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ISSUES OF AIRPORT NOISE IN JAPAN EARLY IN THE 21ST CENTURY

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ABSTRACT

This paper discusses issues of airport noise in Japan early in next century. First, it briefly reviews the history of airport noise last 40 years. It also speaks about temporal change in people's complaints toward public nuisances due to environmental factors, as well as in people's attitude toward noise around airports. Next, it surveys construction programs of new airports and additional runways, as well as the possibility of resultant environmental issues relevant to airport noise. It also speaks about air traffic and noise situation around airports early in next century. Finally, it speaks about future policy against airport noise under the circumstances that a great concern is taken into global issues such as atmospheric conditions and so on.

1 - INTRODUCTION

In Japan, since 1967, airport development has been promoted according to a national plan programmed by the government. This year is the fifth fiscal year of the seventh plan that continues seven years till 2002. Measures for the decrease of environmental adverse effects such as noise exposure, accompanying the growth of air transportation, have also been promoted under the plan since the notification of an environmental quality standard against aircraft noise in 1973 (We call it EQS_AN). Every available means has been carried out for urgent alleviation of severe noise situation around airports and for preservation of people's living environment: introduction of low-noise aircraft under the noise certification system, removal of runways, construction of soundproofing embankments, and subsidization to soundproofing of schools and residential houses. Resultantly, the living environment has been gradually improved, and the noise standards in EQS_AN were satisfied around certain airports. It seems that there is an atmosphere among the administration relevant to issues of airport noise. 'Every applicable means was tried. Noisy chapter-2 aircraft soon disappears from airways in Japan. The last solution is to construct airports on reclaimed lands!'

2 - REVIEW OF AIRPORT NOISE ISSUES IN JAPAN

Brief Review of History: We reviewed history of airport noise last forty years in Japan, emphasizing economical, political and legislative aspect relevant to environmental issues [1-3].

Before 1960: Japan revived in economy from the depression after the World War II, and then it continued the economic growth, especially in the development of the heavy and chemical industries, through the 1950s with little concern to environmental issues. As for aircraft noise, it became a public concern when people were exposed to severe noise due to exercises of jet fighters around air bases. Soundproofing was applied to schools and hospitals as early as in 1955, based on noise measurements using C-weighted sound levels.

During 1960-1980: The period was one of the highest growths in economy Japan has ever experienced. GDP advanced rapidly up to the third highest in the world. Expressways and high-speed railways were constructed one after another. There was an introduction of jet airliners to civil aviation since 1960. Along with the development of economy, the standard of living progressed together with technology

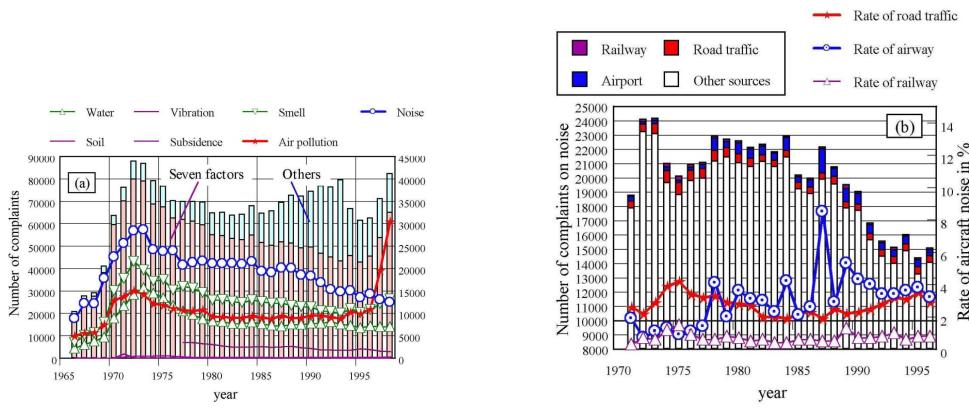
innovation, as well as it accompanied environmental pollution as a negative product. A lot of serious pollution problems such as air and water quality pollution happened to occur and many lawsuits were raised for the problems. Being pressed by objections from the nation, the government provided legislation for the protection of living environment and for the prevention of further pollution during the 1970s. A lot of laws were enacted during this period from the end of 1960s, such as the Basic Anti-Pollution Law /1967 and so on. As for aircraft noise, there is Law for the Prevention of Troubles due to Aircraft Noise around Public Airdrome /1967. Environmental Quality Standards were also notified by the government against environmental noise /1971, aircraft noise (EQS-AN) /1973, and Shinkansen railway noise /1975. In 1975 Civil Aviation Law was revised to establish noise certification system for the control of aircraft noise generation. Japan suffered severe economical recession twice in the 1970s, mainly due to sudden rise of oil price, i.e., 'Oil Shock' originated from disputes in the Middle East. But, the policy aiming at high-speed transportation did not change. Countrywide networks of expressways, railways and airways were expanded throughout Japan. In 1978 Narita Airport opened. As the airport was planned on a plateau with rich green, which was expropriated from farmers, severe political dispute was raised. It left a tremendous bill to pay in the future.

During 1980-1990: The government fulfilled various environmental countermeasures, being based legislation enacted in the 1970s. As to aircraft noise, the government spent all their efforts to satisfy noise limits till 1984 (ten years later than the standard notification). Roughly speaking, soundproofing was almost finished until 1985 and almost 95 % of applicants have been dealt with. However, despite the administrative endeavor, the outdoor noise situation was left with insufficient improvement around several airports. It was in the same period that the Supreme Court ruled decisions to the lawsuits raised from inhabitants at Osaka Airport. To solve noise problems and to deal with the increasing demand of air transportation in Kansai district, the government started investigation of a new airport since 1968. The final report on planning was submitted in 1980 and the construction was started in 1987. At Haneda Airport in Tokyo, removal of airport to an adjacent reclaimed land off coast was planned by the request from the Governor of Tokyo in 1977. The construction was started in 1984.

After 1990: The economical situation became overheating till the end of 1980s, resulting in a sudden breakdown. It still continues over centuries. In 1993 the Basic Anti-Pollution Law was revised to Basic Environment Law. One of the most important changes is the introduction of economical means for environmental protection. During 1991 and 1993, Narita Airport Issues Symposium was held for the discussion among relevant parties/participants. Since 1995, the discussion was finally handed over to a Committee for Symbiosis between the Local Community and Narita Airport. The discussion is now developed to establish Narita Airport as an eco-airport, using recycling as the single most important element in its basic philosophy. In 1994 Kansai Airport opened and Osaka Airport started again as a domestic airport.

Change in Complaints: Figure 1 shows annual change in complaints against environmental issues every fiscal year since 1966. The data were obtained from a report issued by the Environmental Dispute Coordination Commission. The complaints were brought to the office of local authorities throughout the country in Japan. Figure 1 (a) shows the sum of complaints against seven primary factors (air, water and soil pollution, noise and vibration, smell, and subsidence) and the sum of other factors in a bar graph, together with the change for each of the seven factors in line graphs. Until 1995, the seven factors held the greater part of the total complaints (in gradual decrease) and the noise was the primary factor for complaints. But, since 1995, air pollution and smell turned to increase and the former took the first place. One of the causes seems to be in people's taking a high interest in the health effects due to a very small amount of chemical materials in the air such as dioxin. Figure 1 (b) shows the sum of complaints against noise in a bar graph together with the rates of complaints against traffic noise (road, rail and air) in line graphs. It is worthy of notice that the number of the complaints against road and air is almost the same each other and their rates gradually increase in general. It suggests that people's response to aircraft noise seems to be severe compared to road traffic if we recall the difference in the noise-affected area.

Change in Human Response: Figure 2 shows a comparison of dose-response relationships obtained in two social surveys, which were carried out at similar regions in the surroundings of Osaka Airport [6]. One is a large survey (73S), which was carried out in 1973 when noise pollution was severe. The other is a small survey (96S) carried out in 1996 about one year after the open of Kansai Airport. The noise exposure had been reduced more than 15 dB in WECPNL around Osaka Airport, because of the strictly limited number of take-off and landing operations (See Fig. 5 (b)), while at the same time there is a great change in people's life style and points of view toward the environment. This figure compares people's response to a question asking annoyance due to aircraft noise, provided noise dose and survey



(a): Total and individual of various public nuisances.

(b): Total of noise complaints with percent rates of complaints on road traffic, airway and railway.

Figure 1: Change in the number of complaints against environmental issues filed by the Environmental Dispute Coordination Commission.

regions were similar. In 73S survey, the question was asked using 4-step scale, while 96S used 5-step scale. The responses overlie each other between 73-4/4 & 96-5/5 and between 73-(3+4)/4 & 96-(3+4+5)/5. It seems to suggest that people's response in 96S is severe compared to 73S.

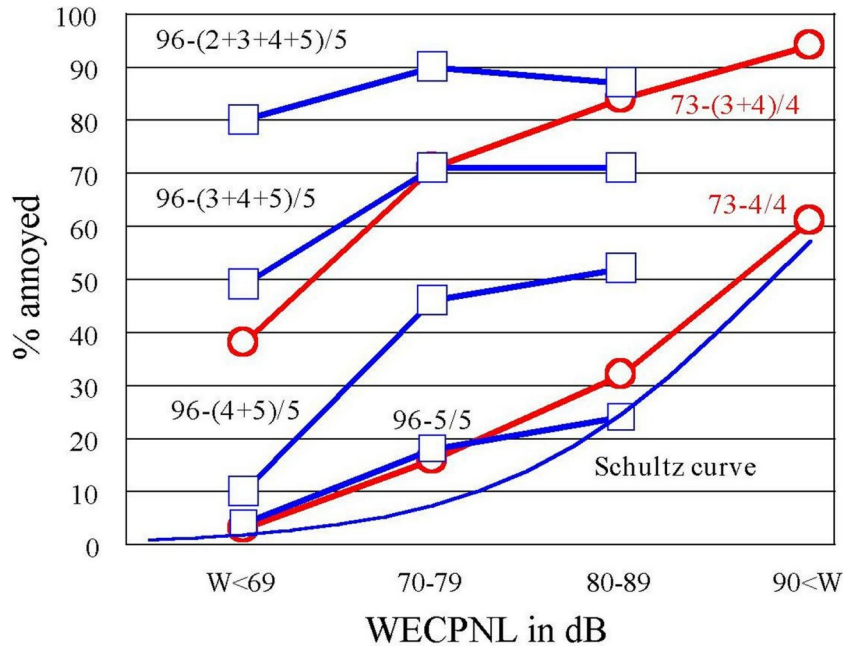


Figure 2: Comparison of noise dose response between surveys at 1973 and 1996 (circle and square, respectively) [6].

The above examination using complaints and dose-response suggests that people's view of aircraft noise became more severe these days than before such as in 1970s. On the other hand, it is true that there is a great demand for construction of new airports as an incentive to activate regional economy. Figure 3 shows the rate of positive affirmation to a question asking about the continuance of Osaka Airport two years after the start of construction work of Kansai Airport. It shows that positive answers to the continuance was greater in number than abolition, even in the most noise area. The site of Kobe Airport, which intends to open airport till 2005, was once one of the likeliest sites proposed for Kansai Airport, but the plan was defeated because of a strong opposition from inhabitants as to noise. Economical expectation and experience of a severe earthquake made the plan to revive and overcome the opposition.

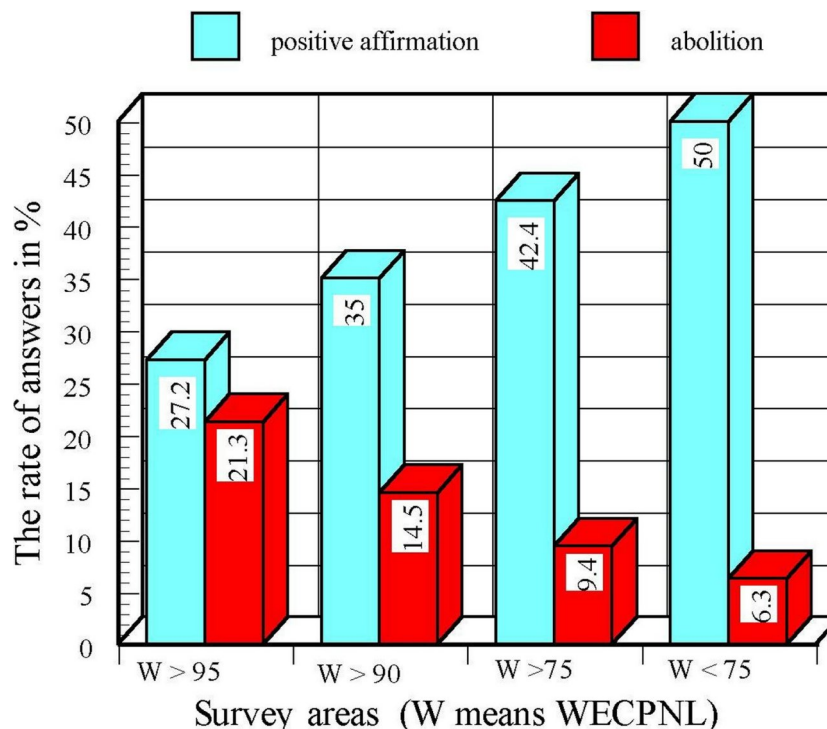


Figure 3: The rate of positive affirmation to a question whether Osaka Airport should be abolished [4].

3 - AIRPORT AND NOISE ISSUES EARLY IN 21ST CENTURY

Construction of Parallel Runway at Narita: It is now under construction of a provisional second runway according to a schedule to open it in 2002. The airport authority now plans to install more remote stations in their unattended airport noise monitoring system, as well as to move houses from the area under the expected flight courses. Complaints are sometimes appealed to the authority as to noise and 'dispersion of the flight course', even if aircraft fly at a height above 6000 ft. The authority began to open flight course information, as well as it has specified a local rule to limit the width of flight course for take-off and landing aircraft near the airport since spring last year. The open of the second runway may affect these issues.

Second Phase Construction of Kansai: Capacity limit will be reached before the year 2003. To cope with the increasing demand for air transportation in Kansai district, it was decided to fulfil the 2nd phase construction of Kansai Airport has been started since July 1999 under the 7-th Airport Development Program. Planned opening of B runway for 2007 and completion of the entire 2nd phase construction will be till 2011. Two years ago, Kansai Airport fulfilled flight path routes modification to fly over land area as an immediate means before the second phase construction in 1996, provided that aircraft fly high above 8000 ft when it flies over land area. There was a severe dispute to fly aircraft over land area, because the government had promised that aircraft fly over sea surface as far as possible. Now, sound level observed is at most 70 dB and no complaints. However, the issue may be revived when the government proposes further modification of flight path routes to realize an optimal airport operation after the open of Kobe Airport or after the completion of the second runway.

Final Phase of Airport Construction at Haneda: The third new runway for cross wind opened in the end of last March. By this removal, noise contour of 75 WECPNL becomes to lie almost on the sea surface. The rest in construction are the second terminal building and other additional facilities. The noise exposure due to airport operation has been decreased very much, as is shown in Figure 4. It is now expected that the airport is available 24 hours in metropolis, without consideration to noise problems, in order to fly more aircraft including international flights. There is, however, a possibility of further noise issues that may happen to occur mainly due to the change of flight path routes. There were complaints against low level fly-over noise at a long distance from runway after the open of the new C runway.

Air Transportation and Noise Exposure Early in Next Century: Figure 5 shows the trend of air traffic from 1970 till early in the next century. (a) Change in the total passengers a year for all domestic lines and all international lines together with the total passengers at each of four main airports, and (b) change in the number of landing operations at the four major airports. The data plotted on and after the

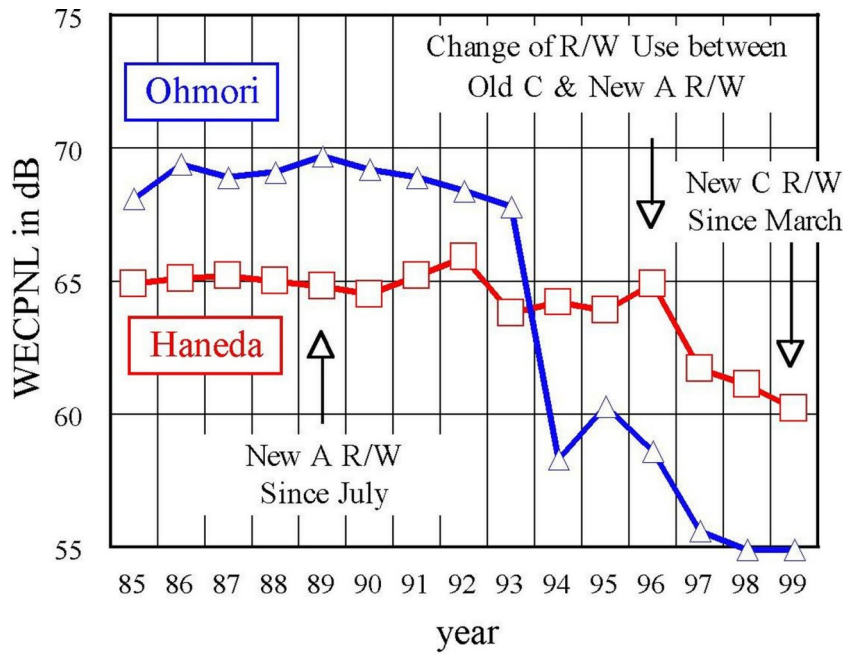


Figure 4: Change in WECPNL at two site locations in the western side of Haneda Airport.

year 2000 are predictions, obtained from a survey for the 7-th airport development program. The number of passengers generally goes on increasing, irrespective of the sudden rise of oil price in 1973 & 1979 and the sudden recession in the 1990s. The future predictions were calculated using a rate of increase 3 % a year in average. To compare to 1995, the increase will rise to 30 % in 2005 and 45 % in 2010. Note that the Green Paper expects that the total increase in Europe will rise to 80 % [3], [5]. Besides, the rate of increase remains to be 0.24 % a year for road traffic and -0.13 % or railway traffic. Figure 5 (b) shows an expectation of the total of landing operations a year at the four airports. The future predictions were calculated, being based on a rate of future economical growth. Landing operations at Haneda will record an increase of 13 % in 2005, but then it reaches the ceiling. At Narita and Kansai, increase is expected as 40 and 60 % in 2005 and 60 and 80 % in 2010.

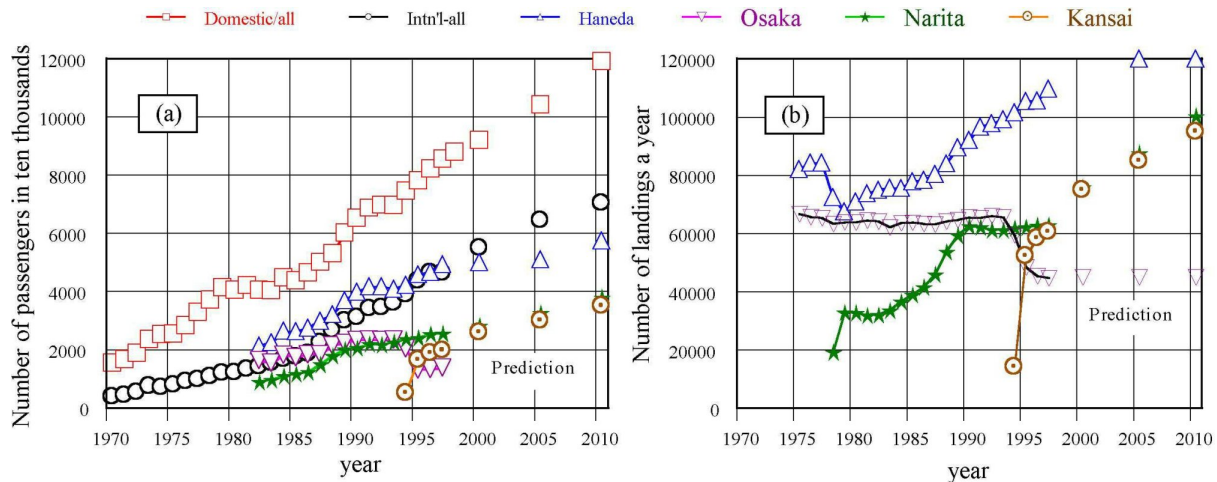


Figure 5: The trend of air transportation in Japan till early in 21st century: (a) change in the number of passengers, and (b) change in the number of landing operations at four major airports; the data on and after the year 2000 are predictions in the seventh airport development plan.

Figure 6 shows future change in noise-affected areas, which were calculated from noise predictions at three typical model airports (large, middle and small). The result suggests that if we obey the current noise policies and if we continue the present measures, the noise situation in large and middle airports

will be lower than the level of 1993. On the other, in case of a small airport, increase in the number of flight operations affects the precision much greater than other factors in the calculation of noise contour. The decrease of noise-affected areas, which were calculated from contours for 14 major airports, is 54 % in 1983 and 40 % in 1993. It suggest that introduction of low-noise aircraft is superior in noise reduction effect.

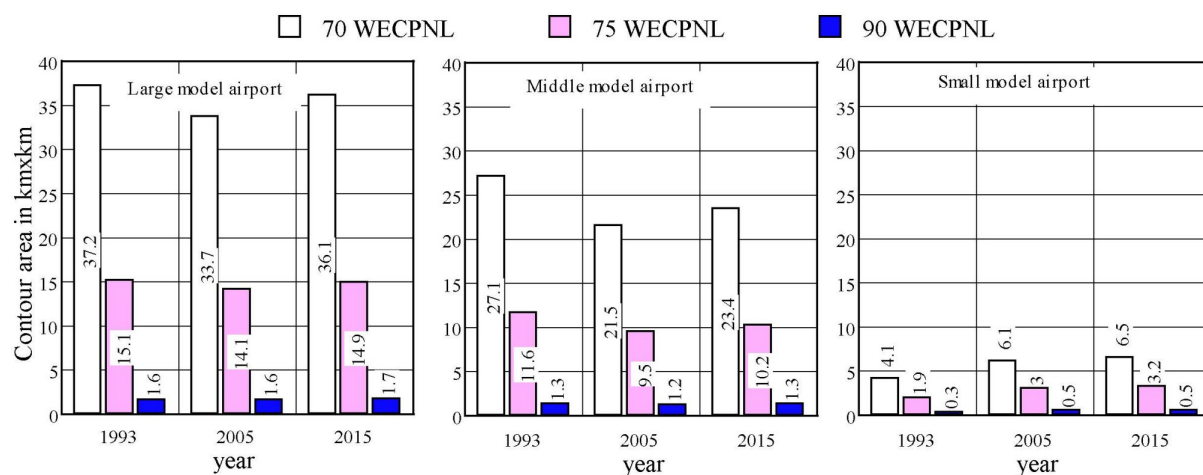


Figure 6: Future prediction of areas of noise contours at three typical model airport (respectively large, middle and small in airport operations); the data was quoted from a document prepared for the seventh airport development plan.

4 - FUTURE IN CONTROLLING AIRPORT NOISE ISSUES

The government has paid the total money cost of 9800 billion-yen for the airport development programs during a period between the end of 1960s and the present. The monetary cost was supplied from landing charge, aircraft fuel tax and so on. Twelve percents of the total, i.e. 1230 billion-yen, were spent for the environmental countermeasures such as subsidization to soundproofing. Application of environmental countermeasures was quite in successful, but it was initially adopted as an emergency means to lessen the severe noise exposure. It seems, however, to be considered as a primary means to solve noise issues. Soundproofing to houses has been almost finished in regions where $W > 75$ dB. It is not recommended to expand the application to quieter regions ($W < 75$ dB), where aircraft noise may be comparable in magnitude to other sound such as road traffic noise. Construction of airports on reclaimed lands has proved successful in avoiding noise issues. But, it seems that there is a limit to the methodology. People seem to have become strongly interested in global issues such as the preservation of natural environment. One of the measures left to us is to reinforce the source noise control, but it requires much more money cost than before. It may be of great value to introduce an economical means to make up a system to help aircraft manufactures and airlines with subsidization to the development and purchase of much quieter aircraft, as is discussed in Europe.

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