



Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Department of Public Health
HSE-East
Dr. Steevens' Hospital,
Dublin 8
Tel. 01 635 2145
Fax 01 635 2103

Date: 01 /02/2021

RE: F20A/0668 - application under Section 34 of the Planning and Development Act 2000

To: Fingal County Council Planning Authority

Dear Sir/Madam,

I am writing to you in relation to application F20A/0668 received by Fingal County Council Planning Authority.

Issue: Proposed changes to North Runway Planning Permission

Dublin Airport is proposing an amendment of the operating restriction set out in condition no. 3(d) and replacement of the operating restriction in condition no. 5 of the North Runway Planning Permission as well as proposing new noise mitigation measures. Proposed action would be:

- To remove the numerical cap on the number of flights permitted between the hours of 23.00 and 07.00 daily and replace it with an annual night-time noise quota between 23.30 and 06.00.
- To allow flights to take off from and/or land on the North Runway for an additional 2 hours - 23.00 hours to 24.00 hours, and 06.00 hours to 07.00 hours.
- Overall, this would lead to an increase in the number of flights taking off and/or landing at Dublin Airport between 23.00 and 07.00 over and above the number stipulated in condition no. 5 of the North Runway Planning Permission.

The proposed noise quota system:

"A noise quota system is proposed for night time noise at the airport. The airport shall be subject to an annual noise quota of 7990 between the hours 2330 and 0600hrs"

Proposed noise mitigation measures:

- A noise insulation grant scheme for eligible dwellings within specific night noise contours.
- A detailed Noise Monitoring Framework to monitor the noise performance with result to be reported annually to the Aircraft Noise Competent Authority, in compliance with the Aircraft Noise Regulation Act 2019.

Potential Health and wellbeing impacts

Noise is an important Public Health issue, that can have negative impacts on human health and well-being (1). Environmental noise is among the top environmental risks to physical and mental health, and is associated with a substantial burden of disease in Europe (1). There is a plethora of evidence that sleep is a biological necessity, and that disturbed sleep is associated with a number of health problems (2). Noise disturbs sleep by a number of pathways, and even at very low levels of noise, physiological reactions can be measured, such as increased heart rate, body movement and arousals (2). Therefore, the proposed changes to the North Runway Planning Permission may have significant consequences for Public Health in the surrounding areas.

Noise, sleep and human health

Insufficient sleep and sleep disorders impact daily functioning, mood, cognition and cardiovascular health outcomes such as obesity, high blood pressure, diabetes, stroke and heart attack (3). Prevalence of poor sleep health is high, particularly amongst vulnerable populations such as racial/ethnic minorities and individuals of lower socioeconomic status (3). Many factors contribute to this high prevalence, including environmental factors. Noise has been shown to fragment sleep, reduce sleep continuity and reduce total sleep time (2). It is therefore important to identify and target determinants of sleep health, including environmental factors. Continuous exposure to aircraft noise increases the frequency of waking up during sleep and decreases slow-wave sleep (also known as deep sleep) (4).

The auditory system constantly scans the environment for potential threats, and humans perceive, evaluate and react to environmental sounds even when asleep (5). During sleep, night noise can be either intermittent (that is discrete noise events rather than constant background noise), or single noise event (5). When noise is accompanied by vibrations the combination of noise and vibration induces higher degrees of sleep disturbance than noise alone and other factors such as situational factors (depth of sleep phase, background noise level) and individual factors (noise sensitivity), contribute to whether or not noise will disturb sleep (5). Repeated noise-induced arousals lead to impaired sleep quality and recuperation, delayed sleep onset and early wakening, less deep and REM sleep, and more time spent awake and in superficial sleep stages (5). Noise may also prevent people from falling asleep again once woken. It is currently unclear how many additional noise-induced awakenings are acceptable and without consequence for sleep and health (5).

When sleep is permanently disturbed and it becomes a sleep disorder, it is classified in the International Classification of Sleep Disorders as “environmental sleep disorder” (2). Noise-induced sleep disturbance is an example of an environmental sleep disorder, which is a sleep disorder that causes complaints or either insomnia or daytime fatigue and somnolence (2). The exact prevalence of environmental sleep disorders is not known (2).

It is generally accepted that insufficient sleep and sleep loss has a great influence on metabolic and endocrine functions, as well as on inflammatory markers, and it contributes to cardiovascular risk (2). C-reactive protein, an acute inflammatory marker, a predictor of strokes and heart attacks has been shown to linearly increase with total and/or partial sleep loss (2). Leptin, which is involved in glucose regulation and weight control, decreases with sleep loss thus increasing appetite and predisposing to weight gain, impaired glucose tolerance (risk of diabetes) and impaired host response (2). Sleep loss also affects neurobehavioural function, especially neurocognitive

performance (2). Noise also activates the stress response, and long-term noise exposures may lead, in persons liable to be stressed by noise, to permanently increased cortisol concentration above the normal range (2). Increased risk of cardiovascular disease is connected with stress. There is considerable evidence for a relationship between sleep and the immune system, and the immune response may be impacted by environmental noise during sleep (2).

Disturbed sleep leads to daytime sleepiness in 40% of affected subjects. As well as the potential health implications, daytime sleepiness interferes with work and social function and can have consequences including cognitive problems, motor vehicle accidents, poor job performance and reduced productivity (2).

Time studies have indicated that the average amount of time people are in bed is 7.5 hours; therefore the average sleeping time would be somewhat shorter. There is considerable variation in sleeping time due to factors such as age and genetics (2). It is therefore recommended that for these reasons, a fixed interval of 8 hours is a minimal choice for night time protection, this protects about 50% of the population (2). It would take a 10 hour period to protect 80% (2).

Aircraft Noise and human health

The WHO Noise Guidelines for Europe identify the following potential adverse health outcomes associated with aircraft noise (1):

- 1) Ischaemic Heart Disease (IHD):
Evidence suggests a dose-response effect for increased Relative Risk (RR) between incidence of IHD in areas with exposure to aircraft noise, and increased RR in mortality due to IHD associated with aircraft noise.
- 2) Hypertension:
Evidence suggests an inconsistent relationship between aircraft noise and hypertension.
- 3) Stroke:
Evidence suggests a dose-response effect for increased RR of stroke in individuals with exposure to aircraft noise.
- 4) Children's blood pressure:
Results of studies examining relationship between aircraft noise and children's blood pressure were inconsistent.
- 5) Annoyance:
Strong evidence exists to prove the association between aircraft noise and annoyance. Evidence exists for an increase in %HA (%Highly Annoyed) per 10dB increase in sound exposure.
- 6) Cognitive Impairment:
Evidence exists for an association between aircraft noise and reading and oral comprehension, as well as an association between aircraft noise and children with poorer performance on standardised assessment, and worse long term memory. No association was found between aircraft noise and executive function.
- 7) Hearing and tinnitus:
No evidence was available for analysis
- 8) Sleep disturbance:
Evidence exists for an association between aircraft noise and self-reported sleep disturbance as well as polysomnography outcomes.

Studies assessing interventions involving opening and closing runways, and subsequent changes in flight paths, showed that change, increase or removal of over-flights resulted in statistically significant changes in annoyance levels of residents. Studies assessing sleep disturbance found that the percentage of sleep disturbance changed in association with the change in noise level exposure caused by flight path adaptations (1).

The report strongly recommends reducing noise levels produced by aircraft below 45dB L_{den} , and reducing night noise levels produced by aircraft to below 40dB L_{den} , as aircraft noise above this level is associated with adverse effects on sleep (1). To reduce adverse health effects, the group strongly recommends that suitable measures to reduce noise exposure from aircraft in the population exposed to levels above these guideline values are implemented (1).

Potential Health Implications of proposed changes:

The changes proposed remove the numerical cap on flights between 23.00 and 07.00, and replaces it with a noise quota for flights between 23.30 and 06.00. It would also allow flights to take off from and land on the North Runway for an additional 2 hours - 23.00 hours to 24.00 hours, and 06.00 hours to 07.00 hours. This would effectively increase the number of flights taking off and landing between 23.00 and 07.00, and reduce the protected period of time during which flight restrictions exist in current permission. Sleep is an important biological process for overall health, and noise has been shown to disturb sleep. In addition to sleep disturbance, aircraft noise is associated with a number of adverse health outcomes.

Sleep time of 8 hours is thought to protect 50% of the population, therefore reduction of the restricted flight times to a 6 hour window between midnight and 6am may have an adverse effect on health outcomes. Proposed noise mitigation measures are welcomed, however consideration should be given to whether these are sufficient to reduce night noise levels to recommended levels, especially in the summer months when air traffic is increased and windows are more likely to be open, modifying insulation effects. The current WHO recommendation is to reduce noise levels to below 45dB L_{den} from 55 dB L_{den} for the hours between 0700 and 2300 and to reduce to below 40dB L_{night} from 40dB -45dB L_{night} for night time hours between 2300 and 0700 (1). This is a factor to consider in relation to the noise level contour, currently proposed by DAA, at night time noise levels of > 55dB L_{night} , to qualify for noise abatement measures for homes in the vicinity of Dublin Airport (6). In the case of Vienna airport, homes in the vicinity with noise levels >54 dB during the day and >45dB at night are eligible for assistance towards soundproofing (7).

Use of an annual noise quota in replacement of a numerical cap on flights during restricted hours, would increase the number of flights between these hours, thus potentially increasing the number of additional arousals for residents in the surrounding area leading overall increase in sleep disturbance. The period between 6am and 7am is the busiest period in the day at Dublin Airport (8). Excluding that period of time from restrictions such as a numerical cap or night noise quota will potentially increase substantially both the night time and the cumulative daily noise exposure for surrounding communities.

Conclusion

The proposed changes may have the cumulative effect of increasing sleep disturbance in residents in the surrounding area, and increasing overall daily noise exposure despite proposed mitigation measures, with potential adverse health outcomes.

Kind regards,



Dr Ruth McDermott
Specialist in Public Health Medicine
MCRN 16416

Submission prepared by: Dr Triona McNicholas, Specialist Registrar in Public Health Medicine, Dr Lucinda Ryan, Senior Medical Officer in Public Health, and Dr Ruth McDermott, Specialist in Public Health Medicine

References

1. World Health Organization. Environmental noise guidelines for the European region. 2018.
2. World Health Organisation. Night noise guidelines for Europe. WHO Regional Office Europe, 2009.
3. Johnson DA, Billings ME, Hale L. Environmental determinants of insufficient sleep and sleep disorders: implications for population health. *Current epidemiology reports* 2018;5:61-69.
4. Kwak KM, Ju Y-S, Kwon Y-J et al. The effect of aircraft noise on sleep disturbance among the residents near a civilian airport: a cross-sectional study. *Annals of occupational and environmental medicine* 2016;28:1-10.
5. Basner M, McGuire S. WHO environmental noise guidelines for the European region: a systematic review on environmental noise and effects on sleep. *Int J Environ Res Public Health* 2018;15:519.
6. Dublin Airport. North Runway Relevant Action Application Update. Dublin, 2020.
7. Elliff T; Cremaschi, M; Huck Violaine. Impact of aircraft noise pollution on residents of large cities. In: Policy Department for Citizens' Rights and Constitutional Affairs EP, editor, 2020.
8. Dublin Airport Authority. Building for the future. Dublin, Ireland, 2018.