

Submission to the Australian Government's Aviation Policy, White Paper Review – March 2023

Introduction

Aviation policy over the past three decades has failed Australia's Aviation Industry, in that policy has clearly promoted industry profits over residential and environmental impacts and the sustainability of the industry against climate change. If the current review does not address this imbalance, Government attempts to improve aviation efficiency and sustainability will continue to fail.

Continuing the biased imbalance of current policy, will further divide the aviation industry from the support of communities affected by aviation impacts and Government endeavours to address adverse environmental and climate change impacts will fall short of achieving their objectives, thereby inducing increased political activism within the wider Australian population.

My submission is encompassed within the White Paper Terms of Reference (ToR), which state: "The Government will promote an efficient, safe, sustainable and competitive Australian aviation sector that is critical to the economy and standard of living of all Australians".

This submission has relevance to the following Tors:

- Airport development planning processes and consultation mechanisms
- Achieving net zero carbon emissions, including through sustainable mechanisms and technology
- Achieving economic reforms needed to improve productivity across transport sectors.

Noise Measurement Systems used for assessing noise in the Environment.

<p>Policy review Inclusion – The Policy Review process must incorporate a standardised approach to noise that includes assessment relative to the background levels and to other human environmental disturbances. This requires standard definitions of noise measurement that are compatible with both Aviation and Occupational Health and Safety requirements.</p>

Justification for Inclusion in Review

Noise can be a pernicious intrusion into people's lives. Noise, as opposed to sound more generally, has negative impacts on human health and well-being and is a growing concern, as transport noise, due to road, rail and air travel, increases in the everyday environment. Of particular concern is the everyday encroachment of noise into Public Parks, World heritage areas and surrounds in addition to the encroachment into residential suburbs of towns and cities.

The World Health Organisation (WHO) considers environmental noise to be a public health issue which is increasing due to road, rail and air transport, wind turbines and personal electronic devices. It has made a series of recommendations for environmental noise based on analysis of whether current indicators are sufficient to prevent noise impacts in communities

and whether current interventions are adequate in preventing or limiting health outcomes in the population.¹

While there are numerous noise indicators in use around the world, the WHO made three recommendations with respect to aviation noise impacts:

- Noise levels for average noise exposure should be brought below 45dB L_{den} , as aircraft noise above this level has been associated with adverse health effects.
- Noise levels exposure overnight should be brought below 40dB L_{night} , as night-time aircraft noise above this is associated with adverse effects on sleep.
- In order to achieve the two above objectives it will be necessary to implement suitable changes to infrastructure.

These recommendations were for not only Europe because they are based on the effect of noise studies across the world, mainly the USA, Europe and Australia.

Similar recommendations were used for road and rail travel although the thresholds were different because of the way aircraft noise is perceived by the general population. When it comes to aircraft noise, the current metrics are not suitable for discriminating low levels of background noise and can still cause problems of sleep interruption leading in the long term to disruptive behaviours in children, accidents and poor performance in workers.

As an example of this, in the autumn of 2018, I was continually woken between 4:45-5:00 am every night for about three months. This only resolved itself when daylight saving ceased. I later found the cause to be two A380 aircraft flying at about 28000 ft over my residence on their way to Auckland Airport via the Sydney waypoint. These aircraft would have been in cruise flight and the noise would have been about 45 dBA L_{max} for each aircraft.² Disturbed sleep cause a number of knock-on effects such as workplace accidents, poor attention spans in children leading to educational disadvantage and have been linked to stroke, heart disease and hypertension³.

The background noise at night near my residence is between 18 and 23 dB L_{A90} indicating a low environmental background noise level. As a consequence Aircraft noise is an intrusion on this background and is readily distinguished from other natural and transport noises. Because levels of 45dBA L_{max} are capable of causing disturbed sleep, it is clear that current guidelines for overflight of aircraft are inadequate. In most inner suburbs around major city airports such as Perth, Brisbane or Sydney the average background noise levels exceed 55dbA $L_{eq,A}$ throughout the night. Therefore, aircraft noise in an inner urban suburb is not as intrusive as in areas of lower background noise such as outer suburbs of cities, farmland or natural parks and World heritage areas.

¹ Environmental Noise Guidelines for the European Region, World Health Organization Regional Office for Europe, www.euro.who.int, 2018. ISBN 978 92 890 5356 3.

² Data taken from <https://www.nats.aero/environment/noise-and-emissions/measuring-noise/lmax/> and regression fitted for height of A380 aircraft. Arrivals L_{max} (95%CI) = 41.3(13.8) dBA; Departures L_{max} (95%CI) = 49.3(16.3) dBA.

³ Noise annoyance - A modifier of the association between noise level and cardiovascular health? Babisch W; Pershagen G; Selander J; Houthuijs D; Breugelmans O; Cadum E; Vigna-Taglianti F; Katsouyanni K; Haralabidis AS; Dimakopoulou K; Sourtzi P; Floud S; Hansell AL, Science of the environment, 452, 50-57, 2013, <https://dx.doi.org/10.1016/j.scitotenv.2013.02.034>.

Furthermore, there is considerable scientific research on aircraft noise which demonstrates that current noise indicators do not properly match perceived noise in the community. There seem to be two problems, the first is tonal in nature and stems from use of the A-weighting which de-emphasises the lower frequencies between 20 and 800 Hz compared to the true noise. The second is the loudness of the noise. Both lead to increase annoyance and poor task performance.^{4,5} The research suggests a tonal correction to the noise of 7dB for the night and 5 for the day would be sufficient and is similar to the correction values suggested in ISO1996-2:2017.⁶

The current noise measurement parameters used for noise, such as dBA, dBC, LaeqT, DNL, SELA, SELC, PNL, PNLT, EPNL etc., while having strict definitions in themselves cause confusion to the general lay person who might be trying to understand how a change in flight paths will impact them or their community. Furthermore, from a professional perspective, without inclusion of 95% confident levels in quoted Government and professional papers makes a mockery of the measurements particularly as much of the uncertainty and scatter in these measurements are not quantified and can be over several magnitudes due to presentation on a logarithmic scale. There is currently a disconnection between the perceived noise in communities and those that Government uses for land use planning and aircraft noise predictions. As a result there are community groups around all the major city airports and a few country towns that are raging against current and proposed flight paths.

In his criticism of the EIS into Western Sydney Airport, Dr Ancich⁷ make the valid point: *“The conclusion of this study is that measurement of noise generated by aircraft in flight has demonstrated that variability in the height of aircraft will result in a wide range of receiver noise levels. This variability in height and the commensurate variability in noise levels will increase the noise impact over Blacktown and the Lower Blue Mountains compared to that predicted in the EIS. The study raises questions as to the reliability of noise level predictions in the EIS for aircraft noise impacts on other areas affected by the WSA as it appears that the variability in height of arriving and departing aircraft was not considered in the EIS”*.

There seem to be several contributory factors. Aircraft do not follow a strict path especially during climb and this means the height can be 2000ft too low or too high. This does affect how an overflight is perceived. The perceived noise is relative to background noise. The background noise affects whether a louder noise causes annoyance. Another factor is the assumption that a building with an open window attenuates any sound by 10dBA. Where this figure comes from is unclear even though it is quoted in the Australian Standard.

⁴ How tonality and loudness of noise relate to annoyance and task performance, Joonhee Lee, Jennifer M. Francis and Lily M. Wang Noise Control Engr. J. 65 (2), 71-82, March-April 2017

⁵ Subjective Evaluation on the Annoyance of Environmental Noise Containing Low-Frequency Tonal Components, Miki Yonemura, Hyojin Lee and Shinichi Sakamoto, Int. J. Environ. Res. Public Health 2021, 18, 7127. <https://doi.org/10.3390/ijerph18137127>

⁶ ISO 1996-2:2017, Acoustics — Description, measurement and assessment of environmental noise — Part 2: Determination of sound pressure levels. <https://www.iso.org/standard/59766.html>.

⁷ Assessment Of Measured Aircraft Noise Levels Under the Existing Flight Paths of Sydney Kingsford Smith Airport With Reference To Western Sydney Airport, Eric J Ancich, Report No 9173-R1, March 2019.

There is a great deal of difference between a background of 60dBA for a 70dBA noise compared to a background noise of 30dBA. The former is perceived to be double the loudness while the second is perceived to be 16 times as loud. You are therefore more likely to get complaints from areas with lower background noise, particularly at night when background urban noise is usually lowest. The obvious metric that is required is one based on ambient noise levels as this automatically takes account of low levels of noise. If this was done, then not only problems with aircraft noise can be addressed but other sources of noise causing distress in the community can be addressed.

Over Flying of World heritage Areas and National parks

Policy review Inclusion – The Policy Review process must incorporate a standardised approach to reducing noise within sensitive recreational areas that takes account of the benefits of these areas to the wellbeing of Australians and to the environment.

Justification for Inclusion in Review

National Parks and World Heritage areas are a source of well being for Australians as well as a source of employment and source of tourism from international and interstate visitors. They also provide natural ecosystems which are relatively free from human incursion (even if threatened by climate change).

In the USA and Europe a limited study of overflights by myself using flightradar24 of world heritage sites found that the only aircraft on commercial routes were well in excess of 28000ft in height and most were over 35000ft. All other flights including nearby airports for tourism were routed around the Parks.

In contrast, flights in Australia such as departures from Kingsford Smith Airport routinely fly on three routes, to the Katomba and Kandos waypoints with aircraft crossing the World Heritage Area of the Blue Mountains and over Wollemi National Park towards Cassilis. Aircraft heights can be as little as 11000ft (Lmax approximately 62dBA) to 20,000ft (Lmax approximately 54dBA). The terrain needs to be taken into account for aircraft noise as the height at Katoomba waypoint is 3200ft making the noise more like 56Lmax than 54Lmax. Before the lockdown in 2020, the number of overflights across the Mountains varied on a daily basis; between 11 and 68 noise events per day in the upper mountains and 42 to 115 noise events per day in the lower mountains.⁸ The variation of noise is highly dependent on the weather and which runway was in use for each of the aircraft. If aircraft are taking off from Kingsford Smith to the south (runway 16R) then a route via the Royal National Park to Glenbrook to Katoomba would see the aircraft on average flying some 2000ft higher across the Blue Mountains than if they had taken off to the North (runway 34L). As a result there is a significant difference between the upper and lower mountains in measured noise. There is also a large variation in tracks due to height constraints used in instrument departures which are dependent on the aircraft type as to how soon those points are achieved. Different distances are due to differences in weight and thrust of each aircraft.

The benefits of having low noise areas are not included in aviation thinking at the present time, even if transport noises may impact as well. For example, when walking along Narrow Neck

⁸ GREATER BLUE MOUNTAINS AIRCRAFT NOISE MONITORING, Marshall Day Acoustics, Prepared for Blue Mountains City Council, Rp 002 20170310, 1 December 2017.

in the Blue Mountains National Park during the early lockdown in April 2021, I was struck by the absence of noise from transport sources particularly road and aviation sources. For once you could clearly hear Lyre birds in the valley below Narrow Neck. A year later as things were starting to open up but without international air travel, it was very obvious that part of the problem is the road noise from the Great Western Highway, but not as great an intrusion as when aircraft returned to flying as well later in 2022.

It is therefore important that the review considers the benefits of national parks and World Heritage areas for the well-being and relaxation of the general population in addition to the more obvious tourism benefits. Overflights, unless they are above 28000ft (or as in the USA above 35000ft), should be limited to as few overflights as possible. In this regard overflights of these sensitive areas needs to be regulated:

- By quantified overfly limits,
- Enforcement measures and penalties, and
- Publicly available monthly information for oversight.

This will require assessment of aircraft instrument waypoints and routes. As well as height designations for departures.

As an indication of the problem for Western Sydney, Glenbrook is 22km, St Marys is 16km and 13km for St Clair from the northern runway threshold of Western Sydney Airport. Each will have aircraft from Western Sydney Airport when it opens with noise levels of 63-73dba Lmax, 66-76dba Lmax and 70-80dba Lmax respectively for each aircraft. The noise levels from daily take-offs and landings are totally unacceptable in this modern age and proper compensation for insulation will be required over a significant part of Western Sydney.

The current Building Code does not address noise standards.⁹ Consequently all the new housing that is going into housing estates in Western Sydney have no regulations regarding protection against aircraft noise. It reinforces the need to implement WHO recommendations for review of noise prevention methods in the community.

The Future of Air transportation

Changing technology in aviation introduces a number of risks that pose a greater threat than at present. I will briefly discuss three areas:

- UAV (Drones) - Remotely and auto piloted aircraft that can travel intercontinental distances.
- UAV (Drones) -Remotely and auto piloted aircraft that travel internally within Australia.
- Introduction of Hydrogen fuelled aircraft.

<p>Policy review Inclusion – The Policy Review process must incorporate a standardised approach to introducing remotely operated aircraft for freight to airports and whether they should be kept separate from passenger air-services at the major hubs.</p>
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⁹ National Construction Code 2023. Volume two is for housing and contains no reference for noise insulation in sections for cladding or glazing. Volume one is mainly for commercial buildings but does include shared accommodation. Again there is no reference for noise insulation.

Justification for Inclusion

UAVs (Unmanned Aerial Vehicles) operate with varying degrees of autonomy ranging from remotely piloted aircraft to fully autonomous onboard computer systems. The aircraft types used can therefore range from use of existing large freight aircraft such as the Airbus A350s or Boeing 777s through to electrically operated drones carrying freight over local distances.

All UAVs introduce risks that are not presently there in civilian use, or which will greatly exacerbate current risks due to completely different risk profiles in their use, even though UAVs have been used for several decades by the military.¹⁰

Trials have taken place in the USA with UAVs which have led to the introduction of legislation for identification of such aircraft.¹¹ There are three ways in which identification can occur;

- Standard broadcasting of identification, location and performance of the Unmanned aircraft and control station.
- Having a remote broadcast module on board that gives information of identification and time marked messages of information from take-off to shut down.
- No formal identification mechanism due to being home built or were built before this regulation was introduced. They have to fly within FAA designated areas and have visual site of the aircraft.

Similarly, CASA are undertaking trials for airspace authorisations within 3 km of airports to support safety outcomes and allows licensed operators of drones to fly into prohibited zones.¹² CASA also give information on what dangerous goods classes are on board aircraft and the allowable quantities.¹³ It is unclear how this affects remotely piloted international aircraft.

The ability to intercept or change the course of such freight aircraft pose a significant national security risk as the control is outside of the country and has to rely on Intelligence agencies intercepting messages of plots. A good example of this type of risk is the placement of Western Sydney Airport within 12 km of Warragamba dam. The approach to runway 05 has a 10 nautical mile approach waypoint where a slight deviation at the end of a flight can destroy Warragamba Dam before any missile interception from Orchard Hills armament depot can occur. Resulting in a 5 year loss of portable water and a multi-trillion dollar loss to Australia's GDP.¹⁴ A copy of the submission to the NSW Government is appended to this submission.

Similar risks from overseas operation occur to facilities outside of all urban centres. Consequently, it is important that such risks are taken into account within the policy

¹⁰ Southcott, G. (2011). Remotely Piloted Air Systems on Trial and in operations. *The Journal of Navigation*, 64(1), 1-14. doi:10.1017/S0373463310000433.

¹¹ <https://www.faa.gov/newsroom/remoteid-final-rule>, April 21 2021.

¹² <https://www.casa.gov.au/drones/industry-initiatives/automated-airspace-authorisations-trial#>

¹³ <https://www.casa.gov.au/operations-safety-and-travel/safety-advice/dangerous-goods-and-air-freight>

¹⁴ Submission on State Significant Infrastructure Proposal, Application Number SSI-8441, EPBC ID 2017/7940 Warragamba Dam Raising, AR. Green, ARGSAB Pacific, Microsimulation Risk Group. 12 December 2022,

framework as it cannot be dealt with using conventional risk techniques due to the complexity of interacting factors.

The use of electric drones as a means of delivery of goods is increasing particularly across major cities. These can intersect with flight paths particularly approach and departures. While currently such flights are allowed to registered pilots for these operations and as indicated above CASA are trialling the use of airspace around airports, there seems to be little consultation with the general public about pathways. Policy needs to be developed in consultation with communities that use or are likely to use these facilities. It also needs to be flexible enough that allows this market to grow.

Policy review Inclusion – The Policy Review process must incorporate a standardised regulatory approach to introducing hydrogen fuelled aircraft and other associated technologies.

Justification for Inclusion in Review

Hydrogen has been touted as a clean and green fuel replacement for hydrocarbons in aviation.¹⁵ At the current rate of growth in aviation even with a 2% reduction of emission per annum, the emission in the atmosphere would double. Use of hydrogen as a replacement was estimated to reduce emissions by 50-75% in that time if sufficient aircraft were hydrogen fuelled.

There are however several technical problems to overcome for large scale use that needs significant research and development. The pace of this can be slow. I was reminded of a visit to Imperial College London in 1990 while on a study tour to gather information related to the hybrid explosion at Moura 4 coal mine. A hydrogen detonation engine was demonstrated to me. Now more than 30 years later we are starting to see realistic use of hydrogen. This visit also reminds me of the detonation risk that can be associated with the use of Hydrogen as a fuel at refuelling and ground transport at airports as the clearance distances for detonations are much larger than for deflagrations normally associated with current aircraft fuels.

Another potential problem in moving to hydrogen in aviation is the different type of pollution that is produced compared to synthetic fuels aimed at reducing CO₂ emissions. Increased Water vapour, high in the atmosphere, cirrus cloud production and contrails are all some of the consequence. The purity of the hydrogen is important due to the fact that burning it is a chain reaction in which hydroxyl radicles and other radicles are produced which can react with impurities such as NO_x and SO_x as well as naturally occurring elements such as chlorine and bromine which occur naturally from land and ocean sources. The introduction of Hydrogen aircraft increases the risk of Ozone depletion in the stratosphere. This layer is between 23000ft at the poles and 66000ft at the equator,¹⁶ well within the height of current aircraft in mid to high latitudes. While some effects are predictable, the long term effects on altering the ozone protection of the planet, are not predictable, if hydrogen at scale is used for fuelling aircraft.

¹⁵ Hydrogen-powered aviation- A fact-based study of hydrogen technology, economics, and climate impact by 2050, May 2020. https://wayback.archive-it.org/12090/20220604222148/https://www.fch.europa.eu/sites/default/files/FCH%20Docs/20200720_Hydrogen%20Powered%20Aviation%20report_FINAL%20web.pdf. A report prepared by McKinsey & Company for the Clean Sky 2 JU and Fuel Cells and Hydrogen 2 JU.

¹⁶ <https://en.wikipedia.org/wiki/Stratosphere>

Policy needs to ensure that enough studies are undertaken on the use of liquid hydrogen, and aircraft emission before hydrogen use is allowed and a regulation framework enacted to ensure safe operation on the ground and in the air.

Climate Change and sustainable futures

<p>Policy review Inclusion – The Policy Review process must incorporate a standardised approach to climate change across all transport portfolios, not just aviation.</p>
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Aviation policy needs to be brought squarely within measures to combat Climate Change. As discussed above, the emission produced by the use of avgas and aviation fuels are unsustainable for a zero emission economy.

A real problem from an Australian perspective is that Federal and State Governments tend to compartmentalise transport including air travel. There are two consequences. First, the public perceive that governments are corrupt and only invest in solutions that benefit sector investors and lobbyists. Secondly there is no overarching policy that is fit and sustainable against climate change which properly allows growth of industry and growth in regional areas. There is no policy which assess where different forms of transport is prioritised for particular distances as a mean of producing a sustainable outcome against climate change.

Research has shown that air-transport is only sustainable and efficient on current criteria over distances greater than 1200km. High speed rail is sustainable and efficient over distances of 300km to 1200km at present with commercial speeds of up to 350km/hr. Of course this efficiency distance might increase if speeds for high speed rail were increased to 400km/hr. Below 300km distances, the use of trucks and cars can be more efficient than air transport modes.

Appended to this submission is a paper I wrote for Jobs for the West program in NSW in 2019. The paper shows that a network of highspeed rail is capable of transferring freight and passengers that is sustainable and can be used to develop regional areas as well as transfer the bulk of freight to within 100km of their destination.¹⁷ An Australian Ultra-high speed rail network in Eastern Australia could transform Australia. While this paper expresses a personal perspective, many of the elements provide an overarching approach to climate change that is sustainable and provides significant opportunity for all forms of transport including aviation.

Currently each type of transport and their reviews are kept in separate policy silos with little if any overarching review of what is really in the best interests of the Australian people, Australian manufacturing and resource use, and regional Australia into the future.

It should be remembered that the introduction of ultra-high speed rail in many European countries has not harmed the aviation sector. In Australia with a relatively low dispersed population such a transformation can enhance local manufacture of automation products for export as well as export of local products in freight. It can also enhance general aviation around the main cities due to taking pressure off local passenger air traffic as High speed rail becomes a more effective transport mode between major cities.

¹⁷ Trains not Planes: Why Australia needs an Ultra High Speed Rail Network, AR. Green, 4th March 2019. Prepared as part of Jobs for the West program.

There needs to be a policy review that assess how integration between different forms of transport can operate and enhance regional manufacturing and exports, through an integrated and sustainable approach across all transport modes rather than continue the present silo approach to policy.

Conclusion

To ensure the sustainability of the aviation industry into the future it is imperative that the issues highlighted in this submission are more specifically enunciated in the Review's Terms of Reference and appropriately addressed in the associated Green Paper, White Paper and future Aviation Policy.

I have recently been informed that the terms of reference have been fixed. If this is the case, then the community consultation process is being undermined from the start and indicates that the Department is only interested in maintaining the current imbalance rather than producing a flexible and Just policy for the next few decades.

It is important that policy also includes penalties for failure to undertake progress towards noise and climate change targets. Such policies should have the ability to be monitor the progress of change and have associated enforced penalties that are policed by an independent body.

Dr AR Green,
7th March 2023