Although the country subscribes to the principles of Annex 16 and has statutory authority to adopt the Annex, it has

taken no affirmative steps to write those standards into its laws or regulations. The Government authorities state quite frankly that they are not in the position to be a leader in the noise control field and are quite happy to purchase what American and other manufacturers might be producing in the future because those planes will have to comply with whatever regulations are then in effect in the U.S. and elsewhere. Such regulations will be satisfactory to New Zealand.

Although Air New Zealand has been made alert to the noise problem by virtue of the impact of curfews in other countries to which it flies, it maintains that noise regulations play no part in its equipment planning decisions.

Chapter 4.

AUSTRALIA

1. Introduction

In international aviation circles, Australia has been known for its rigid Sydney curfew. Coupled with curfews in some key European cities, the Sydney curfew has been a constraint on traffic around the world because of the resultant small operating "windows." These "windows" also can contribute to congestion because traffic may be bunched into the limited time slots. Although progress has been made in quieting aircraft emissions by the introduction of planes with new technology engines, the Australian Commonwealth government which owns and operates the major Australian airports has, because of potential political consequences, shown some intransigence in moving on requests to modify the curfew at least for these quieter airplanes. Although jurisdictional problems have hampered land-use planning, governmental authorities have won some lawsuits concerning noise and have developed some innovative approaches to deal with non-cooperative groups. A small powerful group of voters living in one area can force the retention of a curfew even though the major traffic flow is over another area. This chapter will once again indicate the subjective nature of the noise problem.

2. Government Structure and the Curfew

The Commonwealth of Australia, a country of 14 million people located thousands of miles from world trade centers and with vast

distances within its confines, has a large stake in air commerce. The country has a constitution and parliamentary system of government containing a House of Representatives and a Senate. Unlike New Zealand which has no state subdivisions, Australia is made up of six member states, thereby introducing the complications of conflicting state and federal jurisdictions and as well raising the same issue of restraint of trade in interstate commerce as is raised in the United States. While the Australian Commonwealth government owns and operates the major airports, the facilities are not set up as self-supporting accounting entities. Since all financing is drawn from general revenues, there is nothing in Australia similar to the British Airports Authority which can collect fees and spend them for noise insulation, the purchase of property, or compensation for loss of value. A significant feature of the government structure for aircraft noise is that it is the Minister of Transport, an elected official, who has the power to lift or modify the curfew. Such a situation can and has turned the curfew into a political measure.

2.1 The Sydney curfew. In the late 1950s with the advent of the early pure jet 707 with JT3C engines, a curfew from 2300 to 0600 was voluntarily established by Qantas and the Government. At that time the Sydney Kingsford Smith Airport (KSA) contained one modest 8,000-foot east/west runway with approaches over built-up community areas plus an inadequate short 6,100-foot north/south runway which could only be used under rather special favorable wind conditions. Because early pure jets emitted sound levels up to 120+ PNdB as they

flew over residential areas containing non-airconditioned, relatively poorly insulated homes, the strong reaction to jet noise resulted in the establishment of the curfew. Since that time the north/south runway has been lengthened to 13,000 feet, thus permitting the majority of approaches and takeoffs to be made over the waters of Botany Bay. Later, wide bodied aircraft with sound emissions of less than 1/2 that of the early planes supplanted most of the old pure-jet aircraft. However, despite several attempts of the airline operators to obtain relaxation of the curfew by pointing out the changed airport layout and quieter aircraft, and despite no objection by the airport authorities or civil servants in the Ministry of Transport to a relaxation of the curfew, the curfew remains. Furthermore, it appears that there is no chance for its elimination and little or no probability for a significant relaxation in its application.

Around the Sydney Airport are a number of towns in which proper zoning could contribute to a solution, or at least mitigation, of the noise annoyance problem. However, in several cases the town councils contain real estate developers whose motivation has been to build more housing and to add more floors to present buildings in order to maximize their income. As a result, even in noise sensitive areas, more homes exist now than before the advent of jets. For example, some clever developers check the runway and traffic pattern in use and show their properties only when the wind is "right" so that their properties are not in the current traffic pattern. One Department of Transport investigator observed a land auction at which

the auctioneer, when forced to stop because his voice was drowned out by aircraft overhead, told his audience "the airplanes don't usually fly over here." In such cases, when the new owner finds what the noise exposure actually is, he quickly becomes an avid supporter of curfews and pressures his local and federal representatives for even stricter regulations.

In the Commonwealth of Australia, members of the House of Representatives (MPs) are elected a minimum of every three years. In the Sydney Airport area there are five seats at this federal level. In the last several elections there have been seven changes in the five seats - all said to be over the noise issue. Since noise is critical to the seating of five members of Parliament in a country where there is a narrow margin of victory between the two parties (Labor and Liberal), the party in power may be overturned by the voters just by the sensitive noise issue in the Sydney area. Thus, it is clear that there is very heavy pressure on the Minister of Transport to keep his party in power by holding the line on the curfew. Some members of Parliament have run on a platform of "no more aircraft noise." Even a small reduction of the curfew would be considered a violation of their commitment. The standard cry against any relaxation has been, "This is but the thin edge of the wedge" - toward eliminating the curfew. Thus, enforcement of the curfew to the second is demanded.

2.2 Efforts to modify the Sydney curfew. In 1978 Qantas with a fleet of 19 wide bodied 747s, all but three being of the quieter

type without blow-in doors, reasoning that the changed runway situation plus the new quieter aircraft should merit relief from having aircraft diverted from a Sydney arrival or prohibited from operating out of Sydney by virtue of a few minutes' delay, and realizing that removal of the curfew was politically impossible, proposed "a limited number of curfew dispensations for delayed flights." At about the same time investigations were being made by the federal government on the need for a Second Sydney Airport (SSA). Some of the hard core noise opponents in nearby councils saw this as an opportune time to push for either total closure of Syndey's Kingsford Smith Airport or for no change at all in its curfew.

Most Government civil servants, specifically authorities at Sydney and those charged with protecting the environment, looked favorably on providing flexibility in the curfew and so indicated to the Minister of Transport. However, a MP from Rockdale, a noise sensitive area, put a parliamentary question to the Minister whether he had a plan to change the curfew. The Minister, having been on record previously that there would be no change, contemplating the voting situation, answered that he was not considering a change.

Thus, early in 1979 there appeared to be no curfew relief in sight. There was even apprehension that a new curfew somewhere else, perhaps Singapore, could play havoc with Sydney operations. Since so many advocated closing the airport, apparently some who lived near the airport and earned their living from airport operations did not see a tie between their economic status and the welfare of the airport.

However, to the surprise of many, later in 1979 a breakthrough on the curfew question occured when a policy was adopted permitting some limited "dispensations" for delayed or off-schedule operations of international aircraft.

The modification of the curfew was circumscribed with the limitations that the international noise certified aircraft could land up to one hour into the curfew, i.e., between 2300 hours and midnight, providing the landing was to the north on runway 34 and only engine idle reverse thrust was employed.[11/]

The trial basis was to be short lived, for soon after the new policy was announced local politicians representing the communities around the airport (i.e. their local governments and a Federal parliamentarian) reacted sharply and demanded that the Minister of Transport withdraw his approval. The Minister, seeing adverse political consequences from his recent action, decided to terminate the new plan, but it had had only a three month trial. The experience, from a practical point of view had to be termed satisfactory. The "dispensations" were used only a few times by Qantas and British Airways 747 flights when the flights otherwise would have had to hold at Singapore. Actually, although starting late, each aircraft made up time and landed before curfew time.[12/] Thus the new system had provided the necessary flexibility without any noise disturbances within the

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11/ Letter from Sir Lenox Hewitt, Chairman, Qantas, 2 July 1979.

12/ Letter from Brian Harris, Australian Department of Transport, March 27, 1980.

curfew period. What has disappointed the airlines and many in the Department of Transport is that the communities were able to exert such pressure as to have the "dispensation" rule revoked without any aircraft actually flying into the curfew period.

The foregoing is not surprising to those familiar with reaction to noise around the Sydney Airport. The Sydney noise history is a mixture of emotion and politics in which facts and logic sometimes have had little part. Early in the jet era citizens were so fearful that noise or jet blasts would blow cars off the highways under the approach or takeoff path that traffic lights were erected to stop cars when air traffic was overhead. Once the curfew was established, it tended to become so sacred that the Airport Noise Abatement Committee was forbidden to talk about the curfew during its meetings. More recently, citizens have mounted drives to close the airport entirely and to urge the building of a second Sydney Airport which itself might have a curfew. Moreover, in early 1979 two transports were cited by citizens for violating the curfew because they landed 20 seconds into the curfew time.

One community, Rockdale, although adjacent to the east-west runway which handles a lower percentage of traffic (Chart 4) than does the north-south runway, not only has fought vigorously to maintain the curfew, but also has defied the wishes of the federal and local land-use planners by authorizing the building of multiple storied housing in a noise impacted area. The city went so far as to construct a stadium close to the lead-in lights of runway 8-25

where the noise level has been measured at 119 dB for a 707. Another community to the east, Mascot, also has developed the reputation of being non-cooperative. Other communities have tried to employ zoning and some have gone so far as to alert prospective purchasers there may be a noise problem on their property.

In one year, just before the widebodies were introduced, every government member of the noise committee lost his seat in Parliament

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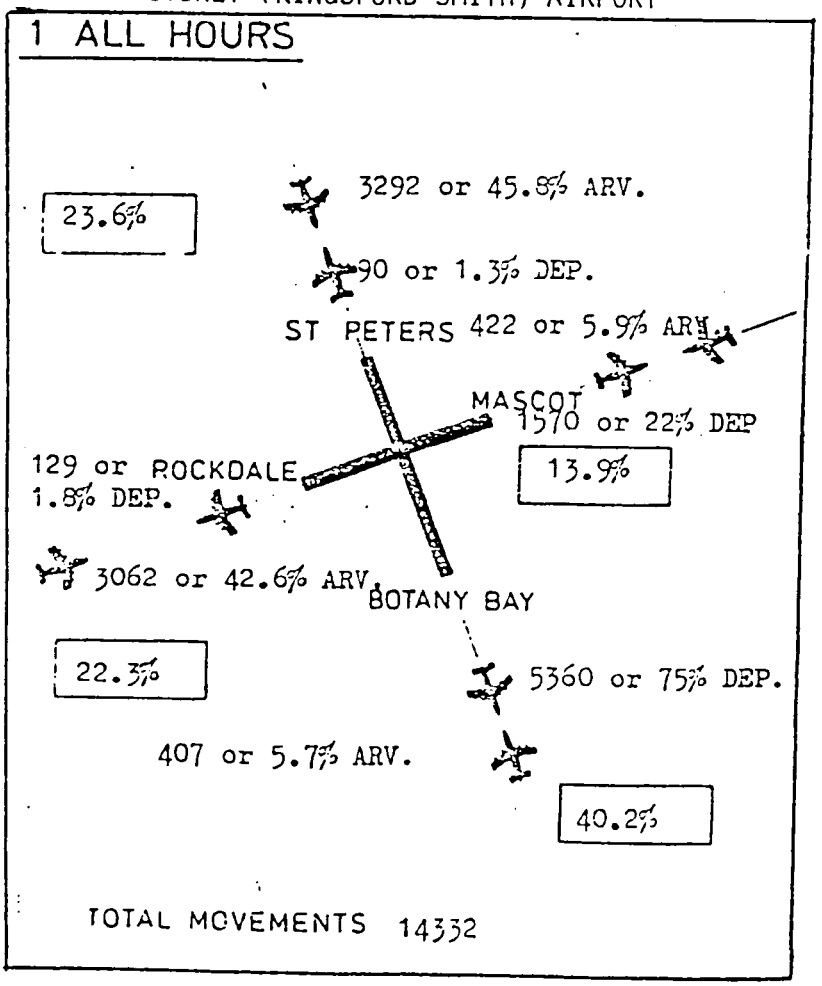
CHART 4

DISTRIBUTION OF TRAFFIC NOVEMBER 1978
SYDNEY (KINGSFORD SMITH) AIRPORT



over the noise issue. Given the foregoing background and the success of real estate people and developers in obtaining positions of power in community government, the difficulties of obtaining curfew relief for noise certificated aircraft are understandable. However, given the limited number of flights per day, about 450 at Sydney compared with 2,000 at Chicago, the question arises as to whether the situation is as serious for the inhabitants as they have represented it to be.

After serious study, the House Select Committee on Aircraft Noise adopted the U.S. measure of NEF for noise zones, but did say NEF should be utilized in terms of "Australian conditions"[13/] which subsequently has been interpreted as placing desirable noise exposure for residences at 25 NEF rather than 30 NEF. The rationale appears to be that because of the mild climate Australians live in homes which have very limited insulation and are rarely air conditioned. Doors and windows are left open. Accordingly, conventional building methods do not afford the degree of sound insulation present in homes in the U.S.[14/] Additionally, they believe Australians spend more of their time outdoors than do people elsewhere.

13/ Report from the House of Representatives Select Committee on Aircraft Noise October, 1970, Parliament of the Commonwealth of Australia, 1970 Parliamentary Paper No. 236.

14/ In 1977 the Standards Association of Australia published a Code of Practice for Building Siting and Construction Against Aircraft Noise Intrusion which urges that because of Australian conditions residences in rural areas should be limited to 25 NEF.

It should be pointed out that the Sydney curfew has been limited to jet operations. Turboprops, such as the L-188, F-28, and piston aircraft have been exempt. For several months the curfew was even lifted for the Lear jet because the aircraft's noise emissions were as low as non-jets. However, although the operations of the Lear jets themselves were not heard by residents, the knowledge that jet flights were taking place raised, as the Australians say, such a "hoo-haw" that the Lear jet curfew exemption was rescinded in favor of a case-by-case review of each application. The "hoo-haw" resulted in again bringing forth the argument that the exception was but the "thin edge of the wedge" for eventual complete removal of the curfew.

2.3 Other curfews. In Australia, Sydney is not alone in its sensitivity to noise. Curfews also exist at Adelaide, Avalon, Brisbane and Essendon (an old airport which formerly was the facility for Melbourne), Partly because of noise Brisbane is changing its runway plans in a redevelopment action. Neither Melbourne nor Canberra have curfews. However, Melbourne and Perth are instituting curfews in 1981 for non-Annex 16 aircraft.

2.4 Environmental Protection Act. Like other countries visited, Australia has an Environmental Protection Act and, as has also been true elsewhere, the bureaucracy under it has been shuffled and reorganized several times. Within the Department of Transport is a very active Environment and Security Branch which currently is of major importance in handling noise matters at the federal level as well as at ICAO. Although each state has its own Environment and

Protection Act or agency and could try to deal with aircraft noise, such action would bring it into competition with the Commonwealth government. Thus, the state agencies are more interested in trucks, motorbikes, and cars than in airplanes.

3. Legal Basis of Noise Regulations[15/]

The Constitution of the Commonwealth of Australia does not give the government express power over civil aviation and hence aircraft noise. Such power as the Government has is deemed to flow from the power of Parliament to control interstate and foreign commerce under Section 52(1) of the Constitution. Although the Government thinks it could control aircraft noise at the source at those airports which it owns under its rights to acquire land for public purpose (airports), this partial control would be unsatisfactory. But under Section 51 it has power to make laws to carry out any international convention to which Australia is a party. Therefore, it can back into noise control at the source through legislating the ICAO Annexes. However, the commonwealth has no power to purchase airport land for noise purposes alone, but only the land necessary for airport operating purposes.

When Australia separated from England, its culture was heavily influenced by the English law and specifically by the English Air Navigation Act of 1920.[16/] As the main source of regulatory power

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15/ Report from the House of Representatives Select Committee on Aircraft Noise, October 1970, Parliament of the Commonwealth of Australia, 1970 Parliamentary Paper No. 236.

16/ It will be recalled that this same situation was noted in New Zealand (Chapter 13).

the Air Navigation Act of the Commonwealth has been used as a basis for promulgating certain operating rules to provide a measure of noise relief over built up areas. However, to further its noise abatement efforts, the Commonwealth has no power to control land-use planning adjacent to airport boundaries. Here the states, regions and municipalities are involved with attendant jurisdictional problems. Cooperation between them has been spotty.

The power to issue permits under Regulation 320A of the Air Navigation Act has been the basis for rules on noise on the airport itself. Curfews, night running of engines, and similar regulations fall into this category. As owner of the airport, the Commonwealth can impose these rules as conditions for the use of the airport. As 100 percent owner of Qantas and Trans Australian Airlines the Government can, of course, prescribe whatever regulations it wishes.

Since under Australian law aircraft noise is not a cause for nuisance action if the flight is otherwise conducted normally, there still remains the serious question about the right of a plaintiff to seek legal remedy because of noise. The matter has not been litigated and the Commonwealth hopes to avoid legal confrontation by protecting the people from serious noise. The Civil Aviation Damage Act by Aircraft of 1958 does not cover nuisance by noise unless it involves direct physical or property damage.

Legislation in the states copy from the U.K. 1920 law and provide that "no action lies in respect to trespass or nuisance by reason only of the flight of an aircraft over any property." It is presumed

that noise is "an ordinary incident of flight."

Finally, the 1970 report of the House Committee on Aircraft Noise concluded that it was unlikely that Commonwealth legislative action could solve the problem of aircraft noise.[17/]

4. Noise at the Source

4.1 Noise Certification: Australia as a member of ICAO supports and administratively applies Annex 16 and FAR 36, but has not officially legislated noise certification. Inasmuch as various Australian cities have strong environmental groups, it is anomolous that a country with such severe curfews has failed to adopt Annex 16. Legally the administrative approach is without teeth; however, except for Ansett, the major ailrines, namely Qantas and Trans Australia, are government owned and are therefore, in no position to buck the Government. Ansett, although being privately owned, is closely dependent on the government for guaranteed loans and route authority. Thus, for Australian carriers Annex 16 can be made effective by government fiat. Nevertheless, for several years, the government has been "readying legislation" to give statutory sanction noise certification. The Minister has recently stated that the Commonwealth will implement noise certification legislation. The question is when? On the other hand, for imported aircraft the government does have legal authority via Federal Regulations under the Customs Act (1901) to control the technical standards; this includes the noise of aircraft engines.

17/ Ibid. p. 48.

4.2 Non Noise-Certified Aircraft: The matter of how to handle older pre-Annex 16 aircraft was settled in August 1977 when the Australian Minister of Transport announced that all commercial jet aircraft must meet ICAO standards by retrofit or removal from service according to a prescribed timetable. The timetable states that by January 1, 1981, at least 80% of the Australian airlines fleets must meet the standards. By January 1, 1985, 100% of the domestic fleet and all foreign aircraft entering Australia must comply with the same standards.

5. Noise Monitoring and Sanctions

In 1970 a parliamentary committee on aircraft noise recommended that Sydney be the first location for a noise monitoring system. Its late establishment enabled designers to profit from some of the mistakes of others. The system consists of 10 unmanned stations at fixed locations around the airport near takeoff and landing flight paths, and one on the airport itself to monitor "ground run-ups." All noise events are monitored 24 hours a day and later the noise is manually matched to the flights with which they were associated by use of the control tower flight data strips. The results are then fed into tapes which are used, inter alia, to

- investigate individual noise complaints
- check night curfew penetrations
- check compliance with preferential noise abatement procedures
- monitor night-time ground running noise
- detect noise in excess of the standard set for the operation
- statistically summarize the day's operations and store the results for various future monthly and quarterly reports
- note noise from reverse thrust operations

So that light short-haul and heavy long-haul aircraft are treated equitably, an "excess" noise event is defined as one in which the aircraft noise exceed a preset level taking into consideration the type of aircraft and its mode of operation i.e., weight of the aircraft and direction and velocity of the wind. Daily, monthly, and quarterly reports are routine outputs of the system and indicate the number of aircraft creating noise "excesses", the amount of "excess", and the companies to which they belong. The standard set is for the 99% lowest emmissions. Whenever an excess occurs the DOT immediately notifies the airline concerned so that the company may investigate. It was emphasized that the system is employed for informational purposes only, and no disciplinary functions have been involved.

Operators of the system pointed out the same objections that were mentioned by other countries with noise monitoring systems, namely the time consuming nature of the work of having manually to tie in results from the monitors with the flights strips, and the large and embarrassing possibility of error.

6. Operational Regulations

In various areas of Australia, and especially around Sydney, groups of influential citizens have forced the adoption of a wide range of operational regulations. As Table 1, Noise Abatement Procedures indicates, the corner pieces of these rules are preferred runways and flight paths, specified take-off and landing configurations for aircraft, and noise curfews at five airports.

NOISE ABATEMENT PROCEDURES

1-APPLICATION

1.1 Noise Abatement procedures have been produced for locations which have noise sensitive areas, and shall normally apply to all jet aircraft and other aircraft having an MTOW exceeding 5,700 kg.(12,500 lb).

1.2 In applying noise abatement procedures, ATC will nominate a preferred runway appropriate to the operation, and aircraft will be required to conform with the resultant traffic pattern. Noise abatement will not be a determining factor in runway nomination under the following circumstances:

(a) in conditions of low cloud, thunderstorms and/or poor visibility;

(b) for runway conditions that are completely dry:

(i) when the crosswind component, including gusts, exceeds 15 knots;

(ii) when the downwind component, including gusts, exceeds 5 knots;

(c) for runway conditions that are not completely dry:

(i) when the crosswind component, including gusts, exceeds 10 knots;

(ii) when there is any downwind component, including gusts;

(d) when wind shear has been reported;

(e) when, in the opinion of the pilot in command, safety would be prejudiced by runway conditions or any other operational consideration.

1.3 Preferred flight paths for arriving and departing aircraft are depicted for particular locations and for departing aircraft they may be in the form of a Standard Instrument Departure. The requirement to follow these flight paths shall be subject to a specific ATC clearance or instruction.

1.4 The requirement to follow a preferred flight path for the purposes of noise abatement may be varied by ATC for operational reasons, e.g. weather, traffic complexity.

1.5 On the runways listed at para 1.6 below, departing turbo-jet aircraft subject to noise abatement procedures will, unless required to do otherwise in accordance with a SID or specific ATC instruction:

(a) climb straight ahead with take-off engine power maintained to a height above aerodrome level of:

(i) 800 feet for domestic aircraft;

(ii) 1500 feet for international aircraft;

(b) maintain a speed range of V2 + 10 knots minimum to V2 + 20 knots maximum - or body angle limit speed - to a height above the aerodrome of:

(i) 2500 feet for domestic aircraft;

(ii) 3000 feet for international aircraft.

1.6 Noise abatement climb procedures are required for operations by jet aircraft from the following locations and runways:

Adelaide	:	Runway 05, 12, 30.
Brisbane	:	Runway 22.
Cairns	:	Runway 15.
Launceston	:	Runway 32.
Melbourne	:	Runway 09, 16.
Perth	:	Runway 20, 24.
Sydney	:	Runway 07, 25, 16, 34.

NOTE: This does not preclude the application of these procedures to other locations and runways.

1.7 Arriving aircraft subject to noise abatement procedures will be directed in a manner that will avoid noise sensitive areas, and approaches will be planned to preferred runways. Pilots are not to make approaches to land below the visual or electronic glide paths for the runway in use.

2— NOISE CURFEWS

2.1 Turbo-jet aircraft operations shall not be scheduled at Adelaide, Avalon, Brisbane, Essendon and Sydney airports during curfew hours. These curfew hours are published in this document with the Terminal Area Procedures sheets together with any dispensations applicable to the location.

2.2 Dispensation to use these airports as alternate aerodromes applies only to the landing operation. Interrupted flights will not be permitted to continue until the termination of the curfew period.

NOISE ABATEMENT PROCEDURES SYDNEY (KINGSFORD SMITH)

1.PREFERRED RUNWAYS

1.1 (a) 0900-2045 GMT (applicable to all aircraft):

Landing	Take-off
1. Runway 34	1. Runway 16
2. Runway 25	2. Runway 07
Equal 3. Runway 07 or 16.	Equal 3. Runway 25 or 34.

NOTE: During the period 0900-1200 GMT, traffic situations will frequently necessitate variations in the above preferences. In these situations ATC will, as far as possible, avoid nomination of Runways 16 and 07 for landing.

(b) 2045-0900:

(i) Landing

Pilots should expect to land on the runway affording a straight-in approach, having regard to the safety, wind and weather conditions mentioned in TWA-4-1, provided that the opposite-direction runway is not in use for departures. Sequencing traffic for reciprocal arrivals on a runway is at ATC discretion and will only be used in certain traffic conditions.

When a straight-in approach is not possible:-

Arrivals from the south-west	- Runway 16, 34 (subject ATC workload), or 25.
Arrivals from the north	- Runway 07 or, subject to ATC workload, 25 or 34.
Arrivals from the east	- Runway 16, 34 or 07, in that order.

(ii) Take-off

Runway 16 - During heavier traffic periods, ATC may direct departing domestic aircraft to use a runway other than Runway 16. If Runway 16 is unsuitable, the most suitable runway nominated by ATC will be used.

2.PREFERRED FLIGHT PATHS

2.1 Arriving Aircraft

These procedures will apply during the following periods:

(a) to international arrivals at all times;

(b to other arrivals 1200-2045 GMT and, at the discretion of ATC when workload permits, 0900-1200 GMT.

(continued overleaf)

NOISE ABATEMENT PROCEDURES SYDNEY (KINGSFORD SMITH) (CONTD)

2.1.1 Arriving jet aircraft will not be permitted to descend below 3000 ft over built-up areas until aligned with the runway centreline at the "gate" to the various runways, i.e. SY NDB and West Pymble.

2.1.2 Other arriving aircraft above 5700 kg (12500 lb) MTOW will not be permitted to descend below 2000 ft over built-up areas until aligned with the runway centreline.

2.1.3 ATC will route aircraft over less noise-sensitive areas to the various runways. Frequent use will be made of seaward tracking during the night hours for arrivals using Runways 34 or 25.

2.2 Departing Aircraft

ATC will route departing aircraft, including aircraft below 5700 kg (12500lb) MTOW in some situations, over less noise-sensitive areas and generally following the routings described in Standard Instrument Departures. During the night hours, the routings in particular SIDs that provide for either seaward tracking or maintaining runway heading until some distance from the aerodrome are preferred for all heavier aircraft types.

3.TRAINING FLIGHTS

3.1 (a) Training is permitted at Sydney only between 2045 and 0900 GMT Monday to Saturday inclusive, except that airwork may be conducted at any time, provided that the training is not over built-up areas. Training on the approach aids shall not continue for more than one hour during any one period.

(b) No assymetric training is permitted below 1500 ft over built-up areas, except as set out in para. 3.1(d).

(c) Practice descents on approach aids shall be confined to ILS or Localiser training.

(d) Assymetric practice descents on ILS or Localiser to the minima specified for these aids may be carried out, provided that in the simulated failure the engine is not shut down.

(e) At any time, arriving regular public transport and charter aircraft may be permitted to carry out a practice ILS or Localiser approach at the conclusion of each leg of flights to Sydney, provided that:

(i) the pilot in command has stated that the approach is required for licence renewal purposes; or

(continued on page 3)

NOISE ABATEMENT PROCEDURES
SYDNEY (KINGSFORD SMITH) (CONTD)

(ii) the aircraft lands straight ahead and does not use a runway other than the runway currently in use, merely for the purpose of carrying out the practice.

(f) Examiner of Airmen test and check flights are permitted on any of the aids in the Sydney Terminal Area, subject to appropriate warning and ATC traffic handling capacity.

(g) Airline companies may carry out aircraft checking and testing flights, other than under asymmetric conditions, on Runway 16, but these will be limited to 2 circuits by any one Company in one day.

(h) All training is at the discretion of ATC as traffic and workload permit.

3.2 Military aircraft on practice ILS or Localiser approaches must intercept the aid at or above 3000 ft.

3.3 VFR and NGT VMC category aircraft will not be permitted to make practice ILS or Localiser approaches unless VMC exist from ground level to 3000 ft.

3.4 Aircraft not intending to land straight ahead at the conclusion of an approach shall carry out the following procedure:

(a) Runway 07

(i) Climb straight ahead until reaching 1200 ft;

OR

(ii) When over the centre of the aerodrome, turn right over Botany Bay, climbing to 1200 ft or above before crossing the western shore of the Bay.

(b) Runway 16

(i) Climb straight ahead until reaching 1200 ft;

OR

(ii) Turn left over the industrial and open land to the north of the aerodrome.

(c) Runway 34

(i) Climb straight ahead until reaching 1200 ft;

OR

(ii) Turn right over Botany Bay.

(continued overleaf)

NOISE ABATEMENT PROCEDURES
SYDNEY (KINGSFORD SMITH) (CONTD)

4. RESTRICTIONS ON JET OPERATIONS

4.1 The operation of jet aircraft is not permitted at Sydney Airport between the hours of 1300 and 2000 GMT. Flights bound for Sydney shall not depart from an airport if it is not possible to land before 1300 GMT. These restrictions shall not apply if operational safety becomes involved or if an aircraft is delayed en route by unforecast headwinds etc. to the extent that a landing at Sydney will be later than 1300 GMT.

4.2 Mercy flights and the planned or unplanned use of Sydney Airport as an alternate are excluded from these restrictions.

4.3 Operators and pilots of jet aircraft are requested to cooperate in limiting the use of reverse thrust when landing on Runway 34 between the hours of 1100-2045 GMT. At pilot discretion, limited reverse thrust, preferably as low as reverse idle, may be used by jet aircraft landing on Runway 34 provided the following conditions are met :

(a) No downwind component;

(b) Scheduled landing distance increased by 15%;

(c) The runway is dry;

(d) Reverse idle selected;

(e) Lift dump serviceable and used;

(f) All other means of retardation serviceable;

(g) Any other condition, in the opinion of the pilot, that may affect safety.

Table 1 and Table 2 display the rules for Sydney as presented in the Aeronautical Publication (AIP). Administrative orders for an airport further detail instructions for limiting ground testing of engines. For example, at Sydney the regulations for ground testing cover four pages specifying such items as (1) limiting the length of time and power for the test; (2) restricting tests for early departure to no more than two hours before scheduled departure and then only if towed to a special point, and (3) detailing the elements required in the run-up report.

Although Melbourne (the second largest city in Australia) has a relatively new airport, Tullamarine, built away from the city primarily for noise abatement purposes, the city is already finding it necessary to develop operational rules (see Table 3). As the next section will reveal, economic pressures have resulted from the failure of land-use planning to protect noise sensitive areas, and so the citizens have asked for relief through operational constraints. However, the Department of Transport has encouraged other measures to alert prospective purchasers of property of potential noise nuisance.

7. Land-Use Planning

The story in Australia of land-use planning for aircraft noise control closely parallels that in the other countries visited. Briefly, there has been general agreement that land-use planning should be given very high priority because, in theory, it can be shown to be a most effective tool in mitigating aircraft noise nuisances around the air-

TABLE 3, MELBOURNE NOISE REGULATIONS

NOISE ABATEMENT PROCEDURES
MELBOURNE

1.PREFERRED RUNWAYS

1.1 Landing

Runways 27, 09 and 16 have equal first preference.
Runway 34 is the least preferred.

1.2 Take-off

Runways 27 and 34 have equal first preference.
Second preference is Runway 16.
Runway 09 is the least preferred.

1.3 These priorities are to be used to ensure that the majority of movements occur on the most preferred runway. They do not dictate the mandatory use of opposite or crossing runways.

2.PREFERRED FLIGHT PATHS

2.1 Arriving Aircraft

When weather and traffic conditions permit, aircraft will normally be routed to avoid the noise sensitive areas of Bulla, Keilor, Sunbury, Sydenham and Greenvale and the location of a public function, the details of which have been specifically advised (e.g. Myer Music Bowl concerts), and via the following flight paths:

(a) Aircraft inbound from the north, east or south will normally be routed via Fenton's Hill or Epping, as appropriate, thence direct to the operative runway.

(b) Aircraft from the west, landing runway 27 and not requiring a full instrument approach, will normally be routed for a right base.

(c) When runway 34 is in use, aircraft routed for a left base shall be directed to intercept the final approach path at approximately 4 NM not below 1500 feet. (This altitude requirement is a combination of noise abatement, R337 and ILS mast clearance procedure. Aircraft routed for a right base will normally be processed via Plenty and Essendon 26 Localiser, overflying that field onto a right base, provided descent below 1500 feet is not authorised until the aircraft is over the top of Essendon.

NOISE ABATEMENT PROCEDURES - MELBOURNE (CONTD)

(d) For traffic sequencing purposes and during daylight hours only, arriving aircraft from the south and south-east may be authorised to track direct to the ML VOR.

2.2. Departing Aircraft

ATC will route departing aircraft, including aircraft below 5,700 kg (12,500 lb) MTOW in some situations, over less noise-sensitive areas and generally following the routings described in Standard Instrument Departures.

3.TRAINING FLIGHTS

3.1 Conditions governing training operations are as follows:

(a) operations will be permitted only between 2000 and 1300 GMT;

(b) circuit training on runway 09/27 will be to the north of the airport, and on runway 16/34 to the west of the airport;

(c) traffic permitting and without a request for a holding pattern, aircraft on repetition ILS approaches will be routed via a normal right-hand circuit;

(d) when Avalon is closed or operationally unsuitable, long duration training at Melbourne is authorised;

(e) irrespective of the availability of Avalon, short duration training at Melbourne is authorised, provided the maximum number of circuits per detail is four, of which only one may be low level as per sub para (g), and one detail per company. Approval will be subject to traffic complexity;

(f) training operations (circuits), both by day and night, are to be conducted under the following ceiling and visibility minima - ceiling 1500 feet, visibility six kilometres;

(g) low level circuits are to be conducted as per the minima specified above and at a circuit altitude not lower than the published circling minima;

port environs. However, in practice, primarily because of governmental jurisdictional problems and the conflicting interests between economic gain through uncontrolled building and the interest in quality of life, land-use planning has had a low rate of success.

Because of the interstate nature of air transportation the Constitution gives the federal, i.e. Commonwealth, government control of air transport. By means of its public works authority the Commonwealth does purchase land and construct airports.[18] However, its jurisdiction ends at the airport boundary. With the agreement of a state, an alternative to federal government ownership of an airport is possible. Nevertheless, there are statutory problems preventing buying land for noise abatement and leasing it back under controlled conditions. In essence, although the federal government oversees aviation, it does not have statutory authority over land-use planning in the states or municipalities.[19]

In the absence of authority over land-use planning, the Commonwealth has, through the Select Committee on Aircraft noise, recommended that those who do have the authority adopt the United States of America Federal Aviation Authority's NEF system with its compatibility table of less than 30 NEF, 30 to 40 NEF and 40 NEF and above, as a guide. In the future, where possible, it has been suggested that the open outdoor type of living in Australia warranted discouraging

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[18] Land Acquisition Act of 1955 Public Works Act 1912(NSW)

[19] It does have such authority in the territories

any home construction in the 25 to 30 NEF area.

The Department of Transport attempts to promote land-use planning by issuing noise exposure forecasts containing compatible zones for the major Australian airports and noise advice to every airfield. Advice is given to builders, architects, councils, and state and local planning authorities. The Department also supports planning by testifying in legal proceedings relative to desirable noise levels and by suggesting other noise control measures. However, in the final analysis its services are advisory in nature and its advice often is not heeded.

State governments have planning bodies but they also are advisory in nature. A parliamentary committee has recommended that land-use planning have the statutory basis of a State government enactment and not be subject to uncoordinated changes by local authorities. It is at the local level that effective zoning does or does not take place. The results, as indicated by the following examples from Sydney, Melbourne and Salisbury area, have been extremely spotty.

7.1 Sydney International Airport. Of all the community representatives around the Kingsford Smith airport the council of Rockdale has been the least cooperative in zoning for compatible land use. Rockdale has representation in Parliament. It has used this representation to press for a continuation of the curfew, the closure of the airport, and, over strong objections from the Department of Transport, it has continued to allow housing developments in noise-sensitive areas and has even constructed a stadium near the landing path to

a runway. Although the Local Government Association of New South Wales recommended that the communities near Kingsford Smith include in the zoning certificates of sale [20/] a reference that the property is in a noise affected area and that further information could be obtained from the Department of Transport, the Rockdale council refused to adopt this recommendation. Three other affected communities, Botany, Hurstville and Marrickville, took affirmation action and included the warning notice. The legal profession has seemed to be uninterested in implementing the various suggestions made by Sydney Noise Abatement Committee to alert prospective property owners to the noise levels or to engage in zoning. As previously noted, economic gain and politics triumph over logic in various noise affected areas around Sydney.

7.2 Melbourne. While the Sydney Kingsford Smith Airport is an old airport which was enlarged to accomodate jets, the Melbourne Airport at Tullamarine is a relatively new airport placed away from the city center in an outlying area and designed to operate 24 hours a day. Total land-use planning was to keep the inhabitants protected from aircraft noise and make it impossible for unscrupulous developers to build in a noise-sensitive area. The older Melbourne airport, Essendon, developed before the days of land-use planning, had become subject to serious noise problems as housing was constructed closer and closer to the airport boundary.

By legislation in 1968, the State of Victoria (in which Melbourne is located) authorizes its agencies to engage in land-use planning

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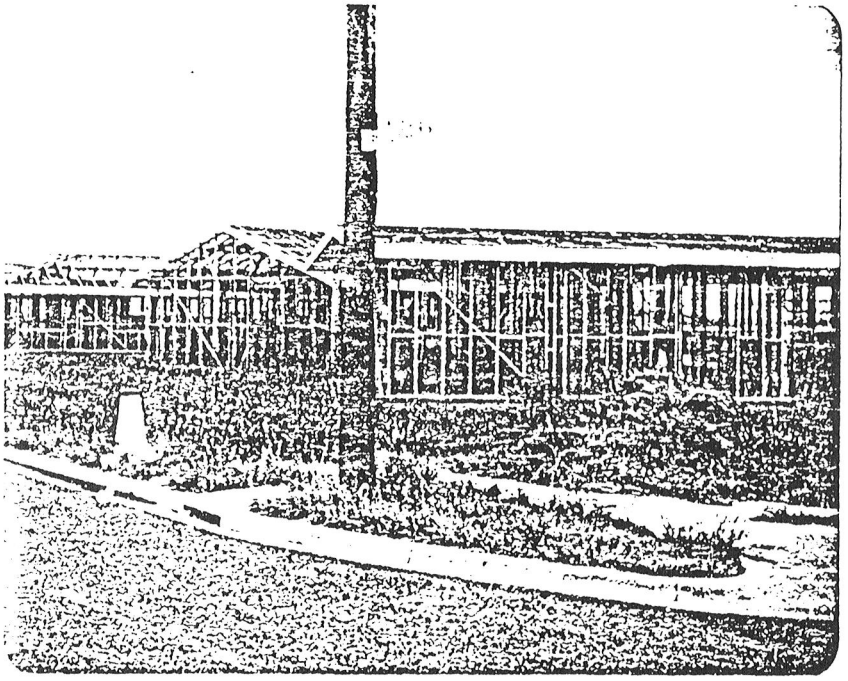
[20/] Certificate 348AS

and to coordinate planning throughout the state. At the lower level, the Town and Country Planning Board has the initial responsibility for environmental protection. Its plans go to the State Planning Council and to any regional authorities affected. They are then forwarded to the Minister for Local Government and to the Governor in Council. Although the plans are binding, they are so general in nature that they have not precluded undesirable construction around airports.

As an example, at Tullamarine the Town and Country Board adopted the U.S. Land Use Compatability Table as a guide, i.e. zones of less than 30 NEF, 30 to 40 NEF, and over 40 NEF, but to be adjusted five NEF for "Australian conditions." Thus, the Board recommended that housing be restricted to areas of 25 NEF or less. Also concerned with the Melbourne airport are the city's Metropolitan Board of Works and its advisory committee, the Victorian Air Fields Committee. Although the Commonwealth Department of Transport constructed the airport and had a substantial ongoing interest in it, the Department had no authority to enforce its zoning ideas. Despite the foregoing extensive structure for protecting the environs of a new airport, in point of fact zoning seems to have been anything but binding. Somehow developers, even including a state body have managed to program for noncompatible use.

Notwithstanding the fact that the Government could not buy land for noise abatement purposes but only for airport use, the Tullamarine project started out well. The Government this time managed

BROADMEADOWS HOUSING SITE AFTER 18-MONTH
"BLACKLIST" BY CONSTRUCTION WORKERS FOR AIRCRAFT
NOISE, TULLAMARINE AIRPORT, MELBOURNE, AUSTRALIA



to buy more land than was needed for airport operating purposes on the ground that it would eventually be needed for an additional runway. Until so needed, it would of course serve as a noise buffer zone. However, the Government's plan could not be carried out. First, the local zoning authorities decided to permit a small pocket of buildings to remain near the airport. Second, somewhat surprisingly, a state body, the Victorian Housing Commission, which actually owned nearby land, decided to build a public housing development in a 25 NEF area just east of the airport in a location called Broadmeadows.

Streets were constructed, electric lines strung and the framing of the houses began to take shape. However, when the laborers working on the houses noted the annoying noise as planes flew overhead, they and their union decided to "blacklist" the construction site. The workers struck and the project remained a skeleton for several years as shown in the accompanying photograph. Labor strength is high in Australia. Later a compromise was worked out in which the development was changed to private housing with strict requirements as to soundproofing and method of construction specified in the local building permit.

When DOT realized that developers and property owners were finding ways to thwart the ideals of compatible planning and were selling land to people who did not know of the extent of aircraft noise when the airport would become fully operational, it hit upon a clever way of advising prospective buyers coming to see land what was in store for them. As the accompanying photographs illustrate, at strategic places on roads near the airport the DOT erected large colored "you are here" signs which clearly show the location of the land in relation to the airport and its runways (Charts 5 and 6). Some of the terrain undulates in such a fashion that the airport itself is not visible from the location of the signs. Further examination of the sign may show that the observer's "desirable property" is directly under the takeoff path or is on a projection of a proposed runway. One such sign is at a point where a purchaser would be subject to aircraft noise from the old, but still used,

CHART 5

NOISE WARNING SIGNS ERECTED NEAR TULLAMARINE AIRPORT

MELBOURNE, AUSTRALIA

CHART 6

NOISE WARNING SIGNS ERECTED NEAR TULLAMARINE AIRPORT

MELBOURNE, AUSTRALIA

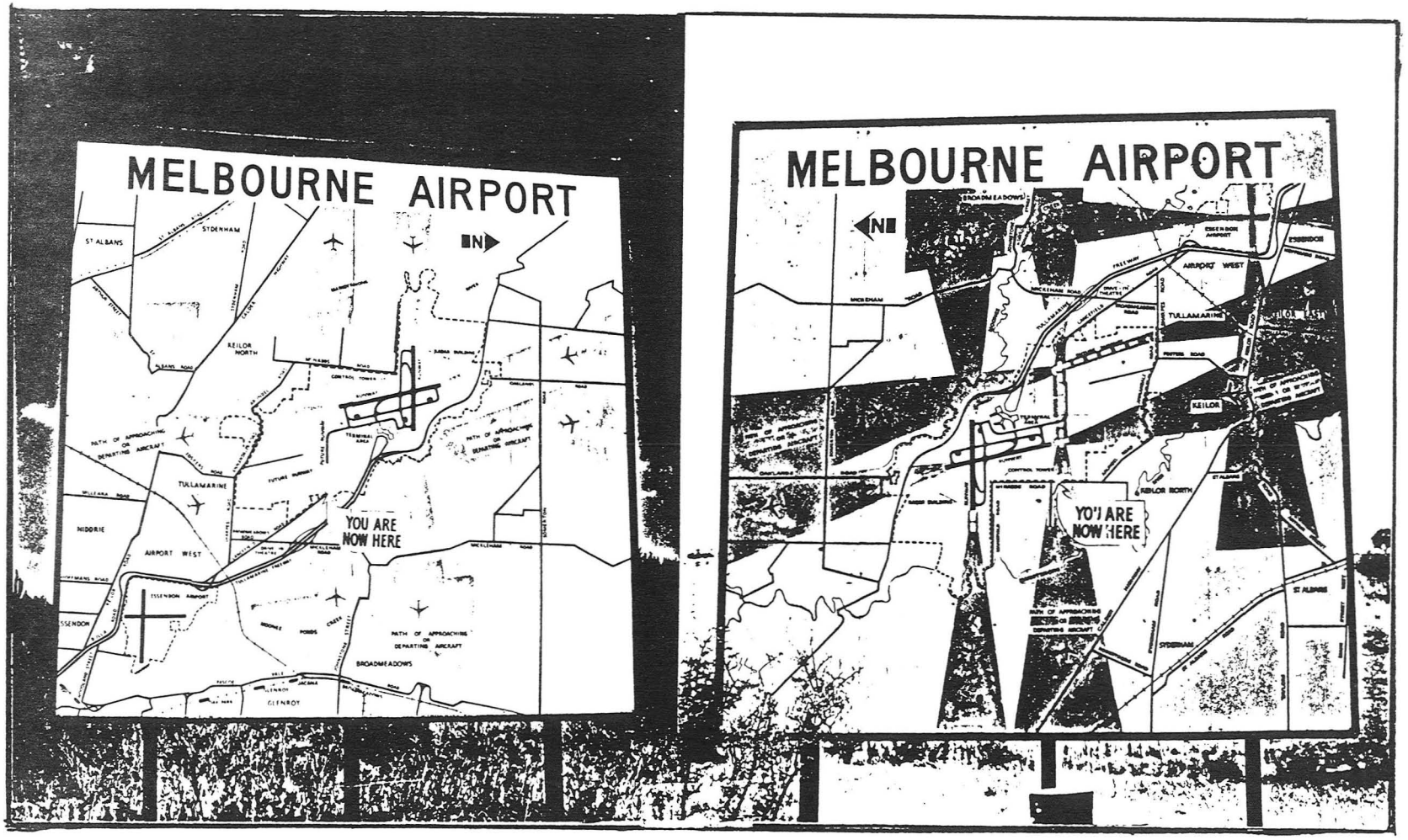


CHART 6

Essendon Airport, as well as from Tullamarine.

7.3 Salisbury. If the courts follow the precedent of the 1977 Salisbury - Rialto Estates case [21] which involved the denial of a petition to subdivide a property in a 30 to 40 NEF zone, the Department of Transport will feel that land-use planning is on the threshold of success. This is the first Australian case in which the U.S. FAA system was adopted and then supported by a legal decision. The case involved Rialto Estates, a concern seeking to develop land at the outer edge of the town of Salisbury, land which was also near the Royal Air Force base called Edinburgh.

Rialto Estates appealed decisions of the Director of Planning and of the Council of Salisbury denying permission (because of air-craft noise) to subdivide the land into over 500 home sites. The developer pointed out that although the land was in the process of being rezoned it actually was zoned as residential. While agreeing that the land was in an area exceeding 30 NEF, the developer proposed to use special construction and insulation to attenuate noise levels in the dwellings. In opposition to the developers appeal, the Council of Salisbury and the Commonwealth secured expert witnesses from the Environmental Security Branch of the Airways Operations Division of DOT and from the Noise Investigation Section of the National Acoustical Laboratories of the Department of Health.

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[21] In the matter of Appeals Between Rialto Estates Pty. Ltd. etc. and the Director of Planning and the Corporation of the City of Salisbury, Planning Appeal Board, 10 May 1977.

Their testimony was instrumental in persuading the Appeal Board to deny Rialto's request.

Two significant parts of the decision should be noted. First, the Board formally upheld the adoption of the U.S. Land Use Compatibility Table and commented favorably on the idea that a buffer zone between 25 NEF and 30 NEF would not be unreasonable in some cases. Secondly, the Board did not accept the argument that by engaging in special construction methods and by soundproofing homes in the slightly over 30 contour, residential zoning would be proper. The Board held that the noise levels in the NEF scale applied to the unimproved land area. Thus, where variances are sought near other airports the Department of Transport has a precedent on which to base its recommendations.

Land-use Planning for a New Sydney Airport. Studies made in connection with proposals for a new major airport in Sydney revealed that the laws for property acquisition in the Commonwealth and State of New South Wales are badly in need of reform [22/]. The matter now is under review by the Law Reform Commission. In general, when property is acquired on a compulsory basis it is on the "value to the owner" basis rather than market value. Thus, unless a negotiated settlement is reached, there are problems of equity. Land-use planning for a second Sydney airport will be difficult because

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22/ Information Bulletin No. 5, Land Acquisition, Major Airport Needs of Sydney (MANS STUDY)

there are no convenient rural areas available as there were at Tullamarine and at Canberra, the Capital. 23/ Additionally, there is the time consuming work of producing and receiving approval of environmental impact statements. The sensitivity of Sydney residents to noise is legendary.

8. Compensation for Noise: Insulation and Noise Related Landing Charges

At the present time Australian laws do not provide for compensation to anyone suffering injurious effects because of aircraft noise. As just noted, a Law Reform Commission has been established and has issued a discussion paper pointing out that none of the laws dealing with land acquisition address the noise problem, and as a consequence the property owner may be treated badly. The discussion paper, a learned treatise including quotations from the Bible, the Magna Carta, Blackstone and Lewis Carroll, analyzes the current state of affairs, and suggests certain changes.24/ If changes are made in the acquisition laws, there may well be compensation because of noise.

23/ Canberra and its airport were located in a sparesly populated area so that planners could have free reign in designing a capital city for the Commonwealth. Aircraft noise is not a problem.

24/ The Law Reform Commission, Discussion Paper No. 5, Lands Acquisition Law: Reform Proposals. The paper, for example, notes that no account is taken of loss of value of the retained land, while value of the taken land may rise because of construction of the airport.

In Australia no mechanism exists for assisting home owners to quiet their homes through payments for insulation. In fact many Australians, partly because of their open style of living, do not favor insulation. Indeed, a study made by the National Acoustic Laboratory found that housewives objected to too much insulation from outside noise (they could not hear their children fighting outside). On the other hand some local councils are slowly moving to require insulation for noise exposed buildings. To this end they use as a guide the requirements made in the 1977 Code of Practice established by the Standards Association of Australia for abatement of aircraft noise intrusion.[25/] This code adopted the U.S. FAA compatibility table.

Noise Related Landing Charges: There are now no noise related landing charges in Australia. A parliamentary committee recommended that such charges be considered. Upon consideration, the Department of Transport believed such charges to be counterproductive. Thus, there is little likelihood of their being imposed.

9. The Australian Airlines' View of the Noise Problem

While in Australia interviews were also undertaken with senior executives of the three major carriers, Qantas, Trans-Australia, and Ansett, as to how aircraft noise regulations had affected their

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25/ The official name is Australian Standard Specification, AS 2021-1977 "Code of Practice for Building Siting and Construction Against Aircraft Noise Intrusion."

operations. As might be expected, their views were similar. While calling attention to the fact that Australia had not legally adopted Annex 16, they noted that this failure had no practical effect. First, through its 100% ownership of Qantas and Trans-Australian, as well as its influence over Ansett, the Government could force these carriers to comply whether they wanted to or not. Secondly, under the Air Navigation Regulations, the Government can place any conditions on the use of the Commonwealth Airports, including noise limitations. Obviously the establishment of rigid jet curfews of 2300-0600 Hours at the five airports of Sydney, Adelaide, Avalon, Brisbane and Essendon has actually constrained scheduling to no scheduled departures or arrivals after 10:30 p.m.

Ansett was not adversely affected by the first curfews because it flew no jets. However, it later suffered when it bought two Quick Change 727-200s for night cargo operations on the assumption that the curfew would be relaxed for cargo. Again the argument of the "thin edge of the wedge" prevented relaxation, and the company was forced to purchase Lockheed L-188s and convert them to freighters in order to fly during the curfew. Now the company is faced with what to do with the old L-188s.

Both Ansett and Trans-Australian indicated that in view of the constant complaints about noise and the limitations imposed by curfews, low noise emissions are high on the list of required features for future purchases. In this connection both airlines left the impressions that they had to push American manufacturers to

obtain quieter equipment while the European manufacturers, primarily Airbus Industries, seemed more motivated toward working toward a solution. Ansett felt the best Boeing could offer in current equipment size for its operation was the 727-200 with the quiet nacelle. Although Ansett liked the increased thrust on the P&W JT8D-17, its noise was a negative factor in evaluating the engine for purchase.

Qantas, primarily because it flies international long-haul routes in heavy widebody aircraft is a slightly different case. Although the initial conversion to an all 747 fleet brought with it the lower noise high bypass powerplants, the gradual addition of longer and longer routes and the higher gross weight aircraft with their higher noise emissions is a matter being watched closely by the equipment evaluation engineers at Qantas.

All three carriers reemphasized that at Sydney noise is a political matter in which real estate developers in several communitites have secured political power in town councils and in the Commonwealth Government to establish and maintain a curfew which was initiated under significantly different airport and emission conditions than currently exist. Neither the airline operators nor the airport authorities are receiving the benefits of the changed runway availability or of the new technology aircraft. They pointed out that Sydney has only 450 movements a day of which a significant number are by flights with high bypass engines. For comparison, Chicago has 2000 movements. In the U.S. it has been estimated that 7 million persons are impacted by noise (30 NEF and above), at Heathrow 2 million and at Sydney only 25,000.

Despite the feeling that Australia's major airport was unnecessarily constrained by the curfew, the carriers believed that as more new technology aircraft are brought in (767, 757, A-300 and others under design), by 1990 conditions would significantly improve. Each of the carriers expressed keen disappointment at the failure of municipal and regional planning authorities to implement the very policies of land-use planning which they claimed to support. The Rialto - Salisbury case brought a glimmer of hope.

10. Summary

Although the legal basis for some of the federal noise regulations is technically weak or non-existent, government airline and airport ownership and airport regulations under statutory authority provide the Commonwealth with the necessary power for noise at the source and operational control for curfews and noise abatement procedures. The curfew at Sydney's Kingsford Smith Airport was initiated in the early period of jet operations before introduction of the high-bypass quieter engine. Runways were short and most of the traffic was forced to use flight paths over densely populated areas. Despite significant changes in the runway layout and the introduction of quieter aircraft, the curfew became a political matter and has remained essentially unchanged. The constraints placed upon carriers by the narrow operating "windows" dictated by curfews in Australia and elsewhere affects airline schedules as far away as New York, Europe and Asia. One major U.S. carrier, American, considered the

curfew a significant factor in its inability to operate the route at a profit - a factor contributing to its decision to abandon its Sydney service.

Although the Commonwealth has no authority over land outside of the airport boundary, it has successfully urged some state and local planning bodies to adopt the U.S. FAA land-use planning compatibility guide involving three NEF zones. Unfortunately, a large number of communities have not adopted such plans and the implementation on the part of some that have has often been very weak. A 1977 case at Salisbury confirmed the U.S. method as appropriate and upheld 30 NEF as a limit; moreover, no credit was allowed for special construction or insulation.

The major Australian carriers all placed aircraft noise emissions as an increasingly important element in their equipment acquisition policies. Qantas, the international carrier, noted that its costs were increased by having to adjust to curfews in Hong Kong, Japan and Europe. The carrier, by settling on an all high bypass fleet, felt it had positioned itself to take advantage of any curfew relaxations which in the future might be based on Annex 16 compliance.

The carriers hinted that they felt because of a desire to extend profitable current production runs the U.S. aircraft manufacturers were not as aggressive in the noise picture as were their European counterparts. Finally, their predictions for the future included (1) a decrease in NEF in the 1990s; (2) continuing sensi-

tivity of people living near airports to noise, and (3) continuing pressure by property owners who would benefit financially by housing or commercial construction in non-compatible zones to defeat land-use planning legislation or impete its implementation.

Chapter 5.

HONG KONG

1. Introduction

Hong Kong is a noisy boisterous city teeming with closely quartered inhabitants of whom 99% are Chinese. Its airport, Kai Tak, is situated in Kowloon bay with concentrations of population on three sides. Unless landings are made from the south and takeoffs to the south, a substantial portion of the population is significantly impacted by noise. In fact, on a circling approach to land to the south, the aircraft track and altitude result in noise which elsewhere in the world would be considered unacceptable by the inhabitants. Given the above, the existence of curfew from 2330 to 0630 is understandable. However, the genesis of the curfew, its flexibility, the lateness of its establishment, and the lack of pressure for further action is surprising. This situation in Hong Kong is in marked contrast with that in Japan and Australia where far less noise has had serious political and economic effects.

2. The Socio-Political-Economic Environment in Hong Kong

To understand the anomolous situation of a noisy environment with limited pressures for further change in noise rules, a brief survey of the Hong Kong social, political, cultural, and economic environment is in order. First, Hong Kong as a Crown Colony of the United Kingdom is one of the last vestiges of colonialism. The structure of government provides little or no representation for the governed. For a hundred and fifty years the inhabitants have been accustomed to this and, until very recently, have been resigned

to it.

In most societies people find it necessary to develop a government as population grows. In Hong Kong the government came first, then the people. Hong Kong was little more than a barren rock when acquired in 1840 as a port for military operations. Later the Chinese arrived and by 1945 Hong Kong grew to an estimated population of 600,000. Subsequently, the continued influx of immigrants has caused rapid growth to the current figure of about 4.7 million. Wages are low and housing is in such extremely short supply that five people live in the normal 10 foot by 10 foot room. Ambient noise is at a high enough level that an aircraft overhead does not add the differential annoyance experienced elsewhere. For hundreds of years the Chinese have been accustomed to domination and a hard life. Their movement to Hong Kong has been of their own choice and their priorities are (1) housing, (2) surviving, and (3) getting ahead. Agitating a non-elected government for reducing noise (of which they make plenty themselves) is not an item on their agenda.

However, the poor immigrants are not the only ones subject to aircraft noise. On the circling approach to the airport are homes of moderately well-off citizens and even some wealthy. These residents are also there by choice, preferring the convenience of their present location to some other place which not only would be difficult to find but would not be much quieter. Any property on the market would quickly find a buyer so that the number of people

affected would not be decreased.

From the commercial point of view, the inhabitants have fully understood that Hong Kong's economic position depends upon a minimum of trade restrictions. More of a laissez-faire philosophy exists in Hong Kong than elsewhere. Accordingly, the enactment of restrictive rules or legislation has been held to a minimum.

3. Structure of Government

The head of the Government of the Crown Colony of Hong Kong is the Governor who is appointed in London by the Queen. In Hong Kong he presides over a Legislative Council and an Executive Council. Each of these councils has more appointed members than elected members so that the will of the electorate can be overriden. The futility of voting is recognized by the inhabitants. Only 15,000 to 20,000 bother to vote.

Under the colonial form of government the government, of course, is supreme. In Hong Kong it can take or demolish property and not pay adequate compensation. In an attempt to find out the will of the people, recently the government held hearings on whether to reserve a portion of land where there were beautiful trees for a park in the city. Although the testimony was heavily in favor of the park idea, the government decided to sell the land in order to make money. Many citizens were dissatisfied but nothing could be done.

Since Hong Kong is a colony, much of the legislation derives from basic English law such as the Air Navigation Act of 1920.

The four most important ordinances or orders are (1) the Air Navigation Overseas Territory Order (the general bible), (2) the Summary Offences Ordinance (establishing the curfew), (3) the Amendment to the Summary Offences Order (giving the Director of Civil Aviation the authority to give special exemptions to the curfew) and (4) the Control of Obstructions Ordinance (controlling heights of buildings or other obstructions around airports for safety reasons only).

Civil Aviation regulations are issued by the Director of Civil Aviation whose department is in the Economics Services Branch of the Government. His department has interacted with the Public Works Department in matters of land use planning. Thus far the departments have worked together until reaching agreement. Of increasing importance in land use planning is the Environment Branch of the Government which, within the last two years, has established a new Pollution Advisory Committee. There is some concern in the Department of Civil Aviation that the Environment Branch may seek to exercise power which historically has belonged with the Director of Civil Aviation. This concern has been heightened by efforts to draft extensive overall legislation dealing with environmental matters for land, air and water. It should be noted that this fear that the Environment Branch may cut in on the turf of an Aviation Department has been expressed in most of the countries surveyed.

4. Hong Kong Curfew

In the absence of rules on noise at the source, we turn directly to the curfew and its unusual history. Hong Kong's curfew, issued under authority of the Summary Offences Order, is from 2330 to 0630. Some further protection against unnecessary noise is provided by restricting operations to the preferential runway between the hours of 2100 and 2330 and 0630 and 0700. Unlike the relatively inflexible curfews in Australia and Japan, the Hong Kong curfew has flexibility. Carriers may ask the Class 1 "watch keeper" for exceptions due to mechanical malfunctions, weather, or other causes; and these are usually granted. Somewhat surprisingly there appears to be few requests for operations outside the curfew. For example, in January 1979, a month in which bad weather in Europe tangled schedules, the average nightly exception rate was 0.58, or a total of 18 for the entire month. The average nightly exceptions for a recent year ran from 0.48 to 1.8. Additionally, unlike Australia and Japan, operations under the exceptions may take place at any hour of the night.

Genesis of Curfew. The most curious and most interesting aspects of the Hong Kong curfew is its late establishment and the reason therefor. As mentioned in previous chapters, in other parts of the world there has been a relatively uniform story i.e., the introduction of jets in 1958, followed by noise complaints, and followed in the early sixties by curfews. However, in Hong Kong,

notwithstanding its noise impacted surroundings, the curfew did not come until 1973.

As noted in our introductory paragraph, Hong Kong has been (and still is) one of the noisiest cities in the world. Radios and TVs blared 24 hours a day. Constant shouting and yelling accompanied the Chinese as they played their favorite game, Mah Jongg. The housing shortage made inhabitants feel that there was no place to move. Aircraft, while noisy, did not seem to cause a differential noise above the regular din sufficient to incite the strong protests that resulted in curfews elsewhere. However, a strange thing happened. When it became necessary to make major repairs to the runway, it could only be done by closing the airport for a number of hours at a stretch over an extended period of time. Since there were fewer flights at night, the night time was chosen for the closing periods. As time went on, the new quiet became obvious to many and sleep was made easier.

Thus it was only when the airport was closed for repairs at night did people recognize how much quieter it was, and, after finding that other cities had curfews, the residents successfully pushed for a Hong Kong curfew to obtain similar permanent relief. When the influential citizens finally became active they pushed hard but unsuccessfully for a total night closure. However, the present more modest system is working well and there are few complaints. Among the reasons for the paucity of complaints are: (1) the

limited number of operations per day (200 in 1980 of which 45 percent were widebody), and (2) the peak period is 1-3 p.m., a period when people are not at leisure or asleep. Nevertheless, some authorities expressed the opinion that the establishment of the new Environmental Pollution Committee may result in an increasing flow of complaints which will have to be dealt with. Among the advantages cited for developing a new airport on nearby Chek Lap Kok island is the removal of operations from noise impacted areas around Kai Tak airport.

5. Operational Regulations

In addition to the operating restrictions imposed by the curfew and preferential runway system, Hong Kong imposes limitations on engine tests and training flights as per Tables 4 and 5. A reading of Table 5 shows that priority is given to tests for scheduled operations at times calculated to minimize delays of origination.

6. Noise Monitoring

There has been growing interest in establishing a noise monitoring system at Hong Kong. Equipment has been ordered to provide measurements at three points. The authorities indicated that the system is to be used only for data gathering. Disciplinary action is not contemplated.

TABLE 4

NOISE ABATEMENT PROCEDURES

The following procedures govern night operations at Hong Kong International Airport:

1. Airport Restricted Hours

No operator is permitted to programme flights between 2330 and 0630 hours local time, but all aircraft delayed by unforeseen circumstances will be permitted to operate up to midnight.

Aircraft delayed beyond midnight by unforeseen circumstances may be permitted on request to operate provided they are:

a) passenger flights, or
b) aircraft which are certified in accordance with noise levels specified in Annex 16 to the Convention on International Civil Aviation.

Requests for delayed operations between the hours of 2400 and 0630 local time are to be made to ATC before midnight and subsequently a written report is to be submitted to the Director of Civil Aviation explaining the reasons for the delay.

Emergency landings will be permitted at any time subject to the proviso that they will always be made from the Lei Yue Mun direction except when landings from this direction are rendered dangerous by adverse runway operating conditions.

All operations between the hours of 2100 and 0700 local time are subject to the Noise Abatement Operating Restrictions detailed in paragraph 2.

2. Noise Abatement Operation Restrictions

Departing Aircraft

Take-off on Runway 31 between the hours of 2100 to 2400 and 0630 to 0700 local time is only permitted in the following circumstances:

i) When weather conditions are below the company minima for Runway 13 departure, or
ii) When cross/tailwind components would adversely affect the safety of aircraft taking off from Runway 13, or
iii) When track guidance is not available to aircraft after take-off on Runway 13 due to unserviceability of ground navigation aids or aircraft equipment.

Take-off on Runway 31 between the hours of 2400 to 0630 local time is not permitted under any circumstances.

Arriving Aircraft

Landing on Runway 13 between the hours of 2100 to 2400 and 0630 to 0700 local time is only permitted in the following circumstances:

i) When the tailwind component (including gust values) on Runway 31 exceeds 5 knots when the runway is wet or 10 knots when the runway is dry, or
ii) When weather conditions are below the company minima for landing on Runway 31, or
iii) When track guidance to Runway 31 is not available due to unserviceability of ground approach aids or aircraft equipment.

Landing on Runway 13 between the hours of 2400 to 0630 local time is not permitted, regardless of other factors, unless the tailwind component (including gust values) on Runway 31 exceeds 5 knots when the runway is wet or 10 knots when the runway is dry.

TABLE 4 (cont.)

3. Engine Tests

Engine run-ups will be subject to the following conditions:

No engine runs above gound idling power will be permitted during the critical hours 2330 to 0700 local time.

No engine runs above gound idle power will be permitted between the hours 2100 to 2330 local time by aircraft engaged in non-scheduled services.

No engine runs above gound idle power will be permitted between the hours 2100 to 2330 local time with aircraft on scheduled service departure after 1200 hours local time.

Restricted power engine runs will be permitted between the hours 2100 and 2330 local time with aircraft on scheduled service departure between the hours 1000 and 1200 local time, in accordance with the schedule in RAC 13-3.

Unrestricted power engine runs will be permitted between the hours 2100 to 2330 local time only for aircraft on scheduled service departure before 1000 hours local time, but aircraft required for early morning training sessions may be permitted unrestricted power runs between 2100 and 2330 hours local time if they are required for scheduled service departure before 1200 hours local time, following the training flight.

4. Training Flights

Requests to carry out training flights, irrespective of the direction of landing and take-off during the period 2100 to 0700 hours local time, must be submitted in writing to the Director of Civil Aviation at least 24 hours in advance of any proposed training.

On Sundays and Public Holidays training flights are not permitted before 0800 hours local time.

Aircraft which overshoot or take-off runway 31 followed by visual manoeuvring in the Western Harbour for an approach on runway 13 should climb to not less than 1,500FT, or as instructed by ATC, and when inbound should not descend below the normal IGS glideslope profile.

All aircraft including helicopters which carry out "CC" NDB approaches for training purposes by day time are not to descend below 1000FT over Cheung Chau. By night time such training flights are not to descend below 2000FT over Cheung Chau.

15 May 1976

Civil Aviation Department
Hong Kong

TABLE 5

SCHEDULE

Power Limitations

1. Propeller Driven Aircraft

Restricted power settings are defined as follows:

Viscount	4 engines at 12,000 rpm or 1 engine at full power
Argosy	- ditto -
HS 748	2 engines at 12,000 rpm or 1 engine at full power
Herald	- ditto -
Britannia	4 engines at 7,000 compressor rpm or 1 engine at full power
Canadair CL 44	4 engines at 12,000 rpm or 1 engine at full power

2. Turbo-Jet Aircraft

BAC 1-11 Series 200	One Spey 506 at a time up to 1,470 lbs thrust (i.e. to 75% N2)
BAC 1-11 Series 500	One Spey 512 at a time up to 1,870 lbs thrust (i.e. to 80% N2)
Boeing 707	One engine at a time up to 80% N2 (Conway) and 1.25 EPR (JT3/JT4)
Boeing 720	One engine at a time up to 1.25 EPR (JT3/JT4)
Boeing 727/737	One JT8D at a time up to 1,960 lbs thrust (i.e. 1.09 EPR)
Boeing 747	One JT9D at a time up to 1.25 EPR (subject to amendment)
Caravelle	One Avon at a time up to 4,500 rpm with the others not exceeding 3,000 rpm
Comet	One Avon at a time up to 4,500 rpm with the others not exceeding 3,000 rpm
Convair 880/990	One CJ805 at a time up to 5,500 rpm
Douglas DC8/ DC8-60	One engine at a time up to 80% N2 (Conway) 1.25 EPR (JT3/JT4)
Douglas DC9	One JT8D at a time up to 1,960 lbs thrust (i.e. 1.09 EPR)
VC10/VC15	One Conway at a time up to 80% N2.

All other engines at Ground Idling Power unless otherwise specified.

7. Compensation for Noise

Given our earlier description of the socio-political-economic situation in Hong Kong, it is not surprising that there are no provisions for the government to pay for insulating homes, or for the government to levy landing fees based on noise emissions for the purpose of using the monies so collected to insulate public buildings such as schools and hospitals. The matter of insulation for schools is quite different in Hong Kong from the situation in the United States. In Hong Kong small private schools continue to proliferate. For reasons of economy the proprietors often buy right under the flight path and later complain that it is hard to teach because of the noise. Thus far nothing has been done. However, the Education Department has made a survey of the situation and is said "to be looking into the matter."

8. Land-Use Planning

Up to the present the Department of Public Works has been responsible for planning. There are a number of reasons why land-use planning in conjunction with noise abatement zoning has been virtually absent. As one of those interviewed explained, there is such a premium on space because of the continuing influx of immigrants that it is really impossible to consider creating any zone around the airport where people could not live. Every inch of space is in demand. Such zoning as there has been has been that

limited to controlling of the heights of buildings to 7 or 8 stories for safety reasons under the Control of Obstructions Ordinance.

Ironically, when the Government started talking about moving the airport to Chek Lap Kok Island, the immediate reaction of people was that zoning in the Kai Tak area could be lifted, the old buildings demolished and replaced with high rise structures. The Government, it was argued, could quadruple or quintuple the prices charged for building on the land and perhaps defray the entire cost of the expensive new airport. Land in Hong Kong is already the most expensive in the world.

However, times do change. There is some evidence that environmental pressures may find an outlet in the new Environmental Pollution Division. Because the Civil Aviation Division is interested in the promotion and protection of aviation it has little incentive to be aggressive in pushing land-use planning for noise zones. Additionally, the Department of Public Works has its hands full in planning for population growth, and thus restricting land use is not high on its priority list. On the other hand the Environmental Pollution Division is oriented differently. As has been previously noted, the privy council and all departments of the government are involved in developing further environmental legislation. Nevertheless, given the population problem, the ethnic distribution of the population, and the colonial form of government, Hong Kong is not the place to look for dramatic advances in land-use planning.

9. Impact of Hong Kong Noise Rules

Somewhat surprisingly, whenever the Hong Kong noise rules were brought up in discussion (whether in Hong Kong or elsewhere) there was not a high degree of protest about the existing regulations. In fact, it was difficult to keep the subject to Hong Kong restrictions; all wished to make known the constraints put upon their companies by the rules in Sydney, Tokyo and Osaka. The apparent reasons for the lack of objection is that scheduling decisions required by other countries' curfews, as well as other reasons, result in peak periods at Hong Kong in the early afternoon. The writer did not hear the words "But for the Hong Kong curfew we could have a much more efficient operation."

Cathay Pacific, the large Hong Kong based carrier, indicated that it had no problems with noise in its fleets. It has disposed of all of its 880s and most of its 707s. With a policy of acquiring only widebodies which already met Annex 16 Chapter 2 by a wide margin, the company felt no one had a competitive advantage over it because of noise emissions. On the other hand, the company pointed out that Tokyo and Osaka gave it the worst problems. Osaka was particularly troublesome because its 9:00 p.m. curfew and the 9:00 a.m. opening effectively deprived the carrier of 12 hours availability of the aircraft. To the query whether this did not provide time for considerable maintenance work, the answer was that the Japanese labor rates were so much higher than those in Hong Kong that no maintenance was

scheduled in Osaka.

Despite the curfew and the engine runup rules, there seemed to be little industry pressure for loosening the rules at Hong Kong. Similarily, despite the high levels of noise emissions on the approach course, the civil authorities did not reflect a sense of urgency for change. Perhaps both sides, given the cultural, political and economic environment in which they find themselves, feel that doing battle would be unproductive.

10. A New Airport To Replace Kai Tak?

Although the movements at Kai Tak are light (estimated at 172 a day in 1980) in comparison with other international airports, the one runway character of the airport and the landside congestion caused by the increasing number of people disgorged by widebodies have led the authorities to begin planning for a new airport which would handle more traffic and alleviate noise.

The current plan under study is to move the airport to the small island of Chek Lap Kok which is adjacent to the larger island of Lantau. The size of the undertaking may be gauged by noting that levelling the island and building a causeway and/or tunnel to Hong Kong is involved. As previously indicated, the authorities feel that financing can be handled because of the tremendous amount of money which can be realized by demolishing buildings in the Kai Tak area and replacing them with high rise structures.

11. Summary

Although areas along the approach path to Hong Kong airport are heavily impacted by noise, the inhabitants affected have not been in a position to mount the effective heavy pressure for noise abatement such as occurred elsewhere. A curfew with some flexibility was imposed only after the inhabitants found quiet while the airport was closed at night for modification.

The addition of an Environment Department in the government and the possibility of further legislation suggests that no relaxation of current rules are in prospect. In fact, given the rise all over the world in attempts to increase the quality of life, the writer concurs with the assesment made at the end of the interviews by both the Hong Kong civil authorities and the representatives of Cathay Pacific that the noise problem may even result in further tightening of rules although the figures may show a decrease in noise exposure after 1985. Should rising costs due to world wide inflation combined with OPEC monopoly pricing result in air fares beyond the reach of those categories of the public who have until recently considered air transport to be a bargain, the reduced frequency of trips resulting from lower demand may lower noise levels to the point that present rules will not be tightened.

Chapter 6.

JAPAN

1. Introduction

From the time Japan began to emerge from its self-imposed isolation and to engage in commerce with the western world, travellers, students and business people have been surprised and fascinated by how different its culture is from that of the western world. Centuries of feudalism under Japanese war lords resulted in a society with customs and values which outsiders have found difficult to understand. Nowhere is this more clear than in the concept of "losing face," or in the necessity for formal consultation with all affected parties before making a decision - a decision which may not even be written but merely expressed orally. Also unusual is the limited use made of lawyers in and out of government. Despite these differences between the two cultures, there are similarities. For example, the national government may be perceived to take arbitrary and authoritarian action. There is also the suspicion of the citizens, often well grounded, that plans are made which will more than coincidentally line the pockets of politicians with gold.26/

The foregoing is reflected in the development of noise control laws, regulations, and oral prescriptions for jet transport aircraft in Japan. For instance, at the New Tokyo International Airport at Narita, the site selection had political overtones. After 16 years of

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26/ In March 1979 a Tokyo newspaper reported that in 1970 a representative in the Diet purchased for 14 million yen eight hectares of land near the end of a proposed runway at Hokkaido and sold it in 1977 for 60 million yen.

effort the airport finally opened on a partial basis in 1978, only after much face was lost. At Osaka, the continued failure of the government and the industry to protect the inhabitants against aircraft noise has led to the world's strictest crew, a drastic limitation on frequencies and - somewhat unusual for Japan - the gathering together of 11 towns around the airport in a series of legal actions involving huge damages and the possibility of airport closure. In March 1979 a Tokyo paper reported that aircraft noise control was the top priority of the country. Indeed, insofar as aircraft noise is concerned, Japan can be said to be the most noise sensitive country in the world.

2. Historical Background

With the outbreak of World War II the Japanese military took over civil aviation. At the end of hostilities and for six years thereafter the Allied Forces controlled air transport. Thus, it was not until 1951 that civil aviation was returned to the Japanese. The basic post-war law governing air transport, the "Law Concerning Civil Aeronautics," became effective in 1952. Considering the small place air transport held in the economy, it is not surprising that the law contained no references to noise control at the source nor did it provide regulations prohibiting building residences near airports. Land-use planning was considered a function of the prefectures (akin to states in the U.S.) and towns. Expansion of urban population in recent years, coupled with increasing frequencies of noisy commercial jets at some 14 airports, resulted in a confrontation between environmentalists and the commercial interests striving to change Japan into an industrialized society.

3. Physical and Sociological Environment

Contributing to the confrontation over the aircraft noise problem were the social and environmental matters. Japan, with a small land mass and high population density of 267 persons per square kilometer, is heavily overpopulated. Of Japan's 37,750,000 hectares (15.2 million acres) only 30 percent is habitable for 110 million people. The resulting high land values inhibited the mobility of the inhabitants of lower valued noise sensitive areas even if they wished to move. Early post-war airports had previously been military airports and required short runways. Such airports were often constructed near heavy concentrations of housing. Further exacerbating the situation was the thin wood type of housing construction and the lack of insulation. Both of these characteristics were the result of the mild climate and the economic status of the airport neighbors. Such homes were relatively defenseless against external sounds and vibrations. As civil aviation by propeller type aircraft increased, so also did noise annoyance; but it was the arrival of the first generation jets in 1959 which served as a catalyst for noise control actions.

The demand for new airports and longer runways needed by transport jets required some people to move from their homes or move the homes - actions which cut at the very fiber of Japanese culture. For centuries, with a high ratio of population to land, ownership of land provided not only a stabilizing effect on family life but prestige value as well. Additionally, the absence of job mobility in the culture meant that for generations families resided in the same location

and developed highly localized friendships. Under these conditions, the sudden imposition of jet noise and vibration and the resultant proposals - made without the normal consultation process - that the inhabitants move elsewhere, generated intense opposition. The deep roots which the inhabitants had in their properties, as well as the cultural shock at the very thought of moving, caused them to place a substantially higher monetary value on their property than did the government. Thus, nearby residents (often poor farmers) not only strongly resisted moving to get away from noise, but took the opposite approach by demanding that the noise be eliminated and, if necessary, the airport be closed. The inhabitants argued very simply that they were there first so why should the government, which owned or controlled the airlines and the airport, intrude upon their lives.

Why did not those living in noise-sensitive areas immediately bombard the government with a multiplicity of lawsuits as has been the case in the United States? One reason was that Japan has not yet developed the lawyer culture which exists in some other countries. For example, the U.S. has 20 times as many lawyers per capita as Japan. In Japan, historically it has been considered shameful to have failed in negotiations and to resort to litigation. Secondly, most of those adversely affected were poor peasants lacking the knowledge and economic resources to mount legal battles. However, there have been cases, notably around Osaka, where litigation has been employed with such success that the Supreme Court has been reluctant to decide a landmark case.

The foregoing might suggest that the Japanese resist all change and wish to remain undisturbed by progress. Such, however, is not the case. Watching television, which is provided by the government on the payment of a monthly fee, is a national pasttime. The disturbance of television reception by reason of fluttering pictures, "snow" on the screen, or audio problems caused by aircraft, has resulted in such pressure on the government for relief that the government now provides subsidies to television subscribers by rebating 50 percent of the monthly fee for those living in the highest noise zone in which housing is permitted, and a 25 percent rebate for those living in the next zone. In fact, the Aircraft Nuisance Prevention Association, a powerful environmental group, had its genesis in combating television, radio, and telephone interference caused by aircraft. Only later did it turn to other forms of noise countermeasures.

4. Non-Statutory Based Noise Control

Before proceeding with a more detailed history and analysis of the development of Japanese noise control measures and policies, differences in the Japanese culture from that of the U.S. should be highlighted to understand better the problem of curfews and the absence of certain statutory regulatory provisions. First, by long established custom, the culture had required prior consultations, or "nemawashi," with everyone affected by an action.[27] If 500 are

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27 / The derivation of "nemawashi" is graphic. Literally it means one must move the roots around before one can pull up the tree. Thus, before a decision is reached, a consensus must be reached with the affected people.

affected then 500 must be consulted; if 5,000 are affected, then 5,000 must be consulted. Second, the culture sanctions many constraints which are not reduced to writing. Although other societies might consider such prescriptions to be examples of moral suasion or "guide lines", in Japan they may become mandatory regulations. Some say that Narita is an example of the failure to extend the consultation process, or "nemawashi," far enough.

A widely held view of the unfortunate developments at Narita is that politicians in the national government arrogantly and arbitrarily, after a power struggle among themselves, selected the Narita site without consulting the local peasants and municipalities, thereby facing the residents with a fait accompli before beginning consultations. Further, a 50 percent cut in airport size during the planning stage guaranteed additional noise annoyance and the possibility that the airport could not handle annual increases in traffic for very long.28/

In any event, the experience in building Narita - delay and violence - would indicate the government misjudged the depth of feelings of the citizens and thus underestimated the compensation required. Further, the situation was complicated by the pressure of radical students who did not live near the airport but who took up the cause of noise for their own purposes.

28/ For a more thorough treatment of the development of Narita see: Fujita, Katsutoshi, "Tokyo's New Narita Airport: An Illusion," annaire de 'Arien et Spatial, pp. 121-132, Montreal, McGill University Press, 1978.

With regard to the point about moral suasion or informal regulations, many policies which are only effectuated in the U.S. and other countries by enactment into law, or by regulations based upon statutory law, are by custom often handled in Japan by the government merely indicating to the business involved that a certain activity will not be permitted.29/ Although many governments - the U.S., the U.K., and others - have written policies requiring the phase out of non-FAR or non-Annex 16 aircraft, as well as the denying of further registration of such aircraft, Japan, sensitive as it is to aircraft noise, has nothing on paper in this area. The Government through the Japan Civil Aviation Bureau (JCAB) has, however, let it be known that such aircraft will no longer be accepted and must be phased out. The carriers have the message. When Japan Airlines sold a non-Annex 16 DC-8 to a foreign carrier and shortly thereafter lost a similar type DC-8 in an accident, it was only after troublesome negotiations with the JCAB that the carrier was able to repurchase the same aircraft it had sold. Thus, the JCAB objected on noise grounds to the reimportation of a plane which was previously legally on its register, and which was identical to other aircraft on its register.

29/ Several classic examples of environmental pollution of water and land by large Japanese individual firms were notable exceptions to this statement and resulted in remedial legislation halting unsafe practices and providing compensation for those affected. Four major legal actions dealt with the Minamata Disease spread by sulphur oxides and organic mercury are cases in point. However, the development of these types of pollution problems developed very slowly and mysteriously compared with aircraft noise.

5. Initial Attempts to Satisfy Jet Aircraft Noise Complaints

Public concern over jet aircraft noise began even before commercial jet operations when, in 1957, a class complaint was brought to the Minister of Transport by inhabitants of Tokyo around what is now called the Haneda Airport. The complaint involved noise by U.S. Air Force jets. With the introduction in 1959 of commercial jet operations in Tokyo by the Comets of BOAC and the B-707s of Pan American, protests rapidly mounted. Consistent with "nemawashi", the response was the appointment, in 1960, of an Aircraft Noise Control Committee composed of representatives of surrounding communities, local public bodies, the airlines, and the Tokyo Civil Aviation Office. After extensive studies the Committee, in 1962, recommended an 11:00 p.m. to 6:00 a.m. curfew. The curfew was administratively established in April 1963 and was accompanied by a change in flight procedures so that aircraft would fly primarily over the sea rather than over populated areas.30 /

In 1964, when Japan Air Lines began jet operations with the CV-880 at Japan's second largest city, Osaka, aircraft noise complaints were promptly filed by local inhabitants. Again, as a result of "nemawashi," a curfew more strict than that in Tokyo was administratively established and some flight paths were altered. However, because the Osaka Airport was located inland and was surrounded by a number of heavily populated municipalities, the altered flight paths did not provide the same relief as at Tokyo. As Osaka grew in importance in international commerce, so did the frequency of the noisy jets. Prior to 1967 there were no laws

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30 / Environmental Policy of Japan, Ch. 4, OECD, Paris 1977.

at the national, prefectural, or municipal government level for the prevention of aircraft noise or for the establishment of zones of compatible use under land-use planning. Inhabitants of various towns around the airport, driven in desperation by the failure of their pleas for meaningful corrective action and seeing themselves the victims of further increases in noise, in 1969 banded together and took the step, most uncharacteristic for the culture, of turning to legal action to extract compensation for past, present and future damages, to place drastic limitations on operations, and to shut down the airport.

6. Development of National Noise Abatement Legislation

As early as 1962, plans were begun for a curfew-free large new international airport for Tokyo to be built in less populated surroundings. In 1965, to speed up the construction process and to protect the airport neighbors from aircraft noise a special law, the New Tokyo International Airport Corporation Law, was enacted establishing the New Tokyo International Airport Authority. The Authority, inter alia, could, after provision for fair compensation, forcibly acquire property for airport use.31/

31/ The full title: "Law Concerning Prevention etc. of Disturbance Caused by Aircraft Noises in the Vicinity of Aerodromes for Public Use. It is erroneous to assume that this special law was made necessary by the absence in the existing Japanese law of the right eminent domain or condemnation. The 1951 Tochi Shuyoo-hoo Law (Compulsory Land Purchase Law) provides for mediation followed by hearings before an "Expropriation Committee" whose decision is binding after Ministerial (national) or prefectural (gubernatorial) approval. Implementation of that law has been slow because political, social and cultural factors lead politicians and bureaucrats to prefer settlement by compromise. Thus, stubborn landholders can hold up land transfer for years.

In the early 1960s residents around the Tokyo and Osaka airports each formed an environmental group to press for noise relief on various fronts. As a response to their efforts, the Diet[32/] enacted the Aircraft Noise Prevention Law of 1967 which provided for the insulation of some types of buildings, compensation for relocating, the establishment of "green zones", etc. Another national law, the Basic Law for Pollution Control was enacted in the same year. It was much broader legislation and attempted to bring together the fractionated system of pollution control which had been in the hands of the prefectures and municipalities. By 1970, 14 laws were enacted or amended dealing with various types of pollution.

The need to handle other types of pollution, as well as noise, was so great that in 1971 a Law for the Establishment of the Environment Agency was enacted. Agency importance is indicated by the cabinet rank held by its Director General. After two years of labor, in 1973, the Environment Agency published its Aircraft Noise Environmental Quality Standards.

Omitted from the 1967 Aircraft Noise Prevention Law was protection from TV interference, a matter important to those living near airports. Primarily to address this omission, in August 1968, the Aircraft Nuisance Prevention Association was established with the financial support of the Japan Shipping Promotions Organization, NHK (Japan Broadcasting Corporation) and the air carriers.

32/ The Diet is the Japanese legislative body similar to the U.S. Congress.

Difficulties in coordinating the myriad of individual prefectural and municipal laws and standards resulted in enactment of the 1974 "National Land Utilization Program Law" under which was developed a National Plan programming a coordinated legal system to deal with such items as the city planning law and the Construction Standards Law at the national, prefectural and municipal level. While not specifically addressed to aircraft noise, the plan coordinates zoning action taking aircraft noise into account. As will soon become clear, most of the measures dealing with relief from present aircraft noise are contained in special aircraft noise laws applying to special designated airports.

By February 1977, 34 prefectures had adopted the national plan. In April 1978, an act involving planning coordination between the national, prefectural and municipal governments, and extending compensation payments because of airport noise at designated airports was enacted.[33/] As is usually the case in legislation by national governments where state (prefectural) and municipalities are involved, the act contains guidelines rather than mandatory prescriptions. Initially only Narita was "designated" as coming under the act. Later Osaka and Fukuoka were added. Before examining the legislation in more detail, we should note numerous actions were taken purely administratively. Curfews, the limitations on scheduling and the adoption of Annex 16, Chapter 2 and Chapter 3 are examples.

[33/] This legislation bears the long but descriptive title "Law on Special and Provisional Countermeasures for Aircraft Noise Around Specified Airports."

6.1 The Aircraft Noise Prevention Law of 1967 (Act 110). In the middle 1960s curfews and changes in flight paths failed to blunt the storm of aircraft noise complaints. Also, technology was not available to quiet noise at the source. At the time the law was passed in 1967, neither the ICAO nor other organizations had developed aircraft noise standards. Therefore, the noise prevention law is aimed at reducing noise at the receiver either by noise-proofing or moving the receiver away from the noise. Application of the law is limited to "specific" public airports suffering heavy jet traffic. Various noise contours, measured in terms of WECPNL, are drawn and noise standards for 3 zones or, as they expressed it, "classes" are established for specific compatible land uses. The "Classes," or zones, as shown in Chart 7 generally are:

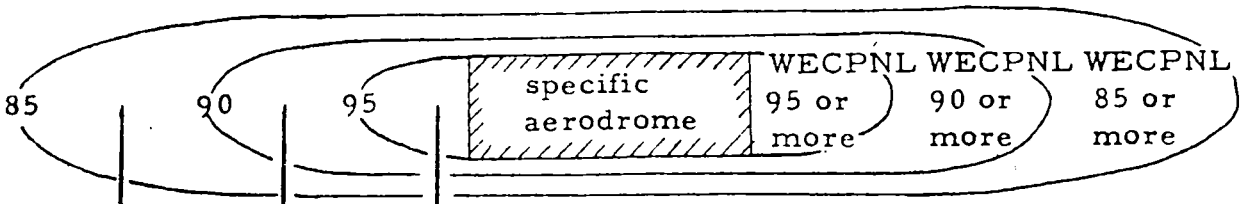
Class 1 noise area	85 WECPNL and more
Class 2 noise area	90 WECPNL and more
Class 3 noise area	95 WECPNL and more

Subsidies were provided to assist the elimination of incompatible land uses and for reducing noise at the receiver by insulation. In an attempt to prevent an individual from moving into a noise zone to trigger payments for himself, the amended law stipulates that no one who moves in after the establishment of a zone by the prefecture is entitled to compensation. Voluntary movements into the zone were not prohibited.

Inadequacies in the 1967 law, particularly relating to (1) the lack of subsidies for insulating private homes, (2) the lack of attention to TV interference, (3) the absence of a means to prevent new

CHART 7

ZONES FOR REDEVELOPMENT AT
"SPECIFIED" AIRPORTS



the third zone area:
the area for improvement of buffer zones, such as green belt.

the second zone area:
the area for removal compensation.

the first zone area:
the area for noise insulation work for existing residences

and in the case of the Environs Improvement Aerodrome, the area for working out the aerodrome's environs improvement project.

Source: Report on Countermeasures Against Civil Aircraft Noises In Japan, Aircraft Nuisance Prevention Association, 1973 p. 18.

Note: While these are the zones specified, they are not the objectives. The Environmental Agency, in its 1973 published standards, has set 70 WECPNL (NN135-40) as the objective for areas devoted exclusively to residences. The level of 75 WECPNL was established where it is necessary to preserve the conditions of ordinary living via soundproofing.

residents from moving into a noise zone, and (4) the very serious problems around Osaka resulted in a 1974 broadening amendment which recognizes the need for a significant restructuring of urban areas near an airport designated as an "Environs Improvement Aerodrome." Thus, the amended law provides for:

1. Subsidies to sound-proof schools, hospitals and public facilities which suffer more than 70 WECPNL (articles 5 and 6 of the Law). The subsidy has been about 90% of the cost. Town halls were added in 1975. In 1979 the amount spent was reported to be 99 billion yen ($500 million).34/

2. Subsidies to sound-proof private residences in zone 1, which is defined as more than 85 WECPNL (Article 8-2), were added by the 1974 amendment. Over 8,250 residences were to be sound-proofed in the Narita area alone. The amount spent in 1979 was reported to be 50 billion yen ($253 million).35/

3. Compensation for relocating families living in zone 2, defined as more than 90 WECPNL (Article 9). Although difficulties were expected at Osaka because land owners would place a very high value on their land and would suffer difficulty in finding substitute lands, few problems were expected at Narita because the airport was in the planning stage and was in a

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34/ OECD Conference on Noise Abatement Policies, May 7-9, 1980. Paris, France (Conference Copy).

35/ Ibid.

sparsely settled area. Progress under this article has been disappointing. The 1979 expenditure was reported as 12.7 billion yen ($63 million).[36/]

4. Initiation of projects to create a green buffer zone known as zone 3 where WECPNL is more than 95 (Article 9-2).
5. Subsidies to those having difficulties in TV reception near airports in zones more than 75 WECPNL (1/4 the bill for those in the 75-80 WECPNL and 1/2 for those in a higher WECPNL).
6. Renewal projects in zones 3 (Article 9-3 and 44).
7. Development of relocation sites (Article 9-3 and 44).
8. Public housing projects (Article 9-3 and 44).

It should again be emphasized that these measures do not apply to all airports, but only to the "specified" public airports. This is much like the U.K. where the term "designated" is used. At present, 13 airports have been "specified." The designation of Osaka in 1974 required a systematic restructuring of the communities surrounding the airport. As a result, an Osaka International Airport Surrounding Community Planning Organization was established.

Finally, it should be noted that the Act contained guidelines only and subsequent experience has shown that the providers of the service and the affected people have frequently not been able to compose their differences on a mutually acceptable basis.

36/ Airport Forum No. 1, 1975, pp. 20-21

6.2 Aircraft Nuisance Prevention Association Foundational Juridical Person. This private sector organization which provides subsidies and engages in research - functions often performed by government - lacks counterparts elsewhere in the world. When to the disappointment of many, the Aircraft Noise Prevention Law of 1967 unexpectedly failed to provide subsidies for noise interference with TV and radio reception near public airports - as had been government practice at military airports - the adverse public reaction spawned the formation, with the approval of the Minister of Transportation, of the Aircraft Nuisance Prevention Association Foundational Juridical Person (ANPA).

Private financing of this organization, considering its functions, is unusual. Nevertheless, ANPA was launched and still is supported by contributions from the Japan Shipping Association, the Japan Broadcasting Corporation and the air carriers. Later, further support was received from airport building owners, souvenir shops, and restaurants at airports. However, the main source of its two billion yen per year income is from operation of parking lots which the government has given permission to build at the Osaka Airport. With funds so acquired, ANPA engages in four branches of operations.

1. Investigating aircraft noise: noise surveys; noise monitoring; vibration effects; TV and radio reception interference.

2. Engaging in actions to reduce aircraft noise reaching the individual: planting of trees to intercept noise and the construction of noise intercepting banks and fences; subsidizing installation of noise-proof telephone sets as well as flutter-proof antennas; subsidizing measures to prevent television interference; subsidizing automatic volume controls for television and telephones.

3. Operation and development of technical equipment for aircraft noise investigation; the establishment and management of the Aircraft Nuisance Research Center.

4. Promotion of aircraft nuisance prevention ideas: promotion and production of movie films; sponsorship of lectures and seminars; publication of studies and documents relating to aircraft noise.

The extensive character of its publications is shown in the Table 6 which shows over 50 documents produced by 1976.

TABLE 6

PUBLICATIONS BY THE AIRCRAFT NUISANCE PREVENTION ASSOCIATION

Series on the Story of Aircraft Nuisances (17 volumes)

1. Airplanes and Cities •
2. Airplanes and Environment •
3. Airplanes and Administration •
4. Airplanes and Safety, Dec. 1975
5. Story of Aircraft Noise, Aug. 1973
6. Story of Air Pollution, Dec. 1973
7. Story of Electric Wave Interferences, April 1974
8. Story of Vibration, July 1974
9. Story of Japanese Airports •
10. Story of Foreign Airports •
11. Story of Land Utilization and New Airports •
12. Survey and Monitoring •
13. Airplanes and Engines, Oct. 1974
14. Airports and Measures for their Vicinity, Sept. 1975
15. Noise Alleviation and Navigation, April 1976
16. Aircraft Fuels and Exhaust Gas, June 1975
17. Easy Terminology of Aircraft Nuisances •

• : unpublished

Aircraft Nuisance Research Series

1969

1. Noises and Supersonic Aricarft
2. Abatement of Jet-Aircra t Noises around Aerodromes
3. Aircraft Noises —Report of an international conference in London—
4. Draft of A Plan evidencing Aircraft Noises
5. Methods indicating Aircraft Noises in the vicinity of Aerodromes —Three-nation conference at Washington D.C.—
6. Aircraft Noise Problems and Countermeasures in Great Britain
7. Noise Control at International Airport

1970

8. Noises and Sonic Booms in relation to Human Factors —The U.S. Department of State—
9. Abatement of on-the-ground Noises in Aerodromes
10. TV Flutter Interferences caused by Aircraft and Prevention thereof
11. Special ICAO Meeting on Aircraft Noise in the vicinity of Aerodromes
12. Control of Atomospheric Contamination caused by Exhaust Gas from Gas-turbine Engines —New York Air Transportation conference—
13. Survey on Air Pollution Emissions from Jet Engines

1971

14. Jet and Noises —National Aerospace Laboratory of Canada—
15. Plan for Regulating Aircraft Noises —The U.S. Federal Aviation Administration—
16. Survey on Noises around Aerodromes —National Applied Anthropology Laboratory of France—
17. Effects of Jet Noises upon the vicinity of Los Angeles International Airport
18. Methods of Computing Optimum Ascending Courses of Aircraft for Abatement of Noises
19. Sonic Throat Inlet

1972

20. Interpretation of NEF Contour on Comparison, Evaluation and Investigation Result of Aircraft Noises.
21. Conclusive Report on Aircraft Noise Abatement in Classrooms
22. Guide for Intercepting Outer-Noises for Existing Houses
23. Final Report on Noise-Proof Housing Pilot Project —Report to the Los Angeles Airport Authority—

1973

24. Action Against Aircraft Noise
25. Possibility of Changing Reaction of Irritation by the Attitude toward Noise Source
26. Development, Evaluation and Expatiation of Noise Exposure Forecasts (NFF) and Interpretation of Land Utilization

1974

27. Study of the Noise caused by Mass Transportation and Possibility of Alleviation
28. Survey of the Monitoring System for Airport Noise Regulations

Other Publications

Calculation of Ground Dosage Distribution Exhause Gas from Jet Airplanes, 1972
2nd Survey of the Noisiness in the Vicinity of London (Heathrow) Airport, 1972
Effects of Noise, Part I, 1973
Effects of Noise, Part II, 1975
Measures against Civil Aircraft Noise in Japan, 1973
Collection of Paintings, "Children's Sky", 1974
Report on the Density Measurement of Contaminated Materials in the Air at O'HARE International Airport and Orange County Airport, 1975

Source: Airport Forum, Feb. 1977, p. 64.

Noise monitoring facilities of the Association include installations at various school locations where aircraft noise is recorded 24 hours a day at 4 second intervals. The data obtained are integrated with information concerning the name of the airline, type of aircraft, runway, departure, arrival, visibility, weather conditions etc. Aircraft which exceed specified noise settings automatically trigger reports which are forwarded daily, weekly, monthly and yearly to JCAB. The semiofficial status of the organization is reflected by the fact that citizen complaints about aircraft noise are directed not to the airline but to the ANPA which, after processing them, sends them to the JCAB. At Haneda a video camera records the take-off profile.

6.3 Noise at the Source. Since the national government controls the airports as well as domestic and international flight rules, it can take initiatives in the areas of such noise at the source rules as: (1) curfews, (2) flight operating procedures, (3) number of flights operated, and (4) aircraft noise emission standards. The initial curfews of 11:00 p.m. to 6:00 a.m. - later made more strict - and the revised flight paths were established as "emergency measures" pending the development of other controls. Of course curfews, changed flight paths, and limitations on the number of flights per day, merely reduce the source of the noise and not the noise at the source. Since in the 1960s there were no standards in law or administration for aircraft noise emissions, the Ministry of Transport and the aircraft manufacturers were faced with the necessity for their formulation.

Although Annex 16, the cornerstone of which is noise certification according to a published standard, was established in January 1972, it was not until July 10, 1975 that Japan, as a member of ICAO, amended its 1952 Civil Aeronautics law to include noise certification as a part of the country's airworthiness licensing requirements. The standards themselves were not placed into law but were included as regulations under the law. However, as previously indicated, given Japan's culture in which regulations may come into force without being reduced to writing, the inclusion into law may well have been more to conform with Japan's obligation as an ICAO member than the need for inclusion to have enforcement authority at home.

Since the original Annex 16 Chapter 2 applied only to aircraft designed in the future, the Annex did not affect aircraft then in operation. However, the Ministry of Transport was not satisfied to wait for noise at source improvements based on airplanes to be designed and built in the future. Accordingly, the Ministry ordered all aircraft for which retrofit noise suppressant kits were available to be converted to meet Annex 16, Chapter 2 within two years. Since no kits were available for the DC-8 or B-707 aircraft, the retrofit requirement was applicable to the 737 and 727 and early 747 aircraft. To speed the retrofit government loans were made available. Required retrofit was completed well before the 1978 deadline.

Since the carriers were successful in convincing the Government not to phase out noisy aircraft, the non-Annex aircraft may theoretically be flown indefinitely. Nevertheless, the JCAB "indicated" to

the operators that although legally non-Annex aircraft could be registered, "administratively" they would not be permitted to operate - the idea being to freeze the operation of non-certified aircraft at the current number and phasing would flow from attrition through accidents, sale or scrapping. However, as previously noted, a problem arose when Japan Air Lines tried to repurchase one of its own planes which had just been sold to replace one destroyed. It was only after difficult negotiations that the JCAB reluctantly reversed its previous denial made on noise grounds and permitted the aircraft to be placed in service.

Phasing out of non-certified aircraft has also been encouraged by oral "suggestions" from the authorities that the Japanese carriers replace their fleets with widebody aircraft containing low-noise high-bypass engines. These "suggestions" antedated the rapid rise in fuel prices which have themselves accelerated the economic obsolenscence of non-Annex planes.

In September 1978, by an amendment to the Civil Air Regulations, the JCAB administratively adopted Annex 16, Chapter 3 of the Third Edition. It may be recalled that Chapter 3 further reduces allowable emissions for aircraft newly designed after October 1977. Thus in practice Japan conforms to, and even exceeds, the most recent Annex rules. It is clear that Japan is no market for used noisy aircraft.

Residents living around the major Japanese airports of Haneda (old Tokyo International), Narita (New Tokyo International), and Osaka, not satisfied with the slow process of obtaining noise relief under the effective dates of implementation of Annex 16, have successfully

demanded a reduction in noise at the source by curtailing the source of the noise via curfews and severe limitations on the number of flights permitted per day. Each of the three airports employ both methods. Given the movements (2,000 a day at Chicago) at large U.S. airports, the level of 160 to 450 now permitted at these Japanese airports clearly reflects underutilization in an economic sense. Curfews and daily frequency limitations will be treated further in connection with the history of noise control at the individual airports concerned. The stories of Narita and Osaka reveal governmental mistakes and the deep feelings of the Japanese about aircraft noise and their attachment to their homes. The stories also illustrate the unanticipated difficulties which arose in implementing laws, rules, and prescriptions which on their face seemed reasonable.

6.4 Special Act for Aircraft Noise in Areas Surrounding Designated Airports, 1978 Act 26. Dissatisfaction with some areas of noise control, such as the inability to persuade or force residents to sell their property or relocate, the lack of participation in noise abatement projects by the prefectures and municipalities, the lack of standards for determining compensation for land or property sales, and the demand that some cleared land purchased with government funds be made available for recreational purposes, led to passage by the Diet of the 1978 law dealing with noise in areas surrounding "a Designated Airport".[37/] It will be

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37/ Unfortunately, the law is available only in Japanese and attempts to obtain an official translation have been unsuccessful. Presumably the essential meaning of the law has been gleaned from translation made in the U.S.

recalled (footnote 31) that since 1951 there has been legislation dealing with the expropriation of private property for public use, but for various reasons the law has been so little used in the noise area that a special law was passed for the Narita project. This 1978 law, under which Narita is the first airport to be "designated," provides

1. In a zone greater than 75 WECPNL, schools, hospitals, residences and apartment complexes cannot be built without special sound proofing.

2. In a zone of over 80 WECPNL, called a "hazardous noise protection zone", buildings are banned; however, an exception is provided. If the governor of the prefecture considers the buildings to be absolutely necessary, he may authorize their construction providing adequate soundproofing and "other protective measures" are taken.

3. In the noise in zone 2. above, the governor has the authority to order buildings which are presently in violation of the standards in the 1967 and 1974 acts destroyed or relocated to less noise sensitive areas.

4. Where the land so cleared is owned by the national government, the land is then to be used for parks and playground which must be free of charge.

5. The noise situation is to be reviewed every five years based upon forecasts of ten years hence.

6. A fine of 200,000 yen for violation of the law.

Chart 8 is a schematic "Outline of Aircraft Noise Abating measures Implemented in Various Noise-Contour Zones Around Airports."

The provisions for implementing the relocation or destruction of property and the determination of compensation were purportedly designed to avoid the previous allegations of hasty and arbitrary action and lack of consultation. In a sense it institutionalizes the "nemawashi" process. Under the new law, the governor must allow a "reasonable time"

CHART 8

OUTLINE OF AIRCRAFT NOISE ABATING MEASURES IMPLEMENTED
IN VARIOUS NOISE-CONTOUR ZONES AROUND AIRPORTS

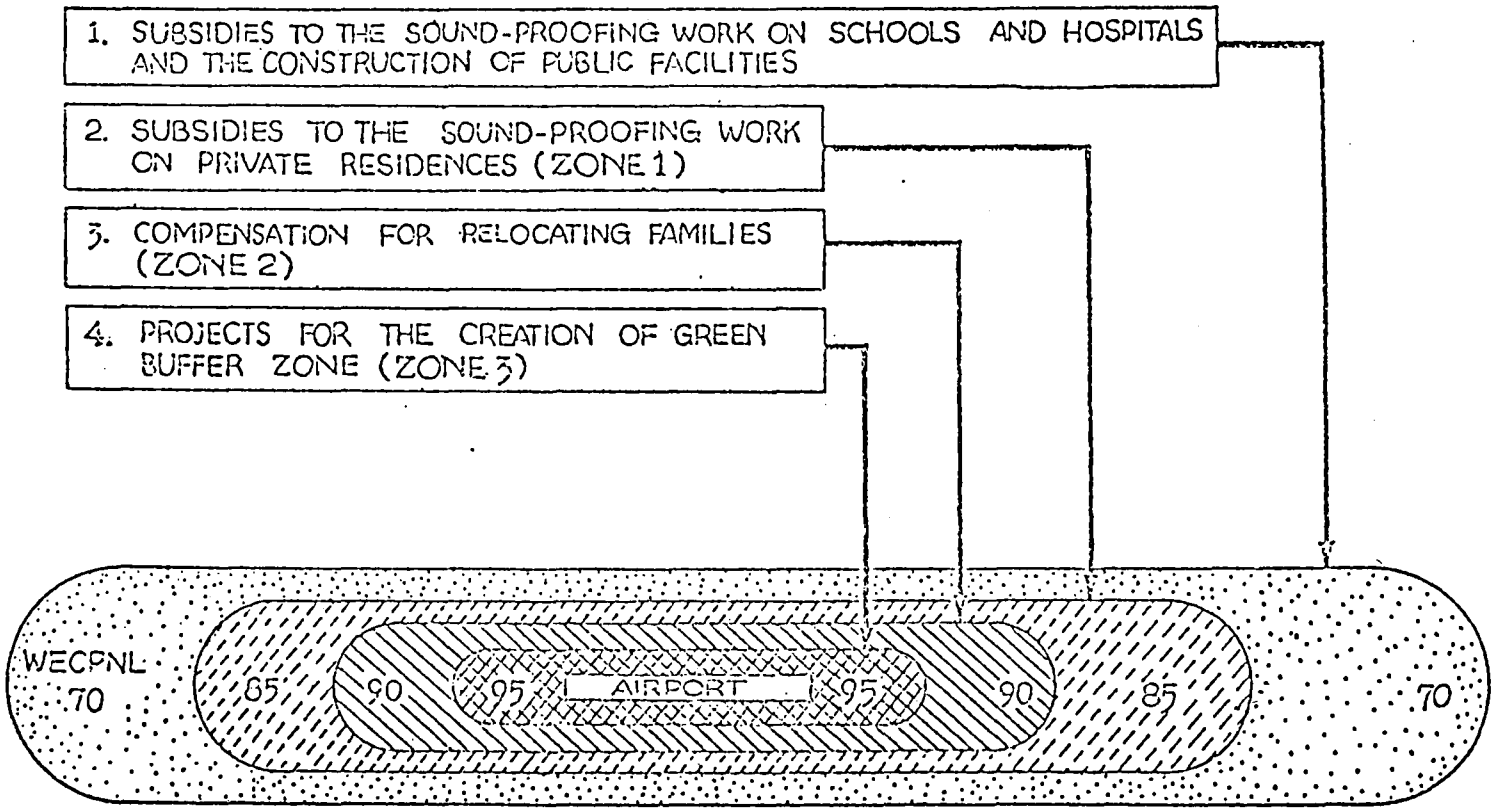

CHART 8

OUTLINE OF AIRCRAFT NOISE ABATING MEASURES IMPLEMENTED
IN VARIOUS NOISE-CONTOUR ZONES AROUND AIRPORTS

for the owners to relocate or destroy the houses and time to reach agreement on the compensation to be provided. If, after the process is completed, the governor does finally order the removal or destruction, then the prefectural government must stand the expense. To reach this terminal point, first there are consultations between the property owner, the airport operator, and other parties who have rights - such as rentors. If no agreement is reached the law provides that the matter then be brought before the special committee for expropriation which is authorized under previous legislation.

Difficulties have already arisen because the new law limits compensation to the "current market value" of the property. Since substitute property is more expensive - some times by a factor of 3 to 5 times - than the noise impacted land which the inhabitants are supposed to leave, the residents in some cases refuse to move. Secondly, if some inhabitants move there is the likelihood that the value of the adjacent properties will decrease. This is particularly true because the nearby shopkeepers suffer a decrease in their business and thus the value of their property shrinks. Shopkeepers then ask for subsidies to make up for the business lost by reason of government action. The legislative prescription that the governor's award be limited not only to "market value" but also to the budget also causes problems.

A final comment is that the 200,000 yen (less than $1,000) is such a small fine for failure to comply that the fine would not serve as a violation deterrent.

7. The Narita Story

At the end of the 1950s there were no truly international airports to serve Japan's growing tourist and commercial interests. Tokyo's International Airport at Haneda and the Osaka International Airport, originally designed for smaller propeller aircraft, were now plagued by noise complaints and were fast reaching capacity. Therefore, in 1962 the Japanese Cabinet decided that a new curfew-free Tokyo airport should be built within 100 kilometers (62 miles) of downtown in an area which could be protected from excessive noise. The size was to be 2310 hectares (5,706 acres). Finally in May 1978, almost 16 years later, after involvement with five Prime Ministers, eighteen Ministers of Transport, riot-caused deaths (inspite of a police guard of up to 14,000), the New Tokyo International Airport (NTIA), also called Narita, was opened to phase one with service limited by a curfew and by schedule restrictions.

By opening date, $5 billion (960 billion yen) had been spent on a 550 hectare (1,358 acres) area, one quarter the size originally planned. Two years later, in 1980, operations were still limited and difficulties were being experienced in initiating the phase two construction program which would add two more runways and two terminals as well as increase the size to 1,035 hectares (2,556 acres). A handful of individuals may be able to tie up construction for some time. How is this possible where consultation and consensus has been a way of Life? The following discussion may shed some light.

One writer[38/] suggests - and similar thoughts were expressed during interviews in Japan - the basic flaw was that the site selection was accomplished as a result of a political power struggle in the Government before the conventional consultation began, and thus the consultations were too little and too late. Back in 1963 the Narita site was not even a top contender for the airport location. An inland area around Tomisato, a village near Narita, was strongly pushed by the Ministry of Transport, while the powerful Minister of Construction, Mr. Kohno, pressed for a site involving the reclamation of off-shore land in Tokyo Bay. Two years later, in 1965, when Mr. Kohno suddenly died, the Tomisato site was unofficially quickly agreed upon without the consent of the local governments involved. Enraged, the local government and the villagers refused to cooperate with the national government and, instead, mounted strong countermoves.

Subsequently, in 1966, Prime Minister Sato, again without consulting the affected residents, unexpectedly announced that the new airport would be constructed on the present site of Narita in the Chiba Prefecture, but would only be half of the original planned size. The decision on size avoided the necessity to purchase 1,200 houses and a great deal of land area. In the same year, the New Tokyo International Airport Authority (NTIAA), was established, with 50 percent government ownership, to construct and manage the airport. Emphasizing the high piority character of the project, the authority gained the right to purchase

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38/ Fujita, op. cit.

land and buildings from the farmers under a special law applicable only to Narita. Phase I was to be completed by 1970 and Phase II by 1973.

Although the national government envisaged, because of the urgent well recognized need for the airport and because of the special facilitating law providing for acquisition of land and compensation therefor, that construction of this proposed curfew-free, capacity unconstrained airport would proceed smoothly, it seriously underestimated the power of the peasant farmers living in and around the selected site who (1) did not wish to be disturbed by noise, (2) did not wish to move for cultural reasons and, in particular, under the conditions offered. Through their political power, the peasants - later augmented by dissident student groups who were able to use the issues for their own ends - were able to delay the opening of Phase I for eight years and then be successful in extracting, as a price of opening, concessions which largely vitiated the main purpose of the airport, i.e., a curfew-free unconstrained operation. One further factor entering the picture was the changing attitude of the public toward environmental questions. The public was demanding more than the stoppage of further pollution. It pressed, particularly through the Environment Agency, for measures to improve the environment aesthetically.

A fascinating book could be written concerning the history of Narita. Space constraints, however, limit us to a few salient points relative to the environmental issues of land-use planning and fuel supply.

Land acquisition: Although in early 1967 the initial acquisition of land went reasonably smoothly, probably because the acquisition of 252 hectares of Imperial Pasture Land was largely an intergovernmental operation, difficulties soon became apparent. By February 1968 demonstrations by various factions opposing construction of the airport had begun. However, while 300 households conditionally agreed to terms offered by the Authority, an organization calling itself the Association for Dedication to the Peace of Sanrizuka (Sanrizuka being an area just off the airport) erected a "Tower of Peace" in order to block effectively aircraft operations. This tower was to stand until late November 1972. Later the first of two steel 150 feet high obstruction towers was erected.[39/]

By 1969, when it became abundantly clear the local government of the Chiba Prefecture was not cooperating, the Minister of Construction took initial steps to acquire property under the Land Expropriation Law. When unsatisfactory progress resulted from one year of negotiations under the law and when it was urged that an emergency existed to complete Phase I of airport construction, an "Emergency Application" was filed with the Expropriation Committee which was composed of "impartial" members appointed by the Ministry of Transport. Although many farmers inhabiting the land objected, the Committee had them forcibly removed. All but 17 of the farmers inhabiting the land to be used for Phase II eventually left.

39/ Narita Airport was not the only project singled out for noise protests by the radical students. Demonstrations occurred against the noise from the "shinkansen", or high-speed bullet trains, as well as against some road building projects.

The eviction had two contradictory results for the Airport Authority. On the one hand, since all appeals from the expropriation action have since been turned down by the courts, the Authority's hand was strengthened for land acquisitions and for removal of recalcitrant farmers. On the other hand, the action has, at least for the present, benefitted the remaining 17 landowners in their fight to remain. The matter of "losing face" is the reason. When other protests led to a delay of another 8 years in opening the airport, the Expropriation Committee took the delay personally and said it had "lost face" by forcing people from their land on an "emergency" basis when, as it turned out, there was no emergency.

Since that time the Committee has refused to use its authority to take the land away from the remaining 17 families. Instead, it has told the Authority to continue negotiating with the farmers, which it is doing. Although the Authority expects that, if necessary, the Committee will eventually again take action the strategy in the meantime is to begin Phase II construction around the contested farms, thus making so unpleasant that the 17 remaining families will choose to leave.

By 1971 anti-noise construction was begun for schools and an "Anti-noise Countermeasure Committee of the New Tokyo International Airport" was organized. The year 1972 saw anti-noise construction for private homes begun by the Chiba Prefecture. On the other hand, effective opposition to both fuel and water pipelines for Narita arose. The pipeline situation led to appeals by the Ministry of Transport to the governors of the Prefectures of Chiba and Ibaraki for cooperation.

Apparently the cooperation was less than enthusiastic because in 1973 town councils in each of those prefectures adopted resolutions for total objection to even the temporary transportation of aviation fuel. At the close of the year the announcement by the Environmental Agency of environmental standards for aircraft noise was a forward step.

Action by the Government on the noise standards and on the March 1974 amendment to the noise prevention law, which made it possible to subsidize the installation of noise insulation in private residences and extend the area of eligibility, coincided with a gradual but hesitating movement toward completion of Phase I of airport construction. Although the Chiba Prefectural Assembly adopted a resolution to accelerate completion of the airport, 35 residents of the prefecture in 1975 filed suit objecting to the original pipeline construction work. The danger of fuel exploding and burning their homes and families was their stated objection. Recognizing the difficulties in convincing the residents and realizing the length of time consultations and legal maneuvers could take, the Airport Authority began attempts to negotiate conditional agreements for jet fuel transportation.

Using their political leverage, the towns were able to take a firm stand with the Airport Authority and negotiate severe constraints on airport operations in return for permitting the airport to operate. One of the noise conditions was a night curfew of from 11:00 p.m. to 6:00 a.m. Of course, without fuel there would be no noise problem as aircraft could not operate. The Authority sought to compensate for the delay in pipeline construction by substituting rail transport. Here

again the Authority ran into trouble in pursuing the "nemawashi" process. The residents had thought up other objections. This time the objections were that trains already made too much noise and any additional tank cars would increase unwanted noise. Further they argued the transportation of fuel in tank cars was dangerous. With or without collision accidents, the cars might blow up. To make it possible for the airport to open by 1978 the Authority agreed early in 1977 to a limitation on the number of trains a day which could carry jet fuel to two, to be operated on two different lines and containing not more than 101 cars. Initially this was estimated to be sufficient fuel for 160 flights per day.

A number of individuals close to the Japanese situation suggest that some of the claims made in the name of noise relief and safety are not sincerely made. For example, in the matter of the pipeline and the trains, since the settlement involves the payment of money for the improvement of schools or playgrounds, it is argued that the complaints are merely mechanisms for obtaining government money. On the other hand, it has been suggested that the government, in self defense, plays the same game. Knowing a confrontation may come up on future projects, the government may purposely let governmental services slip so that restoration or improvement may be offered contingent upon receiving approval for the new project.

By 1977 it was abundantly clear that among the failures of the original Narita plan were (1) the idea that since Narita had a relatively light density of population in comparison with Tokyo, there was

no need to purchase land outside the airport boundary for noise buffer purposes and (2) the failure to protect residents in an area well below 85 WECPNL by subsidies for sound proofing. Thus, in October, the Government submitted a bill which addressed in particular the latter problem and which, in 1978, became the previously described (See 6.4) Special Act on Aircraft Noise Around a Designated Airport.

The opening date for Narita was established as March 30, 1978. As the date approached, demonstrations by radical elements which had taken up the Narita environmental protests for their own purposes became so violent that a protecting police force which had grown to 6,000, reached 14,000. Notwithstanding this army of guards, shortly before opening day, five terrorists broke through the security and severely damaged the control tower, delaying the opening until May 20. Locked into limited service by the curfew and the limit on fuel - a constraint which is expected to last at least three years - as well as beset with the cost of an army of police, it is not too surprising to find that the airport lost $350 million in its first year.[40/]

Since opening day, operations have gone relatively smoothly with but few disrupting incidents. Security police have been reduced to 1,500. However, there are still severe problems in addition to those just mentioned. The airport is a one runway airport and not only has capacity problems but also the operational limitation caused by the absence of a crosswind runway. The second parallel and the cross-

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40/ Aviation Daily, June 4, 1979, p. 199.

wind runway are contained in the Phase II plan. Despite several abortive announcements that Phase II construction is about to start, it has not. Small groups of dissidents, such as the 17 families in the Phase II area and a few left in Phase I, have been a thorn in the side of the national government and the New Tokyo International Airport Authority.

8. Osaka International Airport (Kansai)

If the foregoing has indicated that aircraft noise protests have partially strangled operations at the $5 billion Narita Airport to a fraction of those originally planned and has resulted in huge operating losses, the following will indicate that a still more serious operational problem and potentially more serious financial consequence has developed from the noise annoyance at Osaka. Osaka, with over 10 million in its catchment area, and 4.7 million in 8 cities around the airport is Japan's second largest city. As a result of persistent protests over jet noise by well organized citizen groups, the airport operations are severely restricted by:

1. the world's strictest jet curfew 9:00 p.m. to 7:00 a.m.
2. the world's lowest daily jet operations limit for a fully developed airport - 200 landings and take-offs per day.
3. the usual noise abatement operational procedures
4. stringent ground operating rules including, for example, requiring rolling take-offs from specially placed "stop" positions. Even the exact point of power application is specified.
5. specified noise limits which vary by time of day for designated aircraft types.

6. restrictions on aircraft engine tests not only as to time and place but also as to length of test and percent of power to be used.

Moreover, affected citizens have formed environmental groups and, together with the surrounding local governments, continually push for a wide range of relief measures such as: closing the airport, subsidies for (1) relocation, (2) sound proofing, (3) purchasing homes in more expensive areas, and (4) supplementing revenues from their trade because customers have moved away. Arrayed against this politically powerful combination of protesting citizens - it is estimated that as many as 43,000 individuals have been adversely affected by aircraft noise around the Osaka Airport - are the commercial interests of this heavily industrialized area. These interests feel the citizenry does not understand that the economic vitality of the Osaka area upon which they depend for a living would be severely if not irreparably, damaged if the Osaka International Airport were shut down. The interest of the business community in keeping the airport open until larger and quieter planes or a new airport located elsewhere solves the noise problem is reflected by the presence of business men and even the chairman of the Chamber of Commerce on the airport boards and commissions. A look at the airport environment as it has changed from the early fifties and a consideration of the alternatives available gives an insight into the seriousness of the problem as well as into the difficulties faced by the Japanese in answering requests for greater access to Narita and Osaka by the U.S. and other nations for their international carriers.

8.1 The changing environment around the Osaka Airport. As Illus-

CHART 9

ENVIRONMENT OF OSAKA INTN'L AIRPORT

trated by Chart 9 , the airport is tightly surrounded with residences and apartments many of which house low income families on a rental basis. Such was not always the case. Originally the airport was a military base, considered to be out in the country. The adjacent area was populated with poor farmers who eked out a living in quiet, save for the intrusion of military jets - infrequent in early post-war Japan. However, Osaka grew rapidly after World War II. The urbanization process engulfed the airport area for miles in every direction. Consequently, a number of towns have developed which have their borders either at the edge of the airport or a few miles away, but well within areas strongly affected by aircraft noise. Being without jurisdiction over the airport, the town councils must seek relief through the national government, the prefectural government, the city of Osaka or from such semi-governmental regional groups as may be established.

By the time commercial jets were introduced in 1964 the airport area was virtually surrounded with low income families, mostly renters, whose mores and folkways in a society which had yet to develop mobility made it difficult for them to identify with the need for an airport which complicated their lives. Absent the concept that anyone can progress from humble beginnings to a higher social and economic status, the residents reasoned, not illogically at the time, that air travel was for the rich and powerful business men, politicians and foreigners, and that they, the residents, had neither the opportunity nor the money to use air transport. As they saw it, jet noise disturbed their peace, airport traffic increased road congestion, and, overall, air transport

increased taxes. They, the airport neighbors, received only disbenefits. Therefore, when their early pleas for relief were not answered satisfactorily, the residents kept exerting stronger and stronger political pressure for curfews, for limitations on daily schedules, for compensation for past and future noise, and for the closure of the airport.

8.2 Resort to Legal Action. The initial governmental approach to noise control was an 11:00 p.m. to 6:00 a.m. curfew beginning in 1965. Accompanying the curfew was a redirection of flight paths. This two pronged attack failed to provide the same degree of relief at Osaka as it did at Tokyo because of a larger population in noise-affected areas at Osaka and because the Tokyo airport, unlike Osaka's location, on a bay permitted the direction of some flight paths over water, away from the population.

The Noise Prevention law of 1967 was expected to bring relief, but the citizens felt that relief was minimal. Although some schools were insulated and monitoring began, only a few families moved. Also not enough land was purchased by the Government to prevent land use in an incompatible fashion. Despite the usual reluctance of the Japanese to resort to legal action, in 1969 three groups jointly sued the central government of Osaka for aircraft noise damages of 10,000 yen per month per person continuing until the noise reduced to 65 dB(A). The suit also asked the court to establish a 9:00 p.m. to 7:00 a.m. curfew. In its decision the court found that an appropriate curfew should be 10:00 p.m. to 7:00 a.m., but awarded no compensation for

damages.[41/]

The people's dissatisfaction with the decision led to an appeal to the High Court which by a 1973 decision reversed the lower court and provided for the requested 9:00 p.m. to 7:00 a.m. curfew and for the 10,000 yen per month damages. Fearing the heavy financial burden imposed by such a landmark decision, the government, in 1975, appealed to the Supreme Court which will decide the case on the record submitted to it. Five years have now passed since appeal and no decision is forthcoming. Inquiry in Japan led to the following explanation. At the Supreme Court level the matter was considered so explosive that the Court assigned the case to a 5 judge subgroup. Two of the five judges were retiring and managed to stave off the decision until they retired. The remaining three judges did not wish to bear the responsibility for such a decision and "passed the buck" back to the full 15 member Supreme Court. No one is willing to predict when the final decision will be published. Pending the Court's decision, a curfew of 10:00 p.m. to 7:00 a.m. for international flights is technically established. Nevertheless, a 9:00 p.m. to 7:00 a.m. curfew is administratively applied. Actually, according to the weekly schedules published for March 1979, only 2 international arrivals were scheduled before 10:00 a.m. and none after 8:25 p.m. The first international departure was scheduled at 9:25 a.m. and all arrivals - except a one

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41/ Subsequently legal action was initiated by inhabitants of Fukuoka in which they also ask for 9:00 p.m. to 7:00 a.m. curfew until 65 dB(A) is reached and 10,000 yen a month back to the start of jet operations. Action is being held up pending decision in the Osaka case. Suits have also been filed against the national government by the inhabitants around Komatsu Airport and those around the military bases at Yokota and Atsugi.

day a week freighter at 8:25 p.m. - were scheduled prior to 8:00 p.m.

In a matter separate from the law suit referred to above, and shortly after its filing, 2,256 citizens of the town of Itami City (bordering the Osaka Airport), later joined by 19,841 citizens of nine groups from other neighboring cities in 1969, appealed to the Environmental Dispute Coordination Commission to close the airport and, pending closure, to establish environmental quality standards which would clearly define noise zones and building rules for such zones. The appeal also requested financial aid for insulation, damages of 500,000 yen for each resident, and the establishment of a 9:00 p.m. to 7:00 a.m. curfew. This action triggered a recommendation by the Director General of the Environment Agency, made on December 28, 1971, to the Minister of Transport for the imposition of a 10:00 p.m. to 7:00 a.m. curfew. It was imposed in March 1972.[42/] By the end of 1973 the Environment Agency, "by announcement" established guide lines for aircraft noise environmental quality standards. As shown in Table 7, the objective in Zone I by 1983 is less than 70 WECPNL, and that in Zone II less than 75 WECPNL.

As a result of continued mediation by the Environmental Dispute Coordination Commission, a 9:00 p.m. to 7:00 a.m. curfew was agreed upon and, insulation allowances were provided. The two major and most costly demands facing the mediators were those for closing the airport and for damages of 500,000 yen per resident. After years of

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42/ In December 1975 the 10:00 p.m. curfew was changed to 9:00 p.m. for domestic operations.

TABLE 7

ENVIRONMENT AGENCY
AIRCRAFT NOISE ENVIRONMENTAL QUALITY STANDARDS

December 27, 1973

Measures for Coping with Aircraft Noise

(1) Establishment of Environmental Quality Standards

Table 35. Outlines of environmental quality standards relating to aircraft Noise (officially announced on December 27, 1973 by Environment Agency)

○ Standards

Types of Areas	Standard value (unit: WECPNL)
I	Below 70
II	Below 75

Remarks: Type I: Area exclusively for the purpose of residence
Type II: Area other than Type I and at the same time where preservation of ordinary living environment is necessary.

○ Time Schedule

Type of Aircraft			Attainment Time	Improvement Goal
New airports 3rd class airports			At once	
Existing Airports	2nd class airports	Where aircraft other than jet aircraft only operates	Within 5 years	
		Where jet aircraft operates	Within 10 years	(Within 5 years) Less than 85 WECPNL (outdoor) Less than 65 WECPNL (indoor)
	New Tokyo International Airport			
	1st class airports (excluding New Tokyo International Airport) and Fukuoka International Airport		Within a period exceeding 10 years but as soon as possible	(Within 5 years) Same as above (Within 10 years) Less than 75 WECPNL (outdoor) Less than 60 WECPNL (indoor)

Remarks: For the areas surrounding the airfields used by Self Defense Force, etc., the proper noise level should be secured within the specified period in accordance with the Table above taking into consideration the average number of take-offs and landings, type of aircraft, density of houses.

mediation efforts the disputants, early in July 1980, accepted a mediation plan presented by the Prime Minister's Office's Pollution Disputes Coordination Committee.[43] Although not technically solving the problem, the plan provides a long breathing spell before further action is to be taken.

The demand with the greatest economic and political consequences was the request to close the airport. Settlement provides that the issue be set aside until the opening of the New Osaka International Airport. Since it take 15 years to plan and build an international airport, and since there are many unsettled aspects of the proposed airport - including opposition on cost grounds that it should be built at all - closure has been put to rest. Finally, the disputants agreed to set aside the request for monetary damages pending the Supreme Court decision.

8.3 Actions to counteract deficiencies in the 1967 Noise Prevention Law. While the Osaka lawsuit was winding its way through the courts, the authorities sought other measures to alleviate the noise problems which were by now getting out of hand. Under the 1967 law the compensation system failed to work because the inhabitants around the Osaka airport were unable to find reasonably priced substitutive land and could not reach agreement with the authorities on a price for their properties. Through 1972 only 78 structures involving but 64,200 square meters were removed from the noise zone.[44] Also, although the national

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[43] Japan Times Weekly, July 5, 1980, p. 11

[44] "Countermeasures Against Civil Aircraft Noises in Japan," ANPA, September, 1973.

government was condemned for permitting the noise to exist and even grow, land-use planning was actually under the authority of the prefectures who felt the national government, because it controlled air transport, should provide financial assistance for planning. Thus, there were constraints on effective action by the national government. Finally, while the law provided insulation for schools, hospitals and public buildings, the small residential owner was not protected.

In 1974, sweeping amendments to the Noise Prevention Law saw cooperation between central, prefectural, and city governments replacing the former adversary relationship. First, subsidies for soundproofing residences in surrounding communities were provided. Second, provision was made for sharing noise abatement costs between the national government, the prefectures, and the local communities. The formation of a semi-government organization such as the Organization of Environment Improvement Around Osaka International Airport was authorized contingent upon the airport being "designated" by the central government. Osaka was promptly "designated."

A systematic restructuring of the communities surrounding the Osaka airport was required. The improvement organization, drawn up with cooperation of the prefectural governors, was funded 75 percent by the central government, 12 1/2 percent by Osaka Prefecture and 12 1/2 percent by the Hyogo Prefecture. Although the organization has no forcing powers, it has made enough progress so that pressure for airport closure is fading. Filling in where previous measures failed, the organization promotes compensatory measures for private properties cooperating with

local governments. The program is far more than mere compensation but involves extensive land-use planning, including such other elements as the construction of low-cost housing and the relocation of buildings. Currently, the Organization has six specific noise control projects.[45/]

1. redeveloping old areas near the airport
2. developing new residential areas away from the airport
3. construction of low-cost apartment houses
4. payment of compensation for land, buildings, and relocation moving expenses
5. the demolishing of buildings and the construction of a "green area" in zone three
6. payment for the installation of noise insulation in two rooms at 90% of cost

Chart 7 depicts the zones to which the various projects apply. According to a recent OECD report,[46/] compensation in cash is also paid for a loss in property value, loss of amenity, medical expense, and for housing considered unsuitable for use because of noise.

8.4 Experience under the 1974 amendment. Although the noise countermeasures of the central government, the airport operator, and the Organization for the Improvement of the Environment Around the Osaka Airport have resulted in reduced noise levels in some noise sensitive areas and a reduction of the number of families residing in the areas, such serious problems remain, both as to noise and as to airport capacity that a new international airport is in the planning stage.

In some localities around Osaka only 15 percent of the families eligible to be relocated have moved. Among the reasons are (1) the

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45/ Akira Ishihara, Director, Organization for Environmental Improvement Around Osaka International Airport.

46/ OECD op. cit.

disinclination to leave the home of their childhood as well as that of generations of forebearers, and (2) the inability to find substitute quarters at an affordable price. In the case of home ownership, the tax laws will likely take as much as 50 percent of the sale price. In the case of a renter, any new apartment - even in the so called "low-rent" government projects is likely to be inconveniently located from his place of employment and is likely to rent for more than he can afford to pay. Further, a landlord must have the approval of his tennants to remodel. While the law does provide relocation expenses, it does not provide a monthly rent subsidy where higher rent is involved.

Although national government has bought land, the municipalities feel it has not bought enough and that the land so purchased should be reserved for public parks. And, of course, the towns wish to be consulted about what use the central government will make of the property it has purchased. Two secondary costs have arisen from government purchases of property. First the municipalities lose the tax base and second, clearing homes from the area reduces the income of neighboring tradesmen and the value of their homes which are often in the same building as their shops. The national government has attempted to address the first problem by making grants totalling 1 million yen per year to make up for the loss of the tax base, but this is claimed to be not enough. A budetary problem arises because the funding is limited to two-thirds of the sum raised by an airplane fuel tax of 13,000 yen per 100 liters. To respond to the complaints of the tradesmen, the prefecture and city government provide low-cost loans for living

penses - a short run solution fraught with danger. Finally, because individuals moving into a limited noise area after 1968 are not entitled to noise insulation, voluntary moves are inhibited. However, some effort is being made to change this.

On the brighter side of the aircraft noise picture around Osaka, a strict 9:00 p.m. curfew, the progressive reduction of operations from 450 (of which 260 were jets) in 1972 to 410 (240 of which were jets) in 1974, to the present limit of 200 jets per day, and the increasing proportion of widebody jets - now about 50 percent - have brought about reductions in the noise levels and, consequently, a reduction in the number of families exposed to the higher levels. For the 1973 to 1978 period, the number of households in 85 WECPNL contour were reduced from 42,879 to 27,379, or 36 percent, and the area with the contour reduced by 45 percent. 3y 1977, 642 buildings had been moved or destroyed, 1,078 inhabitants moved and 383,107 square meters purchased by the government.

The above dry statistics are brought to life by a tour of the airport environs. Blocked in checkerboard fashion among homes and rental properties in the noise zone areas are the visible results of the noise countermeasures, namely, cleared areas containing blocks of (1) fenced in recreational facilities, (2) bare areas where houses have been demolished together with a sign that the property had been acquired by the government for noise reasons, (3) bits of cleared land now green with planting, and (4) Japanese homes of various income classes with the tell-tale double-glazing noise insulation. Finally, public

housing projects for displaced families are in evidence. As of 1978 there were 25,926 families in zone 1, 12,449 in zone 2 and 4,554 in zone 3 - a total of 42,879 in the three zones.

Just a few hundred feet from the runup area and take-off position on one end of the major runway is a dense cluster of older homes. Cement noise abating walls so high that the tail of an aircraft cannot be seen from an adjacent road, together with some tree plantings, shield these residences from noise. Visible only 2.4 kilometers (1.5 miles) away is the tower of the heavily insulated Kushiro Primary School in which is located one of Osaka's 10 noise monitoring stations. Thus, substantial physical evidence of attempts to prevent excessive noise from reaching the inhabitants is clearly present.

8.5 Noise Monitoring. Local governments of the smaller municipalities continue to be skeptical that the national and prefectural authorities are doing all they can to reduce noise. Surprisingly, considering their small size, some of these towns often have their own noise monitor and have an extensive environmental program. Other noise monitors are owned by the prefectures or central government. One problem with so many separate systems not all made or maintained by the same company has been the difficulty of reconciling the readings one with another. Nevertheless, readings are carefully collected for violations and for material to be used in evaluating noise complaints. As yet no disciplinary actions have been taken against pilots whose aircraft exceeds the limits - the complaint going to the company.

Osaka authorities compile and analyze aircraft noise complaints,

breaking them down into categories of resident groups, time, place and nature of the complaint. Further categories distinguish between written, telephone or oral complaints. Chart 10 indicates that as of June 1978 the B707s constituted less than 5 percent of operations but over 42 percent of landing noise total energy, while the B747 constituted 9 percent of operations and only 6 percent of the noise.

8.6 The Future of the Osaka Airport and its Environs. While there are still some who, in spite of the trillions of yen spent on the Osaka airport and its environs, demand that the facility be shut down and all operations moved to a new airport 80 kilometers (50 miles) away, their members have declined. The mediation agreement of July 1980 implies a further decline.

The airport authorities and the environmental agency believe current programs will result in noise improvement sufficiently satisfactory to permit continued airport operations - at least for domestic flights. They predict 88 percent of the residents will move from Zone 3 (95 WECPNL) if properly compensated. In Zone 2 (85 WECPNL) a slightly smaller percentage is expected to ask for relocation. However, the strategy is to add pressure upon the rest by announcing that rejection of the offer to move will mean elimination from other benefits of the program. Moreover, the authorities, whose goal is to have no one in an 85 contour, think the number living in the contour by 1983 will be reduced to six or seven thousand. They also suggest that curfew relaxation could be considered when the number of families within the 85 contour reaches 5,000. Another reason for optimism is

CHART 10

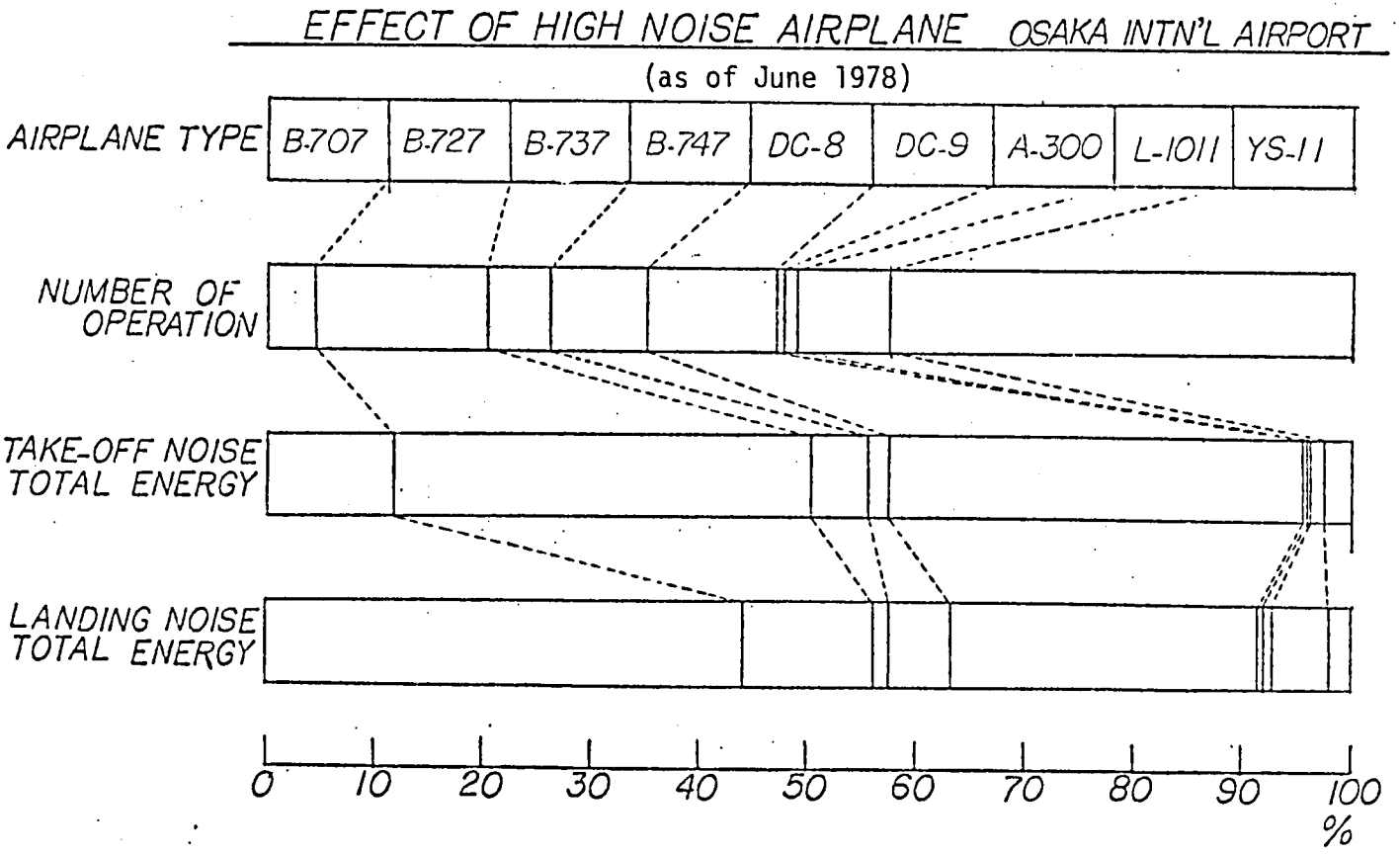

CHART 10
EFFECT OF HIGH NOISE AIRPLANE OSAKA INTN'L AIRPORT
(As of June 1978)

that the industrialization of Osaka has changed attitudes of modern Japanese city dwellers toward the necessity for staying in the homes of their forebearers. Because of this change toward flexibility the old leaders of the recalcitrant groups are being replaced by people with different cultural values. Thus, opposition to moving is being reduced over time.

Because of aircraft noise, the curfew, the cap on jet operations, the physical impossibility of adding runways in other directions at the present airport, and because of the consequent inability to permit new foreign air carrier operations into Osaka, the necessity for a new international airport has been recognized. A site off-shore on Senshu, on a small island southeast of Osaka Bay, has been picked for the new Osaka airport which will be called the New Kansai International airport. Noise considerations dictated this site where no residences, schools, hospitals, public or private buildings will be exposed to a level as high as 70 WECPNL.

The concept of an off-shore airport for Osaka gained acceptance as a result of the successful experience at the new Nagasaki airport. Here the noise problem was solved by building the airport off-shore so that the critical 70 WECPNL did not touch the inhabited mainland. In this case only 66 farmers growing tangerines had to be moved from the island. The burning question at Osaka is will the old airport with the billions of yen invested in noise control programs be phased out because of the superior noise characteristics and capacity attributes of the new Kansai airport - as many demand, or will, because of

the inconvenience of the long distance to downtown Osaka (80 km) and the need for increased domestic service, the old Osaka airport survive? The plan to put off the decision for many years suggests that the airport will survive.

As attractive as is the off-shore concept from an environmental standpoint, soaring cost figures have recently led to opposition of its construction by Japanese air carriers. Thus far Narita has cost $5 billion and is at least $2 billion from being finished. Losing many millions a year in its constrained operations, Narita is not forecast to reach profitability for 40 to 50 years. Cost estimates for the new Kansai (Osaka) airport have reached $12 billion. Japanese carriers fear that if an independent corporation is established to operate the airport on a cost recovery basis, the landing fees will be too high for profitable operations. Therefore they have opposed the Ministry of Transport's plan to begin construction in fiscal 1982.[47/]

Given the unfortunate delays in constructing Narita, authorities are making sincere efforts to avoid repetition. However, being well aware of the "nemawashi" which must be employed and the difficulties which ensue when people who are considered not to be affected decide that they are affected, many Japanese fear that delays approaching those of Narita may take place.

The optimism that noise complaints would diminish - the thesis of government administrators of the noise programs - was partially offset

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[47/] Aviation Week and Space Technology, June 30, 1980, p. 33.

by complaints made by the environmental officials during the investigator's visit to the town hall of Kawanishi - one of the municipalities bordering the Osaka airport.

9. Haneda

As indicated earlier in this chapter, from the end of World War II to 1978, Haneda, located in Tokyo Bay and convenient to downtown, was Tokyo's airport for both international and domestic operations. Entry of commercial jets in 1959 was accompanied by noise complaints leading to the following airport countermeasures

-curfew (1963)
-changes in flight paths (1963)
-operational procedures (1963)
-noise monitoring (1969)
-limitation on the number of schedules per day to 450 (1971)

Noise and future capacity problems at Haneda led to plans in 1962 for a large new curfew-free airport with sufficient capability for unconstrained operations for years to come. As we have seen, the plans resulted in the 1978 opening of a much smaller, schedule-constrained, curfew-ridden airport at Narita. Because of the current and future limited use which can be made of Narita, the Haneda complex is being reexamined for possible expansion. With the transfer of international flights to Narita, Haneda has dropped to 330 operations per day and has excess capacity. Curiously, aircraft noise - originally a motivating factor in plans to leave Haneda - no longer seems as threatening as formerly. Aided by the phasing out of noisy 707 and DC-8 aircraft,

the new scheme involving the reclamation of some land in the bay to permit runway modifications, is said to allow 250,000 operations a year - or 685 per day which is 4 times the current Narita capacity.[48/] If the plans are carried out, the JCAB hopes to lift the curfew for international flights using Haneda. Since Japanese do not like to fly late at night, the JCAB feel a change in the domestic curfew would be unnecessary.

10. Noise-related Landing Charges

Japan is one of the few countries attempting to finance a portion of its noise abatement efforts by special noise related landing charges. It will be recalled that in Vol. I, Europe, charges were in force at: Manchester, England; Orly and General Charles De Gaulle in France; and Frankfurt, Germany. Moreover. Switzerland and the Netherlands were laying plans to implement such charges, but were having difficulty in devising an equitable formula. Several other European countries were "investigating" the noise-related landing charge concept. Except for Japan, none of the countries in the Pacific investigations evidenced a desire to adopt such charges.

The growth of Japan's noise countermeasure programs necessitated the expenditure of increasingly large amounts of public funds. Existing landing fees, based on the gross weight of the aircraft, defrayed only a part of airport operating expenses and did not cover the additional costs, both on and off the airports, of noise control measures. Feeling

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48/ Aviation Daily, May 17, 1979, p. 110.

that the users - the airlines and their customers - should finance these measures, the Aviation Council, and advisory body to the Minister of Transport, recommended the institution of a separate noise-related landing charge. As adopted in 1975, the levy was limited to jet operations. In refusing to pay and in resorting to litigation, the international operators - save Japan Air Lines which had no alternative but to pay - have termed the charges "a complete mess" because of what they perceive to be serious elements of discrimination and inconsistencies in the plan.[49/]

The original noise-related landing charge involved a separate charge based upon the weight of the aircraft and its noise level, averaged between take-off and approach, by the following formula:

$$\text{Charge in yen} = \text{MGWT} \times 290 + \frac{(\text{EPNDB Take-off Value} + \text{EPNDB Landing Value})}{2} - 83 \times 1{,}630$$

-where MGWT equals Maximum Certificated Gross Weight in Tonnes, and 290 and 1,630 are in yen.

49/ According to Aviation Daily, November 26, 1979, p. 116, Aeroflot became the first of 27 protesting foreign carriers to pay its assessment ($448,500). Recently Northwest Orient Airlines also paid. Although payments are coming in, they are largely for the purpose of avoiding compounding high interest charges on the amounts involved. The payments are made under protest and carriers continue with the litigation over the legality of the charges.

At the time the formula produced the following charges

TABLE 8

TYPE OF AIRCRAFT	SPECIAL LANDING CHARGE	
	YEN	US $
B. 747	107,710	359
DC. 8	98,340	327
L. 1011	84,550	281
B. 727	52,250	174
DC. 9	39,530	131

By 1978 the formula had been revised as follows:

$$\text{Charge in yen} = \text{MGWT} \times 580 + \frac{(\text{EPNDB Take-off} + \text{EPNDB Landing})}{2} - 83 \times 3{,}260.$$

The new charges, partially because of loss in the exchange value of the dollar, are about 300 percent of the old in U.S. dollars, and a lower percentage in yen. Table 9 shows the current amounts.

TABLE 9

SPECIAL LANDING CHARGE

Type of Aircraft	Yen	U.S. $
B747SR	215,420	1,034
DC-8	196,680	944
L1011	169,100	812
B727	101,240	487
DC-9	69,280	333

To ensure that passengers contribute directly to the landing charges, the carriers are required to add a "head tax" to be included

in the price of each passenger's ticket as shown in the scale contained in Table 10.

TABLE 10

PASSENGER CHARGE IN TICKET

Passenger	Yen	U.S. $
Adult	600	3.00
Child	300	1.50
Handicapped	450	2.25

According to interviews in Japan made with the aid of a qualified intrepreter, but subject to some language interpretation problems, the charges are based on a 70 percent load factor so that the airlines keep portion of the head tax when the load is above 70 percent.50/

The addition of a separate noise charge for jet aircraft only caused dismay to the international operators who, rightly or wrongly, felt that the existing charges were sufficient and that their planes were being singled out to pay for noise abatement while noisy piston aircraft went free. In principle they were also opposed to the "head tax." As indicated, in refusing to pay they argued that the amount was unreasonable, that ticketing became more complex, and that the law was discriminatory. Possibly for this reason when Narita opened there was no separate charge. The charge at Narita, whatever the

50/ Answers to a request for verification of this interpretation through U.S. and Japanese sources had not been received prior to publication deadline.

amount, was hidden in one landing charge. The airlines are paying the levy without litigation.

Finally, since the plan's formula provides a greater charge as noise increases, it is sometimes mistakenly presented as an incentive plan for carriers to purchase quieter planes. The plan, however, is not designed for this purpose. No aircraft are denied access because they are too noisy, nor, as is reflected in Table 9 , are the charges small for the high-bypass quiet engines. Actually, the purpose of the scheme is merely to generate funds for noise countermeasures. In fiscal 1978, $95 million was raised from these charges.[51] Of course, this amount was just a fraction of the amount spent on noise countermeasures in Japan. Exact figures are hard to find but Table 11 is suggestive of the order and magnitude of some of the expenditures. Chart 11 shows the progressively increasing amounts included in the Japanese budget. It should be noted that one airport, Osaka, has accounted for over two thirds of the amounts. For some reason not explained, Narita is not included in these figures.

TABLE 11
SELECTED EXPENDITURES FOR NOISE ABATEMENT[52]
(Fiscal 1979)

Category	Yen in Billions	U.S. $ in Millions
Private Dwellings	50.6	253
Public buildings, Schools, Hospitals	9.9	49
Family relocation	12.7	63

51/ OECD, Paris Noise Conference 1980 (prepublication paper)

52/ Ibid.

CHART 11

BUDGET FOR COUNTERMEASURES AGAINST AVIATION NOISE

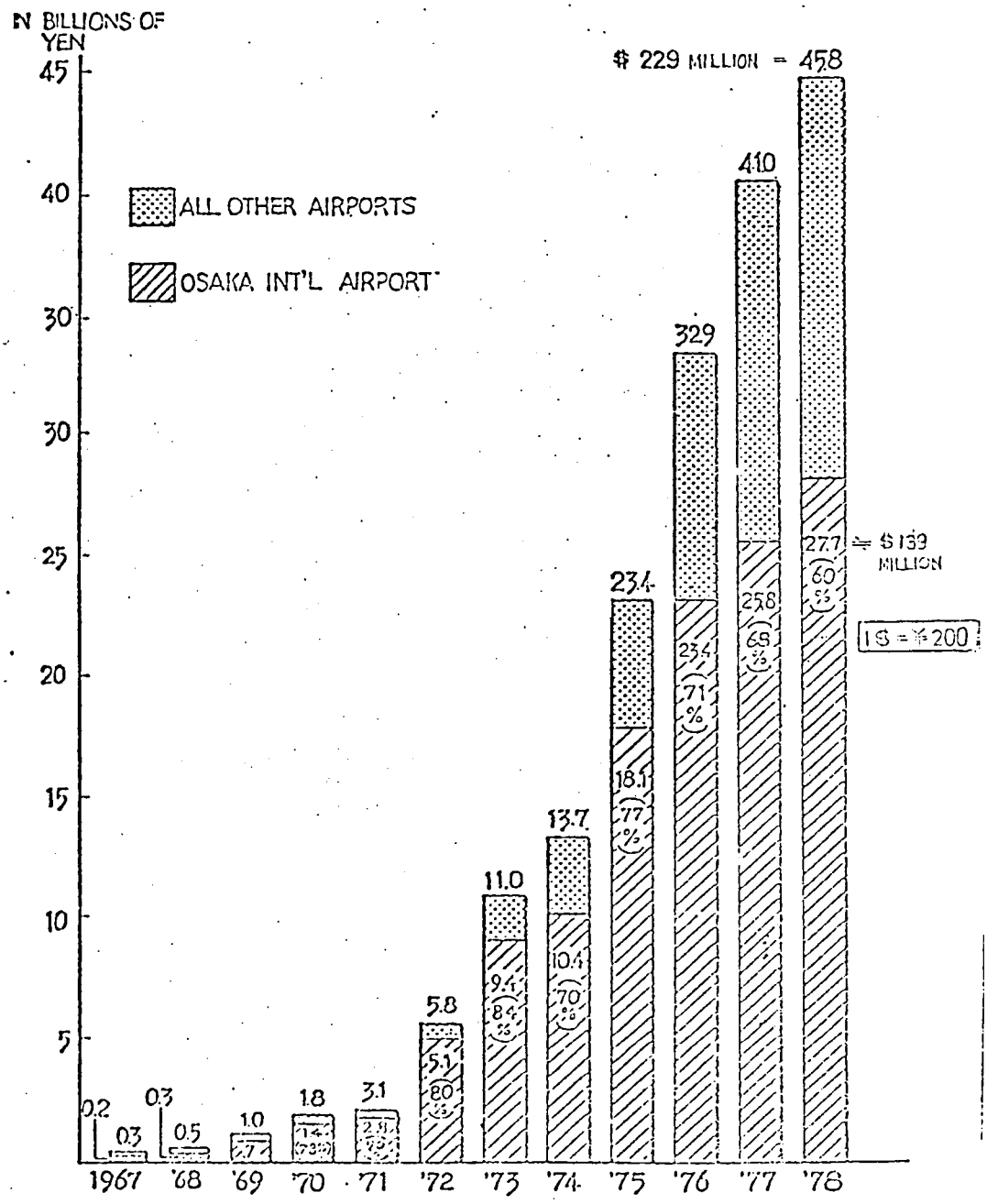


Chart 11

BUDGET FOR COUNTERMEASURES AGAINST AVIATION NOISE

One estimate made during the Japanese visit was that total cumulative expenses have, as of 1978, exceeded 120 billion yen and may reach 400 billion in the future.

11. Impact of Japanese Noise Policies on Air Carriers

Before discussing specific impacts of Japanese noise policies on their present and future plans, Japanese airline executives commented on the psychological nature of noise annoyance and on cultural differences between Japan and the western world. Having found that in some cases farmers in the countryside environment are more sensitive to noise than the average city dweller while in other cases highly educated liberals in a city environment complain more than their country cousins, the executives concluded that noise annoyance is largely psychological and therefore believed the environmental activists have been pushing their case too far.

Although the airlines would like to mount stronger counter-attacks on curfews and schedule controls than they have, they clearly see that the balance of power in Japanese society has shifted to those trying to protect and improve an environment in which the noise problem is the number one issue.

Thus, unlike the U.S. where medium sized narrow-bodied aircraft have continued to sell well so that airlines may supply the frequency of service which they feel is the key to market share, Japanese executives focus on purchasing larger and larger quiet aircraft. With curfews established and only a low level of scheduled jet activity permitted at the international airports of Osaka and Narita, the only

way for the companies to accommodate traffic growth is by use of 747s whenever possible, otherwise by the DC-10 and Airbus. Frequency is not the name of the game in Japan. For noise and fuel efficiency reasons, Japanese airlines are now trying to replace as many narrow-body aircraft per year as finances will permit.

Success of the environmentalists in establishing limits on the number of daily schedules and in imposing curfews has constrained international commerce and adversely affected international relations. A number of international carriers wishing to fly to Japan are denied because of a lack of landing slots - a denial which invites reprisal by other countries. The curfews obviously affect domestic traffic. Moreover, not only do they affect the arrival and departure of international flights headed to and from Japan but they also affect the departure and arrival times at intermediate stops in other countries around the world. Carriers in Great Britain, the U.S., New Zealand, and Australia particularly complained of the adverse affect of Japanese curfews. Finally, notwithstanding the forecast decrease in noise levels and the consequent shrinkage of the areas within a given noise contour, airline executives are pessimistic about the possibility of lifting the curfews and of a significant relaxation of schedule constraints.

The public will, the airlines feel, successfully insist on retaining whatever advantages they have gained by curfews and other regulations. Although wide-bodies are quieter at any given weight than their predecessor narrow-bodies, the airlines feel the public will recognize that on a single event basis the widebodies, when loaded to

capacity, approach the same noise levels as the narrow-bodies. The noise monitors will bear them out. Thus, unless land-use planning embodying strict zoning and sound-proofing under stringent construction standards is carried out on a broad basis, the public will notice very little noise reduction from the new jumbo aircraft.

12. Summary and Conclusion

The emergence of Japan after World War II was accompanied by rapidly increasing population. Shortage of land contributed to portions of the population moving ever closer to airport locations. In the absence of land-use planning, housing eventually reached the boundaries of the airports themselves. Many inhabitants who moved into the Osaka airport area were in a low economic strata and, absent construction codes, built their homes with the traditional Japanese thin wood construction which provided little or no noise insulation. Even modestly priced homes further away from the airports were likewise inadequately protected from jet aircraft noise.

Noise from the first models of jet aircraft generated ever increasing protests by the inhabitants of the airport and its environs. Because of their economic and social status these residents were not air travel customers. They considered air travel to be the province of business men, politicians, intellectuals and rich foreigners. For this reason the residents found it difficult to identify with the benefits accorded to the city by the facilitation of foreign and domestic trade. Where a new airport was to be built on land historically used for farming, as in the case of Narita, the affected farmers concluded that without

their consent a government that did not care about them was introducing a disturbance in their peaceful lives and, worse yet, was trying to force them from their properties without sufficient compensation to permit them to resettle. Thus, the residents around the Tokyo and Osaka ariports perceiving only disbenefits from the airports and aircraft, reacted, sometimes violently.

These strong reactions and the growing interest in protecting the environment moved the Japanese government to initiate a wide range of noise control programs. Unfortunately, the accustomed manner of effecting change in Japan, i.e., by leisurely consultation or "nemawashi," was not geared to the speed needed in modern society. Thus the national government sometimes failed to engage in consultation or underestimated the number of citizens necessary to be consulted, or was perceived to initiate the consultation process only after a course of action had been decided upon.

Although there were laws on eminent domain in Japan, the social stigma attached to resorting to their use resulted in a special law to handle the particular needs at Narita. However, when the new law was employed on an emergency basis to evict some reluctant farmers, a subsequent unrelated delay in construction was perceived by the members of the commission directing eviction to have caused them to lose face. Since that time the commissioners have refused to use their powers of eviction and have recommended a return to negotiation. Consequently, further delays have ensued.

Beginning with the institution of the first curfew in 1963 and

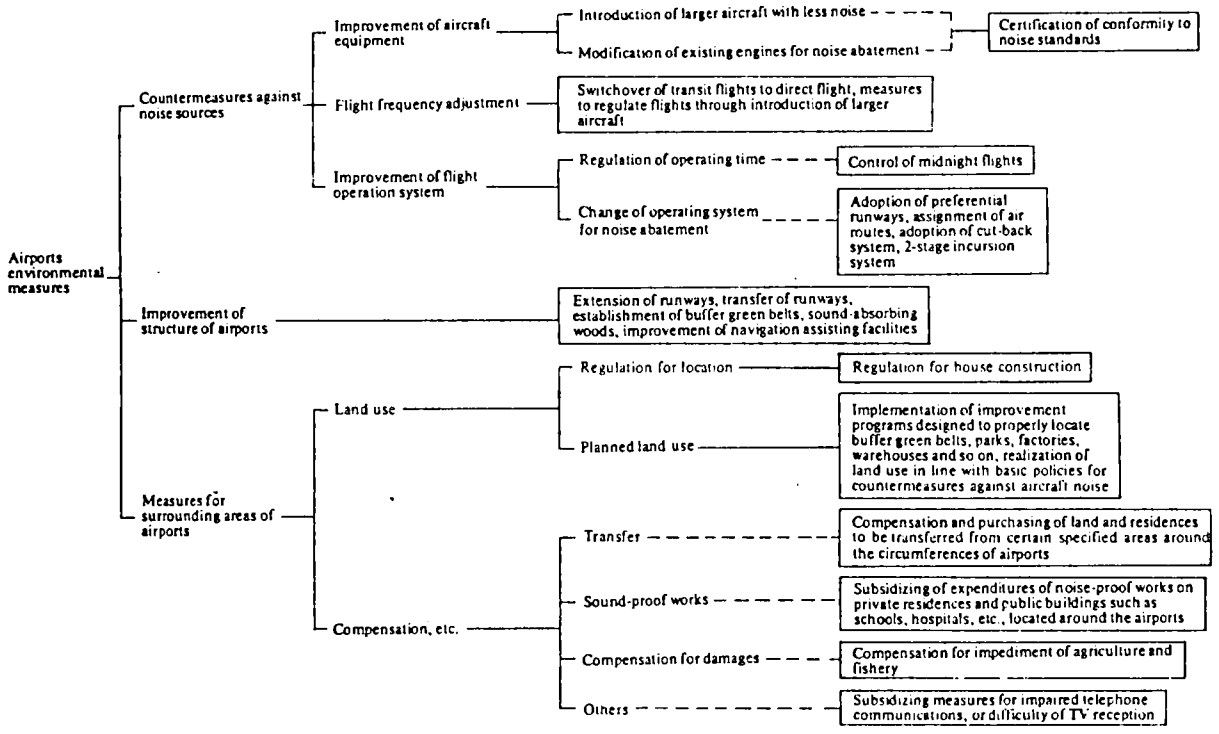
continuing up to the present, Japan has developed the world's most extensive group of codified and non-codified noise control measures. These are supplemented by a wide range of compensation payments to affected citizens. Table 12 is a schematic representation of the noise abatement measures.

One feature of the Japanese aircraft noise story which distinguishes Japan from the other countries studied is the early and continuing interest in abating interference with TV, radio, and telephone reception. By a somewhat curious alliance between the government and a semi-government semi-private organization - the Aircraft Noise Prevention Association, Juridical Person - subsidies such as reduced television monthly rentals, special antennas, automatic volume controls, and "noise-proof" telephones, are provided.

Public dissatisfaction with the failure of curfews and special operational procedures to control jet aircraft noise led to three important legislative acts - 1967, 1974, and 1978 - involving land-use planning and various types of compensation. Land-use planning included restrictions on the construction of housing in certain areas and a systematic rearrangement of urban communities to achieve an appropriate mix of green buffer zones, parts, industrial plants, and private housing. Compensation has been made available for the physical relocation of homes and the purchase of land located within certain zones. Provision has also been made to purchase land outside noise zones for the development of public housing for residents displaced by the abatement programs. Subsidies for noise-proofing began with

TABLE 12

System of environmental countermeasures for the area surrounding airports



Source: Quality of the Environment in Japan, 1978.
Japan Environment Agency, p. 192.

TABLE 12
SYSTEM OF ENVIRONMENTAL COUNTER MEASURES FOR THE AREA SURROUNDING AIRPORTS

schools, hospitals and public buildings, but have been greatly expanded to include private housing. Compensation for losses to farmers and fisherman and low-cost loans to adversely affected shopkeepers is also available.

Although billions of yen have been spent on these extensive measures,[53/] many residents complain that they are not adequately considered in the legislation. Two examples: (1) that portion of the law which does not permit payments to residents moving into a noise zone after 1968 is said to be discriminatory. Noise which was tolerable in 1968 may have increased since then. (2) The rental or homeownership cost differential between the low-cost, noise-sensitive area and that of alternative sites is so great that some residents cannot afford to move. Therefore, they urge the government to provide rental or home purchase subsidies.

In the area of noise at the source Japan has generally, with a curious exception for the 707 and DC-8, moved rapidly and effectively. The country has adopted the latest version of Annex 16 and has imposed stiffer rules than the Annex by requiring that certain of the narrow-body aircraft be retrofitted to meet the ICAO standard. Although technically Japan has no regulatory or statutory requirement, such as do other countries, for phasing out noisy aircraft, the unwritten policy on aircraft registration for existing noisy aircraft plus the unwil-

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53/ Statistics presented at the 1980 Paris OECD conference indicated that in 1979 fiscal 50 billion yen ($253 million U.S.) was allocated to sound proofing dwellings; 99 billion yen for schools, hospitals and public buildings, and 12.7 billion yen for rehousing in the over 90 WECPNL zone.

lingness of any carrier to antagonize the JCAB indicates that the absence of a written rule is of little import.

Although it is not nearly as characteristic for the Japanese to use legal proceedings in settling their disputes as is the case in the United States, groups of citizens around Osaka, disturbed by aircraft noise, have by means of legal action won a case in the high court involving severe restrictions on aircraft operations as well as enormous damages for each affected resident. Although appealed to the Supreme court by the government in 1975, the case, because of its political and economic consequences, has been considered by the court to be too hot to handle. Consequently, no decision has been published. Citizens around Osaka in 1969 appealed to an environmental dispute commission to close the Osaka International Airport. After eleven years of proceedings, the mediation agreement was recently reached which postpones a decision on closure until a new airport is built, which will be years in the future.

Noise-related landing charges were instituted in 1975 and have been under constant legal attack ever since. Until recently all non-Japanese international carriers refused to pay.

The pressure brought by the public for noise abatement has resulted in constraints upon air transport which affect air transport operations around the world. Not only do the curfews severely limit the departure and arrival times of domestic and international trips in Japan, but their impact ripples in all directions throughout the world. Often desirable arrival and departure times are impossible and sometimes air-

port congestion is transferred from Japan to another country. The limited number of trips permitted to operate from the international airports of Narita and Osaka adversely affect the foreign relations of Japan. It has been reported that at least 30 carriers not now flying into Japan have applications with their governments to do so. Limiting the number of daily schedules has implications for equipment purchasing policies and hence for aircraft manufacturers. Absent the luxury of frequency of service, the Japanese carriers are focusing on wide-body jets in high-density seating configurations. The absence of Japanese pressure for aircraft nearer in size to the 737/727/DC-9 series has contributed to the lag in development of replacements for this category aircraft.

Finally, what can be said about the future? First, because of the replacement of low capacity narrow-body, noisy, aircraft with quieter engines, and because of the progress in sound-proofing dwellings, as well as because of removal of residents from noise sensitive zones, various noise level contours in Japan will shrink so that fewer and fewer people will reside within them. Nevertheless, government authorities, airline executives, and the public with whom we talked were in agreement that there will be little or no relaxation of the curfews. The trend of society is in the direction of favoring higher quality of life. Gains won are not easily set aside. Any lifting of curfews will result in more night annoyance than at present. In this respect the reaction in Japan is not different that in every country visited in Europe and the Pacific.

Chapter 7.

SINGAPORE

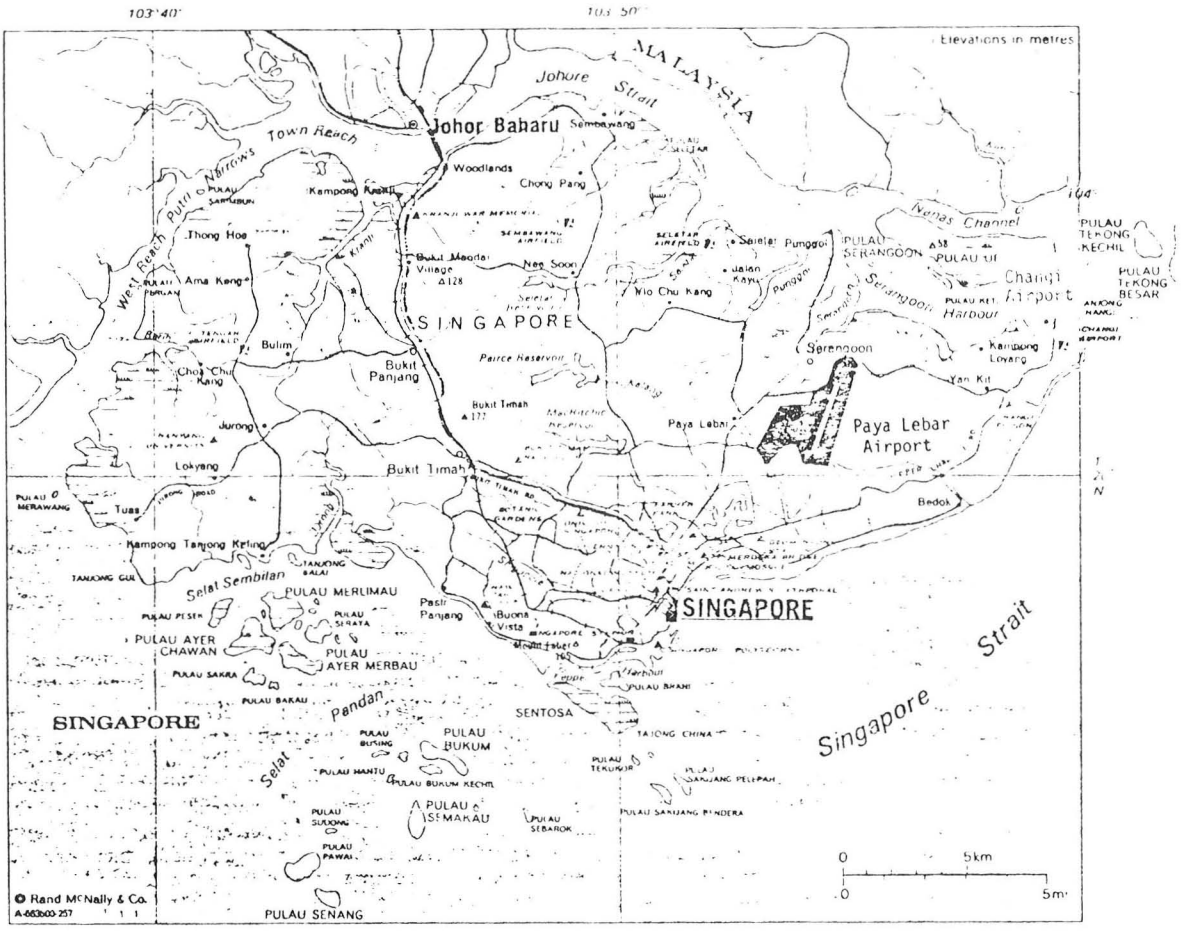
1. Environment

In the preceding chapter on Japan, we noted that the combination of a dense population and a differing culture resulted in the development of many laws, rules, unwritten codes and methods of compensation to deal with aircraft noise. Although the elements of limited land and dense population are present at Singapore, a different culture and the realization by the inhabitants that their welfare depends upon the maximum freedom being given to commerce has led to Singapore's almost complete freedom from limitations on aircraft noise as well as to the absence of compensation for those affected by noise. In view of the fears expressed by airlines in other parts of the world that Singapore might institute a curfew which, together with existing curfews, would virtually halt certain types of operations, it was a surprise to find that constraining regulations, particularly curfews, are not in Singapore's present picture, nor the foreseeable future.

Singapore is a city-state located at the southern tip of the Maylay Penninsula, about 85 miles north of the equator. As shown on the accompanying map, Chart 12, the major portion of the present Republic of Singapore is a diamond shaped island about 26 miles long , east to west, and 14 miles miles wide, north to south. Compressed into this area of 220 square miles is a population of 2.3 million, of which 76 percent are Chinese. A density of 10,000 per square mile makes Singapore one of the most densly populated countries in the world.

CHART 12

SINGAPORE



Within the city, the center of which is located only 7 miles from the present Paya Lebar International airport and 12 miles from the new airport at Changi, the density is 33,000 per square mile. Some areas reach 66,000 per square mile.

On the north, Singapore is separated from West Malaysia by the Johore Strait, a narrow channel crossed by a road and rail causeway more than half a mile long. About ten miles to the south across the straits lie the outreaches of Indonesia. Clearly, the limited area within the city-state, the proximity of other sovereign states, and the location

of the airports themselves relative to concentrations of population imply noise problems with limited options for solution. In view of the foregoing, the finding of the absence of a noise problem suggests that the social, political, cultural and commercial environments in Singapore differ sharply from those in Japan and resemble more closely those in Hong Kong.

A brief vignette is helpful in understanding the Singapore situation. The history of modern Singapore begins with the arrival in 1819 of Sir Thomas Raffles, an agent for the British East India Company. Recognizing the unrivalled port facilities - now the fourth largest in the world - the British purchased Singapore Island, expanded trade and by 1867 the "Straits Settlements" - the official title for Singapore - Malacca and Penang (in Malaya) became a British Crown Colony, an arrangement which continued until 1946. In that year Malacca and Penang were united in the Federation of Malaya and Singapore remained as a Crown Colony. By 1965 Singapore had become an independent republic. One hundred and forty years of British rule has left its stamp on administration and jurisprudence in Singapore.

Singapore's strategic location, its facilities for shipping and air transport, an unusually industrious Chinese population, plus active foreign entrepreneurs, have combined to bring about a phenomenal rate of industrialization which does not seem to be adversely affected by the high heat and humidity characteristic of the area. A population explosion has resulted in strict limitation on family size. A resulting labor shortage in this land-scarce country is attacked by

daily importing thousands of Malaysians over the Johore causeway. Singapore is a literal beehive of activity. Activities which would constrain the state's commerce are not sympathetically received.

2. Government Structure and Aircraft Noise

The overall responsibility for air transport is with the Minister of Communications. For administration there is a Department of Civil Aviation (DCA) under a Director of Civil Aviation and two deputies. No structured anti-noise programs exist. In fact noise is treated in a very relaxed almost joking way. It was pointed out that 76% of the people are Chinese, that the Chinese are noisy and like noise to the extent that noise is an accepted part of life. This is similar to the official comments made in Hong Kong.

3. Legal Basis for Noise Control

On becoming a republic Singapore adopted much of its law from the British Air Navigation Act of 1920 which governed the country during the period of Crown Colony status. Thus, under Singapore's Air Navigation Act of 1966, regulations were made by Air Navigation Orders. An examination of the statute and orders reveals that there is no law or regulation concerning noise and vibration caused by aircraft flying in the airspace over Singapore other than over the airports themselves. Since Singapore is not a party to the Rome Convention of 1952 (which provides for noise and vibration damage by aircraft) the Convention does not apply. Therefore, the only relief available to an innocent third part who suffers damage caused by noise

or vibration is to seek redress under the Common Law by an action in tort (nuisance).

The 1966 law, adopted from Winston Churchill's famous insertion into the Air Navigation Act of 1920, virtually makes impossible recovery for noise damages on an airport. The act states "an action of nuisance shall not lie by reason only of noise and vibration provided that the relevant provisions of concerning noise and vibration are complied with."[54/] However, instead of establishing standards limiting noise, subsection (1) of Section 66 of the Air Navigation Order 1973 states in the affirmative that an aircraft may make noise (unlimited) when taking off or landing, when taxiing, or when being tested. Thus Singapore's laws do not give environmentalists a solid basis for suit.

4. Noise at the Source Control

Since the government is primarily interested in increasing commerce, it takes a very relaxed and informal posture concerning noise at the source

a) Noise certification. The government requires no noise certification in its airworthiness standards. The young staff reasons that since most aircraft coming from other countries are forced to meet standards elsewhere, Singapore could hardly impose stricter requirements, and to impose a certification procedure would only be an expensive "make work" proposition. The Department representatives stated "We let you do it. We take what you send us."

54/ Subsection 2 of Section 4

b) Curfew. There is no curfew at Singapore and none is planned for either Paya Lebar or the new Changi facility. According to the Department of Civil Aviation, the inhabitants themselves consider free entry of commerce so important that they would object should a curfew be suggested.

c) Capacity Limitations (daily limits on schedules). Like curfews, schedule limitations are abhorrent. No such limitations exist or are likely. The enterprising spirit of the city is such that significant modifications to increase capacity are being made at Paya Lebar while a billion dollar new facility at Changi is approaching completion.

d) Noise Monitoring of Emissions. There is no noise monitoring system in operation or planned for either airport. The small mobile unit for ground test at Paya Lebar is hardly an exception to the statement.

e) Operational Procedures. A few modest efforts have been made in this area. Most carriers flying into Singapore have their own noise abatement procedures which they require to be followed at every available opportunity. Therefore the DCA does not feel it necessary to prescribe its own. However, Airway Terminal Control uses its radar to direct traffic over less congested areas. Whereas jet training is often banned at major airports and flight maneuvers required to be conducted over sparsely inhabited areas away from the airport, Singapore does not have this option. Any place more than 20 miles from Paya Lebar or Changi airport is likely to be a foreign country. Therefore training does take place over Singapore itself.

Although there are no rules requiring it, Singapore Airlines voluntarily specifies less than full power in training.[55] One of the few regulations is the ban on "touch and go" landings and "overshoot" practice in one direction at night. Another measure is an informal attempt to control the engine tests at night.

5. Land-Use Planning.

a) Zoning. The kernels of land-use planning at Singapore are little more than germinating seeds in comparison with the rather full flowered growth elsewhere. Noise contours in terms of EPNdB for the two airports have been drwan up by the DCA and forwarded to the town planning authorities for recommended zoning purposes. The procedure is very informal and, according to the DCA, all concerned "would like to keep it this way".

Further small steps toward land-use planning are seen in the airport's request for the state to reserve a buffer zone around the airport for future use. Other movement was indicated by the report that in specified areas around the new Changi airport building authorities have determined not to issue permits for schools, hospitals, and certain homes. Since the government is the biggest provider of low-rent apartment dwellings in Singapore, it has a greater input into housing location than is often the case in other countries. However, as we saw in the case of the Broadmeadow development in

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[55] This may be more effective in saving wear and tear on the engines than in noise abatement. Take-offs at lower power mean that the aircraft will climb slower and hence some people may be exposed to higher noise which would not have been the case had full power been used followed by a quicker power reduction.

Australia - a case where land was not in short supply - a government housing agency does not necessarily coordinate its activities with those of the air transport authorities.

b) Insulation Subsidies. Unlike in Japan, there are no provisions in Singapore for assisting with the insulation of living quarters. Airconditioning in the densely populated areas is not common so that windows are open most of the time. Therefore, insulation would be of little help.

c) Relocation Expenses. Again, in contrast with Japan, Singapore has no such provisions. In general, there is no demand by citizens for such a move.

d) Subsidies for Loss in Property Values Due to Aircraft Noise. Acceptance by the inhabitants of aircraft noise as one of the incidents of Singapore life has meant no loss in property values and, therefore, there has been no demand for this type of subsidy.

6. Airline Perspective

Singapore Airlines (SQ) with a 31 plane (February, 1980) fleet of 747s, 707s, 727s, and 737s has exploded upon the airline scene since its establishment as the national carrier in 1972. In May 1978 it astounded the aviation world with a purchase of over $900 million of Boeing equipment including "rolling over" its 747 fleet with new improved 747 "super B" models. Less than one year later 6 A300 B-4 200s were ordered. In its short existence - 8 years - it has become known for its superb service, its technical excellence,

its ability to earn a profit while depreciating 747s in as little as 6 years and used aircraft in 5 years, and for its dedication to unfettered free competition. In its rapid expansion, it has gained entry to many foreign markets and has thus had to face the problem of aircraft noise regulations. The reaction of its management to the aircraft noise problem represents the final bit of information in our study.

According to the company[56] curfews in Australia, London and Hong Kong reduce utilization, require scheduling at undesired times, increase operating expenses, and hence "hurt a lot". In purchasing 727s and 737s the company did not buy "hush kits" because they were an added expense and were not required for use to Hong Kong, Thailand, India, Sri Lanka and Brunei. Even in the purchase of the 747, noise was not the focus of attention. The airlines' equipment philosophy is "Whatever is good enough for the developed countries, is good enough for Singapore Airlines." In any event low noise, they point out, is a byproduct of the high-bypass fuel-efficient engine. Since the developed countries require manufacturers to meet noise standards there is no need for Singapore's engineers to be dedicated to acoustical work or for its equipment planning analysts to allocate attention to noise.

Notwithstanding its billion-dollar commitment for 747s, the company has for some time been seeking replacement for other aircraft. Because

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[56] Most of the material in this section was culled from a brief interview with Mr. J.Y.M. Pillay, Chairman, SIA; and more extensive interviews with Mr. Lim Chim Beng, Managing Director; Robert Tan Tin Teck, Assistant Director of Engineering and Michael Long Kwon Woo, Manager of Technical Services.

of their noise, 727-100s were the first slated to go. However, rising costs of fuel have now become the urgent driver for replacement of the 707. Replacement for the 737-100 is being sought not for noise or fuel, but because the aircraft is too small. The company also observed that for several years it had been trying to interest Boeing in building a slightly larger replacement for the 727 - something in the area of 150 to 200 passengers. The perception was that Boeing, in trying to milk the 727 production run for as long as it could, had made possible the success of Airbus Industries.

As to the future, the company's feelings were that because of noise regulations, general inflation and, in particular, because of fuel prices, fares will be increased so much to cover costs - particularly until new technology midsized aircraft appear in volume - that public resistance to the higher fares will result in a rapid decrease in the price of used aircraft and in a demand considerably below that being forecast by the aircraft manufacturers.

7. Summary

During the writer's research in Europe for Volume I, fears were expressed that a Singapore curfew might be established which, when added to curfews in Europe and at certain Pacific airports, would have a drastic affect upon international scheduling. The findings in this chapter indicate the fears to be groundless. Singapore, despite its population density and despite the location of its airports near the population, does not have, nor is likely to have, a curfew. Laissez-faire best describes the attitude of the government and the inhabitants

toward aircraft noise. Additionally, there are no requirements for aircraft noise certificates, for noise monitoring, or for capacity restrictions. In comparison with other Pacific countries, operational rules in Singapore for aircraft noise are almost nonexistent. Some small beginnings toward land-use planning have been made near the new Changi airport, but it is too early to tell whether the zoning will hold when population pressures increase the need for housing.

In view of the general laissez-faire attitude, it is not surprising to find an absence of subsidies for noise insulation, for relocation expenses, and for loss in property values. The basic law dealing with aircraft noise is a carry-over from concepts embodied in the British Air Navigation Act and places a heavy burden on the parties seeking legal redress. Since the goal of this prosperous city-state is to thrive on international commerce, and since the population perceives aircraft noise to be consistent with the goal, the likelihood of the imposition of restrictions on aircraft noise is remote. The forthcoming move of aircraft operations to the New Changi airport - located further from the city - whose approaches permit more flight paths over water, makes the likelihood even more remote.

We opened the Pacific study with Honolulu, an airport without a curfew or other significant restrictions on operations. We close with Singapore, an airport without a curfew and also free from other noise restrictions. In the intervening chapters we examined airports in

Australia, Hong Kong, New Zealand and Japan and found all to be engaged in varying degrees of aircraft noise abatement measures in answer to a rising tide of citizen complaints and in response to the public's growing interest in preserving and improving the quality of life.

Chapter 8.

SUMMARY AND CONCLUSIONS

1. The Measurement of Noise

The developed countries of the world have been wrestling with aircraft noise since the introduction of transport jet aircraft in 1958. Volumes I and II contain a country by country examination of various noise abatement measures and a scrutiny of the political and socio-economic factors involved. The technicians' solution for measuring noise - relating it to a common annoyance level and then adopting a standard to be followed - was found to be simplistic. Two problems, each demonstrating human frailties quickly became apparent. First, noise annoyance is highly subjective - a given level of noise is perceived quite differently according to the individual's or group's ethnic, social, cultural, or economic background.

The Chinese are noted for their high tolerance to noise, whereas the Swiss are not. In one country the rich - presumably because of their understanding of the needs of commerce - are said to be more tolerant than the poor. In another, the rich - presumably because they have leisure time and can afford to complain - were said to be less tolerant. In a village on the German-Swiss border even flights over this idyllic area spawned villager and farmer protests of international proportions. Yet the same level of noise near the Frankfurt airport failed to generate complaints.

At Sydney airport neighbors complain when transport jets fly into the curfew by 20 seconds or when a Learjet, whose noise levels

are less than that of some piston aircraft, operates during curfew hours. In Japan, authorities indicate that intellectuals from the academic field complain much more than the working man. On the other hand, in Singapore and Hong Kong the rich and poor, the intellectuals and the non-intellectuals, accept aircraft noise as the price of living in those locales.

The second problem, after recognizing that a noise nuisance does exist, is establishing a unit of measure containing the elements of annoyance which accurately reflects what the ear hears. Chapter 3 of Volume I, "Measuring Noise Nuisance" points out that conflict between the experts, contributed to by national pride of authorship, resulted in no less than eight well-known noise descriptors. Failure of the world to agree on a common measurement has required the construction of conversion tables which, because of the different elements embodied in each of the various descriptors, are approximations at best.

2. Noise Control Measures and Their Impact - Reducing Noise at the Source.

In the countries surveyed a wide range of noise abatement measures, many of them of a "Band-aid" nature, have been attempted. The counter-measures can be summarized under the three following headings: (1) reducing noise at the source, (2) reducing the source of the noise, and (3) reducing the transmission of noise to the individual.

Reducing noise at the source can be used by applying sound absorbent material to engine and airplane components of existing aircraft, or by applying the latest technology to the design of new

aircraft. Conventional wisdom holds that reducing noise at the source is the preferred method for noise abatement. If carried out satisfactorily, billions of dollars could be saved by states and various levels of government in noise abatement costs. To avoid different noise at the source standards for each country, most of the nations of the world, through membership in ICAO, join in establishing noise at the source standards. The resulting Annex 16, which is very similar to FAR 36, contemplates that each country will adopt the standards in the Annex by making them a part of a required noise certificate for an airworthiness certificate.

Proponents of the Annex say that required noise certificates force airlines to purchase quieter aircraft. However, others assert that the Annex represents a belated stamp of approval on proven older technology. It is, they also argue, merely window dressing to tell complainants that since an aircraft meets Annex 16 it is therefore quiet. In Volume I, Chapter 7 we report that Swissair, faced with allegations of misrepresentation when it told the airport neighbors in Zurich that its acquisition of noise certificated DC-9-50s would be quieter than the previous DC-9-30s, felt it necessary to purchase, for noise reasons, the DC-9-80 - a larger plane than it desired. Annex 16 with its prospective dates of application, has not been the solution to the noise problem. In fact, while all the member countries visited subscribe to its principles, some have not yet formally adopted the Annex.

Development of the high-bypass quiet jet engine and mating it with large capacity airplanes has been beneficial to the public image

of the air transport industry. Generally speaking, these large aircraft are perceived to be less annoying than their predecessors. Part of the perception stems from the effect of the wide-bodies on the cumulative noise event measurements, rather than the single event measurements of fully loaded aircraft. When jumbo jets are substituted for narrowbody aircraft, the reduction in frequency of operation which occurs has a significant effect on the cumulative noise index. Further, the quality of noise from these aircraft appears to be more tolerable to the airport neighbors.

On a single event basis, however, the jury is still out. Although it may be validly stated that wide-bodies are much quieter than narrowbodies on a weight comparable basis, the noise limitation formula in both Annex 16 and FAR 36 permit higher noise emissions as aircraft become heavier. It is already legally permissible for an Annex-certificated heavy jumbo jet to emit a noise level higher than that of some non-Annex aircraft. As new, larger aircraft are added to fleets, particularly if they are heavily loaded, the original perceptions of these aircraft as being acceptably quiet may be in jeopardy.

Since the purpose of Annex 16 (U.S. FAR 36) is a progressive reduction of noise at the source to an acceptable level, the airlines, the manufacturers (and often the airport operators) argue that current curfews and scheduling limitations be relaxed for Chapter 2 (Stage 2) aircraft and completely eliminated for Chapter 3 (Stage 3) aircraft. If the reason for the limitations was noise, then the limitation should be lifted as the noise is reduced. What incentive,

they ask, is there for an airline to acquire, or a manufacturer to produce, a more expensive but quieter aircraft if the newer aircraft has no preferential treatment over the noisy aircraft?

In general, despite the appealing logic of this argument, governments have not responded favorably. At Heathrow and Gatwick (Vol. I, p. 58) the British have made a start by providing night quotas which progressively decrease to zero the number of night takeoffs permitted by aircraft defined as noisy. The prevailing feeling in Europe and the Pacific is that although reduced noise emissions will only inhibit or halt the spread of operational constraints, they will shrink substantially the number of people living in noise zones. As a consequence of this latter benefit, national, state, and local governments will be saved billions of dollars of expense for land purchases, loss in value payments, insulation, relocation and urban renewal expenses - all of which come from the taxpayer or consumer.

Several attempts, e.g., at Manchester and Frankfurt, have been made to reduce noise at the source by establishing incentive-type noise-related landing charges. However, as pointed out in Volume I, the rebates provided for quieter aircraft in their schemes are so small that there is insufficient economic incentive to hasten the replacement of noisy aircraft. Although France and Japan currently employ noise charges, such charges are really measures for raising money to support noise abatement activities. Switzerland, the Netherlands, and France have been working on a noise charge which would be directly related to noise emissions as well as to the gross weight of the aircraft. However,

the authorities struggling to develop an equitable formula suggest that the final result will be a scheme for increased revenues rather than one which will have a significant incentive for reducing noise at the source.

3. Reducing the Source of the Noise

The quickest and most effective way for the short run satisfaction of noise complaints is reducing the source of the noise by: (a) closing the airport, (b) employing night curfews, (c) imposing daily and hourly limitations on the number of aircraft movements, and (d) banning or limiting the operations of aircraft whose noise emissions exceed a specific limit. These methods can be done singly or in combination with one another.

a) Closing an airport. This method, in the absence of an alternate airport, would provide maximum economic and social shock to a city. Nevertheless inhabitants around Japan's Osaka International Airport, because of the unacceptable noise levels experienced, have engaged in 11 years of legal maneuvers to shut down the airport. Court action, although not closing the airport, was sufficiently on the side of the environmentalist protestors that plans have been accelerated to build a new international airport some 40 miles away where noise will not be a problem. By a recent mediation agreement, the decision of airport closure has been put off for a number of years.

At one time the closure of Haneda upon the opening of Narita was proposed. Very vocal and politically powerful environmentalists around Sydney's Kingsford Smith Airport periodically have been advancing pro-

posals to close that airport upon the building of a new one. Of the airports listed during this study, Hong Kong is the most likely city to build a new airport, ultimately financed largely by proceeds from the sale of the valuable property at the old airport. Although airport neighbors at Osaka favor a similar plan, the proposed location of the new airport and the tremendous need for air service for the downtown area make ultimate closure of the present Osaka International Airport unlikely.

b) Curfews. Next to closing an airport completely, curfews have the greatest public impact in reducing the source of the noise. Obviously a strict curfew renders the surrounding area totally free from aircraft noise. Given the ease of implemention of curfews, it is not surprising that public pressure for aircraft noise relief has led to the adoption of international curfews around the world. In this study we find General Charles De Gaulle Airport in France, Arlanda in Sweden, Kastrup in Denmark, Honolulu in Hawaii, and Peya Lebar in Singapore to be without a formal or informal curfew. Curfews at Heathrow, Gatwick, Frankfurt, Amsterdam, Auckland, Wellington, Sydney, Tokyo and Osaka airports contain varying degrees of "flexibility", ranging from almost zero at Osaka, to occasional special treatment for Annex 16 aircraft, and curfews applying only to jet take-offs.

Offsetting the benefits of curfews for the airport neighbors are the heavy economic costs and inefficiencies imposed. Curfews cause congestion immediately prior to starting time and immediately upon their termination. Indeed curfews often merely transport noise problems else-

where. Airline executives expressed a common complaint, e.g., that a curfew at some point half way around the world caused inconvenience in scheduling at intermediate points and was wasteful in terms of manpower. Finally, airline officials in Europe, while complaining about their problems with existing curfews, exhibited concern that the mere adding of one or two curfews in critical places not now subject to curfews could lengthen a scheduled trip by several days, making the costs prohibitive.[57/]

After reviewing the political, social, and economic pressures involved, we conclude that curfews have reached their peak impact in international operations. A trend toward quieter aircraft, coupled with a reduced rate of traffic growth because of rising travel costs, may combine to lessen the pressure for further action. However, it is not likely that curfews now in place will be significantly relaxed.

c) Limiting the number of daily or hourly movements of jet aircraft. This noise control measure is one step less than the total ban of a pure curfew. The approach, though rarely used, is carried the farthest in Osaka where a daily limit of 200 jets is imposed. The airport also has established an hourly limit on the number of IFR movements (jet and non-jet). Even the ratio between take-offs and landings is prescribed.

These daily and hourly limits, made in the name of noise abatement, severely constrain the ability of the air transport industry to

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57/ For further treatment of the effect of curfews, see Guy Goodman, "The Potential Effect of Curfews on Scheduling and Delays." Paper given at joint meeting of AIAA, SAE, ATRIF in Boston 1978. Mr. Goodman is Director of Engineering and Environment, IATA.

respond to the commercial and social needs of the people. The most obvious effect is to dictate that carriers focus their equipment acquisition on jumbo aircraft with higher and higher seating densities, so that low schedule frequencies can be maintained. Such focus has contributed to a lag in the development of low-noise, fuel-efficient short to mid-range aircraft. In the case of Japan, many domestic airports cannot accommodate the jumbos nor would the traffic support their use if the jumbos could be accommodated. Many beautiful resort areas are undeveloped because of the unavailability of planes which meet the high environmental standards which would be imposed on new operations.

d) Banning or limiting operations by aircraft with noise emissions above a specified amount. We noted that many countries limit noise emissions through noise certification under Annex 16 or FAR 36. By definition these maximum emissions are based upon operations at the maximum certificated gross weight of the aircraft. Several countries permit an otherwise noncomplying aircraft to take-off if its take-off weight is reduced to that which will enable it to meet the maximum allowable noise limit. In an extremely noise sensitive country, such as Japan, precise noise limits may be established for a particular point. For example, at the Kushiro Primary School noise monitoring site, 1.5 miles northwest of the airport, limits have been established which vary with the hours of the day and whether the aircraft is landing or taking off. Limits, such as the two just mentioned, may require off-loading of revenue passengers and cargo - an economic penalty - or may impose a fuel constraint which reduces the flying distance available.

4. Reducing Noise Reaching the Individual (Immission Control)

Supplementing methods for reducing (a) noise at the source and (b) reducing the source of the noise, countries have adopted a variety of measures for reducing the noise levels reaching the ears of the individual. Since noise decreases 6 dB with each doubling of distance and since atmospheric absorption of noise is substantial, the basic principles of emission control dictate increasing the distance from the source or synthetically to do so by inserting barriers between the source and the recipient. A tabulation of such emission control methods follows:

- -operational procedures
- -land-use planning:
  - -airport relocation
  - -zoning for compatible use
  - -relocation of housing and people
  - -regional redevelopment
  - -real property noise notices
- -insulation of schools, hospitals, public buildings, homes and commercial buildings
- -erection of noise barriers such as berms, noise fences, noise-cut walls, sound mufflers, and the planting of noise intercepting trees
- -special TV antennas and noise-proof telephones

4.1 Operating Procedures. Every airport visited employed formally or informally such noise abatement operating procedures as high angle climbs, flight path direction on take-off and approach, and power management. Many airports have also established additional ground operating rules for reversing, APU use, time and extent of engine tests, use of noise mufflers, rolling take-offs, and the use of preferential runways. Noise abatement operating procedures fall into the "Band-Aid" category because they involve departures from procedures previously established for safety and economic reasons.

4.2 Land-use Planning - Zoning. In tabulations of measures taken for noise abatement, land-use planning is usually depicted as the method most frequently used.[58] However, in practice we find its effectiveness has been disappointing. Generally, because of the various layers of government involved and because of the political and economic power of special interest groups, land-use planning has not lived up to its promise. Intentionally locating an airport in sparsely settled areas, as was done at General Charles De Gaulle, Geneva, Arlanda, Auckland and Melbourne, has been shortly followed, in spite of varying degrees of zoning efforts, by an influx of inhabitants who then begin to complain about aircraft noise. In these and other instances, zoning and building codes have been too little and too late. In some places, such as municipalities around Sydney, real estate interests have blocked even modest zoning attempts.

When airports became surrounded by dwellings, e.g., Osaka, the establishment of zones requiring people to move away from the noise has turned out to be very expensive and fraught with social as well as economic problems, not only for the municipalities and airport authorities but for the residents in the affected area as well. As authorities around Osaka and Narita have found out, a "market price" offer

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58 / ICAO State Letter of 22 February 1979, Ref: 2/46 - 79/25 and its enclosure "Report on Measures Adopted or Planned to Deal with Noise Problems at Airports, January 1979. See also U.S. Department of Transportation, FAA, Office of Environment and Energy, FAA report EE-79-02 "International Environmental Data Bank."

to inhabitants of low value housing which will require relocation to a significantly more expensive location and which would separate them from their jobs and friends, often is perceived to be no offer at all.

4.3 Insulation. Where noise is not too intense, various countries seek to placate affected parties by subsidizing insulation for schools, hospitals, and public buildings, and by requiring insulation in new construction of homes, apartments and office buildings. More recently, housing insulation payments have been expanded in concept and increased in amount in Britain. Moreover, Japan has found it necessary to add the insulation of homes to its previous insulation program. Surprisingly, insulation of schools in Japan is said to be so effective that aircraft overhead are not heard. On the other hand, insulation is not viewed as an acceptable solution in Australia where an open style of living and outdoor activities militate against distinguishing between outdoor and indoor noise standards.

While many countries have established such measures of airport immission control as acoustical cells or noise mufflers for engine test as well as designated places for runup checks, Japan has carried the concept the farthest with its extensive construction of noise-cut walls, noise fences, berms, dikes and heavy plantation of noise intercepting trees. Nowhere else did we find an organization with as wide a range of programs as Japan's Aircraft Noise Prevention Association which, in addition to tree planting and research on noise, actually subsidizes noise reducing antennas, "noise-proof" telephones and automatic volume controlers for TV as well as providing counselling for

noise-proof construction processes.

5. Noise Notices, Easements, Noise Monitoring

Noise notices, easements, and noise monitoring, although not reducing noise, have been used with varying degrees of success in dealing with the noise problem, particularly in an attempt to erect a valid defense against future litigation. In Australia, imaginative efforts to place prospective property owners on notice as to the noise implications of their purchase have progressed further than in other countries. Around Sydney some zoning certificates of sale contain a notice that the property is in a noise affected area and that further information can be obtained from the Department of Transport. Also, at Melbourne, when the Department felt zoning authorities were not properly protecting the area, large signs depicting the airport layout and the relation of the property to it were erected at various critical points.

Noise easements (the purchase of the right to expose the property to noise in the future) have proved much less popular than land acquisition itself. Unless the easement document is carefully drawn, changed circumstances in noisiness or frequency may give rise to an attempt of the owner to extract more money. On the other hand, land purchases give the airport operator the full right to use the land, including exposing it to noise. Land acquisition for noise buffer purposes presents problems because the airport operator often does not have the authority to purchase land outside the present airport boundary unless it is needed for airport operating purposes. Thus, purchases for

buffer zones must be made through regional or other authorities who are reluctant to take the property off of their tax rolls. However, in several countries, under national government auspices, land adjacent to the airport is being acquired for buffer purposes. France, Germany, Switzerland and Japan are in this category. Around Osaka the growing number of plots of open spaces, recreational facilities, and green gardens in noise impacted areas formerly occupied by homes and rental units attest to progress.

Although noise monitoring as such does not decrease or increase noise, its growing use provides data helpful in detecting deviations from noise standards and in providing a basis for evaluating noise complaints. Germany and Switzerland publish their monitoring results in such a way as to provide competition among the airlines to maintain a high standard of compliance.

6. Legal Basis for Noise Regulations and Lawsuits

The legal basis for noise regulations varies widely from country to country. In Great Britain, its Crown Colony of Hong Kong, New Zealand, Australia, and Singapore, by statute aircraft noise is not cause for action at law. Nevertheless, under other statutes, an extensive body of rules and regulations has been established to protect inhabitants and abate aircraft noise. Very few lawsuits have been filed over house damage. The long pending lawsuit in France against Pan American, TWA, and Air France for soundproofing expenses, and the landmark case before the Supreme Court of Japan involving curfews and huge monetary damages, have been bottled in court procedure for years. This history suggests

the ineffectiveness of the legal adversary approach to solving aircraft noise problems.

As previously indicated, in a number of countries the lack of legal authority by central governments who own and operate airports to purchase adjacent land for uses compatible with aircraft noise levels has permitted the movement of population closer and closer to the airport until reaching the airport boundary. Consequently, dwellings became engulfed by aircraft noise and the residents then sought redress. Land-use planning is often a matter of recommended guidelines which because of local pressures frequently are not followed.

Effective noise control requires a sharing of legal responsibilities between national, state, regional, municipal and special airport authorities. The more recent developments in Osaka, in which national government legislation, aid, prefectural legislation, extensive coordination between communities in the Organization for Environment Improvement Around Osaka Airport, and continued work by the Aircraft Nuisance Prevention Association, have all but eliminated pressures for outright closure of the airport and has established groundwork for a workable solution.

7. Conclusions for Volume I and Volume II.

(1) Acceptance of a high level of aircraft noise as part of the price the public is willing to pay for air service has been in continuous and accelerating decline since the advent of commercial jet aircraft in 1958. Hong Kong and Singapore are exceptions to this rule.

(2) The unwillingness of the population to accept the noise levels of first generation jets is reflected in the estab-

lishment of a growing list of countermeasures such as: limitations on noise at the source (FAR 36, Annex 16); limitations on the source of the noise (curfews, daily and hourly schedule constraints, operational procedures); and immission controls (relocation of airports and people, insulation, land-use planning, building codes). Australia, Great Britain, France, Germany and Switzerland are major examples.

(3) Of the methods of noise control listed above, control of noise at the source, e.g., reducing the emissions of the aircraft itself, and land-use planning to prevent people from offsetting the reduction of noise at the source by moving closer to the noise, are the preferred long-run solutions. Countries whose populations and culture do not center on outdoor living and open-windows have found insulation to give significant benefits. Although when answering questionnaires, most countries, airports, and municipalities state that they employ land-use planning to abate aircraft noise, the results of their planning have fallen far short of their potential. When realities are examined, we find a lack of cooperation between overlapping jurisdictions, the use of "suggested guidelines" rather than mandated standards, conflicts of interests between the homeowners or apartment dwellers, the real estate interests, the commercial interests and the interests of the taxing authorities.

(4) Some of these controls, e.g., curfews and limitations on the number of daily operations, in addition to adversely affecting operations in the country of origin, also impose restrictions on scheduling half way around the world to the detriment of convenience and economics. Great Britain, Switzerland, Syndey, Tokyo and Osaka are notable examples.

(5) The limitation in (4) above force equipment decisions which would not otherwise be made. Examples: Swissair's purchase of the DC-9-80 for noise reasons, although the size was larger than desired. Japanese Airlines' focus on high-density widebody aircraft to accommodate traffic growth with the low frequencies necessitated by daily schedule limitations. Partly as a result of the foregoing, attention has been diverted from designing new technology smaller medium- and short-haul aircraft needed to develop resort and commercial areas now suffering from inadequate or complete lack of air service.

(6) Despite the technical evidence that some large widebody Annex 16 (or FAR 36) aircraft are noisier than smaller non-Annex aircraft, the public perceives the widebodies to have a satisfactory noise level. The quality of the noise is a partial explanation.

(7) In some countries the public does not accept the notion that because an aircraft meets Annex 16, Chapter 2 standards, it is acceptably quiet. Switzerland, Australia, and Japan are examples.

(8) Public pressure for phasing out older non-Annex 707s and DC-8s has, in the absence of definitive ICAO action, resulted in policies varying between countries for accomplishing this goal. However, demands by the environmentalists for a date after which construction of Annex 16 Chapter 2 airplanes would be terminated have not resulted in action meeting these demands. Moreover, some DC-8s, once thought to be subject to phasing out because of noise and fuel costs, are being converted to Chapter 3 aircraft by re-engining with CFM-56 engines.

(9) In terms of volume of operations, the number of landings and take-offs by widebodies is dwarfed by those of the narrow-body 727/737/DC-9, BAC 111 types. With about 950 of the former and 3,900 of the latter (which take-off and land four times as often), the latter category is rapidly becoming the noisiest in the world fleets and continues to cause public dissatisfaction with the progress of noise abatement.

(10) Foreign airlines and airport authorities, without exception, critically noted the failure of aircraft manufacturers - particularly the American manufacturers - to develop a quiet midsize aircraft to assist with the noise problem. They suspect manufacturers, desiring to maximize profits on their narrow bodies, have purposely or inadvertently held back on new technology replacement aircraft. The manufacturers' defense has been (1) the high rate of past traffic growth led them to believe that replacement aircraft would be substantially larger, (2) because of increasing costs and economies of scale it was not possible to build a mid-sized plane with the required operating cost factors, and (3) neither the financial nor technical resources were at hand to develop simultaneously the widebodies and replacement for mid-sized craft.

(11) Until the mid 1970s U.S. Manufacturers of airframes and powerplants maintained overwhelming dominance in the world air transport market. However, in Europe and other parts of the world, Airbus Industries with its quiet and efficient A-300 series of widebody aircraft is now carving out an increasing share of the market. Its success in competing with American manufacturers has encouraged the company to work on designs for replacing the 727/737/DC-9 series with a quiet, efficient aircraft tailored to short-to-medium trip

lengths and in a size closer to the 737/727/DC-9 series than to the 757 and 767. European and Pacific area airlines as well as their governments suggest that unless the American manufacturers quickly bring to the market a significantly quieter, fuel-efficient replacement for the narrowbodies before Airbus, Fokker or the British, the U.S. will lose this large market which, in addition to providing employment for American workers, supplies much needed foreign exchange.

APPENDIX A

MAJOR INTERVIEWS

HONOLULU, HAWAII

James Brennan, Manager, Station Operations, United Airlines
Bob Chun, Assistant Chief of Engineering, Hawaii Department of Transportation (DOT)
James Davey, Executive Director, Honolulu Airlines Committee
E. Kierosawa, Engineer, Honolulu Airport, Hawaii DOT
Won Kraft, Manager, Honolulu Airport, Hawaii DOT
Owen Miyamoto, Chief, Air Transportation Facilities Division, Hawaii DOT
Joe Nestor, FAA, Deputy Regional Manager, U.S. DOT
Richard Post, Regional Vice President, United Airlines
William Ziegler, FAA, Regional Manager, U.S. DOT

AUCKLAND, NEW ZEALAND

Ray Emery, Airport Manager, Ministry of Transportation
Capt. D.W.C. Keesing, Director of Flight Operations, Air New Zealand
T.D. Kemp, Chief Engineer, Air New Zealand
Peter Mack, Assistant Airport Manager - Development - Ministry of Transportation
G.W. Matheson, Director of Corporate Planning, Air New Zealand

WELLINGTON, NEW ZEALAND

Gilbert Halley, Assistant Director - Airports, Ministry of Transportation (MOT)
A.J. Healy, Deputy Secretary for Transport, MOT
Richard Imus, Economic Counselor, U.S. Department of State
E.T. Kippenberger, Director of Civil Aviation, MOT
Ernest T. Sabett, Chief Aeronautical Engineer, MOT
Armisted I. Seldon, U.S. Ambassador to New Zealand

SYDNEY, AUSTRALIA

L.I. Cook, Aircraft Evaluation Manager, Qantas Airways
Brian Claxton, Deputy Supervisor, Air Traffic Control
Reg Crampton, Airport Director, Sydney
Jack Davey, Senior Technical Officer (Noise Monitoring) Sydney Airport
Capt. John D. Fulton, Qantas Airways

Sydney, Australia (continued)

Bruce Heckenberg, Superintendent of Environment and Safety, N.S.W. Region
Sir Lenox Hewitt, Chairman Qantas Airways
Jack Rose, National Acoustic Laboratories, Australian Department of Health
R.J. Yates, Deputy General Manager and Chief Operating Officer, Qantas Airways

CANBERRA, AUSTRALIA

Mel D. Dunn, Assistant Secretary, Environment and Security, Commonwealth DOT
G.S. Jefferson, Engineer, Environment and Safety Department
Normal Roberts, Captain, Ansett Airlines
Graham Strompf, Engineer, Environment and Safety Department

MELBOURNE, AUSTRALIA

F.W. Austin, Director of Engineering, Trans-Australia Airlines
Paul Bruce, Special Projects Engineer, Ansett Airlines
R.B. Douglas, Senior Airworthiness Engineer DOT
Denym J. Elliott, Senior Engineer, Special Projects, Ansett Airlines
Brian Harris, Senior Engineer, Environment and Security, DOT
G.S. Jefferson, Engineer, Environment and Safety Department, DOT
I.M. Leslie, First Assistant Secretary, Flight and Airworthiness, DOT
Kenneth R. O'Brien, Chief Airworthiness Engineer, DOT
J. Schofield, First Assistant Secretary, Operations, Environment and Aviation Security, DOT

CROWN COLONY OF HONG KONG

W. Brian Angove, Administration, Flight Operations, Cathay Pacific Airways
Kenneth D. Barnes, Operations Department, Cathay Pacific Airways
Capt. Ray Daw, Cathay Pacific Airways
Michael Jenvey, Chief Operations Officer, Civil Aviation Department
Ken Smith, Managing Director, Hong Kong International Airport
R.T. Stirland, Manager, Airline Planning, Cathay Pacific Airways

TOKYO, JAPAN

Nobumasa Fukushima, Aircraft Evaluation Engineer, JCAB
Kuniharu Kanda, Chief, Noise Control Office, New Tokyo International Airport Public Corporation
Susumu Kato, Chief of Noise Prevention Technology Office, JCAB

Tokyo, Japan (continued)

Nobuo Kawamura, Economic/Commercial Section, U.S. Embassy
K. Kawata, Assistant General Manager, Airport Department, JAL
Takatoma Maruyama, Managing Director, Aircraft Nuisance Prevention Association
Sakae Morita, Director, Research Center, Aircraft Nuisance Prevention Association
Hiroyuki Nagai, Chief of Environmental Counter Measure Office, New Tokyo International Airport
Chikanori Noda, Senior Vice President, Flight Operations and Maintenance, JAL
Shiro Oshima, Director, Airworthiness Division, Civil Aviation Bureau (JCAB), Ministry of Transport
William Piez, Counsellor, U.S. Embassy, Tokyo
Masayuki Shiomi, Specialist, New Tokyo International Airport Division, JCAB
Naohiko Takesue, Deputy General Manager, Airport Operations Bureau, New Tokyo International Airport Authority, Narita
____Tashima, Advisor, Aviation Pollution Control Association, Haneda
Kiyoshi Terashima, Director, International Affairs Division Civil Aviation Bureau, Ministry of Transport
Hiroshi Ueda, Counsellor in Charge of Narita, JCAB
Jun Yasukawa, Specialist, Noise Prevention Technology Office, JCAB

OSAKA, JAPAN

Normal L. Achilles, Chief, Economic Commercial Section, American Consulate General, Osaka/Kobe
Thomas W. Ainsworth, U.S. Consul General Osaka/Kobe
Robert E. Brown, Economic Commercial Officer, American Consulate General, Osaka/Kobe
Akira Ishihara, Director, Organization for Environmental Improvement Around Osaka International Airport
Kohtaro Ishino, Deputy Director, Osaka Civil Aviation Bureau
Ichiro Ieda, American Consulate, Osaka
Ikuo Kani, Aircraft Noise Control Section, Kawanishi Municipal Office
Akira Sugimura, Deputy Director, Osaka Airport
Akira Takeda, Director, Civil Aviation Bureau, Osaka Office
Mr. Tagami, Chief, Noise Control Section, Osaka Airport Office
Capt. Hidtaki Unicki, Japan Airlines
T. Yonekubo, Director, Noise Control Center, Osaka Airport Office

SINGAPORE

Lim Chin Beng, Managing Director, Singapore Airlines
Ng Wee Hiong, Deputy Director of Civil Aviation
Tan Kwang Hung, Director of Civil Aviation
Willy Kwang, Sr. Assistant Director for Operations, Department of Civil Aviation
J.Y.M Pillay, Chairman, Singapore Airlines
Tan Tin Teck, Assistant Director of Engineering, Singapore Airlines
Long Kwon Woo, Manager Technical Service, Singapore Airlines