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Advancing the interests of our members and the profession

By Email

15 June 2018

Mr Peter Bleasdale
Airport Planning Manager
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SYDNEY INTERNATIONAL AIRPORT NSW 2020

Email: peter.bleasdale@syd.com.au

Dear Peter,

AIPA COMMENTS ON THE AERONAUTICAL ASSESSMENT OF THE HAYES DOCK DEVELOPMENT PROPOSED AT PORT BOTANY, NSW

The Australian and International Pilots' Association (AIPA) is the largest Association of professional airline pilots in Australia. We represent nearly all Qantas pilots and a significant percentage of pilots flying for the Qantas subsidiaries (including Jetstar Airways Pty Ltd). AIPA represents around 2,400 professional airline transport category flight crew and we are a key member of the International Federation of Airline Pilot Associations (IFALPA) which represents over 100,000 pilots in 100 countries.

AIPA, through its Safety and Technical Sub-Committees, is committed to protecting and advancing aviation safety standards and operations. We are grateful for the opportunity to provide our views to Sydney Airport Corporation Ltd (SACL) on our concerns about airspace protection in relation to the proposed Hayes Dock development by Hutchison Ports Australia (HPA).

The HPA Proposal

HPA is seeking to install new Gooseneck Cranes in their Sydney International Container Terminals Limited (SICTL) facility at Port Botany that will operate to cover the full length of Hayes Dock. The proposed installation of four Gooseneck Cranes over the next five years will supplement existing Shuttle Boom Cranes to allow larger 8,000-13,200TEU vessels to load and unload at Hayes Dock.

The Problems

The HPA proposal creates two problems: one, the cranes are significant obstacles; and two, the larger vessels create turbulent wakes in strong winds.

OBSTACLE CONTROL AT AERODROMES

The ICAO Annex 14 Obstacle Limitation Surface

ICAO designed the OLS as the volume of airspace to be kept free from obstacles in order to minimize the dangers presented by obstacles to an aircraft, either during an entirely visual approach or during the visual segment of an instrument approach. In addition to flight safety, ICAO considered the purpose of the OLS was to protect a volume of airspace to preserve the accessibility (regularity) and efficiency of the aerodrome.

While the flightpath variations that underpinned the original design have reduced with technological development, there remain plausible scenarios where controlled or partially-controlled low-level visual manoeuvring may take place in relative proximity to the runway. The OLS transitional and inner horizontal surfaces provide some protection for unplanned or emergency visual manoeuvring, even where the more formal and standardised circling from instrument approaches or normal circuit procedures are not permitted

Penetrating the OLS

The proposed development of Hayes Dock involves the penetration of two of the spatial surfaces that form part of the existing Obstacle Limitation Surface (OLS) for Sydney Airport. Importantly, the nature of the penetrations is different – one is temporary and one is permanent.

The temporary penetration relates to some fully loaded ships infringing the Transitional surface while in the shipping channel entering or leaving the dock. While undesirable generally, AIPA considers the risk associated with the temporary penetration as tolerable.

The permanent penetration of the existing OLS in relation to the cranes at Hayes Dock is of the Inner Horizontal surface, which overlays the shipping channel and the Dock. That surface has a nominal height of 45m above the runway, which translates into a height of 51m above the Australian Height Datum (AHD). The Gooseneck Cranes will penetrate the OLS Inner Horizontal surface by a substantial 29.5m.

Through IFALPA, as well as our own direct involvement with the ICAO OLS Task Force, it has been established that the purpose of the OLS is to define the limits of airspace intended for safe operations (safety and accessibility/regularity objectives) at, and in the vicinity of, aerodromes and to safeguard aerodromes from excessive growing of obstacles (accessibility, efficiency and capacity objective). It follows that any penetration of the OLS must have consequences for each of those objectives.

AIPA is generally opposed to penetrations of the OLS and particularly under the current approval regime.

Our opposition stems from many concerns, ranging from the lack of transparency in the decision-making process to the almost complete imbalance in the grounds for approval on the one hand and, on the other, in the duty for the proponent to fully identify and justify the consequences of the penetration. Critically, the approvals and their long term consequences for safety, accessibility/regularity, efficiency and capacity objectives are not only for the most part irreversible, but also act as precedents for other penetrations that act to cement, if not accelerate, those consequences.

The AvLaw document which purports to be an Aeronautical Impact Assessment highlights our concerns.

On page 8 of the Hutchison Ports Aeronautical Impact Assessment *Gooseneck Cranes as Port Botany* dated 23 March 2018, AvLaw states:

> This report has been prepared based on AvLaw's extensive experience in assessing and developing safety cases to support applications for penetrations of prescribed airspace and addresses the aeronautical issues relating to the proposed expansion activities of HPA at their base in Port Botany.

AIPA considers the document to be wholly inadequate as a form of safety case.

AvLaw is entirely cavalier in its approach to considering penetrations of the OLS, offering no assessment of the consequences generally or over Hayes Dock specifically. There is certainly no justification as to why any consequences should be accepted. The discussion of Circling Approaches is a rather egregious example: circling is permitted for RW 16R/34L but currently restricted for RW 16L/34R solely for a lighting issue but, according to AvLaw, never happens in practice, so we can happily ignore any issues. There is no mention that circling is a PANS-OPS procedure, unrelated to the OLS. However, while procedural variations due to emergency conditions are mentioned, the potential consequences of OLS penetrations in such circumstances are not discussed at all.

The AvLaw document only makes unsubstantiated assertions – there are no supporting arguments. It is far from what AIPA considers to be a safety case. As inappropriate as we consider that to be, it unfortunately appears to be an outcome encouraged by the state of the applicable law.

The Irony of the *Airports Act 1996*

Part 12 of the *Airports Act 1996* establishes a framework for the protection of airspace at and around the leased Commonwealth airports. The relevant regulations are the Airports (Protection of Airspace) Regulations 1996, commonly referred to as the APARs.

While AIPA shares the ICAO OLSTF view that airport safeguarding is fundamentally about establishing a framework that creates and maintains a sound economic balance between the use of air and ground space, it seems to us that the current *Airports Act 1996* framework works against that principle.

As AvLaw points out, subregulation 14(2) of the APARs specifies that"

"The Secretary **must approve** a proposal unless carrying out the controlled activity would interfere with the safety, efficiency or regularity of existing or future air transport operations into or out of the airport concerned" [emphasis added]

Naturally, this leads to AvLaw's self-serving assertions that the OLS penetrations do not create the identified interference. The APARs leave it to others to advise the Secretary if they do not share that opinion, but it remains the Secretary's sole discretion as to the weight put on those opinions.

Of course, the Secretary can approve a proposal subject to any conditions the Secretary considers appropriate, although once the penetration is in place, the proponent is only likely to have to bear the cost of lighting and marking (if deemed necessary), whereas the operational consequences are borne by the community at large.

Disappointingly, the pro-approval emphasis is essentially unfettered. In contrast to subregulation 14(5), which draws a line in the sand and prohibits long term penetrations of the PANS-OPS surfaces, subregulation 14(5) only prevents the Secretary from approving an OLS penetration if:

"…CASA has advised the Secretary that carrying out the controlled activity would have **an unacceptable effect** on the safety of existing or future air transport operations into or out of the airport concerned." [emphasis added]

AIPA suggests that a defensible set of tests to establish the boundary between acceptable and unacceptable effects would be most difficult to establish. It is ironic that a 1cm penetration of a PANS-OPS surface is statutorily prohibited, thus avoiding any assessment of the consequences, yet it appears a 30m penetration of the OLS either considered to have no real consequences or the consequences are too hard to identify in any meaningful way.

In any event, there is no transparent process whereby the opinions offered to the Secretary pursuant to regulation 13 or the decision of the Secretary can be examined by the public. Two of the great dangers AIPA sees in this lack of transparency are that there is no peer review or benchmarking of approvals of controlled activities under the APARs and there is limited or no visibility of the extent to which a particular airport's OLS is already compromised by previous approvals.

In this particular instance, does the fact that the Inner Horizontal has an approved penetration by an 86m AHD obstacle some 550m to the east along the southern edge of the dock render any particular assessment of this proposal moot?

Conclusions

AvLaw has provided no justification for its assertion that penetrating the OLS by 29.5m has no operational consequences.

Under the current legislation (applicable only to the leased Commonwealth airports), the threshold to be met to prevent penetrations of the OLS are impossibly high. As a result, there is effectively no protection of the OLS – a situation that AIPA considers to be unacceptable.

HAZARDOUS WIND DISTURBANCE OF AIRCRAFT AS A CONSEQUENCE OF LAND USE ON AND NEAR AERODROMES

AIPA has a significant involvement in the continuing development of NASF Guideline B and all issues related to the hazardous wind disturbance of aircraft as a consequence of land use on and near aerodromes. As a result of our engagement on these issues, we have seen a significant improvement in, not only Guideline B, but the approach of many proponents to assessing the related risks.

It is disappointing that AvLaw has not chosen to reflect the development in this space, but rather looked only at this development proposal as a compliance exercise. While AIPA respects the proponent's right to meet the minimum requirement, we do not consider that such an approach can reasonably form the basis of a true safety case.

The Assessment Area

AIPA has long held the strong view that the along-runway assessment length should match that recommended by NLR – 1500m – based on their seminal research that in all other respects has been adopted in Australia as world's best practice. In the particular case of the third runway (RW 16L/34R), the 1500m along-runway assessment length covers from each threshold to just before the high-speed exits. For RW 16L, approximately 25% of Hayes Dock is directly abeam part of the along-runway assessment length and, for RW34R, the full length of Hayes Dock is directly abeam the assessment length

Importantly, wind with a southerly component will create a turbulent wake from either a docked ship or a ship in transit in the shipping channel that impinges on the runway and needs to have a validated analysis that measures the windshear and turbulence rather than an arbitrary decision to exclude those winds.

We have attached Google Maps depictions of the full NLR length Turbulence Assessment areas for RW 16L and RW 34R to illustrate the appropriate geometry.

The Choice of CFD over Wind Tunnel Modelling

The choice of CFD modelling over wind tunnel modelling is open to the proponent. However, the *Windshear and Turbulence Assessment* doesn't elaborate on why the proponent considered CFD as the preferred assessment method, despite clearly noting at least one serious drawback in terms of the limited scenario evaluations.

AIPA considers wind tunnel modelling to be a well-established assessment methodology and shares NASAG's view that CFD is a rapidly evolving but far from standardised technology. In their July 2016 *Technical Review of Guideline B*, CPP made extensive comment about the complexities of CFD and the particular need for validation of the chosen coding to be verified in assessment reports. While the chosen software is identified and seemingly valid, at least in its primary purpose for modelling combustion processes in engines, it is not clear what turbulence model is used. A simple web search for the stated "k- turbulence model" suggests that the model may well be one of a wide range of "k-epsilon" or a "k-omega" models, each of which has limitations in terms of the output being sought and in validation for particular applications.

Our preference for windshear and turbulence assessments is for the threshold wind speeds for parameter exceedance to be identified for a range of wind directions appropriate to the particular runway being assessed, before examining the relevant meteorological data. In this way, scenarios are removed from further consideration by assessment rather than presumption.

In choosing the assessment technology, AIPA believes that the proponent must deliver an equivalent validated outcome and that the likelihood of the assessment failing to detect an operational risk must be as low as reasonably practicable. While we do not purport to be technology experts, we are guided by the caution expressed widely by acknowledged wind engineering experts and peer-reviewed research about the limitations of using CFD.

It appears to us that the choice of CFD modelling over wind tunnel testing may have precluded examining the full range of potential wakes, presumably from a cost perspective, due to the "computational intensity". In any event, AIPA considers that the assessment should not be limited by the proponent's financial decisions, particularly if the potential to identify unsafe conditions is missed.

The Scenarios

Despite excluding some scenarios due to presumptions about the assessment area, there is no discussion about establishing the worst case ship configuration for various easterly component winds. In this proposal, there is a worst case 'docked' scenario and there is a worst case 'transit' scenario.

There is only one 'docked' scenario considered, the '8/10/13.2' scenario. Inspection of Table 7-1 strongly suggests to us that a 'docked 13.2/13.2/8' scenario appears to be worth examining. Consideration should also be given to two ship scenarios with an empty berth in between.

The worst case 'transit' scenario is also worthy of assessment, despite the transit time of ships in the shipping channel being relatively short, because any landings (or take-off or go-around) that are coincident with the ship transit window are at some level of discernible risk.

While our initial view of the extensive inclusion of analysis of the '13.2/13.2/8 south' scenario was that it should have been excluded from the analysis, our more recent view is that it is a valuable illustration of the consequences of an accident. It is inferentially established that the '13.2/13.2/8 south' scenario would only apply if loss of ship control resulted in a 13.2k ship being grounded on the western edge of the Hayes Dock shipping channel. However, should such a contingency arrive, it is unlikely that the operational consequences of the ship's turbulent wake on the runway would be at all short-lived.

As a general comment, Table 7-1 is fairly sparsely populated and not comforting as evidence of a safety motivated analysis of potential risk to aircraft operations.

The Results

In subsection 6.1, the statement is made:

The figures show the top down views of the wind velocity results for all scenarios at 10m height above ground level, which is generally **the limiting height for wind shear**. [emphasis added]

Figure 6.5 appears to show exactly that outcome. However, in subsection 6.2, a contrary statement is made:

The figures show the top down views of the wind turbulence velocity results for all scenarios at 35m height above ground level, which was **the worst-case height for wind shear in most cases**. [emphasis added]

Coincidentally, AIPA is assessing a current wind tunnel assessment for a development proposal at a different airport that includes the following statement:

The study points were located on the centerline of the runway at the most critical locations for building induced turbulence, which are at building height directly downwind of the subject development, and half the projected width of the proposed building either side of this point. Additional points were tested at varying heights above and below building height (up to an height of 60m (200ft)), directly downwind of the subject development, to demonstrate that the most critical height was indeed building height. [emphasis added]

This latter statement appears to be largely in concert with the traditional building-induced turbulence literature, but somewhat at odds with the Hayes Dock CFD results. In the case of the modelled ships, the equivalent building height is 50m (the top of the container stack) for the 13.2K TEU ship, but that is not a height for which results are published.

AIPA is not in a position to resolve these apparently substantive differences, but some explanation seems warranted.

The Meteorological Data

One of the reasons that AIPA prefers the analysis to establish threshold levels for exceedance of the windshear and turbulence criteria before proceeding to establish the likelihood of that threshold wind speed and direction from historical data is to allow for real-time protection of the aircraft. Unforecast weather does occur and short term variations often occur at shorter time intervals than typically predicted. Flight crews can make better decisions if they are alerted to adverse conditions approaching those threshold wind speeds and directions.

The other difficulty we have is with the time analysis for likelihood such as used here. As the report notes, the data is both patchy and inconsistent in many cases. Data capture for continuous weather monitoring is a relatively recent event – some data that appears to be continuous may only represent 10 minutes in every half hour or hourly reporting cycle. Wind roses published on the BoM website represent data collected 10 minutes before 0900 and 1500 daily, averaged over many years, but revealing little about what really takes place at night particularly.

The report does make mention of the difficulties with the historical data, but it is not entirely clear how much of the data validly allows conclusions to be drawn with any great accuracy about the likelihood of wind of a particular strength and direction occurring and for how long.

Conclusions

The *Windshear and Turbulence Assessment* document is inadequate. It appears to be entirely motivated by minimum compliance rather than safety outcomes.

The decision to conduct the assessment using CFD rather than wind tunnel modelling appears to have resulted in very selective censorship of appropriate scenarios and assessment areas.

AIPA believes that more detailed analysis is required to ensure that all potential risks are identified and that the analysis tools are validated appropriately to ensure that the likelihood of the assessment failing to detect an operational risk must be as low as reasonably practicable.

Yours sincerely,

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Attachments: 1. Turbulence Assessment Area RW 16L

2. Turbulence Assessment Area RW 34R

Attachment 1 to
AIPA Letter to SACL
dated 15 June 2018

Attachment 2 to
AIPA Letter to SACL
dated 15 June 2018