Considering noise policy for low-noise but frequent fly-over events far from the airport

Ichiro Yamada [1]

[1] Aviation Environment Research Center, Airport Environment Improvement Foundation Japan, K5 Bldg., 1-6-5, Haneda Kuhkou, Ohta-ku, Tokyo 144-0041, JAPAN, i-yamada@aeif.or.jp

ABSTRACT

This paper considers possible noise policy for coping with noise issues due to low-level but frequent aircraft fly-over sound events being observed below flight routes in regions far from the airport. In Japan, severe noise impact near airports had been mitigated owing to noise measures like introduction of low-noise aircraft, operational and land-use control and remedial measures, resulting in a great expansion of air transportation. It has, however, now caused new noise issues in regions far from the airport. In order to manage a massive volume of air traffic efficiently, air traffic control requires approaching aircraft to be in line in airspace distant from the airport and to fly successively at short intervals along specified routes with the aid of precise navigation system. Consequently, when a specific route is active, residents below the route suffer intolerable noise annoyance due to incessant fly-overs, resulting in severe noise complaints. This paper makes a brief review of these noise issues, and then considers how to evaluate noise impact of such unsteady, time-changing sound exposure as well as discusses possible measures for solving those issues.

INTRODUCTION

Yamada (2012-1~3) made a review of the history of airport noise mitigation programs that the government of Japan has performed under the national framework of environmental measures against aircraft noise, including noise control at each side of emission, transmission and immission. Owing to its concentrated efforts including the introduction of low-noise aircraft over the past four decades since mid-1970s, noise exposure around airports was dramatically decreased and living environment was improved to the better, although the national noise guideline of “Environment Quality Standards for Aircraft Noise” is still not met at several major airports yet. In the meantime, in the middle of 1990s, noise exposure around major airports resulted in a stop of decreasing or in a gradual increase due to increase of aircraft movements, irrespective of large decrease in single event noise exposure. Especially, at Haneda, in order to manage a massive volume of air traffic efficiently, air traffic control requires approaching aircraft to be in line in airspace distant from the airport and to fly successively at short intervals along specified flight routes with the aid of precise area navigation. Thus, when a specific route is active, residents near the route suffer intolerable noise annoyance due to incessant fly-overs, whereas they hear no aircraft sound if the route is not active. As a result, there is a strong outbreak of noise issues in regions far from the airport, although noise exposure level in year-averaged L_{den} never exceeds noise criteria for remedial noise measures. Aircraft noise remains to be a challenging issue toward a further harmonized growth of air transportation and cities like Tokyo metropolis, especially for the quality of life.

This paper makes a brief review of current issues of airport noise in Tokyo metropolitan area and discusses how to prevent such an outbreak of noise issues related with further expansion of airport capacity.

AIRPORT CAPACITY EXPANSION IN TOKYO METROPOLITAN AREA

Tokyo metropolitan area consists of City of Tokyo and several mega prefectures. It is the highest rank of urbanized area for longer than fifty years. There are two major international airports Tokyo (Haneda) and Narita: Haneda is located on the north-west sea coast in the city centre of Tokyo, while Narita is located in a rural district of Chiba Pref., 60km distant from Haneda. In addition to these airports, there are two small civil airfields and 6 military bases within a radius of 50km around Haneda.

Haneda was originally developed on the coast over fifty years from 1931-1987 till the airport removal to an offshore reclaimed land. There had been a lot of severe noise complaints brought from inhabitants dwelling in adjacent regions. It was one of motive forces for the airport removal to offshore. Airport removal and expansion were performed from 1988 to 2007. It proved successful in solving noise issues as the offshore removal program progressed stepwise. However, to meet with further increase of air traffic demands, planning of airport re-expansion was started in 2000 and the fourth runway D opened for servicing in October 2010.

Figure 1 shows recent situation in airport capacity expansion at Tokyo Metropolis (Haneda and Narita). Owing to endeavours sweating blood for mitigation measures to solve noise issues, airport capacity increased to 523,000 movements per year after the offshore removal up to September 2010, became to 591,000 after the construction of D-runway, and it is now expected to further increase up to a maximum of 747,000 movements till the end of this year, which will be sufficient for satisfying air traffic demands for the time being. According to ITSP (2010) and MLIT (2014), as of April, 2014, at Haneda the maximum of total capacity increased to 717,000 as a result of capacity expansion for international flight operations to 90,000, whereas at Narita airport capacity increased to 270,000 on March 31, 2013 as a result of an agreement for capacity expansion among Airport Company, local governments and the national government in October, 2010, on conditions of further endeavours for environment measures and mutual prosperity.

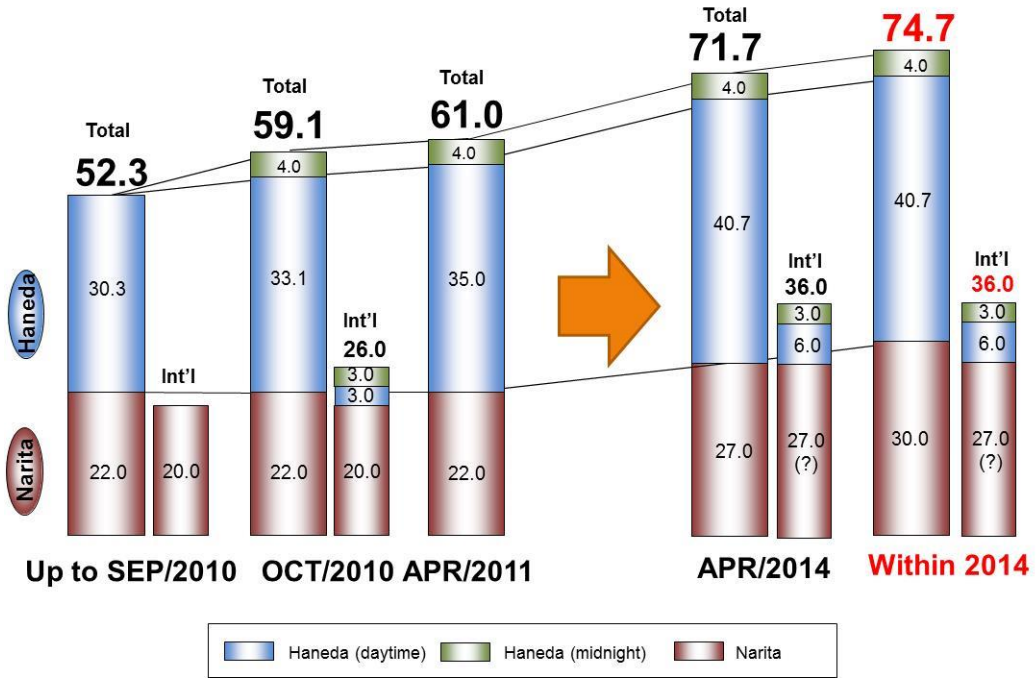

Figure 1. Recent expansion in airport capacity (aircraft movements in ten thousand per year) at Haneda and Narita in Tokyo metropolitan area from 2010 till 2014.

According to NAA (2014), the capacity expansion to 270,000 at Narita was realized through reform of taxiways, expansion of apron, improvement in traffic management for simultaneous parallel take-off and landing as well as relaxation of curfew conditions (prohibition of night-time flight operations over 7 hours from 23:00 to 6:00) on March 31, 2013: It was decided that closing time of flight operation hours can be extended from 23:00 to the midnight 0:00, in case a flight operation is expected not to be in time before the curfew due to predetermined specific reasons like bad weather in addition to emergency and if the operator agrees to pay an extra charge. There were 54 applications to this system during the last 11 months and the money paid amounts to a total of JPY 20 million was exclusively distributed to six relevant local governments. Note that when local governments agreed to the relaxation, they requested performing a research project to study effects of aircraft noise on health including sleep disturbance. The study is now under implementation and is at a stage of a preliminary survey.

Now, there are a lot of ideas discussed for further capacity expansion at Haneda. Discussion seems to be accelerated after Tokyo was chosen to host the 2020 Summer Olympic Games last year, but three options remain realistic: 1) constructing a new runway, 2) establishing new flight routes and 3) re-use of old B-runway facilities with a revision of air traffic control. The third one is an alternative of the first because it seems difficult to complete runway construction in time till the Olympics. These options, however, must surely include flight routes over the downtown Tokyo in order to realize an increase of air traffic capacity up to 488,000 times. It is crucial. According to Yai (2013), people aiming at development of city infrastructure claim adoption of flight routes over highly-urbanized city area of Tokyo for further capacity expansion and for disaster prevention in the metropolis. People that fear environmental deterioration express negative opinions such that over-city flight operations bring severer noise impact on downtown Tokyo. On the other, people suffering low-level but frequent noise events in Chiba require noise burden sharing between Chiba and Tokyo, because all three options will result in further increase in flight operations, which makes the situation of noise damage more serious. Note that economic researchers even in Chiba consider only positive effects of air traffic expansion toward the Olympics, but nothing about noise impact.

NOISE ISSUES RELATED WITH AIR TRAFFIC EXPANSION AT HANEDA

At Haneda, high noise region was confined on the sea surface owing to airport removal to offshore in the last decade of the 20th century, construction of the fourth runway D, introduction of approach using Localizer type Directional Aid (LDA), etc., in addition to prohibition of take-off and landing over highly-urbanized city area of Tokyo and flight route control during approach and departure. Figure 2 shows a comparison of flight route situation before and after the in-service start of the fourth runway D.

Before in-service of D-runway, as is shown in the left figure of Fig.2, noise complaints were mainly brought from Urayasu and Kisarazu, shown using green circles. When a new plan of flight routes was proposed in 2004, local governments along the coast expressed their anxiety about noise impact due to flyovers above the tip of the urbanized northern area Urayasu including a famous amusement park in case aircraft approach along a flight route for bad weather from the north. To solve it, the direction of final approach had to be changed by 9.5 degrees by turning the fourth runway 7.5 degrees clockwise as well as by introducing a navigation of Offset-ILS. Flight altitude over the area was also raised from 3,000ft to 4,000-5,000ft. As a result, approaching route was set to divert to pass over the sea surface and sound level

observed in the coastal area set to stay lower than 70dB. On the other, in Kisarazu, located in the opposite southern side of Tokyo Bay and 20km or longer distant to the south of airport, aircraft flew higher than 3,000ft for approaching in case of north wind, resulting in exposure to fly-over noise lower than 70 dB every one or two minutes, while there were almost no aircraft flyover in case of south wind. Noise issues due to low level but incessant aircraft approaching occur in case of north wind at Haneda at that time. Thus, people below the flight routes required noise evaluation that fits their sensation by taking an average only over busy periods when aircraft frequently flew, although the national noise guideline requires taking a year-average. We should note that there were few noise complaints nor any requests on flight routes from local residents and governments under flight routes scattered in a wide area including Chiba city irrespective of similar noise level and flight altitude.

After the service start of D-runway, as is shown in the right figure of Fig.2, flight routes for south wind were totally changed. Fixed flight routes over densely populated city of Chiba were set up for south wind situation and aircraft came to precisely fly along specified flight routes at a short interval using area navigation, as if trains run on the railway. In other words, air traffic concentration happened to occur above the densely populated Chiba city, 20 km or farther distant from the airport, resulting in severe noise complaints in case of south wind configulation of flight routes. It was unbearable for people living right under the flight routes, although confining flight routes in a narrow corridor was determined after discussion between

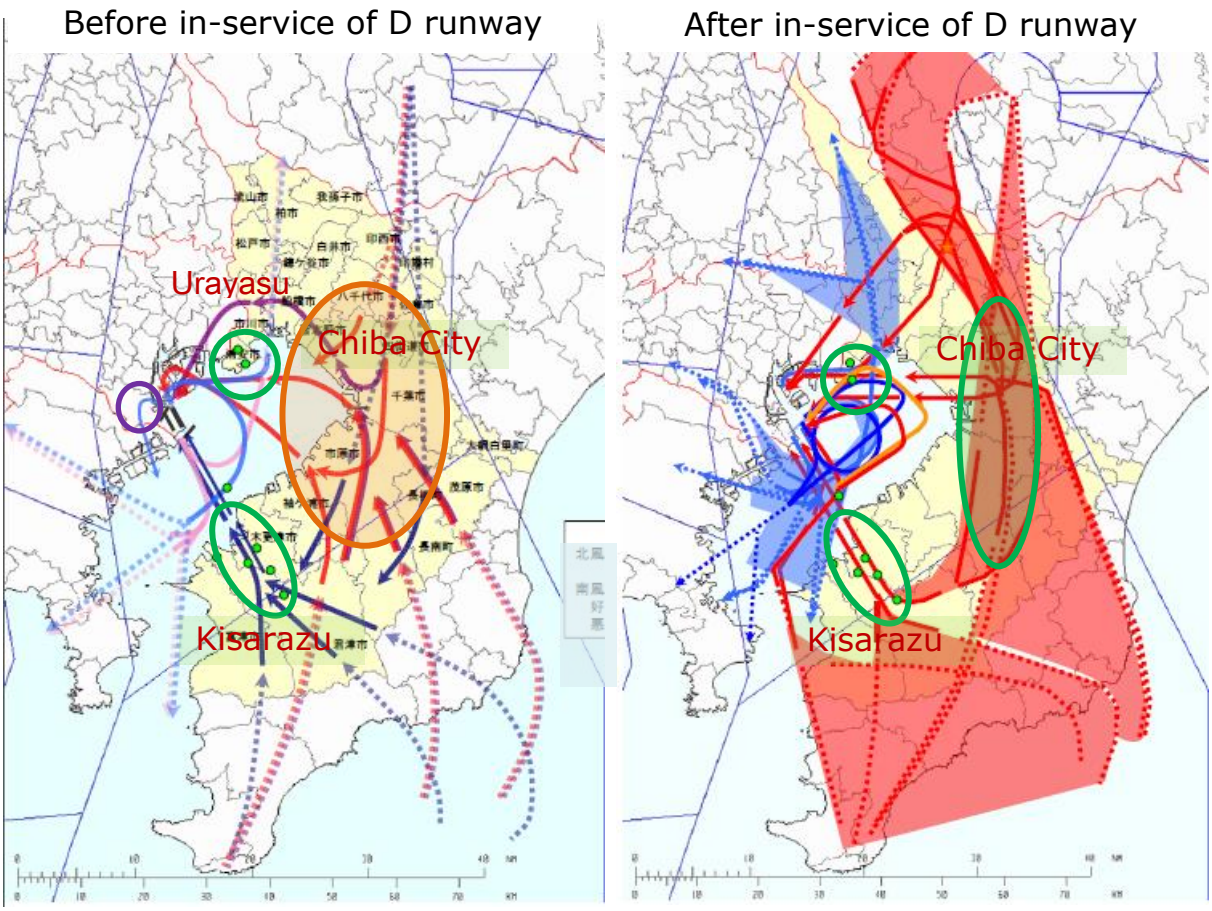

Figure 2. Flight route situation (left) before and (right) after the service start of the 4th runway D at Haneda. Green circles indicate areas where severe noise complaints were raised, while small green dots show locations of unattended noise monitoring.

local governments and the national government (Civil Aviation Bureau). People complain about noise annoyance due to low level but very frequent sound events of at most 60-70dB due to incessant aircraft approaching. Before the in-service of D-runway, outbreak of such noise complaints was confined to a narrow area in Kisarazu, sparsely populated and below the straight approach routes to the airport for A and C runways, whereas after in-service of D-runway, approaching is repeated at a high frequency over Chiba, densely populated similar to downtown Tokyo. Another issue is intersection of two arriving aircraft in case of south wind conditions. In order to fly a lot of aircraft efficiently, air traffic controllers instruct aircraft from southern Japan to fly to B-runway and instruct aircraft from northern Japan to fly to D-runway. Those aircraft sometimes intersect in the sky at a location in Chiba. Of course, their altitudes are different to ensure flight safety, but people looking up are worried about as if those aircraft may collide with each other. The air-traffic control department hastened to change the routes, but unfortunately it only caused the routes to cross at another location several kilometers distant from the former and residents near the new intersection started to complain. Incessant fly-over precisely on the same route as if fly on a railway may have caused such issues. WEB pages of Chiba Pref. says: "Result of noise monitoring this summer in 2013 suggests that noise climate is a bit improved, but day-evening-night level L_{den} is about 10dB higher than that before the in-service of D-runway. Noise burden due to air traffic at Haneda is still concentrated in this prefecture." It suggests that Chiba feels Tokyo is unfair about sharing noise burden: Flying over downtown Tokyo has been strictly restricted, whereas a lot of aircraft flying over Chiba, although noise level is at most about 45-50dB in L_{den}.

POSSIBLE MEASURES

First, let us consider possible measures for low-level but incessant noise events. Thanks to measures at each side of emission, transmission and immission, noise climate around airports has been surely improved from red to grey if we compare it with forty years ago. The maximum level of aircraft noise we hear near the airport is surely reduced by 15-20dB. It is only 60-70dB in regions distant from the airport. Nevertheless, people make severe noise complaints as if they never bear it. Looking at those complaints against low-level but incessant noise events due to flyovers approaching the airport, we wonder whether human response to noise dose has changed. According to Stewart (2014), recent news on aircraft noise at Heathrow speaks about similar situation: "It also gives too much weight to the noise of each individual aircraft (which has fallen over the years) and not enough the number of planes overhead (which has increased dramatically in recent years – with a blip for the recession). Using L_{Aeq}, four hours' worth of non-stop noise from Boeing 757s at a rate of one every two minutes is said to cause the same annoyance as one extremely loud Concorde followed by 3 hours 58 minutes of relief. That is clearly not a reflection of reality!"

Aircraft flying by area navigation follow a specified route precisely and air traffic controllers instruct aircraft fly in line at an interval as short as possible in order to raise the efficiency in air traffic up to the maximum capacity. As a result, residents who hear low-level but incessant sound events as far as the flight route is active are forced to easily recognize the sound of aircraft flying above their head. It reminds us the famous "cocktail party effect": "Being forced to listen to the sound of aircraft flying" will make themselves more conscious of the aircraft and get more annoyed with the sound and make them appeal severer noise complaints. Concentration may make people feel noise louder. We should remember that there were few noise

complaints in Chiba before the in-service of D-runway. The Japan Civil Aviation Bureau is under examination to raise flight altitude, which is specified for the north-bound approach route in case of “south wind & good weather” conditions, approximately 150 meters higher for aiming at further noise reduction. However, is that gives us a valuable means for solving such noise complaints? No! Instead, we should consider changing such flight situation and let aircraft fly in a rather scattered manner. Considering air traffic consisting of a mixed fleet of various aircraft types and size, it may give us suppression of noise annoyance as well as realization of a higher efficiency in traffic control than those when aircraft fly in line. We should investigate such a possibility through our collaboration with air traffic controllers. According to Ishii et al. (2012), there is a research project, named as DREAMS, which aims at confining noise impact within a specified zone on the ground by changing flight route dependent on meteorological conditions. It may give us an extra effect to lower noise annoyance due to incessant flyovers.

Local governments and residents in Chiba say that Tokyo enjoys convenience of air traffic and economic benefits from airport activities at Haneda, whereas Chiba suffers only noise impact due to aircraft flyovers as a negative product, and argue for fair noise burden sharing among relevant regions surrounding the airport. It seems, however, that Ota Ward of Tokyo adjacent to the west side of Haneda refuses noise immission even due to a few "take-off and left-turn" movements per day in the early morning, but it has no idea to feel sympathy to Chiba’s argument for noise burden sharing. Minato Ward of Tokyo in the north of Haneda and Kawasaki City in Kanagawa Pref., in the south of Haneda, now refer very little to airport noise from Haneda. It can be considered a NIMBY problem. How should we solve such issue? Haneda Airport belongs to Ota Ward administratively, and the airport is always conscious that it is a member of the local association in Ota and participates in community events to keep good communication with the residents. But, it is not possible to behave similar with Chiba since Haneda is administratively independent of Chiba, Kawasaki and Minato. We should examine how to establish close relationship with these local communities similar to Ota.

Issues of low-level noise due to incessant flyovers occur outside zones for noise mitigation programs under the law. If we mitigate people’s dissatisfaction against such noise, we should work out a private grant for contribution to promote the growth of air traffic or to promote social relationship with local communities.

Next is a comparison of “fair noise burden sharing” with “noise impact minimization”. Permitting take-off and landing over the downtown Tokyo for further capacity expansion at Haneda will surely cause intense noise exposure in residential areas near the airport. It means that noise climate which was once improved from devastating red situation owing to airport removal to offshore may return to comparatively worse pink situation which must be a target of noise mitigation measures under the law. Without considering such influence, we cannot compare which of “fair noise burden sharing” and “noise impact minimization” will be superior.

The noise guideline of “Environmental Quality Standard for Aircraft Noise” requires that noise exposure in residential areas around airports must satisfy noise limits specified. Noise exposure level under the flight route in Chiba is surely below noise limits, whereas that in Tokyo is higher than noise limits. It is difficult to compare noise impact between different conditions. It is necessary to reinforce noise limits of aircraft certification. Even if permitted to fly aircraft over the downtown Tokyo, available flight

routes are limited because there are restrictions for available airspace, a lot of high-rise buildings and a lot of helicopters frequently fly.

It is essential to understand all risk factors and continue to manage those. It is necessary to make a prospect of current and future status of air traffic as well as environmental impact, to promote information through various media in an appropriate manner to local residents and to facilitate exchanges with the local community and to promote partnership with the local community. Aircraft noise still remains to be a challenging issue toward further harmonized growth of cities and air transport as well as for the quality of life in cities. There are a lot of issues we should consider to realize further capacity expansion without outbreak of environmental issues: how to disseminate sufficient information to residents in appropriate manner and how to solve the difficult issue which of “fair noise burden sharing” and “noise impact minimization” we should place more important. We must deal it from various aspects by recognizing it as part of pollution problem complex including noise, local air quality, global warming, economic situation, social and political relations, etc.

CONCLUDING REMARKS

This paper discussed possible noise policy for coping with noise issues due to low-level but frequent aircraft fly-over noise events being observed below flight routes in regions far from the airport. In Japan, severe noise impact near airports had been mitigated owing to noise measures like introduction of low-noise aircraft, operational and land-use control and remedial measures, resulting in a great expansion of air transportation. It has, however, now caused new noise issues in regions far from the airport. In order to manage a massive volume of air traffic effectively, air traffic control requires approaching aircraft to be in line in airspace distant from the airport and to fly successively at short intervals along specified routes with the aid of precise navigation system. Consequently, when a specific route is active, residents below the route suffer intolerable noise annoyance due to incessant fly-overs, resulting in severe noise complaints. We discussed the mechanism for severe noise complaints irrespective of low-level noise exposure. We also discussed which of noise burden sharing or noise impact minimization we should place more importance on.

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