



Australian Acoustical Society

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*Divisions established in New South Wales, Queensland, South Australia, Victoria and
Western Australia*

Aircraft Operations
Aviation Environment Branch
Department of Infrastructure, Transport, Cities and Regional Development
GPO Box 594
CANBERRA ACT 2601

Dear Sir / Madam,

The Australian Acoustical Society (AAS) became aware that the Department of Infrastructure, Transport, Cities and Regional Development is undertaking a review to determine the appropriate scope and breadth of future noise regulation for remotely piloted aircraft (drones) and urban air mobility (UAM) aircraft. Unfortunately, our attention was only drawn to the submission process late in the public exhibition phase. However, as a key stakeholder, we believe it important that we provide a submission.


In this respect we approached one of our members who provided the AAS with an assessment of the Issues Papers. Had time permitted, it would have been preferable to provide a submission that consulted more widely with our membership. However, Dr Rob Bullen is well known for his high level of expertise in aircraft and helicopter noise assessment, and for his role on relevant Australian Standard Committees. We are therefore comfortable in submitting his assessment on behalf of the AAS, with the caveat that there may be other issues that our members may wish to raise both individually and later in the development of any specific guidelines for drones and UAMs. I have attached both the submission and a copy of Dr Bullen's resume.

Going forward, we would welcome the opportunity to represent on any working group.

As a key stakeholder we would also appreciate being included on any future notifications regarding noise issues. Our General Secretary can be contacted to notify members at: [REDACTED]

I am also happy to be personally contacted at: [REDACTED]

Yours sincerely,



Jeff Parnell

22/11/19

Vice President

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19 November 2019

Jeff Parnell
Australian Acoustical Society

COMMENTS ON ISSUES PAPERS – REMOTELY PILOTED AIRCRAFT AND SPECIALISED AIRCRAFT

Dear Jeff,

As requested, this letter sets out comments on the above two recently-released issues papers. Separate comments are provided for each paper.

Review of the Air Navigation (Aircraft Noise) Regulations 2018 - Remotely Piloted Aircraft

The above paper concerns noise issues associated with remotely piloted aircraft (RPA or drones) and urban air mobility (UAM) aircraft. It:

- discusses the current regulatory framework that would apply to noise from these types of aircraft; and
- canvasses options for developing a more comprehensive framework.

Issues associated with RPA aircraft (“drones”) and UAM aircraft will be discussed separately.

RPA Aircraft (“Drones”)

Adequacy of Existing Regulatory Regime

With respect to noise from drones, the paper concludes that it is unclear how the current framework for controlling aircraft noise would apply to this emerging technology, and to the extent that existing regulations covering aircraft noise were applied, they would probably be inappropriate.

I am in agreement with this conclusion. The current Australian aircraft noise framework is based on controls placed on aerodromes. It assumes that the number, type and timing of aircraft operations can be controlled, or at least predicted, by the operator of the aerodrome. In the case of a proposed significant change to aircraft operations, it is the aerodrome operator that will in practice be required to produce predictions of the resulting noise impacts; compare these with standards (based on nationally-accepted guidelines and/or local regulations); and present the results to an approval authority (which may include the Commonwealth Department of the Environment, Airservices Australia, or the local council depending on the size and significance of the aerodrome). The possibility that

residents may be affected by noise from two or more aerodromes is considered remote, and it is assumed this can be handled as a “special case”.

In contrast, noise from drones will arise from multiple sources, and the routes flown and times of use are essentially unpredictable. It is not considered feasible to require individual operators to manage noise from these aircraft in the way that aerodrome operations are managed.

Noise Impacts and Control

For any intermittent noise such as from traditional aircraft or rail traffic, reaction depends on:

- the noise level from individual events;
- the number of events per day;
- the time of day at which the events occur; and
- possibly other factors including the history of noise exposure from the particular source.

Units such as ANEF combine the first three of these factors into a single index. However, experience has shown that while this is useful for land use planning in the presence of existing noise, it is less helpful in understanding reaction to newly-introduced noise, which will be the relevant case for drone noise for some time to come. In addition, as noted above it is difficult to envisage how such an index could be predicted, or what body could enforce compliance with all three of these factors.

Hence it would seem reasonable from both a theoretical and a practical point of view that noise levels and numbers of events be controlled separately, under different regimes.

Noise from Individual Events

The noise emission levels of drones could be controlled under a national testing scheme similar to Australian Design Rule 83/00 for motor vehicles. The exact acoustical units to be used in testing could be determined at a later time, but I would recommend against complex, opaque units such as Effective Perceived Noise Level and in favour of simpler units such as A-weighted L_{max} or SEL at certain defined locations during a defined fly-by. The certified noise level would allow drones of that type to fly in certain specified areas and under certain conditions.

The most lenient (or no) restrictions would apply to drones performing medical, firefighting, beach surveillance or similar work. Progressively tighter restrictions would apply to drones permitted to operate under Standard Operating Procedures (SOPs); in rural areas; and in built-up areas. Some exemptions may be reasonable, for example for aircraft under 250 grams.

If at some point in the future an international testing regime for drones were instituted, similar to that for traditional aircraft, then clearly this would take precedence over any Australian system. However, in the meantime, development of an Australian system

appears to be necessary to allow for industry regulation. Testing would most appropriately be under the control of Airservices Australia, who could of course outsource the actual conduct of the testing.

In selecting appropriate control levels, the most problematic case would be for non-SOP operations in built-up areas. The control level should be set to provide an appropriate minimum level of impact given other restrictions on numbers of operations in these areas (see below). Little research is available on specific noise impacts from these aircraft, although one study (Christian and Cabell, *“Initial Investigation into the Psychoacoustic Properties of Small Unmanned Aerial System Noise”*, <https://ntrs.nasa.gov/search.jsp?R=20170005870>) indicates annoyance from a drone may be about 5 dB higher than from a delivery truck at the same A-weighted SEL, which would be consistent with results for traditional aircraft. Based on evidence available to me, the maximum allowable noise level in these areas should be chosen to provide a level of about 70 - 75 dBA L_{ASmax} at the nearest residence not involved in the operation. However, this determination definitely requires further study.

Numbers and Times of Events

Especially in the case of non-SOP operations in built-up areas, it is considered necessary to apply restrictions on the numbers and times of drone operations that are heard by an individual resident. Applying such a restriction will be challenging, but unrestricted operations, even by drones with certified noise levels, are considered likely to cause significant reaction which could damage the standing of the industry and potentially result in more stringent regulation than would otherwise be warranted.

The simplest option would seem to be to provide permits to fly a limited number of operations per day within designated areas, with the total number of permits being capped, providing certainty for residents that no more than this number of events will occur. Points to be determined include:

- the size of the relevant permit areas – I envisage no larger than a postcode area;
- the definition of “within the area” – possibly defined simply by the location of the destination, with separate permits applying for designated origin locations;
- determination of which operators will receive the limited number of permits. One alternative would be an auction, similar to the “slot auctions” used at some airports;
- how to cater for operators who may wish to fly large numbers operations on a very infrequent basis;
- time-of-day restrictions – possibly separate permits would be required for daytime (7am-7pm) and evening (7pm-10pm) operations. I suggest that, at least initially, no operations be permitted between 10pm and 7am.
- what body would administer the permits; and of course
- the actual number of permits allowed in various areas.

With respect to the administering body, there are a number of competing considerations including the following.

- The number of allowed operations also impacts on safety, which is of course a preeminent concern, and it may be useful to vest the control of numbers of drone operations for safety and for noise in a single body. On the other hand, it is likely that relevant numbers of operations to control noise impact will be significantly lower than required for safety, so a safety-oriented body such as CASA may not be the appropriate choice.
- It is likely that local communities will want to be consulted about the number of permits issued for their area, and such consultation is most appropriately conducted by local government.
- Complaints are most likely to be directed to local government, who would be in the best position to investigate whether a non-compliant drone has been used or whether permit restrictions have been breached.
- Administration of the system, while not requiring detailed technical knowledge, would be time-consuming, and may result in unnecessary duplication if performed at the local government level. Food delivery operators, for example, may not wish to deal separately with each local council to obtain permits to operate.

Proposals in the Review Paper

Section 2.7 of the review paper sets out proposals for regulation of noise from drones. These are reproduced here, with comments.

- a. *Concentrating Commonwealth noise regulations for drones on their air navigation (not their base of operations) based on:*
 - *drone size, weight, and design;*
 - *tested noise levels e.g. effective perceived noise in decibels, sound level, L_{AMax} (the maximum noise level reached) or weighted noise levels which are used for traditional aircraft;*
 - *operational height and location e.g. commercial/ industrial/ residential/ rural/ remote areas; and*
 - *particularly in built-up and residential areas, the use of restrictions based on total number of flights per day, the duration of flight, how many flights per hour and time of flights (day/night).*

This is consistent with the views above, except that the number of potential categories of regulation appears excessive, with separate regulations for commercial / industrial etc and also for flight duration and flights per hour. In addition, it is not made apparent that implementation of the final point, while necessary, will be difficult and will involve a different control regime to that required for control of individual noise levels.

- b. *Regulations not applying to recreational drones, all drones below 250 grams and drones operating under standard operating conditions.*
- c. *Regulations not applying to particular types of operations including emergency services, agricultural and other prescribed service operations (e.g. lifesaving patrols, essential medical supply delivery).*

These points are consistent with the views above.

- d. Drones that meet recognised international aircraft noise certification standards not requiring approval under the Regulations (as is the case now with other aircraft types).*

This is basically consistent with the views expressed above, but it should be noted that if an international testing regime for drones is implemented this would require substantial modification to, and possibly discontinuation of, the Australian testing.

- e. Benchmarking acceptable noise levels for overflying different land use areas (including residential areas) having regard to acceptable noise levels permitted from other similar noise generating equipment under State/Territory legislation*

This appears to simply amplify point a, indicating that limits on single-aircraft noise (while presumably administered by the Commonwealth) should consider existing State regulations and legislation. I suggest they should also consider relevant research on noise specifically from drones.

- f. Allowing noise regulation of drones by State/Territory Governments where this is consistent with the application of their regulations to other types of noise disturbance from operating equipment and not inconsistent with Commonwealth legislation.*

As noted above, I believe the most appropriate body to administer restrictions on numbers and times of operation in built-up areas is yet to be determined. However, if that body is determined to reside at State government level, these regulations should be entirely distinct from regulations for other types of noise disturbance. Interaction with Commonwealth regulation could occur with respect to CASA regulations regarding safety, and in that case the Commonwealth regulations should always prevail.

Summary

Details of a workable regime to control noise from drones clearly need to be considered carefully, taking account of available research as well as the interests of interested parties. This would best be performed through a workshop or series of workshops including all stakeholders as well as experts in the evaluation of noise impacts.

In this process, I believe that the following should be considered guiding principles:

- Controls should be proportionate to the purpose and location of the operation. Minimal controls would be required for certain safety- and health-related functions, as well as for operations by very light aircraft. Moderate controls (on noise level only) would be required for operations under Standard Operating Procedures, and for operations in rural areas.

- In the most significant case - non-SOP operations in built-up areas - controls should be exerted on all of:
 - the noise level from individual noise events;
 - the number of such events per day; and
 - the times of day at which noise events occur.

UAM Aircraft

Adequacy of Existing Regulatory Regime

As noted in the issues paper, operations by these aircraft are somewhat more easily compared with existing operations, particularly by helicopters. Operations would occur from specified locations which can be compared with heliports, and arrivals and departures can in principle be from any direction, although they can also be constrained to operate only within certain corridors.

However, it should also be pointed out that the current regime for controlling helicopter noise is fragmented, with no clear guidance from any national standard or guideline. Approval for a new helipad is subject to State-based planning regulations, but there is typically little or no guidance from State authorities as to how to assess the major environmental issue which is noise from the vehicles when in flight.

The advent of UAM aircraft is likely to bring this lack of guidance into focus, and hence the development of a national policy for assessment of both helicopter and UAM noise is considered important.

Noise Impacts and Control

The factors affecting noise reaction from these operations are the same as noted above for drones (and other intermittent noise sources). However, reaction may be different for events at the same nominal A-weighted noise level, due to differences in tonality, impulsiveness and other acoustic and non-acoustic factors. Once again it is important to understand these differences, based on research evidence, and how they affect the appropriate noise levels at which to apply controls.

In the case of UAM aircraft, the issues paper assumes that there will be designated “landing and take-off sites”, and the construction and operation of such a site will presumably require planning permission under State legislation. It seems clear that this would be the point at which controls on operations associated with the site should be applied. The problem is to ensure that these controls are based on appropriate measures of noise impact and, if possible, are consistent throughout Australia.

To determine noise levels from individual aircraft it would be possible to institute a regime of Australian noise testing for UAM aircraft similar to that envisaged above for drones. However, in this case it is considered more likely that an international testing regime would be instituted. In its absence it would be feasible to require the proponent of a take-

off/landing site to undertake their own testing of all aircraft proposed to operate at the site, and this would appear to be the simpler and cheaper option.

With regard to measures of overall noise exposure, it should be noted that measures designed for land use planning, notably ANEF, would be inappropriate for use in assessing the impact of a proposed new development. A much more useful basis would be the handbook "*Acoustics—Guidance on producing information on aircraft noise*" produced by the Australian Standards Association, which while it does not propose specific criteria, sets out the type and detail of information that would be required to make such a decision.

It is considered that the most appropriate way to address noise impact from this type of aircraft operation would be for a Commonwealth agency (potentially Airservices Australia) to produce a document setting out clear normative noise criteria for the assessment of proposed UAM operations. (It may also cover civilian helicopter operations.) The criteria would be based on the type of information set out in the above Standards Australia document, and may also reference Airservices' procedures for assessing proposed changes in operations by traditional aircraft.

State governments would then be free to take these normative criteria and incorporate them into their own planning assessment procedures. In my view they would almost certainly do so, thus achieving Australia-wide consistency.

Proposals in the Review Paper

Section 3.7 of the review paper sets out proposals for regulation of noise from UAM aircraft. These are reproduced here, with comments.

- a. *National noise regulation for UAM aircraft using noise levels based on aircraft with similar propulsion, i.e. helicopter, propeller-driven aircraft or tilt-rotor.*
- b. *Concentrating Commonwealth noise regulation of UAM's on their air navigation (not their base of operations) allowing for:*
 - *operational height and location e.g. commercial / industrial / residential / rural / remote areas; and*
 - *in built-up and residential areas, the use of restrictions based on total number of flights per day, the duration of flight, how many flights per hour and time of flights (day/night).*

As noted above, it is suggested that normative assessment procedures should be produced by a Commonwealth Government agency which may be taken up by State authorities in their planning approval process. The procedures would take account of noise levels, operating procedures including flight corridors, numbers of events and times of day of the operations. In this case, like many existing assessment procedures for similar noise, these procedures would probably be based on noise levels experienced at the nearest residence independent of the type of land use.

The control would be in the form of granting or not granting planning permission for the establishment of a take-off/landing site, and the application of appropriate conditions of approval.

- c. UAM aircraft that meet recognised international aircraft noise certification standards not requiring approval under the Regulations (as is the case now for other aircraft types).*

This appears to envisage that controls would apply to the noise levels from individual aircraft. Under the proposed regime it is not individual aircraft that would be approved, but take-off/landing sites. Tested noise levels from individual aircraft would form part of the requirements for approval, and can be obtained by the proponent.

- d. Allowing noise regulation of UAM aircraft by State/Territory Governments using their environmental protection regulations where this would be consistent with the application of these regulations to other types of aircraft such as at landing sites and not inconsistent with Commonwealth legislation.*

The proposed method of linking Commonwealth and State assessment procedures is detailed above.

- e. Requiring Australian Noise Exposure Forecasts to be produced by the aircraft operator around landing and take-off sites to identify and manage potential noise impacts.*

Production of ANEF charts is related to land use planning. Such documents may be useful in cases where there is proposed residential development around an already-existing take-off/landing site, but should not be used to assess proposed changes in operations or to describe noise impact to existing or potential residents.

Summary

The proposed regime for control of noise from UAM aircraft is based on the State planning approval process for a take-off/landing site. It is suggested that this should be based on direct, specific guidance from a Commonwealth authority, potentially Airservices Australia.

The process of determining the details of that advice would be the responsibility of the Commonwealth authority, but it is suggested that comprehensive consultation with relevant stakeholders would be essential in developing this guidance.

Review of the Air Navigation (Aircraft Noise) Regulations 2018 - Specialised Aircraft

For potential new supersonic aircraft, the review paper notes that existing assessment procedures would be triggered by the advent of any such aircraft at any airport in Australia. In particular, the EPBC Act would require assessment of the community noise impact arising from those operations.

The concern expressed in the review paper is basically that it is not clear how such an assessment would be conducted, and what information it would be based on. The proposal is simply that the Department intends to develop a “full regulatory position” on supersonic aircraft based on current work on international standards.

It should be pointed out, however, that in an assessment under the EPBC Act it is up to the proponent (usually an airport) to justify the proposed change. I would expect that an airport proposing to allow supersonic aircraft would provide an Environmental Impact Statement that included all relevant information on noise impacts. This would be guided by a Departmental position if there was one, but in its absence the proponent would simply need to make its case as best it could. A full stated Departmental position has not necessarily been available in past assessments, but these have been presented and approved (or rejected) on their perceived merits.

Hence, although it would be valuable, a “full regulatory position” on noise impact from supersonic aircraft is not seen as an urgent necessity, even if such aircraft were to be a potential reality in the near future.

For historic aircraft, the concerns of the review paper relate largely to procedural issues rather than issues of actual noise impact. The only point that may be related to significant noise impact is:

- a. Considering whether different conditions or limits should be placed on private historic aircraft flights as opposed to those where the aircraft is being used as part of an air show or special event.*

Here there is concern that aircraft with an exemption from noise regulations on the basis that they are “historic” may be used for multiple flights on a private basis, which could result in significant impact. Here my position would be that a special exemption is provided for that aircraft’s operation at a particular event or for a particular purpose, and that these uses should be explicit in the exemption. If used at other times and for other purposes, there seems to me no reason why the same noise limits should not apply to these aircraft as to any other.

I trust that these comments are useful. If you would like further comment or explanation, please do not hesitate to contact me.

Yours sincerely,

ROB BULLEN CONSULTING

A handwritten signature in black ink, appearing to be 'Rob Bullen', with a stylized, cursive style.

Rob Bullen
Principal