5. Hansard, RRA & T 99-100

Senator Back asked:

Senator BACK—Sure. One of the frustrations that has come through today from people who are or have been members of the committee is their inability to get sufficient information that they can report back to their communities. The charge placed, I suppose, upon yourselves is an inability or unwillingness to table various reports which would help them in (a) understanding and (b) reporting back. For example, an environmental assessment was undertaken in the environs of Perth airport. Is it the case, and perhaps Mr Owen could answer this, that such an environmental assessment was undertaken and a report produced but that it is not available to that committee or to the wider community?
Mr Russell—Before Mr Owen answers that question, I might say that it has always been our intention to release this report. We have taken the opportunity to review 12 months of operation of the new air route changes in order to take into effect the seasonal variations in terms of which air route is used on what occasions, and our aim is to have that information completed and released very shortly—all of it.
Senator BACK—So we would expect to see that perhaps this financial year?
Mr Russell—I would hope within the next week.

6. Hansard, RRA & T 100

Senator Back asked:

Senator BACK—The second report that has been the subject of some contention is the safety audit, presumably conducted by CASA. That report is available to you but not to the committee. Is that correct?
Mr Russell—It was the subject of some freedom of information requests that were made, as we understood, to CASA last year. I think this issue has come up at Senate estimates hearings in recent times. There was a review by CASA of our terminal control unit operations here in Perth in 2003, and in addition to that we have a regular reporting system where every day we review safety incidents that occur in Australian airspace. Taking that report and the safety information that had come to our attention at around the same time, in the period of 2003 to 2004, we determined that there was a need for us to change the airspace. I understood that you already had some of that information in terms of the CASA audit, but I am happy to find you more information if that is what you would like me to do.

7. Hansard, RRA & T 106-107

Senator Back asked:

Senator O'BRIEN—We had evidence at the commencement today from John Macpherson, who was on the PANMCC. His submission is a private submission; it is not one from the department. He said in the context of WARRP:
The second issue with the effectiveness of the strategy was that the nature of the information provided on the ASA website describing the proposed flight path changes was too obscure and technical to be of use to persons other than aviation experts. I visited the website several times in response to circular emails advising that the site had been updated. However, I found that the information provided at that time consisted of a 'spaghetti' of flight paths with cryptic descriptive notes, overlaid on a map that did not show landmarks that would have enabled potential noise-affected areas to be identified.
Can this committee get copies of that material so we can understand what—
Mr Russell—The material that was put on our website?
Senator O'BRIEN—Yes.
Mr Russell—Yes, indeed.
Senator O'BRIEN—I would appreciate that so that we can understand the submission and how people reacted to it in the context of the information.
Mr Russell—Sure. We are happy to do that.
Senator O'BRIEN—In response to a question I asked Mr Macpherson he said he did not and as far as he is aware no other member of the PANMCC sought additional information about those maps, if I can call them that. Could you provide on notice advice as to whether that is true or not.
Mr Russell—I will take it on notice, but we do understand that there were emails and communication sent out during this period of the planning stages of the WARRP. To my understanding, we did not receive a whole lot of questions and feedback. Frankly, we expected them but we did not get them from the representatives on that committee. The problem from our viewpoint was that we assumed that no questions meant that people understood it. I think that was a mistake, quite frankly. I know in this organisation quite often I have to ask people to explain in plain English. I suspect that that was part of this issue. We will make that information available.
Senator O'BRIEN—So you have records that will show the nature of at least what the email conversation was about—
Mr Russell—In terms of the lead up towards?
Senator O'BRIEN—Yes.
Mr Russell—I am sure we can provide the emails and the website material.

8. Hansard, RRA & T 108

Senator Back asked:

CHAIR—How many—and I do not know the technical term—airspace reviews or route reviews at airports has Airservices Australia overseen?
Mr Owen—In terms of airspace reviews—
CHAIR—In a similar vein as Perth. I just want a rough number. You can take it on notice.
Mr Russell—Maybe we will. It does not happen regularly and it does not happen always quite on the scale of Perth, but there are changes that occur every few months or so. I am happy to take that on board and come back to you.

9. Hansard, RRA & T 112-113

Senator Back asked:

Senator SIEWERT—Can I ask one question about Jandakot? I am sure Senator Adams is going to go where I was just about to go with the monitoring. On Jandakot, we have had some evidence today that suggests that there is potential for a significant increase in noise at Jandakot in terms of bigger aircraft coming in, the landing strip has been upgraded to take heavier planes, et cetera. Have you been looking into that? What process has been undertaken in looking at that potential increase in noise in Jandakot?
Mr Russell—We are not aware of any larger aircraft operating into Jandakot over and above the volumes of light aeroplanes that operate in there at the moment.
Senator ADAMS—A 737 landing in there?
Senator SIEWERT—We had a report today that a 737 has landed there and the airport has been upgraded.
Mr Russell—I heard of that myself only this afternoon and it is something we will have a look at.
Senator SIEWERT—Could you take that on notice for us?
Mr Russell—It is not a regular movement of a jet aircraft into Jandakot so, yes, I will take that on notice.

Senator SIEWERT—The concern of the community is that the strip has already been upgraded.
Mr Russell—I do not know all the details but I will take it on notice.

AIRSERVICES AUSTRALIA

Office of the Chief Executive Officer

GPO Box 367, Canberra ACT 2601
25 Constitution Avenue, Canberra ACT 2600
t 02 6268 4182
f 02 6268 5685
ABN 59 698 720 886

Senator Fiona Nash
Chair Rural and Regional Affairs and Transport References Committee
Parliament House
CANBERRA ACT 2600

Dear Senator Nash

Thank you for your letter of 5 May 2010 forwarding questions from your Committee from the Perth public hearing for the inquiry into the effectiveness of Airservices Australia's management of aircraft noise.

The attached package includes answers together with supporting information. Also included in this package is material requested by Committee members during the Perth hearing.

Senator Back – Hansard pp 99-100

Please find enclosed the following requested reports:

- <u>Attachment 1</u>: Western Australia Route Review Project (WARRP) Environmental Post Implementation Review and original Environmental Assessment.
- <u>Attachment 2</u>: Independent noise monitoring report, which confirms Airservices' initial assessment.
- <u>Attachment 3</u>: Civil Aviation Safety Authority (CASA) Audit Report on Airservices Australia's Perth Terminal Control Unit.

The Perth hearing underlined community confusion about the process of a CASA Request for Corrective Action (RCA). Requests for Corrective Action are legally binding safety directives that must be actioned expeditiously to prevent potential safety breaches. There is limited scope for Airservices to delay action on these directives.

Sustained and unprecedented levels of growth in air traffic from about 2000 at Perth Airport highlighted that significant change was required to address growing airspace complexity and potential for aircraft confliction.

The CASA audit in 2003 found airspace limitations precluded pilot navigation or radar vectoring onto final approach for the Runway 03 Instrument Landing System. CASA therefore issued an RCA. This CASA finding was consistent with Airservices' own analysis of Perth's terminal and broader Western Australia airspace which is continually reviewed as part of our safety monitoring of operations.

WARRP was the solution to the issues identified by both CASA and Airservices. CASA endorsed all of the proposed changes to the air route structure prior to implementation.

Senator O'Brien – Hansard pp 106-107

Airservices is not aware of Perth Airport Noise Management Consultative Committee members seeking additional information on material provided by Airservices in the lead-up to the implementation of WARRP.

Attachment 4 contains relevant requested website and email information.

Senator Nash – Hansard pp 106-107

An Airservices Air Traffic Control (ATC) change proposal is any change in air traffic management practices that may affect aircraft movements. This includes proposals to alter or introduce:

- New or amendments to an instrument approach;
- A new or amendment to an existing flight path or air route;
- Re-classification of airspace;
- Change to preferred runways;
- Change in time of day of operation (eg. amendments to tower hours of operations – as the time of day that a tower operates may alter the flight path used by aircraft);
- A change to a support system that may influence the capacity or mode of operation of an ATC unit; and
- A change that allows use of a flight path / airspace by different type or number of aircraft.

Airservices conducts environmental assessments when it considers change proposals. There have been 30 of these assessments produced in 2010 (to date), 91 in 2009 and 74 in 2008.

There have been no other operational changes of a similar scale to WARRP over the past decade.

Senator Siewart – Hansard pp 112-113

In relation to Jandakot Airport, the Committee heard from a witness about a Federal Airports Corporation review for the potential leaseholder. Airservices is not aware of this report.

We have not observed a change to the aircraft mix or an increase in use by heavier aircraft. One recent exception related to the purchase of a Boeing 737 by Polytechnic West Aerospace Centre, which is based at Jandakot, for training aircraft engineers. We understand this was a one-off flight from Perth to Jandakot to join the centre's training fleet.

In conclusion, many of the submissions to the Senate Inquiry contained misconceptions and inaccuracies about areas that fall outside Airservices' legislated and regulated accountabilities. Under the *Air Services Act 1995*, our primary function is to provide services for purposes relating to the safety, regularity and efficiency of air navigation and as far as practical to minimise the impact of these activities on the environment.

I trust this information assists the Committee's deliberations.

Yours sincerely

Greg Russell

Greg Russell
Chief Executive Officer
21 May 2010

SENATE RURAL AND REGIONAL AFFAIRS AND TRANSPORT REFERENCES COMMITTEE

Inquiry into the effectiveness of Airservices Australia's management of aircraft noise

Questions to Airservices Australia

1. The members of the committee have heard terms such as PBN, RNAV and RNP mentioned. Please explain to the committee what these terms mean and are they relevant to Australian airports?

- Performance Based Navigation is a term used to describe the broad range of technologies that use satellite navigation sources and reduce aircraft reliance on conventional, ground-based radio-navigation infrastructure. An aircraft flying a PBN path uses onboard equipment and procedures to follow a defined trajectory.

- Area Navigation (RNAV) is a more basic form of PBN in which equipment onboard the aircraft calculates and follows a direct navigation path between two points, without the aircraft having to overfly intermediate, ground-based navigation aids. While RNAV paths are typically limited to straight lines, they represent an improvement over conventional, ground-based navigation in the sense they facilitate an aircraft flying a direct, straight route between two points.

- Required Navigation Performance (RNP) is a more advanced form of PBN with the aircraft's onboard navigation system, combined with satellite navigation, as opposed to ground-based navigation, providing enhanced safety through performance monitoring and alerting.

- A key feature of RNP is that it allows aircraft to follow precise, curved paths, eliminating the need to build routes out of straight-line flight segments. The ability to design curved paths is particularly important to airspace designers who are trying to design routes in congested airspace, around noise-sensitive areas, or through geographically challenging terrain.

- The International Civil Aviation Organisation (ICAO) is the United Nations entity that determines the standards under which civil aviation is regulated and administered. Australia is a signatory.

- Australia has agreed to ICAO Resolution 36-23 for introducing PBN and Approaches with Vertical Guidance. The Civil Aviation Safety Authority (CASA) published Australia's implementation plan in March 2010, with RNP one element of this plan.

- The CASA plan says RNP standards are the more capable of the two PBN specifications and is recognised worldwide as the navigation standard that should be adopted in the medium to long term to support improvements in safety, efficiency and the environment.

2. In December last year, *The Age* reported that Qantas was expanding its use of the latest generation of GPS-based navigation systems to some Melbourne flights and that the technology presents "a perfect flight path, gate to gate". The technology is referred to as RNP. Where are we currently in terms of the introduction of RNP systems in aircraft within Australia and what airports are using this technology for their arrival and departure procedures? The media report indicated that Melbourne was going live that month (3/12/2009) and that Perth and Sydney would follow soon.

- RNP-AR (see explanation Q 4) procedures have been used primarily by Qantas since 2006 as part of a CASA trial. Qantas trialled the procedures, at various stages, with 737-800 aircraft at 17 Australian locations: Adelaide, Alice Springs, Ayers Rock, Brisbane, Broome, Cairns, Canberra, Darwin, Gold Coast, Hobart, Kalgoorlie-Boulder, Karratha, Melbourne, Mount Isa, Port Hedland, Sydney and Townsville.

- CASA initiated the trial of RNP-AR in partnership with Qantas, Airservices Australia and Naverus in 2006. Post 2009, Airservices Australia took the decision to lead a national RNP-AR deployment on the basis of extending the potential safety, efficiency and environmental benefits demonstrated through the CASA trial to the broader aviation industry and the community.

- More recently Jetstar and Air New Zealand have utilised these trial procedures with Airbus A320 aircraft at Brisbane and Gold Coast Airports.

- Commencing 2010, Airservices Australia is now responsible for making RNP-AR available in line with International Civil Aviation Organisation and CASA standards. A five-year project to introduce RNP-AR at major Australian airports is underway. The procedures will be available to approved international and domestic airlines and a wide range of RNP-AR capable aircraft.

- The project is in the preliminary design phase for RNP-AR procedures in Brisbane and Melbourne, including looking at how the technology can improve environmental outcomes. Subject to safety and environmental assessment, and communication and consultation processes, Adelaide, Canberra, Cairns, Gold Coast, Perth and Sydney are intended to follow over the next two years.

- Tailored community consultation, consistent with Airservices' *Communication and Consultation Protocol*, will be part of each implementation process.

3. The Airservices Australia website has mentioned the Brisbane Green trial. How does the Brisbane project fit in with what has happened at Melbourne and what will happen at other airports such as Perth and Sydney?

- The Brisbane Green initiative was part of the CASA RNP-AR trial (refer Q 2) using existing flight path corridors.
- Melbourne and Brisbane are the first two Australian airports in the preliminary design phase of RNP-AR implementation. Perth and Sydney are among six locations (refer Q 2) intended to follow, in consultation with relevant communities, over the next two years.
- There were no RNP-AR flights in Perth under the CASA trial. At Sydney, one specific Qantas pilot using existing flight paths has flown a small number of approaches to assess the integrity, safety and efficiency of RNP-AR at a higher density terminal area and to better quantify the benefits.

4. What is RNP-AR? (Required Navigation Performance –Approval Required).

- RNP-AR is the highest performing type of PBN procedure. It offers the most benefit to users by allowing for predetermined, precise, curved flight paths that optimally navigate within an airspace to reduce track miles, conserve fuel, preserve the environment, and increase airspace capacity. These procedures require specific aircraft functionality and pilot crew training in order to be used.

5. The Airservices Australia Quarterly Report to Industry (December 2009) indicated that Airservices had developed RNP concept tracks for the first four airports (Brisbane, Melbourne, Adelaide and Sydney). Will Airservices provide copies of the RNP-AR "Concept Tracks" which had been developed by December 2009 and RNP-AR "Concept Tracks" which may have been developed subsequently to the committee?

- The “concept track” is a visual representation of the technology’s potential capability. It may not be flyable by airlines or compatible with air traffic control procedures from safety and efficiency perspectives. The “concept track” is not a preliminary design and public release would pre-empt the significant work required to construct a genuine proposal. It would be a misrepresentation to present a “concept track” as bearing any resemblance to a finalised RNP-AR procedure.
- The next stage of the design process, “preliminary design”, is more informed and contains sufficient testing and rigour to be considered a proposal and therefore appropriate for public communication.
- Airservices can provide RNP proposals to the Committee when they have reached the necessary level of development in the preliminary design stage.

6. How much of the detailed design has already been produced?
How much of the $10.7 million, that was set aside for this project, has already been committed?
How is this work progressing given the stated implementation of Q4 2010 for Brisbane, Melbourne, Adelaide and Sydney?

- $4.2 million has been committed on the entire design process for the eight identified airports.

- Melbourne and Brisbane are the first two Australian airports in the preliminary design phase of RNP implementation. Perth and Sydney are among six locations (refer Q 2) intended to follow, in consultation with relevant communities, over the next two years with preliminary design work already commenced on one track in Sydney. Airservices' *Communication and Consultation Protocol* will be applied to all preliminary designs.

7. What are the relationships between RNP-AR and both previously published and future procedures:
- STAR (RNAV): Standard Arrival Route (Required Area Navigation),
- RNAV (GNSS): Global Navigation Satellite published on 11 March 2010 for major Australian airports, and
- PBN: Performance Based Navigation.

- See explanation provided in Q 1 for RNAV and PBN.

- STARs are a designated Instrument Flight Rule linking a significant point, normally on an Air Traffic Service route, with a point from which a published instrument approach procedure can be commenced. Major aerodromes typically have a 'family' of STARs which link major air routes to instrument approach procedures. They have been conducted under either RNAV or RNP navigation specifications since the mid-1990s.

8. Please inform the committee of the role of US firm Naverus in this project? When was the contract with Naverus signed for the detailed design of RNP-AR procedures for Brisbane, Melbourne, Adelaide and Sydney airports?

- Naverus is a CASA-authorised RNP procedures design company that won the Airservices' tender to provide RNP-AR procedures, and subsequent design maintenance for three years. The contract was signed on 27 August, 2009.

9. If more than one contract has been entered into with Naverus, please inform the committee of the relevant contract dates and details of each contract.

- There is only one contract.

10. The Airservices Australia media release dated June 2009 issued upon the signing of the Naverus contract mentioned 28 major airports. Which airports are they?
For which other airports had 'planning for rollout' commenced in December 2009 and what is the current status of this work?

- Adelaide, Alice Springs, Avalon, Ayers Rock, Ballina/Byron Gateway, Brisbane, Broome, Cairns, Canberra, Coffs Harbour, Darwin, Gold Coast, Hamilton Island, Hervey Bay, Hobart, Kalgoorlie/Boulder, Karratha, Launceston, Mackay, Melbourne, Mount Isa, Perth, Proserpine/Whitsunday Coast, Rockhampton, Sunshine Coast, Sydney, Townsville and Williamtown.

- The Airservices Board has approved the progression of the first eight aerodromes (refer Q 2). The case for providing procedures at the other locations will be examined after the completion of the initial eight.

11. Will RNP-AR procedures need to be developed for Perth? If so when will this occur, or do these procedures already exist under a different name?

- Perth is one of eight locations planned over the next two years. The initial data-gathering exercise is expected to occur in late 2010.

- RNP-AR procedures do not already exist at Perth under a different name.

12. What plans does Airservices Australia have with respect to community consultation of plans connected with this project?
When does Airservices consider is the most appropriate stage and timing for community engagement and consultation with respect to RNP-AP's given that concept tracks were completed in December 2009 and detailed design should, by now, be well advanced if not complete for some tracks at some airports?

- Tailored community consultation, consistent with Airservices' *Communication and Consultation Protocol,* will be part of each implementation process.

- Airservices Australia has provided the Committee with a copy of its *Communication and Consultation Protocol,* which provides further detail on the process. Airservices is applying the protocol to this project as part of the preliminary design phase process.

13. If there has already been community engagement with respect to this project, when and with whom has this occurred? What information was provided and what were the outcomes?

- Yes, in locations such as Cairns, Adelaide, Melbourne and Canberra using methods not inconsistent with the *Communication and Consultation Protocol.*

- As recent as 11 May 2010, the first preliminary deign for Sydney was shown to the Long Term Operating Plan (LTOP) Implementation Monitoring Committee (IMC) for comment (yet to be received).

14. Have any RNP-AR procedures been the subject of internal environmental assessment by Airservices Australia and, if so, will Airservices provide copies?

- Prior to the commencement of trial procedures, CASA required Qantas to provide a study of the likely environmental effects at the aerodrome and the measures that would be taken by Qantas to mitigate those effects.

- This initial assessment used Airservices Australia's Environment Branch assessment processes to establish whether this proposal will have or is likely to have a significant environmental impact in accordance with Airservices' own environmental assessment principles and criteria and the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999.*

- The operational documents used in airspace design are generally of a technical nature and not easily understood by lay persons. This is because there is an implied knowledge and the information won't necessarily be meaningful to the reader. An example of an assessment conducted for the Melbourne trial is at Attachment A.

15. Have any RNP-AR procedures been referred to the Minister for Environment Protection under section 160 of the Environment Protection and Biodiversity Conservation (EPBC) Act and if so, when?

- No.

16. Have Airservices Australia ever referred any matter to the Minister for the Environment under section 160 of the EPBC Act for reason of aircraft noise rather than heritage concerns? If so, where and when?

- Yes – 27 May, 2005 regarding the Brisbane Airport parallel runway project.

17. To what extent is Airservices Australia prepared to change its process for assessing proposed flight path changes to make it more open and accountable?
To this end, is Airservices Australia willing to:
a. Release its international noise prediction reports for review?
b. Introduce other triggers for formal assessment, for example a 'public interest' test?
c. Open up its 'Environmental Principles and Procedures for Aircraft Noise' to public review?
d. Introduce a consultation process where the internal assessment shows no formal assessment is needed?

- The operational documents used in airspace design are generally of a technical nature and not easily understood by lay persons. Airservices has highly qualified personnel who conduct these assessments and there is only a small pool of talent in Australia with the expertise to apply this knowledge in an airspace design context.

- Airservices' preference is for experts to explain the results of specialised reports, like environmental assessments, to consultative forums. This is because there is an implied knowledge with this material and expert briefing is a more constructive approach than sharing operational documents that won't necessarily be meaningful to the reader.

- Airservices *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise* have worked effectively with the 70 decibel threshold since 1997.

- There were previously no guiding standards so these were developed using the best international evidence and after 12 months consultation involving industry and the then Commonwealth Department responsible for Transport. This was designed to establish a reasonable, equitable and transparent process.

- Airservices is not responsible for developing policy however we would welcome review or similar steps that provided clarity on acceptable noise standards in Australia.

18. Going forward, what specific model of community consultation does Airservices Australia proposed to undertake?
a. In what circumstances will consultation occur?
b. Who will be consulted?
c. Will this information be of a technical or practical nature?
d. Will there be direct community consultation?
e. If there is community consultation:
i. In what matter will this be conducted?
ii. What will be the model of advertising this consultation?
iii. How will Airservices Australia determine which localities should be included in the consultation?
iv. Will community consultation include a process for community feedback to be reported back to Airservices Australia for planning?

- Airservices Australia has recently consolidated and refined a tailored consultative process to be applied when introducing new technologies or procedures.

- Where flight path change proposals are not primarily safety related, there is often greater opportunity to involve communities during the design of proposals. This may be where various operational, environmental (reduction in aircraft emissions) and efficiency drivers are also being pursued and in these cases, Airservices tailors its consultation accordingly. This approach identifies the level of consultation required with the community beyond the airport noise community committees, the need to personally brief community stakeholders, the effectiveness of Airservices' targeted information mediums and the strength and nature of comments on a proposed change with aircraft noise implications for the local airport community.

- Airservices has provided the Committee with a copy of its *Communication and Consultation Protocol,* which provides further detail on the process.

19. What are the different process/models of consultation used around Australia? During the meeting hosted by the Shire of Mundaring, it was said that Airservices Australia frequently attends public meetings:
a. Are public meetings a standard process for community consultation at any airports in Australia?
b. Are there other forms of direct community consultation used at any airports in Australia?
c. Are there difference in constitution and terms of references between PANMCC and other similar bodies across Australia?
d. Does Airservices Australia foresee any reason why a consistent community consultation cannot be mandatory across Australia for different levels of airport? For example, is it possible that all major airports, or all airports with a specified traffic capacity, have the same community consultation process?
e. If this is not possible, please explain why different community consultation processes would be appropriate in different circumstances?

- In Australia, airport community consultation forums are conducted by respective airports and not by Airservices Australia. Where applicable, Airservices attends these forums as either a member or on an invitation basis. The Government's Aviation White Paper announced that all airports subject to the planning framework in the *Airports Act 1996* will be required to establish and lead Community Aviation Consultative Groups. These Groups will address planning and development issues and a range of other operational matters, such as aircraft noise.

20. Notwithstanding the complexity of the Perth airspace, in the initial phase of the Western Australian Route Review Project (WARRP), were there any other routes considered?
a. If at any time during WARRP, alternative flight paths were considered:
i. Can you provide a diagrammatic example of these paths?
ii. What were the specific reasons that each of the potential paths was not pursued further?
iii. Was the range of potential flight paths made known to any airline prior to a final determination of flight paths being made?
b. What is the reason (by reference to diagrams if necessary) that the flight paths could not be located more extensively over national and state parks in the Darling Range locality?

- The substantive air route structures considered are at Attachment B. Option 3A was selected as being the most suitable and the Standard Instrument

Departure (SID) / Standard Terminal Arrival Routes (STAR) structure designed to support this option is at Attachment C. Subsequent simulation trials refined the SID / STAR design. WARRP was discussed with airspace users at Perth as required. This information was provided to Perth Airport Aircraft Noise Management Consultative Committee members during the project period and published on Airservices' website.

- The SID / STAR structure utilises these areas as much as is practicable, however the operational capabilities of aircraft and potential noise impacts to residents are limiting factors.

21. What consultation takes place between Airservices Australia and any airline during route reviews?
a. It is entirely reasonable there be some level of consultation between airlines, airports and Airservices Australia. In the process of a route review, what is the relative degree of importance given to feedback received from airlines, compared to all other considerations?
b. What is the level of disclosure during consultations with any airlines, what information is shared and what information do they have access to?
c. What was the nature of consultation between Airservices Australia and any airlines during the WARRP?

- Airservices' consultation with industry during WARRP was technical in nature and conducted as required. At all times, safety was the primary consideration.

22. What action is taken by Airservices Australia upon receiving a specific complaint through the Noise Enquiry Unit detailing the height, time, direction, noise and airline or other information that can identify an aircraft flying outside the Airservices Australia guidelines?
Are there any repercussions for airlines whose aircraft fly in contravention of the WARRP guidelines?

- There are no WARRP 'guidelines'. Complaints made to the Airservices Australia Noise Enquiry Unit are followed up in accordance with their nature and priority, for example safety issues are referred to the Civil Aviation Safety Authority. Airservices has also taken the option to advise the aircraft operator and/or owner where reported practices are of concern to the community.

23. Was the WARRP instigated in response to the CASA audit report from 2002 or 2003?
Within correspondence from Airservices Australia and on its website numerous references are made to a CASA audit from 2002, however when the Hon Judi Moylan MP made a Freedom of Information request for the relevant CASA audit that prompted WARRP a copy of the CASA audit report number 03-01 completed on 27 June 2003 was provided.

a. If the relevant CASA Audit Report was number 03-01, please provide a reference point to the relevant safety concerns that led to the WARRP being undertaken, as these concerns are not apparent from the information provided under the FOI request.
b. If the relevant CASA Audit Report was not number 03-01, why was this report provided in response to the FOI request?

- The relevant CASA Audit report is number 03-01 which is dated 8 July 2003. The relevant reference is Request for Corrective Action (RCA) 0301-02 which is discussed on pages 4 and 6 of the report.

- The RCA was based on a finding that airspace limitations precluded pilot navigation or radar vectoring onto final approach for the Runway 03 Instrument Landing System with any recognised standards.

- This finding complemented Airservices' own analysis of Perth's terminal airspace which had been conducted around that time. This latter work resulted in a number of System Action Improvement Reports under Airservices' internal Safety Management System. These reports are similar to CASA RCAs in that they are formally recognised by CASA and, therefore, are required to be resolved.

- The introduction of a linked Standard Terminal Arrival Routes (STARs) system was required to resolve the CASA RCA and Airservices' System Action Improvement Reports.

- Due to the limited access that civilian aircraft have to military airspace at Perth, establishing such a system required the entire redesign of the former Standard Instrument Departure (SID) / STAR package.

- Perth's route structure now has linked SIDs and STARs, segregated flight paths for jets and non-jets, and a reduced number of reporting and crossover points.

- WARRP also involved extensive change to air routes that extended beyond the Perth terminal area. CASA endorsed all proposed changes to the air route structure under this project prior to implementation.

24. Does Airservices Australia have any control over the frequency of flights?

- No.

It was stated at the public meeting hosted by the Shire of Mundaring that the frequency of flights is decided by airlines and not by Airservices Australia. However, new lateral separation minima were introduced as part of WARRP which allowed GPS certified aircraft to be separated laterally by 7+7+1 nautical miles, i.e. 15 nautical miles. Prior to WARRP this was 29 nautical miles. When aircraft are flying in the Perth Control Area, they are generally limited to a maximum speed of 250 knots. At this speed, a 15 nautical miles separation equates to 3.5 minutes.

- Various speed limitations apply to aircraft operating below 10,000 feet within the Perth Terminal Area and are expressed in terms of Indicated Air Speed. Fifteen nautical mile separation is not a standard used by Airservices Australia in terminal areas.

Does the lateral separation minima dictate to the airlines what the maximum frequency of flights is, as residence in the Darling Range local have frequently reported that planes often fly overhead at intervals of 3.5 minutes?

- No.

25. Under the new flight paths for Perth Airport, are there any circumstances in which jet and non-jet aircraft may share the flight track albeit with some vertical separation?

- Yes. Whilst the Western Australia Route Review Project generally established separate flight paths for jet and non-jet traffic, where the departure or arrival of an aircraft is in close proximity to the aerodrome, common flight paths are used due to the critical requirement for these aircraft to be aligned with the duty runway. In addition, four flight paths remain common due to their low frequency of traffic and military airspace restrictions.

26. The committee understands that the recent resurfacing of the main runway at Perth Airport was accompanied by an excellent community consultation strategy.
a. Who led the community consultation regarding the works?
b. How did it differ from consultation undertaken by Airservices Australia during the WARRP project?

- This was a Perth Airport project and the consultation was its responsibility, not Airservices.

AIRSERVICES AUSTRALIA

Environmental Assessment

Qantas Proposed RNP Approach Procedures
and
Airservices Australia Proposed
RNP Linked and RNP aligned STARs for
Melbourne Airport

Prepared September 2009,
Report No: AsA-ECC-09-201

DISCLAIMER

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Version	Author	QA	Date
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Airservices Australia

Head Office 25 Constitution Avenue
Canberra City ACT 2601
Australia

GPO Box 367
Canberra ACT 2601

Phone 02 6268 4111
Fax 02 6268 5683

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EXECUTIVE SUMMARY

Under Civil Aviation Safety Authority (CASA) Instrument numbers 38/08 and 251/08 Qantas Airways Ltd and Jetstar Airways Pty Ltd respectively have been given permission to undertake a trial using Required Navigation Performance – Authorisation Required (RNP) approach and departure procedures for their Boeing B737-800 and Airbus A320 aircraft operations at airports around Australia. In addition, Qantas is proposing the use of RNP approach and departure procedures for the Airbus A330 aircraft that are operated by Qantas and Jetstar and for the Boeing 787 aircraft that it currently has on order for use by itself and Jetstar.

This assessment considers a proposal from Qantas for their Boeing B737-800 and Airbus A330 and Jetstar Airbus A320 and Airbus A330 aircraft and the Boeing 787 aircraft it currently has on order to conduct a trial at Melbourne Airport of proposed RNP approach procedures for Runways 09, 16, 27 and 34. The analysis was undertaken to determine the likely environmental impact of proposed RNP approach or departure procedures at Melbourne Airport. In order to provide an indication of the impact the proposed Boeing 787 aircraft may have when operating at Melbourne Airport, flights by the Qantas 767 aircraft was used as a means of identifying the air routes they are likely to use and an indication of the number of arrivals at Melbourne Airport they may conduct.

To enable aircraft to use the proposed RNP approach procedures Airservices Australia has designed Standard Arrival Routes (STAR) that will be linked to the proposed RNP approach procedures to enable aircraft to use an RNP approach procedure without requiring ATC intervention. As the proposed RNP approach procedures are dependant on aircraft using the proposed RNP linked STARs the assessment for each of the proposed RNP approach procedure also considered the impact of aircraft using the proposed STARs in order to ensure all aspects of the proposed procedures ere fully considered.

Advice obtained from Airservices Australia's Air Traffic Control (ATC) Project Implementation Office, Melbourne ATC and Qantas regarding the continuing practice of providing direct tracking from/to a distant waypoint for aircraft conducting an RNP approach or departure was also taken into consideration and advice provided by Qantas that its B37-800 aircraft are only expected to use these procedures for approximately 75 percent of operations for each aircraft type considered during this assessment.

The analysis has taken into account the concentration of aircraft when they are following an RNP approach procedure and the current concentration of aircraft that are following the existing RNAV STARs for Melbourne Airport. The analysis has also identified that each of the proposed RNP approach procedures enable aircraft to join for an RNP approach at more than one joining waypoint along its approach path with the last joining point located approximately five nautical miles from touch-down. The analysis has also identified the following four flight path characteristics that are flown by aircraft when conducting an approach to a runway at Melbourne Airport:

- aircraft that have followed the STAR for its entire length during their approach to a runway;
- aircraft that have been radar vectored by ATC for traffic management purposes;
- aircraft that have been provided with direct tracking for a visual approach to their assigned runway; and
- aircraft that have conducted a visual approach that can join for an RNP approach at the last joining point along its approach path or will need to change their flight path to ensure

they can join for an RNP approach or maintain the same approach path for a visual approach to the runway

Based on this analysis the impact of each of the proposed RNP approach procedures and their linked STARs has been determined.

Runway 09 RNP approach procedures

There are four proposed RNP approach procedures and four linked STARs for arrivals to Runway 09. The linked STARs are the ARBEY, MONTY, WAREN and WENDY STARs and the assessment has found their proposed flight paths to be the same as the current STARs. The assessment determined the four proposed RNP approach procedures will follow a slightly different flight path to that currently followed by arrivals to this runway and except for one short section of the WENDY STARs linked RNP approach procedure the proposed RNP approach flight paths are over rural areas. The analysis shows areas below the WENDY STARs linked RNP approach procedure will track aircraft over an industrial area of Melton.

The analysis also showed that during a 12 month period there was an average of 0.3 arrivals per day by the Qantas and Jetstar aircraft, they only used this runway for a total of 28 days and had an average of 4.3 arrivals per day on these days.

Runway 16 RNP approach procedures

There is one proposed RNP approach procedure and five proposed linked STARs for arrivals to Runway 16. The linked STARs are designed to replicate the current ARBEY, BADGR, LIZZI, WAREN and WENDY STARs and the assessment has found their proposed flight paths to be the same as the current flight paths. The proposed RNP approach procedure begins at Bolinda (BOL) NDB and is a straight-in approach to Runway 16, following exactly the same flight path as currently followed by arrivals to this runway that are conducting an instrument approach to Runway 16. This proposed RNP approach procedure will also permit aircraft to join it at EMUZE waypoint which is located 7.7 nautical miles from touchdown on Runway 16.

The assessment determined aircraft using the proposed linked ARBEY STAR and the RNP approach procedure should not alter the noise impact from aircraft that is currently experienced. However, the assessment noted arrivals using the proposed linked BADGR, LIZZI, WAREN or WENDY STARs and this proposed RNP approach procedure may alter the flight path followed by aircraft using the current STARs for their approach to Runway 16.

The assessment noted the Qantas and Jetstar arrivals that are following the current STARs should not alter the noise impact currently experienced. It also noted arrivals will continue to be provided with radar vectoring for traffic management purposes and some of the aircraft that intend to conduct an RNP approach to Runway 16 may also due to traffic management requirements, be required to accept radar vectoring during their approach to Runway 16.

However, the assessment also noted the aircraft that currently conduct a visual approach to Runway 16 can either maintain their approach path and join for an RNP approach at EMUZE waypoint or join final after EMUZE waypoint and conduct a visual approach to this runway change their flight path in order to conduct an RNP approach to this runway. The assessment noted an annual average of 24.8 Qantas and Jetstar arrivals per day use the BADGR, LIZZI, WAREN and WENDY STARs for their approach to Runway 16 and that 18 percent of these arrivals will need change their flight path if wanting to conduct an RNP approach to this runway.

Runway 27 RNP approach procedures

There are two proposed RNP approach procedures and five proposed linked STARs for arrivals to Runway 16. The linked STARs are designed to replicate the current ARBEY, BADGR, LIZZI, WAREN and WENDY STARs and the assessment has found their proposed flight paths to be the same as those currently flown. The assessment showed one of the proposed RNP approach procedures is designed to link to the proposed ARBEY STAR and the other is designed for aircraft that use the BADGR, LIZZI, WAREN or WENDY STARs to join for an RNP approach at EPP NDB.

The assessment showed the proposed RNP approach procedures that is designed to link to the proposed ARBEY STAR will generally follow the same flight path of the current STAR with the exception of a small section where the proposed RNP approach path will track aircraft along the eastern edge of the current flight path when they are tracking over the residential area of Epping and rural area of Wollert.

This proposed RNP approach procedure will also permit aircraft to join it at EDSAL waypoint which is located 5.1 nautical miles from touchdown on Runway 27. The assessment also determined an annual average of 11.7 Qantas and Jetstar arrivals per day that use the ARBEY STAR and approximately 15 percent of these arrivals will need to alter their flight path if wanting to join for an RNP approach at EDSAL waypoint.

The assessment determined there should be minimal change to the noise impact of Qantas and Jetstar aircraft that currently use the BADGR, LIZZI, WAREN or WENDY STARs for their approach to Runway 27 as the analysis showed the majority of current arrivals join for their approach to this runway at EPP NDB. It also showed only one percent of a daily average of 12.9 arrivals will need to change their flight path in order to conduct an RNP approach to this runway.

Runway 34 RNP approach procedures

There are four proposed RNP approach procedures and five proposed linked STARs for arrivals to Runway 16. The linked STARs are designed to replicate the current ARBEY, DYTES, MICHM, PORTS and WENDY STARs and the assessment has found their proposed flight paths to be the same as those currently flown. The assessment also showed the proposed RNP approach procedures are designed to link to the proposed ARBEY STAR, the proposed DYTES and MICHM STARs, the proposed PORTS STAR and the proposed WENDY STAR.

Three of the proposed RNP approach procedures will permit aircraft to join it between the start and SQIRE waypoint which is located 6.0 nautical miles from touchdown on Runway 34 and the other will permit aircraft to join it at FILIP waypoint which is located 11.0 nautical miles from touchdown on this runway. The assessment showed current arrivals follow a straight in approach which is used by aircraft currently conducting a visual or GNSS approach to this runway or an angled approach that is flown by aircraft using the current VOR RWY 34 approach procedure.

The assessment showed the proposed RNP approach procedures that is designed to linked to the proposed ARBEY and WENDY STARs will follow a different flight path to that currently followed but it also showed the majority of their proposed approach path will be over non-residential and the industrial areas of Derrimut, Laverton North and Brooklyn prior to overflying residential areas that are currently overflown by aircraft that are conducting a VOR or straight in approach to Runway 34. It is expected that the aircraft that have followed the current ARBEY or WENDY STAR will be following the linked Runway 34 RNP approach procedure but recommends the number of Qantas and Jetstar aircraft that follow these RNP approach procedures be monitored.

The analysis showed an annual daily average of 9.1 arrivals per day by Qantas and Jetstar aircraft that used the ARBEY and WENDY STARs of which 13 percent of the total number of Qantas and Jetstar arrivals that used these STARs will need to change their flight path in order to conduct a RNP approach to this runway.

The assessment showed the proposed RNP approach procedure that is linked to the proposed PORTS STAR will follow a straight in approach to Runway 34, along the same flight path followed by aircraft that currently conduct a visual or GNSS approach to this runway. The analysis also showed the Qantas and Jetstar aircraft that currently conduct a VOR approach to this runway are likely to change their flight path increase the noise impact on areas that are currently overflown by aircraft conducting a visual or GNSS approach to this runway. The assessment also showed an annual daily average of less than one arrival per day by Qantas and Jetstar aircraft of which only two percent will need to change their flight path to join for an RNP approach by FILIP waypoint.

The assessment of the proposed RNP approach procedure that is linked to the DYTES and MICHM STARs showed these arrivals will track over a different flight path to that currently followed by arrivals conducting a visual, GNSS or VOR approach to Runway 34. It also showed these arrivals only use this procedure when, due to adverse meteorological conditions, aircraft cannot track via Essendon Airport for their approach to this runway.

The assessment also showed the proposed approach path will track aircraft over industrial and residential areas of Fishermans Bend and Yarraville and there was an annual daily average of less than one flight by Qantas and Jetstar aircraft that used the DYTES or MICHM STARs for their approach to Runway 34. The assessment showed approximately 27 percent of the Qantas and Jetstar aircraft were radar vectored for traffic management purposes and it is expected there will be a similar number of arrivals that will be required to be radar vectored even though they have initially been assigned this RNP approach procedure for their approach to this runway.

The assessment also showed there may be small changes to the noise impact from the aircraft using these proposed RNP approach procedures but the difference in noise levels, whether an increase or decrease should not be perceptible (i.e. less than 3 dB(A) change in aircraft noise) to the residents living below their flight path. The analysis also considered periods when there may be an excessive number of arrivals to each runway due to prevailing meteorological conditions and has found a large variation does occur for a number of days per year for each runway. However, this change in number of arrivals should not alter the noise impact currently experienced.

Conclusion

The proposed RNP approach and departure procedures for Melbourne Airport should in general not alter the noise impact from aircraft operations to such an extent that it should perceptible to residents of communities below the flight paths. This conclusion is based on the following:

- the majority of the proposed RNP approach procedures will follow the flight path of current STAR procedures;
- in the cases where there is a difference in the flight path followed, the analysis has showed there will generally be a relatively low number of flights involved or the changes are generally confined over non-residential areas;
- There will be a concentration of aircraft that will be following the proposed RNP approach procedures when compared to current arrivals but in many cases this concentration will be similar to that which currently occurs;

- Melbourne ATC has indicated that aircraft will continue to be provided with direct tracking from a distant waypoint and this should reduce the potential concentration of aircraft using the RNP approach procedures, thereby minimising the potential for an increase in noise exposure;
- There should be no change in the altitude aircraft using the proposed RNP approach procedures when compared to current operations, therefore, it is expected to result in no perceptible change in noise levels experienced by residents in communities under the proposed flight paths; and
- The expectation of no perceptible changes in noise levels is supported by noise monitoring data from aircraft using RNP procedures at Cairns and Gold Coast airports.

Based on the above findings the proposal for Qantas B737-800, B767 and A330 aircraft and Jetstar A320 and A330 aircraft to use RNP approach procedures at Melbourne Airport is not expected to result in a significant environmental impact. However the following recommendations are made.

Recommendations

1. The Melbourne Airport Noise Abatement Committee is to be provided with the outcomes of this environmental assessment by the proponent of the RNP approach procedures.
2. The general public is to be notified of the proposed changes via an appropriate medium e.g. local newspapers, radio, etc by the proponent of the RNP approach procedures.
3. Monitoring of complaints received by Airservices Australia's Noise Enquiry Unit for a period of one year after implementation to determine if the use of these procedures by Qantas and Jetstar aircraft has any unanticipated environmental impact on residential areas.
4. If the introduction of these RNP approach and departure procedures results in any unexpected adverse environmental impact or if the RNP procedures are to be used by additional aircraft types or operators then further environmental assessments will be required.

Environmental Assessment of Qantas Proposed RNP Approach Procedures and Airservices Australia Proposed RNP Linked and RNP aligned STARs for Melbourne Airport.

Introduction

Qantas Airways Ltd is introducing Required Navigation Performance – Authorisation Required (RNP) approach and departure procedures for its Boeing 737-800 and Airbus A330 and proposed Boeing 787 aircraft and Jetstar Airbus A320 and Airbus A330 aircraft at various airports around Australia and also plans for its B787 aircraft to also use RNP approach and departure procedures at Australian Airports. As part of this process, the Civil Aviation Safety Authority (CASA) issued Qantas with Instrument 38/08 in order to continue a trial of these procedures using its Boeing 737-800 aircraft. Similarly, CASA has issued Jetstar with Instrument (251/08) for it to commence a trial of these procedures using its Airbus A320 aircraft. A condition of each instruction is that before a trial of RNP procedures can begin at an airport, CASA must be provided with a report detailing an environmental assessment of the proposed procedures, indicating the environmental impact of aircraft that will be using RNP procedures at this airport and the measures that will be required to mitigate any negative environmental impact.

The proposed RNP approach procedures for Melbourne Airport are designed to take advantage of Qantas Boeing 737-800, Airbus A330 and proposed Boeing 787 aircraft and Jetstar Airbus A320 and Airbus A330 aircraft navigation and flight management systems (FMS) capabilities using Global Positioning System (GPS) to provide aircraft navigation to an accuracy not previously possible when making an approach to an airport. In addition, as part of the proposed introduction of RNP approach procedures Airservices Australia is proposing the publishing of Standard Arrival Route (STAR) procedures that will be linked to the Qantas RNP procedures, enabling Air Traffic Control (ATC) to issue an approach procedure (STAR) to an aircraft and know it will also be using the linked RNP approach procedure.

This assessment utilised Airservices Australia's Environment & Climate Change Unit assessment processes to establish whether this proposal will have or is likely to have a significant environmental impact in accordance with the Environmental Protection Biodiversity Conservation (EPBC) Act 1999.

Description of Proposal

The Qantas proposed RNP procedures are for arrivals to Runways 09, 16, 27 and 34. Copies of the proposed RNP approach procedures are shown in Attachment C and RNP waypoint coordinates in Attachment D. In addition, each of the proposed RNP approach procedures has a missed approach procedure as part of their design requirements, which are shown on the RNP plate shown in Attachment C. In the majority of cases each RNP approach procedure has been designed to track aircraft along a flight path similar to that currently overflown by arrivals to all runways at Melbourne Airport.

In addition, Airservices Australia has proposed the promulgation of STAR procedures that are designed to replicate the flight path followed by the existing STAR for aircraft arriving on Runway 09, 16, 27 and 34 and provides a link to the Qantas proposed RNP approach procedures.

The RNP procedures are being assessed as part of a proposal by Qantas and the RNP Linked STARs are being assessed under ARMS entry number 191942.

The analysis of aircraft movement numbers used in this analysis include:

1. Qantas B737-800 aircraft and Jetstar A320 aircraft as these types will begin using these procedures when approval by CASA has been provided;
2. Qantas and Jetstar A330 aircraft which are expected to begin using these procedures when these aircraft have been upgraded with the required FMS equipment; and
3. Qantas B767 aircraft as they are to be replaced by the Boeing B787 aircraft which are to be delivered with the required FMS equipment.

A review of the proposed RNP approach procedures and the proposed linked STARs was undertaken to identify which of the proposed RNP procedure is linked to which proposed linked STAR. The result of this review is shown in Table 1. To assist in matching the proposed linked STAR to a proposed RNP approach procedure the linking waypoints name is shown in brackets following the RNP procedures name.

Table 1. Current STARs, Proposed RNP and RNP aligned RNAV STAR Procedures

Runway	Current STAR	Proposed RNP	Proposed RNP linked STAR
Runway 09	ARBEY STAR	RNAV-M (RNP) – (WILDE)	ARBEY ONE MIKE STAR
Runway 09	PORTS STAR	RNAV-P (RNP) – (MISCH)	PORTS ONE PAPA STAR
Runway 09	WENDY STAR	RNAV-P (RNP) – (ML828)	WENDY UNIFORM STAR
Runway 09	Radar Vector	RNAV-P (RNP) – (ML836)	MONTY ONE PAPA STAR
Runway 16	ARBEY STAR	RNAV-U (RNP) – (BOL)	ARBEY UNIFORM STAR
Runway 16	BADGR STAR	RNAV-U (RNP) – (BOL)	BADGR UNIFORM STAR
Runway 16	LIZZI STAR	RNAV-U (RNP) – (BOL)	LIZZI UNIFORM STAR
Runway 16	WAREN STAR	RNAV-U (RNP) – (BOL)	WAREN UNIFORM STAR
Runway 16	WENDY STAR	RNAV-U (RNP) – (BOL)	WENDY UNIFORM STAR
Runway 27	ARBEY STAR	RNAV-M (RNP) – (ML796)	ARBEY ONE MIKE STAR
Runway 27	BADGR STAR	RNAV-U (RNP) – (EPP)	BADGR ONE UNIFORM STAR
Runway 27	LIZZI STAR	RNAV-U (RNP) – (EPP)	LIZZI ONE UNIFORM STAR
Runway 27	WAREN STAR	RNAV-U (RNP) – (EPP)	WAREN ONE UNIFORM STAR
Runway 27	WENDY STAR	RNAV-U (RNP) – (EPP)	WENDY ONE UNIFORM STAR
Runway 34	ARBEY STAR	RNAV-P (RNP) – (RENER)	ARBEY ONE PAPA STAR
Runway 34	DYTES STAR	RNAV-P (RNP) – (BOLTY)	DYTES ONE PAPA STAR
Runway 34	MICHM STAR	RNAV-P (RNP) – (BOLTY)	MICHM ONE PAPA STAR
Runway 34	PORTS STAR	RNAV-U (RNP) – (PIERS)	PORTS ONE UNIFORM STAR
Runway 34	WENDY STAR	RNAV-P (RNP) – (LAVER)	WENDY ONE PAPA STAR

Based on the information shown in Table 1, the assessment of each of the proposed RNP approach procedures also involved analysis of its linked STARs in order to identity if there will be any environmental issues with a proposed RNP approach procedure or with its linked STAR.

Methodology

Track plots showing the flight path of the proposed RNP approach procedures for Runways 09, 16, 27 and 34 which are overlaid over the flight path of current STARs, the proposed linked STARs and flight tracks of jet aircraft arrivals to Melbourne Airport were prepared using proprietary mapping software. The jet aircraft flight tracks were obtained from the Airservices Australia's Noise and Flight Monitoring System (NFPMS) for the period of 1 January to 31 March 2009 and aircraft movement analysis used NFPMS data for the period of 1 May 2008 to 30 April 2009.

The assessment of the proposed RNP approach procedures and the proposed RNP aligned RNAV STARs has also taken into account that the proposed RNP approach procedures are designed to RNP 0.30 standards, a maximum track width of 0.3 nautical miles (approximately 555 metres), which will result in a more concentrated flight path than currently followed by arrivals to all runways at Melbourne Airport.

The assessment also noted and considered that each of the proposed RNP approach procedure can be joined at other points along its flight path by aircraft that wish to conduct an RNP approach to the assigned runway. A comparison was also made of the altitude requirements of the proposed RNP approach procedures and that of the current STARs to determine if there may be any difference to that which currently occurs.

Advice received from Qantas that approximately 75 percent of all Qantas B737-800 operations use an RNP approach or departure procedure at Australia airports where these procedures are available was also taken into consideration when assessing the change to the impact of the proposed RNP approach procedures and the RNP aligned STAR procedure. This assessment did not assess the RNP missed approach procedure for each of the proposed RNP procedures as previous analysis has shown aircraft using this operation have minimal environmental impact.

Analysis was also undertaken to identified the percentage of all jet aircraft and Qantas and Jetstar flights that, during the 1 January to 31 March 2009 period, followed the current STAR, were provided with radar vectored for traffic management purposes or were provided with track shortening in order to identify the number of aircraft who can join for an RNP approach to a runway without requiring to change their current flight path.

The analysis also used noise information collected from aircraft conducting RNP approaches at other Australian airports as a means of identifying possible changes to the noise impact from aircraft operations at Melbourne Airport who are following an RNP procedure during their approach to any of the runways at this airport.

The assessment also determined differences in aircraft emissions when there was an identified difference in track miles flown as an estimate of the annual amount in carbon dioxide (CO_2) that will be saved or generated. This analysis used an internationally recognised "rule of thumb" principle that for each nautical mile of flight an aircraft will burn 11 kilograms of fuel and each kilogram of fuel creates 3.16 kilogram of CO_2 when burnt.

The assessment used the Airservices Australia's Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise to assist in determining if the implementation of the proposed RNP procedures at Melbourne Airport is likely to result in a significant environmental impact on underlying communities.

Analysis of Aircraft Noise Levels Associated with RNP Procedures

To assist in determining if there may be a change to the noise impact from Qantas B737-800, B767-300 and A330 aircraft and Jetstar A320 and A330 aircraft when they begin using RNP approach procedures at this airport, a comparison of Qantas B737-800 aircraft operations at Gold Coast and Cairns Airports prior to and following the introduction of RNP approach and departure procedures at these airports was undertaken. To assist in this noise analysis, plots of the Gold Coast and Cairns Airports showing the locations of the Noise and Flight Path Monitoring System (NFPMS) noise monitoring terminals (NMT) for each airport are shown in Figures 1 and 2.

Figure 1. Gold Coast NMT Locations

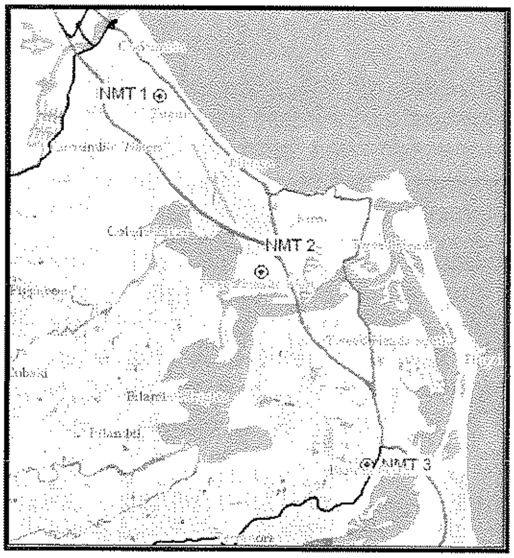
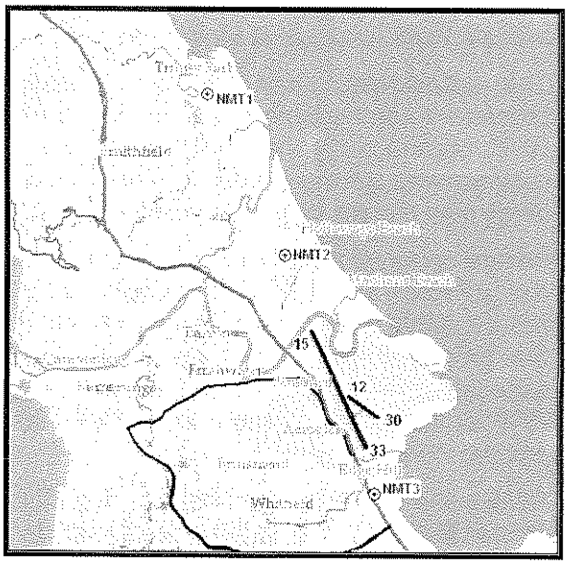


Figure 2. Cairns NMT Locations



Gold Coast Airport Noise Analysis

The Gold Coast Airport analysis used noise data obtained from the NFPMS at three noise monitoring terminals (NMT) for the period of 1 January to 31 March 2006 and 1 January to 31 March 2008.

The NMTs used in the analysis were:

- NMT 1, located at Tugun Bowls Club and approximately 1.3km prior to Runway 14 touchdown;
- NMT 2, located Tweed Heads West and approximately 2.2km prior to Runway 32 touchdown; and
- NMT 3, located Banora Point and approximately 7.4km prior to Runway 32 touchdown.

The analysis used aircraft noise data obtained from these NMTs to determine if there were any differences in noise levels generated by Qantas B737-800 aircraft prior to and following the introduction of RNP approach and departure procedures at this airport. The result of this analysis is shown in Table 2.

Table 2. NFPMS Noise Data Analysis of Noise Recorded at Gold Coast NMT Sites

NMT	Operation	Runway	1 Jan – 31 Mar 2006 Noise Events			1 Jan – 31 Mar 2008 Noise Events			Difference in Mean LAMAX dB(A)
			Number	Mean LAMAX dB(A)	Deviation dB(A)	Number	Mean LAMAX dB(A)	Deviation dB(A)	
1	A	14	123	86.3	1.2	100	87.5	2.6	1.2
2	A	32	43	87.2	1.1	14	86.4	3.1	-0.8
3	A	32	43	76.2	1.4	12	73.1	4.0	-3.1

A comparison of the noise data shown in Table 2 indicates the following: -

Arrivals: -

- The mean maximum sound level (LAMAX) dB(A) noise levels recorded at NMT 1 for Qantas B737-800 aircraft conducting a visual/instrument approach to Runway 14 compared to conducting an RNP approach indicated an average increase of 1.2 dB(A).

- The mean LAMAX dB(A) noise levels recorded at NMT 2 for Qantas B737-800 aircraft conducting a visual/instrument approach to Runway 32 compared to conducting an RNP approach indicated an average decrease of 0.8 dB(A).
- The mean LAMAX dB(A) noise levels recorded at NMT 3 for Qantas B737-800 aircraft conducting a visual/instrument approach to Runway 32 compared to conducting an RNP approach indicated an average decrease of 3.1 dB(A).

The above analysis shows there is a small difference in average maximum noise levels recorded for Qantas B737-800 RNP arrivals at the Gold Coast Airport. There was an increase of 1.2 dB(A) recorded at NMT 1 and a decrease of 0.8 dB(A) recorded at NMT 2. However, the analysis shows the average maximum noise levels recorded at NMT 3 decreased by 3.1 dB(A) for aircraft landing on Runway 32 using an RNP approach procedure.

As a change in noise levels of less than 3 dB(A) is generally not perceptible to the human ear, the changes resulting from the introduction of RNP approach and departure procedures at Gold Coast airport have generally not resulted in any perceptible increase in aircraft noise levels.

Cairns Airport Noise Analysis

The analysis of Qantas B737-800 operations at Cairns Airport was undertaken as part of Airservices Australia's community responsibilities following the implementation of RNP approach and departure procedures at this airport. This analysis indicated a similar trend shown in the analysis of operations by these aircraft at the Gold Coast Airport.

The NMTs used in this analysis are located at:

- NMT 1, located at Yorkeys Knob and approximately 6.5km prior to Runway 15 touchdown,
- NMT 2, located at Holloways Beach and approximately 2km prior to Runway 15 touchdown, and
- NMT 3, located at Cairns Hockey Field and approximately 1.1km prior to Runway 33 touchdown.

The results of the analysis of the noise generated by these aircraft when using RNP approach procedures indicated:

- There was no difference in the average noise levels generated by aircraft conducting an RNP approach to Runway 15 at NMT 1 to that previously generated,
- There was a decrease of 0.2 dB(A) in average noise levels generated by aircraft conducting an RNP approach to Runway 15 at NMT 2 to that previously generated,
- There was an increase of 0.4 dB(A) in average noise levels generated by aircraft conducting an RNP approach to Runway 33 at NMT 3 to that previously generated, and

As with the results from the Gold Coast Airport, the changes resulting from the introduction of RNP approach procedures at Cairns Airport were less than 3dB(A), and therefore did not result in any perceptible increase in aircraft noise levels.

To assist in the analysis of the proposed RNP approach procedures for Melbourne Airport a plot of the NFPMS NMTs for this airport is shown in Figure 3. A comparison of the NMTs shown in Figure 3 with aircraft approach flight paths indicates NMT 32 is slightly north of the approach path for arrivals to Runway 09, NMT 2 is below the approach path for arrivals to Runway 16, NMTs 5 and 6 are below the approach path for arrivals to Runway 27, NMT 1 is below the instrument approach path for arrivals to Runway 34, NMT 4 is below the visual approach over Essendon Airport for arrivals to Runway 34 and NMT 31 is to the west of the instrument approach path for arrivals to Runway 34.

Figure 3. Melbourne Airport NMT Locations

It is noted that NMT 4 is located below the approach path for arrivals to Runway 35 at Essendon Airport and it was not used in this comparison and NMT 32 is primarily located to measure noise data of aircraft departing from Runway 27.

A comparison of the locations of the Melbourne Airports NMT's 1, 2 and 4 shown in Figure 3 with those for Cairns and Gold Coast Airports indicates that none of the Melbourne NMT's are located a comparable distance from touchdown to a runway. However, this comparison did indicate some of the NMT's located at Cairns and Gold Coast Airports are located such that noise data from Qantas B737-800 overflights could be used to provide an indication if there may be a change in the noise impact of aircraft conducting an RNP approach to a runway at Melbourne Airport. This comparison indicated the following:

- Melbourne NMT 1 is located approximately 10.6 km prior to Runway 34 touchdown and Cairns and Gold Coast Airports do not have an equivalent NMT location;
- Melbourne NMT 2 is located approximately 5.2 km prior to Runway 16 touchdown and the closest Cairns or Gold Coast NMT is Cairns NMT 1 which is located approximately 6.5 km prior to Runway 15 touchdown;
- Melbourne NMT 3 is located approximately 5.7 km prior to Runway 34 touchdown and 1.9 km to the right of this approach path and the closest Cairns or Gold Coast NMTs is Cairns NMT 1 which is located approximately 6.5 km prior to Runway 15 touchdown;

- Melbourne NMT 31 is located approximately 4.2 km prior to Runway 34 touchdown and 0.6 km to the left of this approach path and Cairns and Gold Coast Airports do not have an equivalent NMT location;
- Melbourne NMTs 5 and 6 are located approximately 13.1 and 6.8 km respectively prior to Runway 27 touchdown and the closest Cairns or Gold Coast NMTs is Gold Coast NMT 3 which is located approximately 7.4 km prior to Runway 15 touchdown,
- Melbourne NMT 32 is located approximately 7.1 km prior to Runway 09 touchdown and the closest Cairns or Gold Coast NMTs is Cairns NMT 1 which is located is located approximately 6.5km prior to Runway 15 touchdown and Gold Coast NMT 3 which is located approximately 7.4 km prior to Runway 15 touchdown

This comparison also indicated the Gold Coasts NMT 1 and NMT 2 and Cairns NMT 2 and NMT 3 do not have an equivalently located NMT at Melbourne Airport which can be used to provide an indication of the expected noise levels for aircraft conducting an RNP approach to a runway at Melbourne Airport.

Assessment of Proposed RNP Approach Procedures and Linked STARs

The assessment of each of the proposed RNP approach procedures and their linked STARs included determining if the proposed approach procedures will have a different flight path to that currently flown by arrivals to Melbourne Airport and if there is a proposed variation to its approach path the possible environmental impact of Qantas and Jetstar aircraft when using the proposed approach path when compared to the impact of current arrivals. The assessment of each of the proposed RNP approach procedures and their linked STARs are detailed below for each runway.

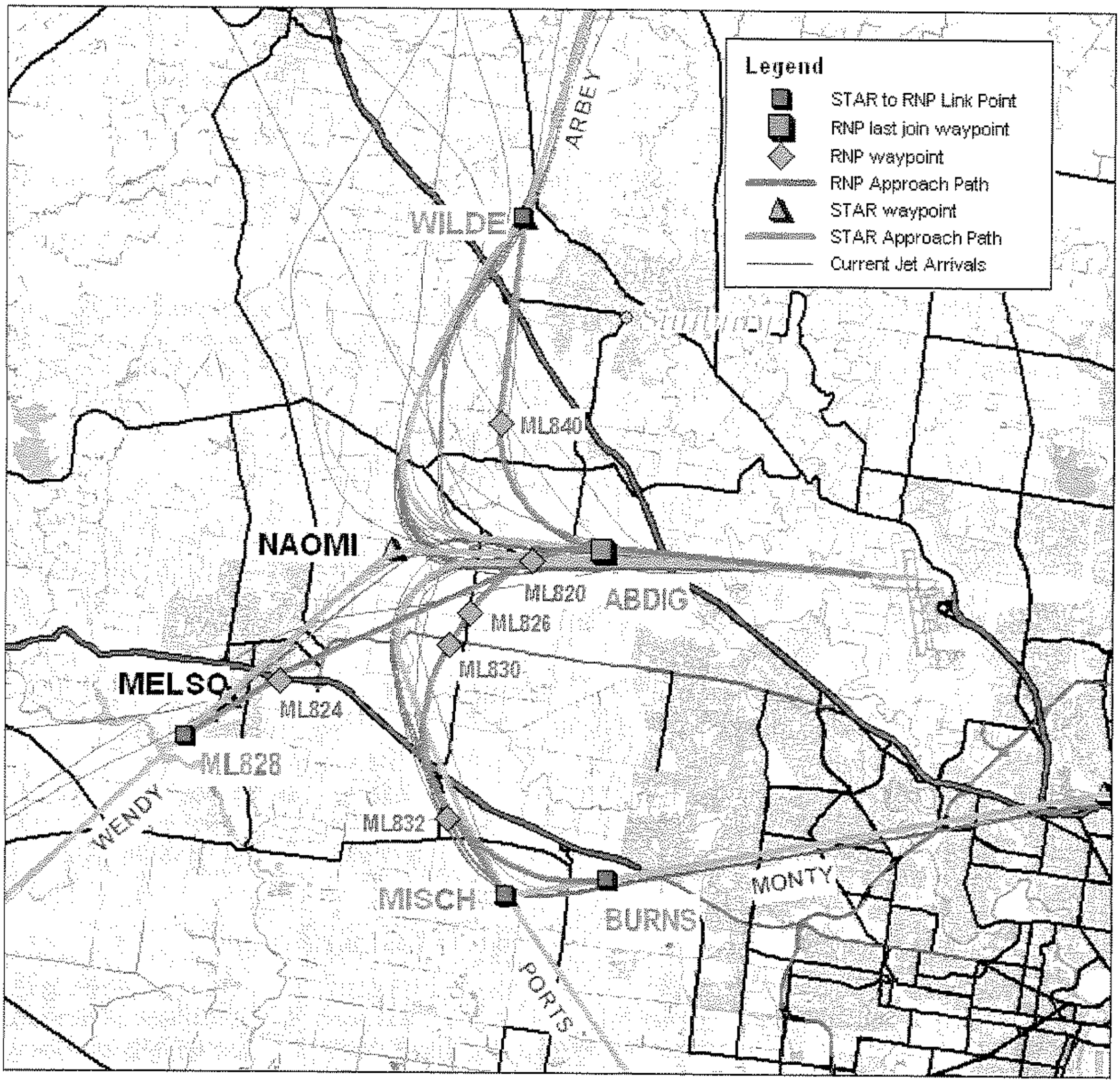
Due to some of the proposed RNP approach procedures not having a unique identifier, the reporting of the assessment of some of the RNP procedures used the linked STAR as a means of identifying the proposed RNP approach procedure. This assessment also used aircraft movement date provided by Qantas for its Boeing B737-800 and Airbus A330 aircraft operations and movement date provided by Jetstar for its Airbus A320 and A330 aircraft operations.

Proposed Runway 09 RNP Approach Procedures and Linked STARs

Table 1 shows there are four proposed RNP approach procedures and four RNP linked STARs for aircraft arriving on Runway 09. Plots of the proposed RNP approach procedures are shown in Attachment C, Figures C1 and C2 and proposed RNP linked STARs are shown in Attachment E, Figures E3, E7, E8 and E10. A plot of the proposed RNP approach procedures, their linked STARs and flight tracks of all jet arrivals to Runway 27 during the 1 January to 31 March 2009 period is shown in Figure 4.

The initial analysis of all the proposed RNP approach procedures indicates aircraft will be able to join for an RNP approach to Runway 09 at or prior to ABDIG waypoint, which is located 5.1 nautical miles from touchdown. The proposed RNAV-M (RNP) RWY 09 approach procedure and its linked ARBEY MIKE STAR, are designed for aircraft arriving from the north that currently use the ARBEY STARs and the proposed RNAV-M (RNP) RWY 09 approach procedures and its linked MONTY BRAVO STAR, PORTS PAPA STAR and WENDY PAPA STAR are designed for aircraft who currently use the MONTY, PORTS WENDY and STARs for their approach to this runway.

Figure 4. Runway 09 RNP and Linked STARs Approach Paths



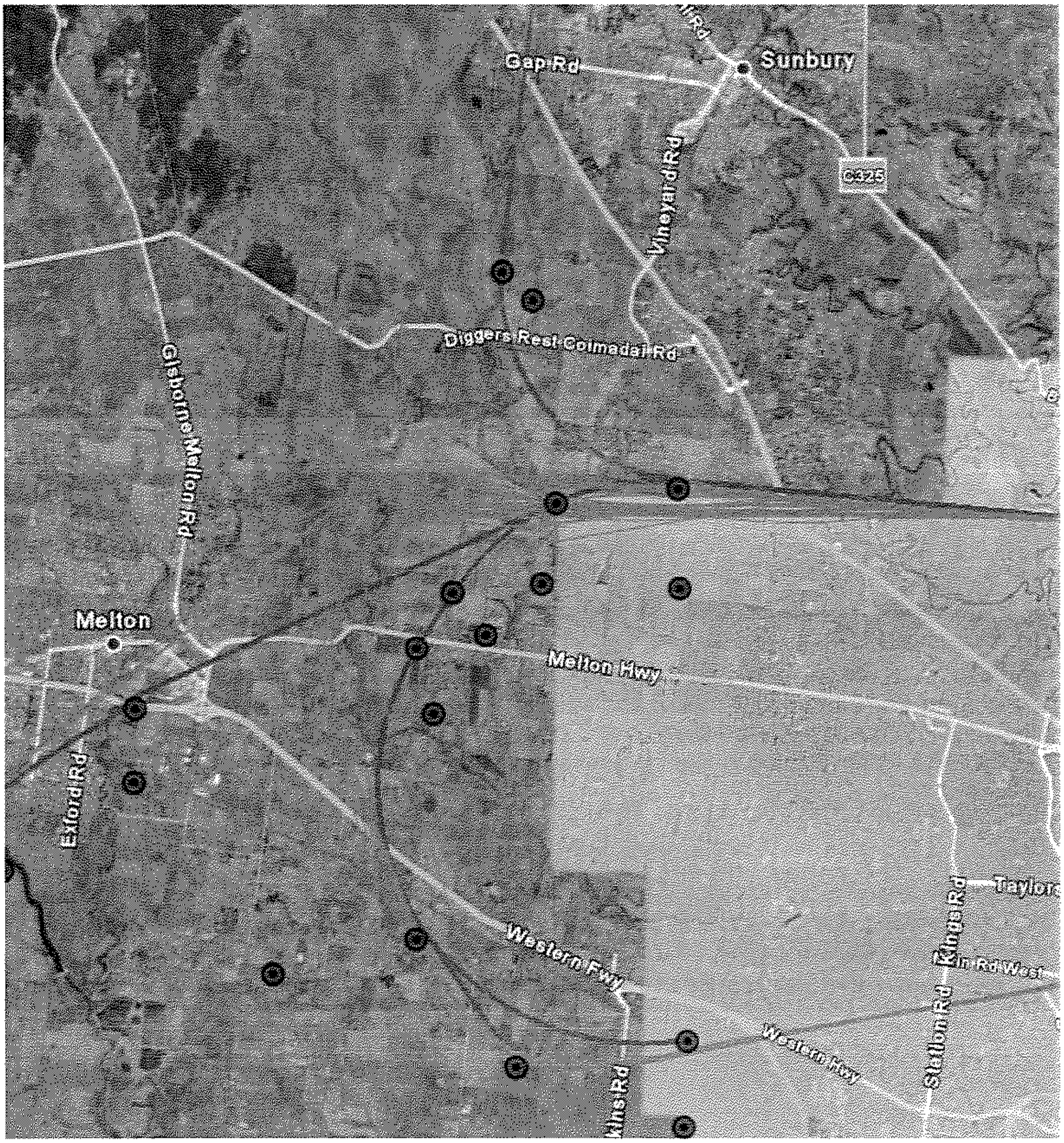
Analysis of aircraft movements over the 1 May 2008 to 30 April 2009 period was also undertaken to assist in determining if the proposed RNP approach procedures and their linked STARs will alter the noise impact of aircraft operations on the areas they overfly during their approach to Runway 09. This analysis was undertaken by identifying the number of arrivals to this runway by all jet aircraft and the Qantas and Jetstar aircraft for each STAR that is used for an approach to this runway. This analysis is shown in Table 3.

Table 3 indicates the maximum number of arrivals to this runway only occurs for a relatively few days during the year and when it does there was an average 8.0 arrivals by all jet aircraft and 4.3 arrivals by Qantas and Jetstar aircraft on the days it was being used. To assist in the analysis of these proposed RNP approach procedures their flight path was using Google Earth overlaid to the current approach tracks and satellite imagery to identify the usage of the areas that are currently overflown and will be overflown by aircraft using these procedures and shown in Figure 5.

Table 3. Annual Aircraft Movement Analysis for Runway 09

STAR	ARBEY		MONTY		WAREN		WENDY		Total	
	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP
Total Moves	183	85	35	13	16	5	31	17	265	120
Ave Daily Moves	0.5	0.2	0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.7	0.3
Max Daily Moves	46	14	16	5	7	2	7	4	76	29
Days with Moves	27	24	5	5	4	3	18	12	33	28
Daily Average when used	6.8	3.5	7.0	2.6	4.0	1.7	1.7	1.4	8.0	4.3

Figure 5. Runway 09 Current arrivals and RNP Approach Paths



The analysis of the proposed RNP approach procedures and aircraft flight tracks shown in Figure 4 and number of arrivals to Rwy 09 during the 1 May 2008 to 30 April 2009 period indicated:

- the proposed RNP approach procedure that is linked to the ARBEY STAR will deviate from the existing flight path at WILDE waypoint and track over mainly rural areas and some rural residential areas that currently have limited overflights;
- the proposed approach path for arrivals from the north-east and east that have followed either the MONTY STAR will deviate slightly from the existing flight path during the turn onto final which Figure 4 and Figure 5 shows will be over rural areas;
- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- the proposed approach path for arrivals using the WENDY STAR will deviate from the existing flight path at MELSO waypoint and track over a reduced area of Melton which Figure 5 shows will be over an industrial, then over rural areas before joining for their final approach;
- the proposed approach path for arrivals using the PORTS STAR will only deviate slightly from the existing flight path during the turn onto final which Figure 4 and Figure 5 shows will be over rural areas;
- the majority of current jet arrivals have joined final prior to ABDIG waypoint, the last point aircraft can join for an RNP approach to this runway;
- daily average of less than 1 aircraft per day arrive on this runway with a maximum of 46 arrivals on any one day;
- aircraft using this procedure will track close to the NFPMS NMT 32 during their approach to this runway;
- comparison of the noise analysis undertaken for Cairns and Gold Coast Airports indicated Cairns NMT 1 and Gold Coast NMT 3 are located a similar distance to NMT 32 for Melbourne Airport and there should be a slight reduction in noise levels experienced but the extent of the reduction will probably not be perceptible to the human ear; and
- based on Qantas advice, not all aircraft will use an RNP approach using these approach procedures.

The above analysis indicates there should not be any change to the noise impact of aircraft arriving on Runway 09 that have used one of these proposed RNP approach procedures or their associated STAR as the analysis showed this runway has limited usage for arriving aircraft and when it is used due to prevailing meteorological conditions it is only for short periods.

Savings in Emissions for Proposed Runway 09 RNP Approach Procedures

The above analysis shows there may be a difference in track miles flown by aircraft using any of the proposed Runway 09 RNP approach procedures and an analysis to determine if there may be a difference in emissions was undertaken. This analysis indicated the following:

- An arrival using the ARBEY STAR should have a reduction of approximately 4 nautical miles;
- An arrival using the WENDY STAR should have a reduction of approximately 1 nautical mile; and
- An arrival using the MONTY and PORTS STARs should have a reduction of approximately 2 nautical miles.

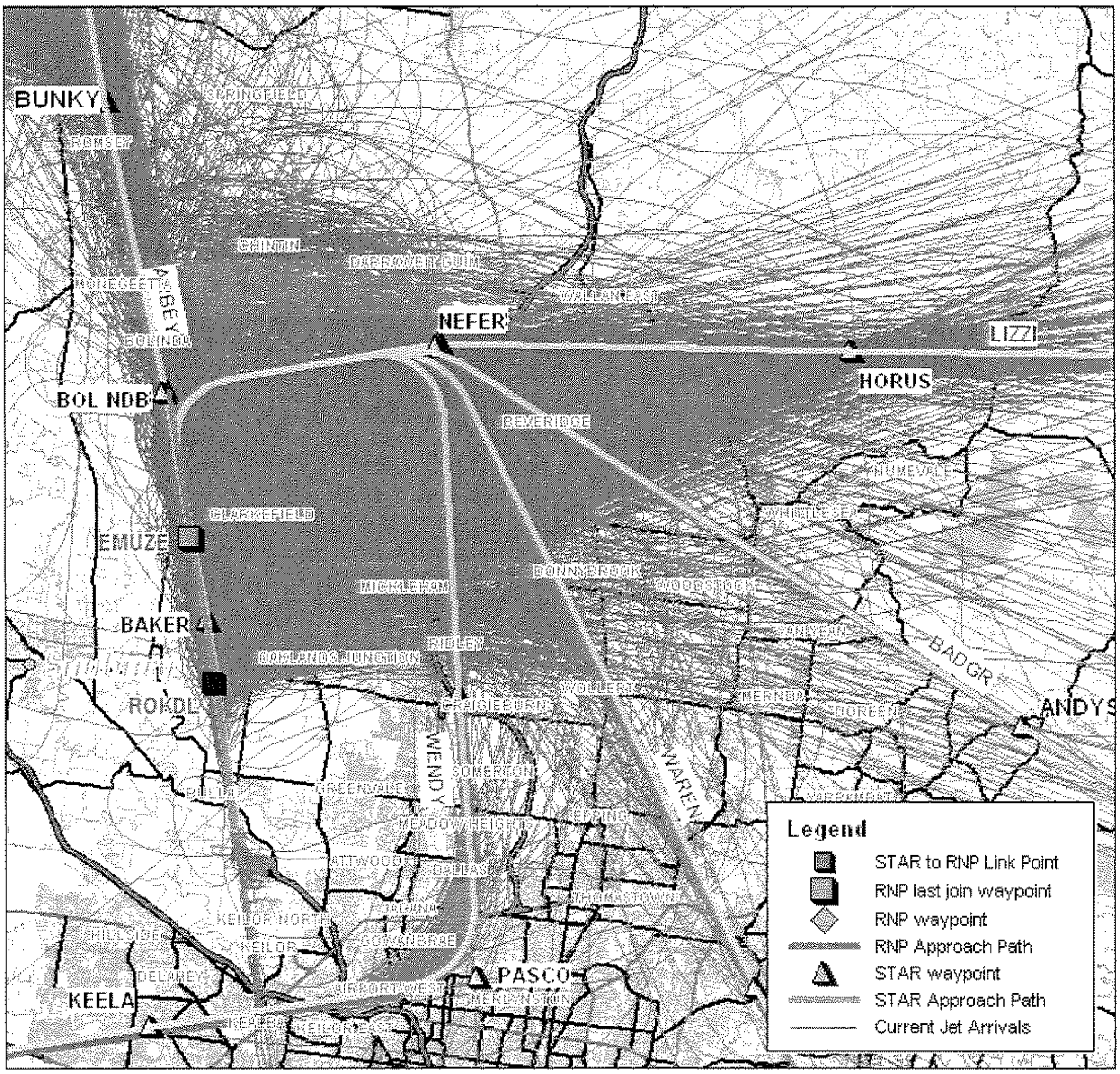
Based on the estimated reduction on track miles, the current daily average number of arrivals that will use each procedure and the "rule of thumb" principle to determine changes in emissions it was calculated an annual saving of approximately 13,500 kilograms of CO_2.

Proposed Runway 16 RNP Approach Procedures and Linked STARs

Currently there is one proposed RNP approach procedure and five linked STARs for arrivals to Runway 16 from the north, north-east, east, south and west. Plots of the proposed RNP approach procedures are shown in Attachment C, Figure C3 and the proposed RNP linked STARs are shown in Attachment E, Figures E3, E4, E5, E9 and E10.

The proposed RNAV-U (RNP) RWY 16 approach procedure is designed to track aircraft along the same flight path followed by aircraft that are currently conducting an instrument approach to Runway 16 and the proposed RNP linked STARs are designed to track aircraft along the same flight path as that of the current STARs. A plot showing the proposed RNP approach procedures and RNP linked STARs is shown in Figure 6.

Figure 6. Proposed Runway 16 RNP and Linked STARs



Attachment C, Figure C3 shows aircraft can join for an RNP approach to Runway 16 at both Bolinda (BOL) NDB or EMUZE waypoint and the analysis of the proposed BADGR, LIZZI, WAREN and WENDY STARs will show the aircraft that have been provided with direct tracking can still join for an RNP approach at EMUZE waypoint and there have been a large number of the aircraft that have been provided with direct tracking for a visual approach to this runway who have joined final after EMUZE waypoint.

Figure 6 shows there have been aircraft that have arrived from the north-east, east, south and west that have been radar vectored to the north of BOL NDB for traffic management purposes and the concentration of aircraft when using an RNP approach procedure should not alter the impact of aircraft from that currently experienced as the proposed approach path replicates the existing final approach path for all arrivals that track via BOL NDB.

Attachment C, Figure C3 also shows aircraft using this procedure are required to be at 3,000 feet at EMUZE waypoint. To determine if there may be a difference in aircraft altitude compared to that which currently occurs an analysis of aircraft altitude using NFPMS flight tracks for the period of 1 March to 31 March 2009 was undertaken at BOL NDB and the location of the proposed EMUZE waypoint and is shown in Figures 6 and 7.

Figure 7. Altitude Analysis at BOL NDB

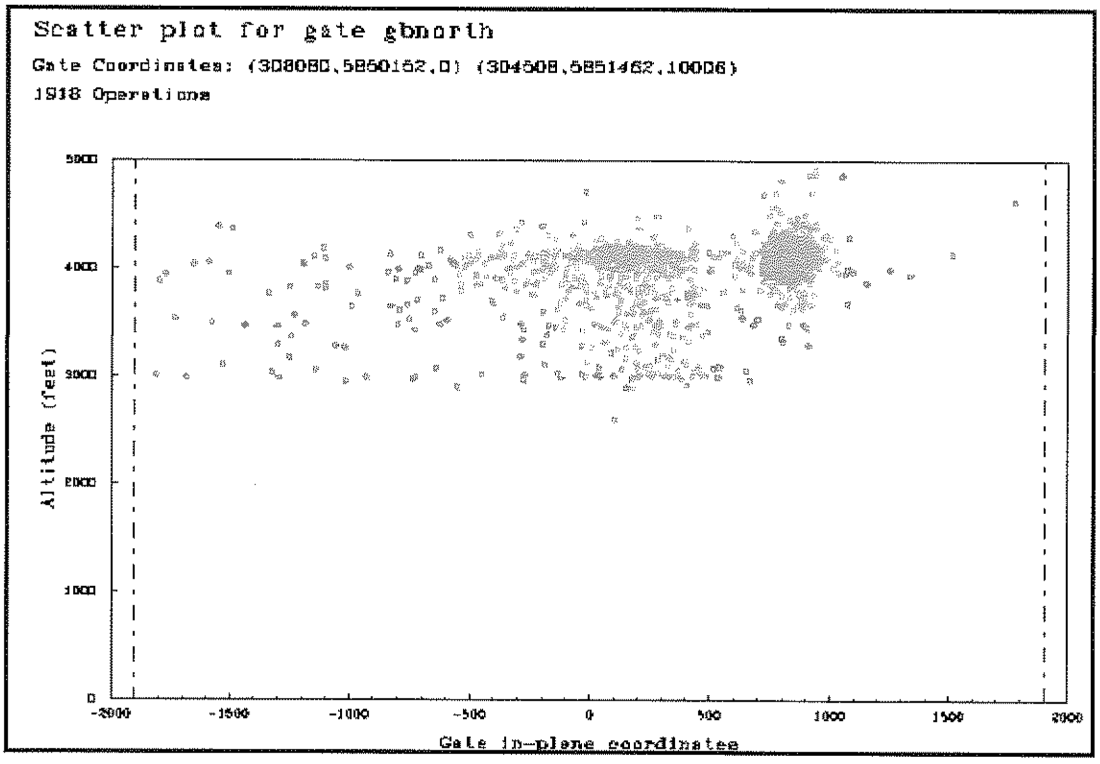


Figure 8. Altitude Analysis at EMUZE Waypoint

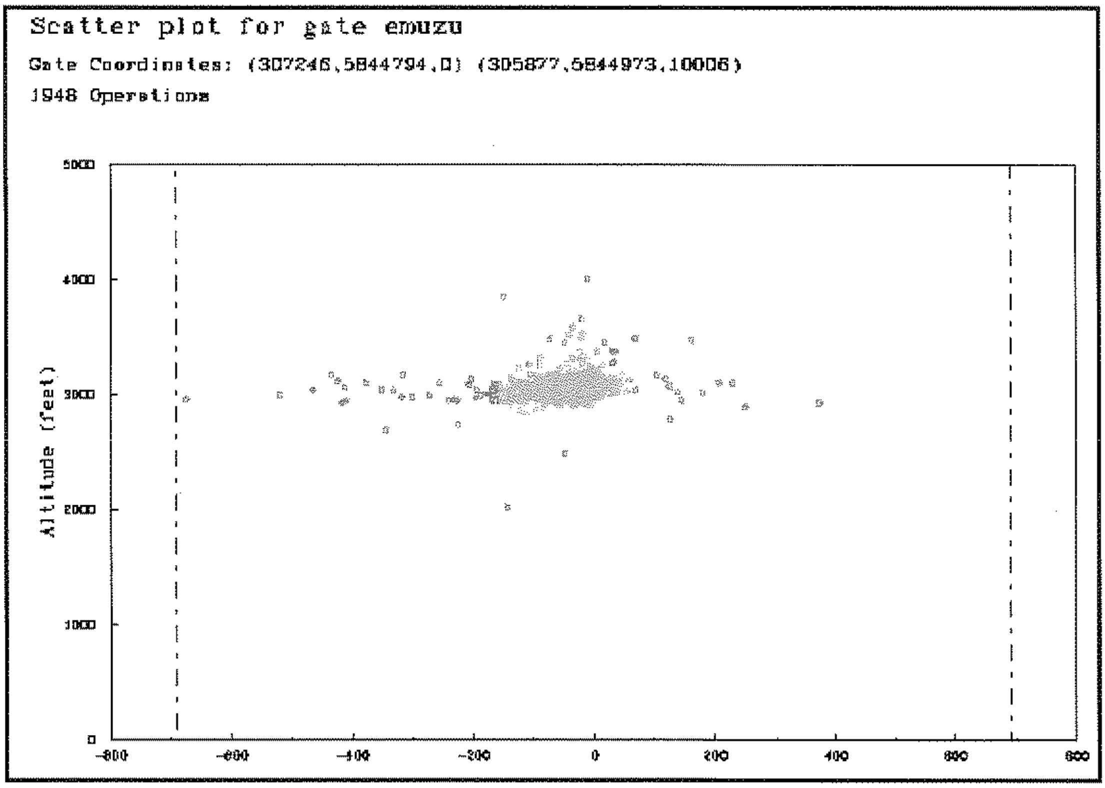


Figure 7 shows that at BOL NDB the majority of aircraft are around the 4,000 feet level and some down as low as 3,000 feet and Figure 8 shows the majority of aircraft are at or above 3,000 feet at the location of the proposed EMUZE waypoint. Therefore, no change in the altitude of aircraft is expected.

Analysis of aircraft movements over the 1 May 2008 to 30 April 2009 period was undertaken to provide an indication of the number of arrivals by all jet aircraft and the Qantas and Jetstar aircraft that use the five STARs for their approach procedures to this runway is shown in Table 4.

Table 4. Annual Aircraft Movement Analysis for Runway 16

STAR	ARBEY		BADGR		LIZZI		WAREN		WENDY		Total	
	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP
Total Moves	18986	7021	2035	114	14931	5594	3436	1778	3150	1540	**42538**	**16047**
Ave Daily Moves	**52.0**	**19.2**	**5.6**	**0.3**	**40.9**	**15.3**	**9.4**	**4.9**	**8.6**	**4.2**	**116.5**	**44.0**
Max Daily Moves	113	46	16	3	102	39	24	13	22	11	**264**	**100**
Days with Moves	295	273	260	98	281	267	264	257	285	273	**289**	**289**
Daily Average when used	**64.4**	**25.7**	**7.8**	**1.2**	**53.1**	**21.0**	**13.0**	**6.9**	**11.1**	**5.6**	**149.4**	**55.5**

Analysis of Table 4 indicates Runway 16 is used for more than 80 percent of days during the 1 May 2008 to 30 April 2009 period and Qantas and Jetstar aircraft arrive on this runway on majority of the days it is used. Table 4 also shows there is a variation in the number of arrivals by the Qantas and Jetstar aircraft that used each STAR when compared to the total number of jet aircraft arrivals that used each STAR.

The initial analysis also showed all arrivals to Runway 16 that will be using the proposed RNAV-U (RNP) RWY 16 approach procedures will track close to the NFPMS NMT 2 during their approach to this runway and a comparison of the noise analysis undertaken for Cairns and Gold Coast Airports indicated Cairns NMT 1 is located a similar distance from runway touchdown and there should be a slight reduction in noise levels experienced but the extent of the reduction will probably not be perceptible to the human ear.

Due to the variation in the flight paths followed by aircraft using the current STARs, analysis of this proposed RNP approach procedure and its linked STARs has been undertaken for each of the proposed STARs to determine if there may be a difference in the impact of aircraft using the proposed STAR and this RNP approach procedures due to change in flight path followed, concentration of aircraft along a flight path and movement analysis by Qantas and Jetstar aircraft when compared to movement analysis of all jet aircraft arrivals to Runway 16 and are detailed below.

RNAV-U (RNP) RWY 16 and Linked ARBEY UNIFORM STAR

The ARBEY MIKE STAR and its linked RNP approach procedure are designed for aircraft arriving from the north through to the north-west. Their approach path for arrivals to Runway 16 will require aircraft to track along the same flight path via ARBEY and BUNKY waypoints then Bolinda (BOL) locator where the aircraft will join for a straight in approach to Runway 16. There is no RNP aligned STAR for arrivals from this direction.

A comparison of the proposed RNP approach procedure, the current STAR and current approach tracks shown in Figure 6 indicates there should not be any change in the impact to that currently experienced as Figure 6 shows the majority of aircraft are following a concentrated flight path after they have passed BOL NDB. Figure 6 also shows the flight path of current arrivals using the ARBEY STAR prior to BOL NDB is also concentrated. Figures 6 and 7 also show the altitude requirements of the proposed RNAV-U (RNP) RWY 16 approach procedure should not change aircraft altitude to that currently experienced.

A comparison of movement number for Qantas and Jetstar aircraft shown in Table 4 and Attachment A, table A1 indicates there is the potential for a large increase in number of arrivals to Runway 16 using the ARBEY STAR but the analysis shows there should not be any difference in their approach path when using this RNP approach procedure and the ARBEY UNIFORM STAR as Figure 6 shows their approach path is concentrated after passing BUNKY waypoint and prior to this aircraft appear to have been provided with direct tracking from a distant waypoint or are being radar vectored for traffic management purposes and joining final at or about BOL NDB.

Based on this analysis and the noise analysis undertaken for RNP arrivals to Runway 16, it is expected that there should not be any difference in the noise impact of aircraft to that currently experienced as the proposed the RNP approach procedure and its linked ARBEY UNIFORM STAR should not alter the flight path of aircraft as the analysis shows the majority of these have joined prior to BOL NDB and there have been many days when there has been an increased number of aircraft that have landed on Runway 16 after arriving from the north.

This initial analysis also indicated aircraft using this RNP approach procedure will track close to the NFPMS NMT 2 is located close to the proposed ROKDL waypoint. Cairns NMT 1 is a similar distance from touchdown to a runway and the of Qantas B737-800 operations at Cairns Airport indicated there should be a slight reduction in noise levels experienced but the extent of the reduction should not be perceptible to the human ear.

As there will not be any changes track miles flown by aircraft using this proposed RNP approach procedure changes in aircraft emissions were not calculated.

RNAV-U (RNP) RWY 16 and Linked BADGR, LIZZI, WAREN and WENDY STARs

This proposed RNP approach procedure can also be used by aircraft that currently use the BADGR, LIZZI, WAREN and WENDY STARs and the ILS-Y or LOC-Y RWY 16 or ILS-Z or LOC-Z RWY 16 instrument approach procedures for their approach to Runway 16. An initial analysis indicates the only change for aircraft using this RNP approach procedure should be prior to the actual point that they join this procedure after they have followed the linked BADGR, LIZZI, WAREN and WENDY STARs, or if they have been radar vectored for traffic management purposes or provided with direct tracking to join the RNP approach procedure between BOL NDB and EMUZE waypoint.

To assist in the determining if there may be a change in the flight path followed by aircraft that are currently using the current BADGR, LIZZI, WAREN and WENDY STARs a plot of the proposed linked STAR overlaid to flight tracks of aircraft that used this STAR for their approach to Runway 16 are shown in Figures 8, 9, 10, and 11 respectively.

Due to the spread of aircraft shown in Figures 8, 9, 10, and 11 analysis was undertaken to identify the different flight path followed by aircraft during their approach to Runway 16 that can be identified as being capable of joining for an RNP approach to this runway and those who would have to change their flight path to do so. This analysis identified three current flight paths that will enable aircraft to join for an RNP approach and one flight path that will require them to change their approach path in order to join for an RNP approach to this runway. These flight paths are:

- followed the STAR and join for an RNP approach;
- radar vectored for traffic management purposes and join for an RNP approach;
- followed a visual approach path that joins final prior to EMUZE waypoint and allows aircraft to then join for an RNP approach to this runway; and
- conducted a visual approach that joined final after EMUZE waypoint and will require aircraft to be provided with a different approach path.

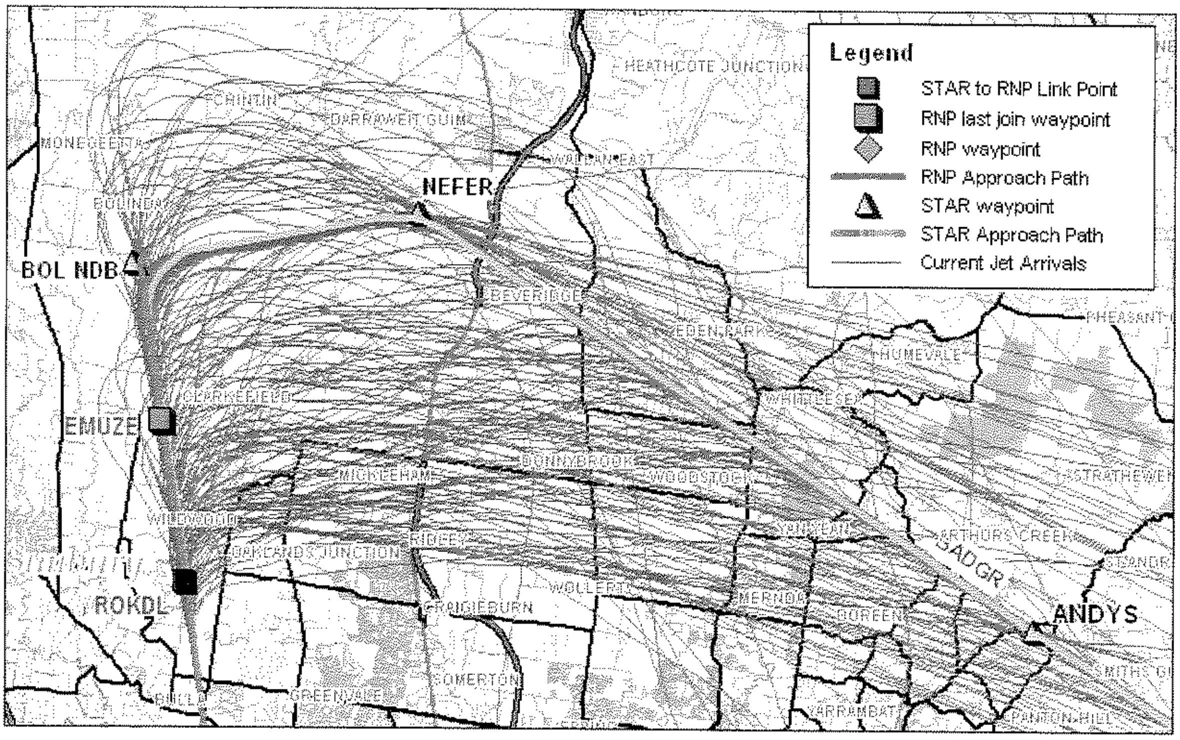
Using these identified approach paths and aircraft movement numbers, analysis of the RNAV-U (RNP) RWY 16 and the BADGR, LIZZI, WAREN and WENDY STARs was undertaken and is detailed separately below.

The analysis undertaken to determine if there may be a change to the noise impact of aircraft using the BADGR, LIZZI, WAREN and WENDY STARs showed aircraft using the RNAV-U (RNP) RWY 16 and the will follow the same final approach path as the proposed the RNAV-M (RNP) RWY 16 approach procedure when passing NMT 2 and the analysis of the proposed RNAV-M (RNP) RWY 16 approach procedure indicated there should be a slight reduction in noise levels experienced but the extent of the reduction should not be perceptible to the human ear at this noise monitoring station.

RNAV-U (RNP) RWY 16 and Linked BADGR UNIFORM STAR

Figure 9 shows a narrow flight path of those aircraft that have followed the BADGR STAR, the aircraft that have been radar vectored for traffic management purposes and those that have been provided with a visual approach to Runway 16. Analysis of the NFPMS flight tracks shown in Figure 9 was undertaken to determining the number of flights by all jet aircraft, Qantas 737-800 and Jetstar A320 aircraft and Qantas and Jetstar A330 and B767 aircraft who followed the STAR, were radar vectored, provided with a visual approach that enabled them to join prior to EMUZE waypoint or join for a visual approach by joining between EMUZE and ROKDL waypoints.

Figure 9. Proposed Runway 16 RNP and Linked BADGR STAR



Based on the four different flight paths, analysis of the proposed BADGR UNIFORM STAR indicated the following:

- The proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- there should not be a change in the flight path of aircraft following the proposed BADGR UNIFORM STAR as there is no difference to that of the current BADGR THREE STAR;
- an annual daily average of 5.6 arrivals by all jet aircraft and approximately 0.3 arrivals per day by Qantas and Jetstar B737-800, B767, A320 and A330 aircraft;
- the three months NFPMS track data showed
  - 58 percent of all arrivals were along the STARs flight path, of which one percent of these arrivals were by Qantas and Jetstar aircraft;
  - 33 percent of all arrivals conducted a visual approach of which two percent of these arrivals were by Qantas and Jetstar aircraft;
  - 9 percent of all arrivals were provided with radar vectoring of which there were no Qantas and Jetstar aircraft; and
  - the majority of the Qantas and Jetstar arrivals who conducted a visual approach will need to alter their flight path to join final prior to EMUZE waypoint.
- the Qantas and Jetstar aircraft that conducted a visual approach ands have joined final prior to EMUZE waypoint aircraft should be able to join for an RNP approach to Runway 16 if they followed a similar approach path;
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of only one arrival per day by Qantas B737-800 aircraft using this approach procedure;

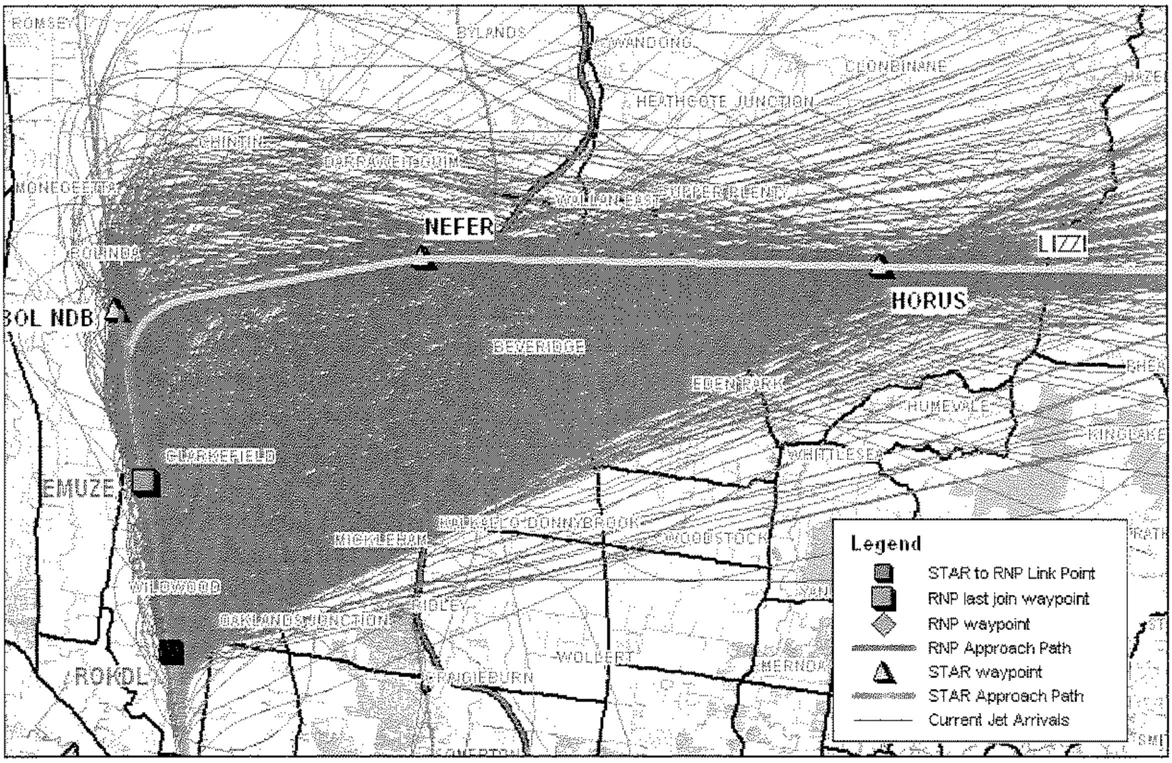
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis, based on data from Cairns and Gold Coast Airprots, showed the noise generated by aircraft conducting an RNP approach to Runway 16 should be slightly less than current arrivals when tracking over NMT 2 but the reduction will probably not be perceptible to the human ear.

Based on the altitude analysis of aircraft at BOL NDB and proposed EMUZE waypoint, flight path analysis, daily average number of movements, maximum possible number of arrivals using this procedure, the concentration of aircraft when using an RNP procedure and the noise analysis of aircraft conducting an RNP approach it is expected the proposed RNAV-U (RNP) RWY 16 and the Linked BADGR UNIFORM STAR should not be any adverse impacts due to the minimal number of arrivals that arrive using the BADGR STAR for their approach to Runway 16.

RNAV-U (RNP) RWY 16 and Linked LIZZI UNIFORM STAR

Figure 10 shows a narrow flight path of those aircraft that have followed the LIZZI STAR, the aircraft that have been radar vectored for traffic management purposes and those aircraft that have been provided with a visual approach to Runway 16. This analysis involved determining the number of flights by all jet aircraft, Qantas 737-800 and Jetstar A320 aircraft and Qantas and Jetstar A330 and B767 aircraft that during the 1 January to 31 March 2009 period followed the STAR, were radar vectored or provided with a visual approach that would enable them to conduct an RNP approach by joining prior to EMUZE waypoint or track to join for a visual approach by joining between EMUZE and ROKDL waypoints.

Figure 10. Proposed Runway 16 RNP and Linked LIZZI STAR



Based on the four different flight paths, analysis of the proposed LIZZI UNIFORM STAR indicated the following number of daily arrivals along each of the identified flight paths

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- there should not be a change in the flight path of aircraft following the proposed LIZZI UNIFORM STAR as there is no difference to that of the current LIZZI TWO STAR;
- an annual daily average 6.2 arrivals by Qantas B737-800 and Jetstar A320 aircraft and 9.1 arrivals by Qantas and Jetstar B767 and A330 aircraft of a total 40.9 jet aircraft arrivals per day that used the LIZZI STAR for their approach to Runway 16;
- the three months NFPMS track data showed
  - 58 percent of all arrivals were along the STARs flight path, of which 13 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 23 percent were by Qantas and Jetstar B767 and A330 aircraft;
  - 39 percent of all arrivals conducted a visual approach of which 14 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 24 percent were by Qantas and Jetstar B767 and A330 aircraft;
  - 3 percent of all arrivals were provided with radar vectoring of which 12 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 29 percent were by Qantas and Jetstar B767 and A330 aircraft; and
  - 90 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to EMUZE waypoint;
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 15.9 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and 18.8 arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 4 shows a maximum of 39 arrivals per day by Qantas and Jetstar aircraft during the 1 May 2008 to 30 April 2009 period which is similar to the maximum number of arrivals by Qantas and Jetstar aircraft shown in Attachment A
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 16 should be slightly less than current arrivals when tracking over NMT 2 but the reduction will probably not be perceptible to the human ear.

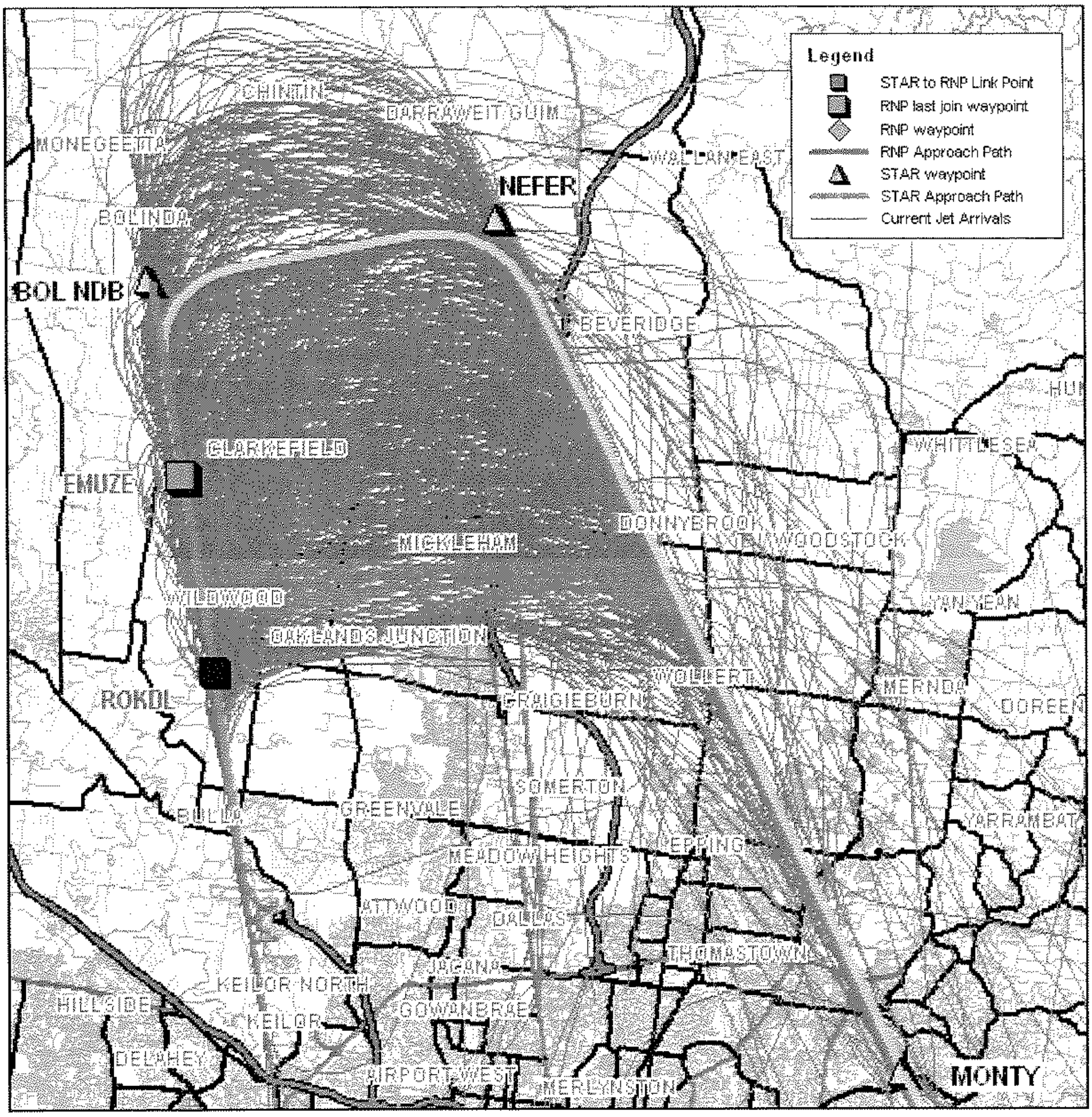
Based on the altitude analysis of aircraft at BOL NDB and proposed EMUZE waypoint, flight path analysis, daily average number of movements and the noise analysis of aircraft conducting an RNP approach, it is expected the proposed RNAV-U (RNP) RWY 16 and the Linked LIZZI UNIFORM STAR should not be of concern to the areas below their flight path of the aircraft that will be following this RNP approach procedure and STAR for their approach to Runway 27.

The analysis also showed the aircraft that have been radar vectored for traffic management purposes and those that have been provided with track shortening can join for an RNP approach to Runway 16 if they join final prior to EMUZE waypoint. However, the analysis did show the aircraft that have accepted track shortening and have joined for their final approach after EMUZE waypoint will alter their noise impact if they change their flight path in order to conduct an RNP approach to Runway 16.

RNAV-U (RNP) RWY 16 and Linked WAREN UNIFORM STAR

Figure 11 shows a narrow flight path of those aircraft that have followed the WAREN STAR, the aircraft that have been radar vectored for traffic management purposes and those provided with direct tracking for an approach to Runway 16. The analysis involved determining the number of flights by all jet aircraft, Qantas 737-800 and Jetstar A320 aircraft and Qantas and Jetstar A330 and B767 aircraft during the 1 January to 31 March 2009 period that followed the STAR, where radar vectored, provided with a visual approach that would enable them to conduct an RNP approach by joining prior to EMUZE waypoint or track to join for a visual approach by joining between EMUZE and ROKDL waypoints.

Figure 11. Proposed Runway 16 RNP and Linked WAREN STAR



Based on the four different flight paths, analysis of the proposed WAREN UNIFORM STAR indicated the following number of daily arrivals along each of the identified flight paths

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- there should not be a change in the flight path followed by aircraft using the proposed WAREN UNIFORM STAR as there is no difference to that of the current WAREN NINE STAR;

- Table 4 shows a maximum of 13 arrivals per day were recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 which is slightly less than the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 17.8 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and no arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 16 should be a slightly less than current arrivals when tracking over NMT 2 but the reduction will probably not be perceptible to the human ear;
- an annual daily average of 4.9 arrivals by Qantas B737-800 and Jetstar A320 aircraft and no arrivals by Qantas and Jetstar B767 and A330 aircraft of a total 9.4 arrivals by all jet aircraft that used the WAREN STAR for their approach to Runway 16;
- the three months NFPMS track data showed
  - 47 percent of all arrivals were along the STARs flight path, of which 37 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and there were no arrivals by Qantas and Jetstar B767 and A330 aircraft;
  - 45 percent of all arrivals conducted a visual approach of which 45 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and there were no arrivals by Qantas and Jetstar B767 and A330 aircraft;
  - 8 percent of all arrivals were provided with radar vectoring of which 41 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and there were no arrivals by Qantas and Jetstar B767 and A330 aircraft; and
  - 81 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to EMUZE waypoint.

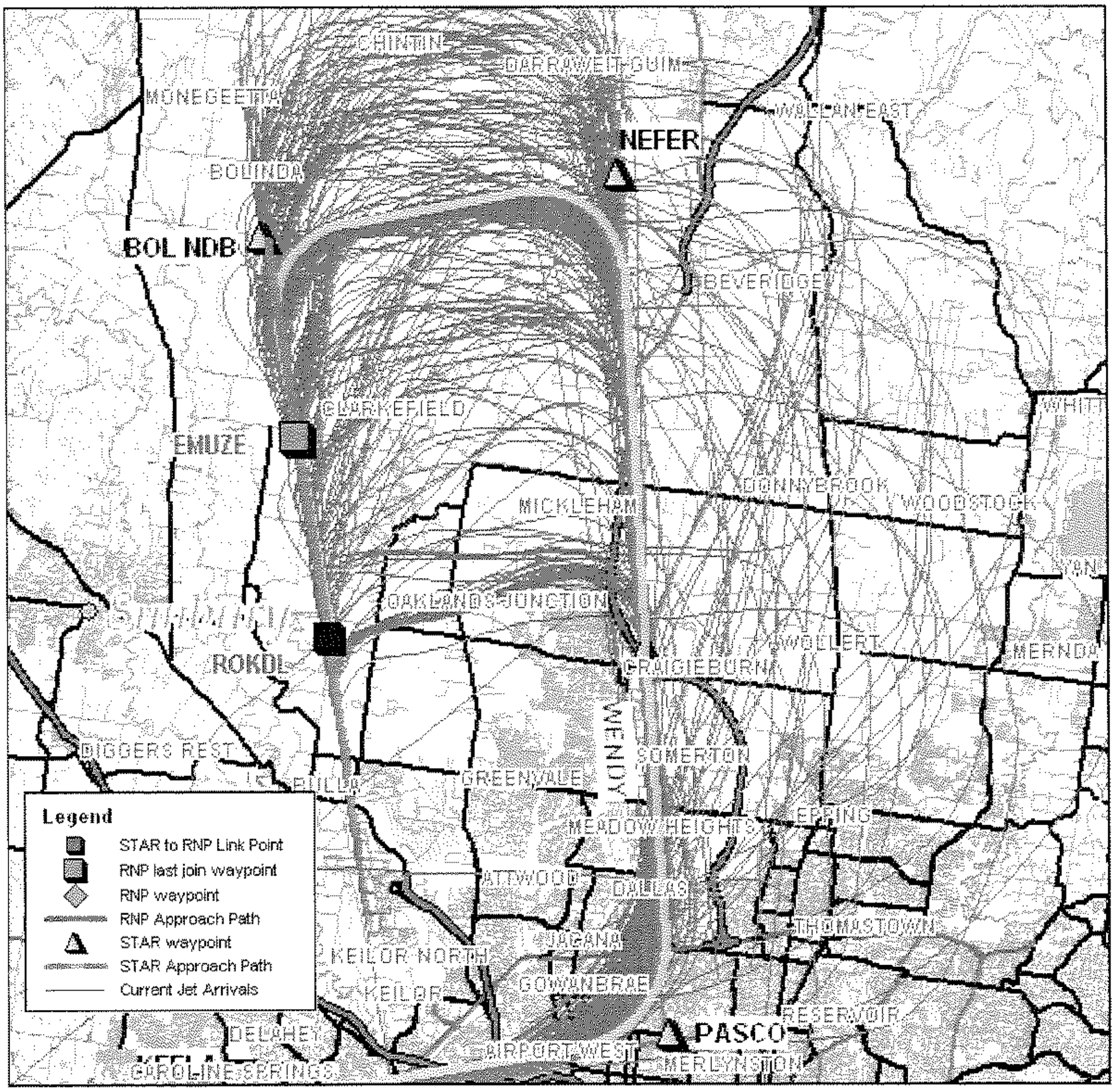
Based on the altitude analysis of aircraft at BOL NDB and proposed EMUZE waypoint, flight path analysis, small daily average number of movements by Qantas and Jetstar aircraft along each of the identified flight paths and the noise analysis of aircraft conducting an RNP approach when passing the NFPMS NMT 2 site it is expected the proposed RNAV-U (RNP) RWY 16 and the WAREN UNIFORM STAR should not be of concern to the areas below their flight path of the aircraft that will be following this RNP approach procedure and STAR for their approach to Runway 27.

The analysis also showed the aircraft that have been radar vectored for traffic management purposes and those that have been provided with track shortening can join for an RNP approach to Runway 16 if they join final prior to EMUZE waypoint. However, the analysis did show the aircraft that have accepted track shortening and have joined for their final approach after EMUZE waypoint will alter their noise impact if they change their flight path in order to conduct an RNP approach to Runway 16.

RNAV-U (RNP) RWY 16 and Linked WENDY UNIFORM STAR

Figure 12 shows a narrow flight path of those aircraft that have followed the WENDY STAR, the aircraft that have been radar vectored for traffic management purposes and those that have been provided with a visual approach to Runway 16. The analysis involved determining the number of flights by all jet aircraft, Qantas 737-800 and Jetstar A320 aircraft and Qantas and Jetstar A330 and B767 aircraft during the 1 January to 31 March 2009 period that followed the STAR, where radar vectored, provided with a visual approach that would enable them to conduct an RNP approach by joining prior to EMUZE waypoint or track to join for a visual approach by joining between EMUZE and ROKDL waypoints.

Figure 12. Proposed Runway 16 RNP and Linked WENDY STAR



Based on the four different flight paths, analysis of the proposed WENDY UNIFORM STAR indicated the following number of daily arrivals along each of the identified flight paths

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- there should not be a change in the flight path of aircraft following the proposed WENDY UNIFORM STAR as there is no difference to that of the current WENDY THREE STAR;
- an annual daily average of 1.1 arrivals by Qantas B737-800 and Jetstar A320 aircraft and 3.1 arrivals were by Qantas and Jetstar B767 and A330 aircraft of a total 8.6 arrivals by jet aircraft to Runway 16 that used the current WENDY STAR;
- the three months NFPMS track data showed

- 59 percent of all arrivals were along the STARs flight path, of which 8 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 17 percent were by Qantas and Jetstar B767 and A330 aircraft;
- 22 percent of all arrivals conducted a visual approach of which seven percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 34 percent were by Qantas and Jetstar B767 and A330 aircraft;
- 25 percent of all arrivals were provided with radar vectoring of which five percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 24 percent were by Qantas and Jetstar B767 and A330 aircraft; and
- 75 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to EMUZE waypoint.

- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 4.6 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and 6.4 arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 4 shows a maximum of 11 arrivals per day were recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 which is similar to the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 16 should be slightly less than current arrivals when tracking over NMT 2 but the reduction will probably not be perceptible to the human ear.

Based on the altitude analysis of aircraft at BOL NDB and proposed EMUZE waypoint, flight path analysis, small daily average number of movements by Qantas and Jetstar aircraft along each of the identified flight paths and the noise analysis of aircraft conducting an RNP approach when passing the NFPMS NMT 2 site it is expected the proposed RNAV-U (RNP) RWY 16 and the WENDY UNIFORM STAR should not be of concern to the areas below their flight path of the aircraft that will be following this RNP approach procedure and STAR for their approach to Runway 27.

The analysis also showed the aircraft that have been radar vectored for traffic management purposes and those that have been provided with track shortening can join for an RNP approach to Runway 16 if they join final prior to EMUZE waypoint. However, the analysis did show the aircraft that have accepted track shortening and have joined for their final approach after EMUZE waypoint will alter their noise impact if they change their flight path in order to conduct an RNP approach to Runway 16.

Combined Impact of RNAV-U (RNP) RWY 16 Approach Procedure and Linked STARs

The above analysis indicates Qantas and Jetstar aircraft that will follow this proposed RNP approach procedures and linked ARBEY, BADGR, LIZZI, WAREN and WENDY STARs should not alter the impact that is currently experienced from aircraft that follow the current STARs for their approach to Runway 16. The analysis also showed aircraft may continue to be provided by ATC with radar vectoring for traffic management purposes and Qantas and Jetstar aircraft can join for an RNP approach at BOL NDB and EMUZE waypoint. It also showed aircraft can continue to accept direct tracking and join final prior to EMUZE waypoint and still conduct an RNP approach to Runway 16.

However, the analysis also showed the aircraft that are currently provided with direct tracking for a visual approach to Runway 16 that wish to join for an RNP approach and have joined final after EMUZE waypoint will be required to follow a different flight path, resulting in an increase in the number of aircraft overflights of areas who are currently overflown by aircraft who a following the current STAR.

The analysis also showed that there was an average of 24.8 Qantas and Jetstar arrivals per day that used either the BADGR, LIZZI, WAREN or WENDY STARs for their approach to Runway 16 and approximately 18 percent of the Qantas and Jetstar aircraft will be required to change their flight path in order to conduct an RNP approach to this runway. The analysis was not able to determine if there may be a change in the number of aircraft that conduct a visual approach and join for an RNP approach at BOL NDB or EMUZE waypoint and any subsequent potential change to the noise impact these aircraft may cause.

Analysis of Emissions Savings for Proposed Runway 16 RNP Approach Procedure

The above analysis shows there should not be any difference in track miles flown by aircraft using the proposed RNAV-U (RNP) RWY 16 approach procedure and any of its linked STARs as the analysis showed there are no differences between the flight path of the currant STARs and the proposed RNP approach procedure and any of the linked STARs. The analysis did show some aircraft may continue to be provided with direct tracking from a distant waypoint and join for an RNP approach at EMUZE waypoint or radar vectored for traffic management purposed and can still join for an RNP approach at BOL NDB. The analysis also showed there may be a difference in track miles flown by aircraft who are currently being provided with direct tracking and joining final after EMUZE waypoint, however, due to the variation in flight path followed by these aircraft and not being able to determine the number of aircraft that will join at EMUZE waypoint, analysis to determine the difference in emissions by the Qantas and Jetstar aircraft when conducting a visual, Instrument or RNP approach to Runway 16 could not be undertaken.

Proposed Runway 27 RNP Approach Procedures and Linked STARs

Table 1 shows there are two proposed RNP procedures for aircraft arriving Runway 27 and five proposed linked STARs for arrivals that currently use the ARBEY, BADGR, LIZZI, WAREN and WENDY STARs for their approach to Runway 27. Plots of the proposed RNP approach procedures are shown in Attachment C, Figures C4 and C5 and RNP linked STARs are shown in Attachment E, Figures E3, E4, E5, E9 and E10. A plot of the proposed RNP approach procedures, their linked STARs and flight tracks of arrivals to Runway 27 during the 1 January to 31 March 2009 period is shown in Figure 13.

An initial analysis of the proposed RNP approach procedures indicates both allow aircraft to join the procedure at EDSAL waypoint which is located 5.1 nautical miles from touchdown. Analysis of the proposed RNP approach procedures for arrivals that currently use the ARBEY, LIZZI, BADGR, WAREN and WENDY STARs are detailed below.

Attachment C, Figures C4 and C5 show aircraft can join for an RNP approach to Runway 27 at both EPP NDB or EDSAL waypoint and Figure 13 shows that aircraft have been provided with direct tracking can still join for an RNP approach at EDSAL waypoint. Figure 13 also shows there have been a large number of the aircraft that have been provided with direct tracking for a visual approach to this runway who have joined final after EMUZE waypoint. It also shows there have been aircraft that have arrived from the north-east, east, south and west that have been radar vectored for traffic management purposes.

Attachment C, Figures C4 and C5 also show aircraft using this procedure are required to be at 2,100 feet at EDSAL waypoint and to check if there may be a difference in aircraft altitudes to that which currently occurs an analysis of aircraft altitude using NFPMS flight tracks for the period of 1 March to 31 March 2009 was undertaken at EPP NDB and the location of the proposed EDSAL waypoint and is shown in Figures 13 and 14.

Figure 13. Runway 27 RNP and Linked STARs Approach Paths

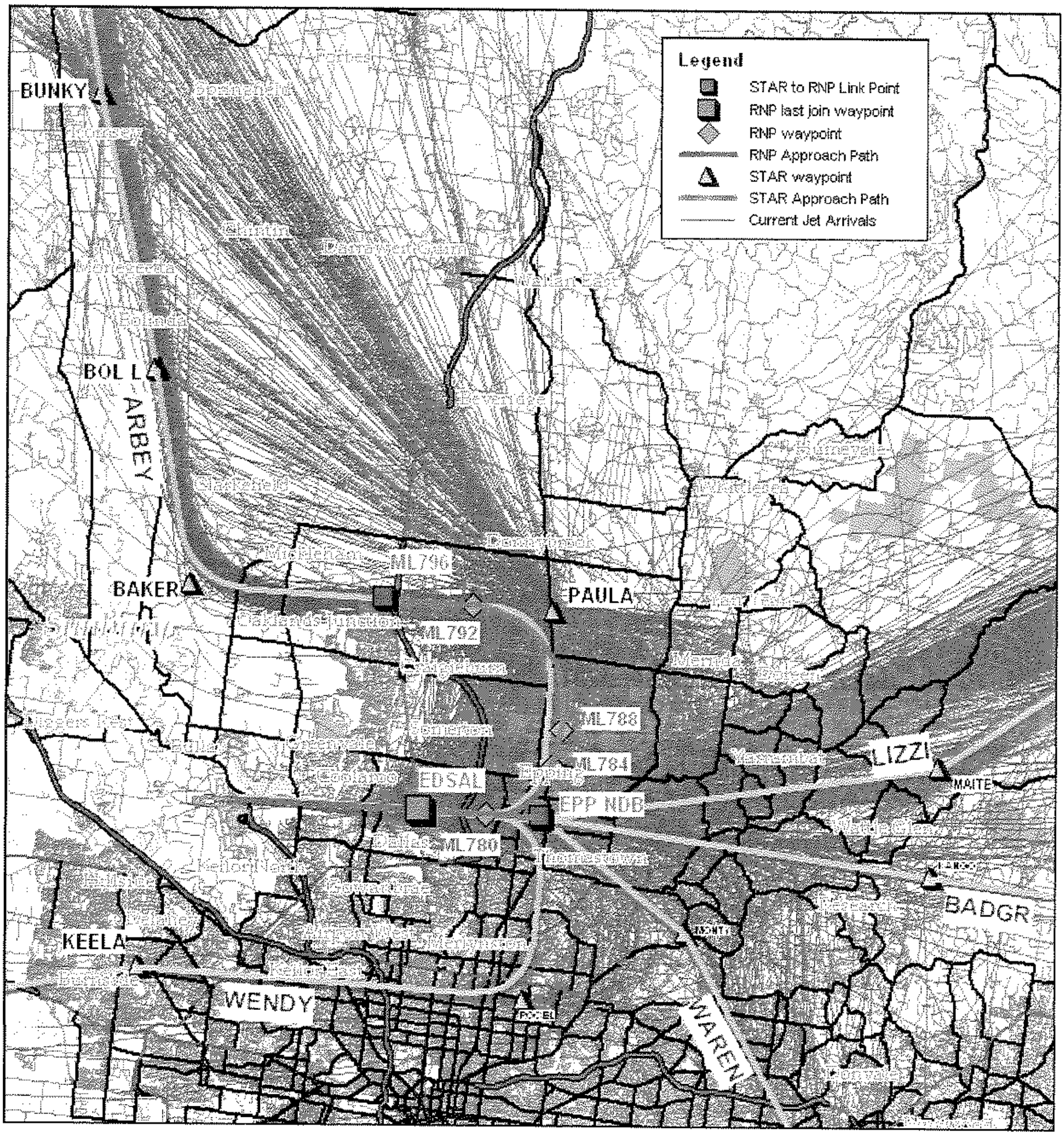


Figure 14. Altitude Analysis at EPP NDB

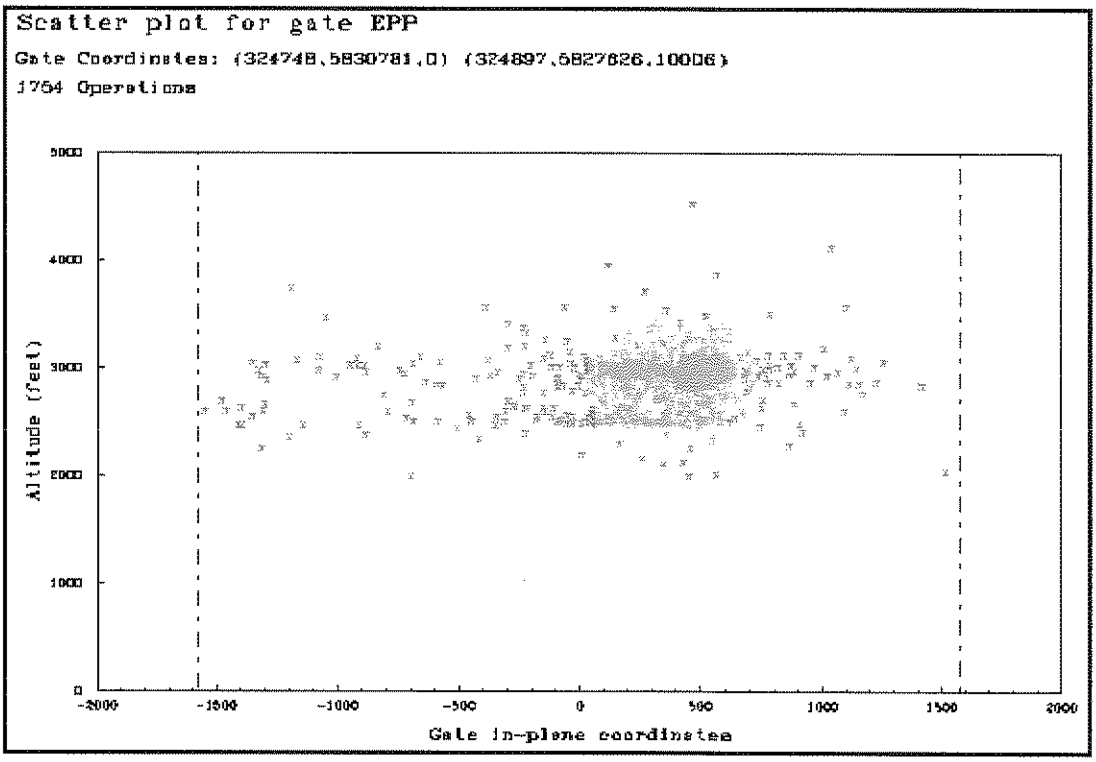


Figure 15. Altitude Analysis at EDSAL Waypoint

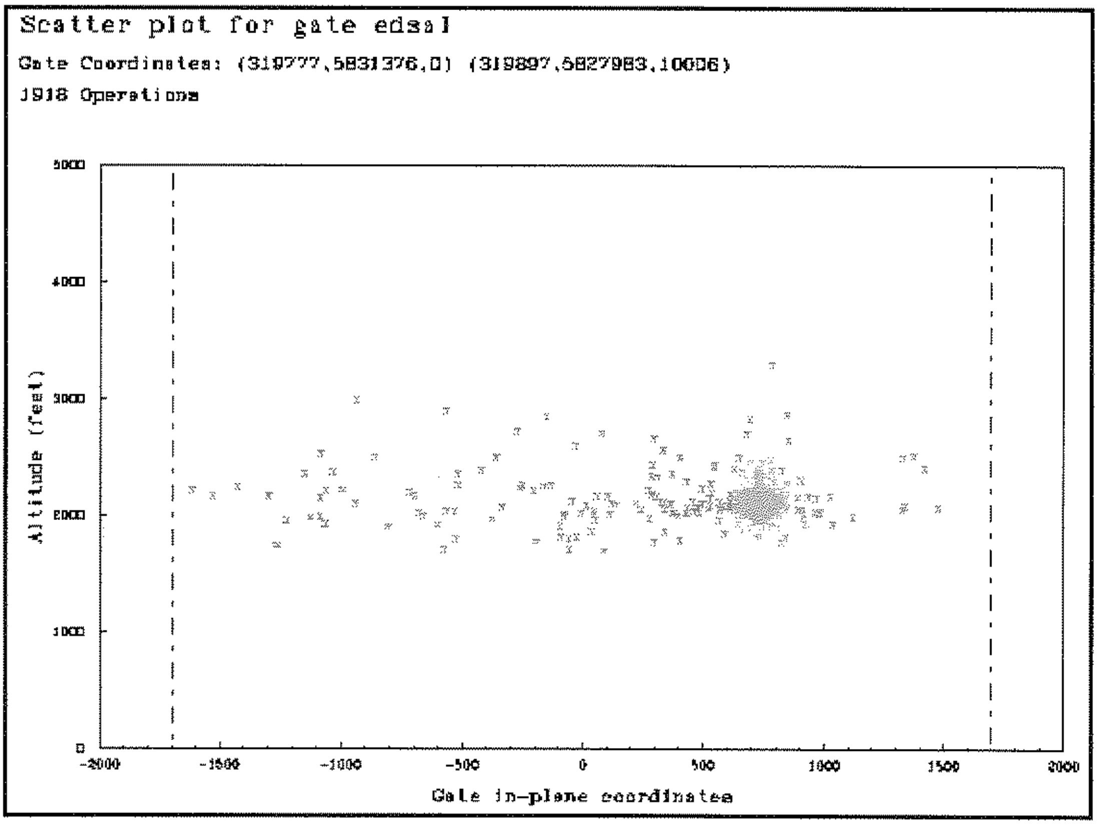


Figure 14 shows there are two altitude bands for aircraft conducting an approach to Runway 27, one at approximately 3,000 feet and the other at 2,500 feet when tracking past EPP NDB, which analysis of current Runway 27 STARs indicated aircraft using the ARBEY or WENDY STARs join at EPP NDB at an elevation of 2,500 feet and aircraft using the BADGR, LIZZI or WAREN STARs join at 3,000 feet at EPP NDB.

Figure 15 shows that at proposed EDSAL waypoint the majority of aircraft are around the 2,100 feet level, which is the altitude requirement of the proposed RNAV-U (RNP) RWY 27 and RNAV-M (RNP) RWY 27 approach procedures.

Analysis of aircraft movements over the 1 May 2008 to 30 April 2009 period was undertaken to provide an indication of the number of arrivals by all jet aircraft and the Qantas and Jetstar aircraft that use the five STARs for their approach procedures to this runway is shown in Table 5.

Table 5. Annual Aircraft Movement Analysis for Runway 27

STAR	ARBEY		BADGR		LIZZI		WAREN		WENDY		Total	
	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP
Total Moves	10777	4264	914	68	8553	3185	2285	1047	825	397	23354	8961
Ave Daily Moves	29.5	11.7	2.5	0.2	23.4	8.7	6.3	2.9	2.3	1.1	64.0	24.6
Max Daily Moves	102	46	12	2	84	33	21	10	17	8	217	85
Days with Moves	284	269	258	62	287	271	332	289	240	186	351	332
Daily Average when used	37.9	15.9	3.5	1.1	29.8	11.8	6.9	3.6	3.4	2.1	66.5	34.5

Analysis of Table 5 indicates Runway 27 was used for more than 90 percent of days during the 1 May 2008 to 30 April 2009 period and Qantas and Jetstar aircraft arrive on this runway on majority of these days. Table 5 also shows a variation in the number of arrivals by the Qantas and Jetstar aircraft that used each STAR when compared to the total number of jet aircraft arrivals that used each STAR.

The initial analysis also indicated aircraft using this RNP approach procedure will track over the NFPMS NMT's 5 and 6 during their approach to this runway and a comparison of the noise analysis undertaken of Cairns and Gold Coast Airports indicated the Gold Coast NMT 3 has the most similar location and the noise analysis of Qantas B737-800 operations at this airport indicated there may be a slight increase in noise levels experienced from arrivals conducting an RNP approach but the extent of the increase should not be perceptible to the human ear.

Due to the variation in the flight paths followed by aircraft using the current STARs, analysis of the proposed RNP approach procedures and their linked STARs has been undertaken for each of the proposed STARs to determine if there may be a difference in the impact of aircraft using the proposed STAR and this RNP approach procedures due to change in flight path followed, concentration of aircraft along a flight path and movement analysis by Qantas and Jetstar aircraft when compared to movement analysis of all jet aircraft arrivals to Runway 27 and are detailed below.

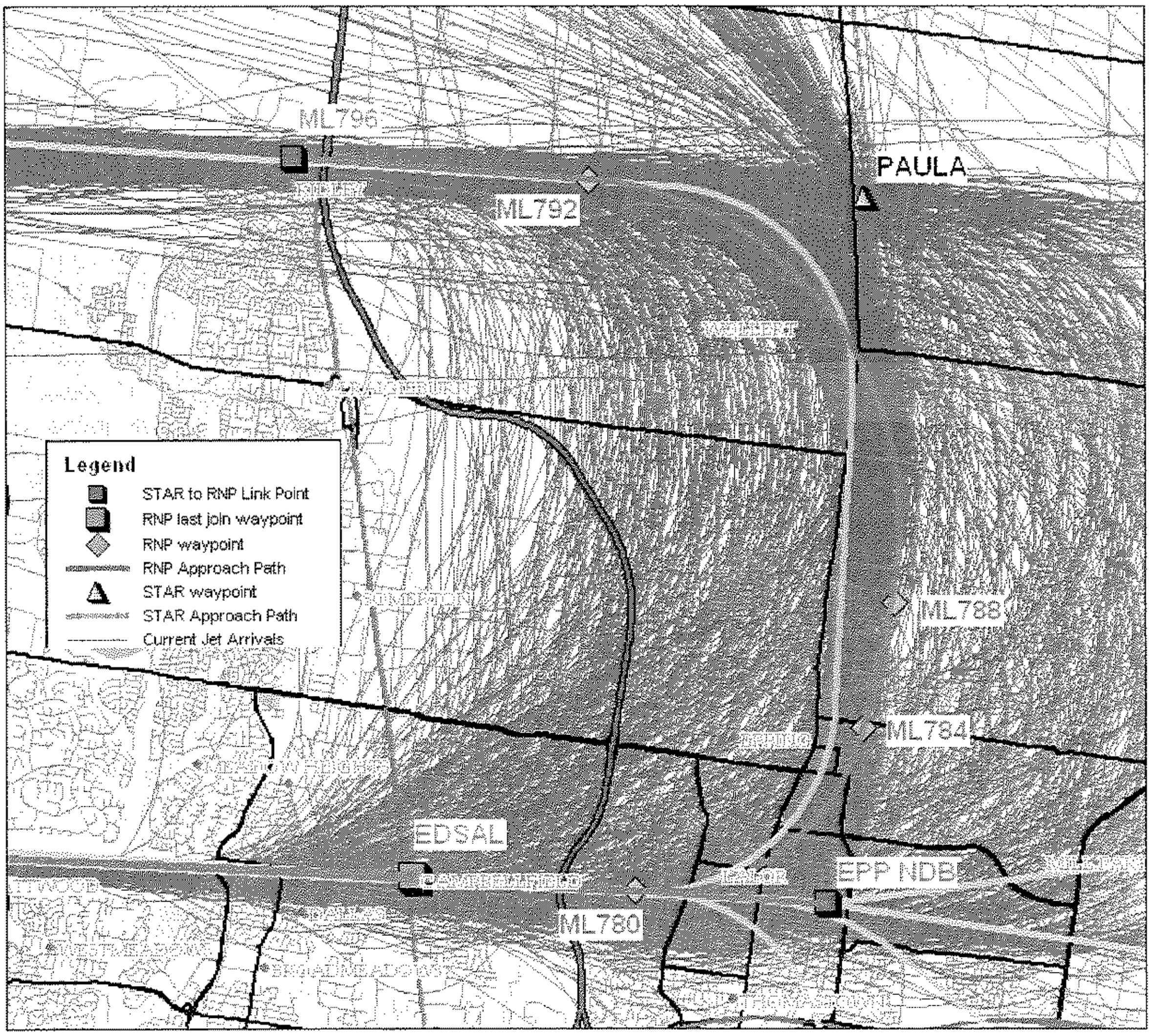
RNAV-M (RNP) RWY 27 and Linked ARBEY MIKE STAR

For arrivals from the north and north-west that currently use the ARBEY STAR are able to conduct an RNP approach to Runway 27 after joining at waypoint ML796 or any of the other waypoint between here and EDSAL waypoint, which is the last waypoint that aircraft can join for an RNP approach to Runway 27. A comparison of the proposed flight path for this RNP approach procedure with that of the current ARBEY STAR indicates that except for one segment between waypoints ML788 and ML784 it will follow the same flight path of the STAR.

Figure 13 shows the arrivals that have followed the ARBEY STAR via BAKER waypoint or have been provided with direct tracking to PAULA waypoint where they have either followed the STAR or been provided with further direct tracking to join final soon after EDSAL waypoint. It also shows there have been a large number of aircraft who have been radar vectored for traffic management purposes or provided with a short visual approach to Runway 27.

Due to the density of the flight tracks shown in Figure 16 an enlargement of the flight path for the RNAV-M (RNP) RWY 27 between waypoints ML796 and EDSAL waypoint was prepared to show the flight tracks of aircraft that have followed the STAR, those that have been radar vectored and those that have been provided with a short visual approach to Runway 27.

Figure 16. RNAV-M (RNP) RWY 27 ARBEY Approach Path



Analysis of the proposed RNP approach procedure and its linked STAR indicated the following:

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;

- there should not be a change in the flight path of aircraft following the proposed ARBEY ONE MIKE STAR as there is no difference to that of the current ARBEY SIX STAR;
- the proposed RNAV-M (RNP) RWY 27 approach path differs slightly from that currently flown between waypoints ML788 and ML784, when over the residential area of Epping and rural area of Wollert;
- aircraft have been provided with direct track from a distant waypoint to PAULA waypoint can still join for an RNP approach at waypoints ML788, ML784, ML780 and EDSAL waypoint;
- a spread of the aircraft following the current ARBEY STAR for an instrument approach to Runway 27 is approximately 0.5 nautical miles between PAULA waypoint and EPP NDB;
- by way of comparison, RNP approach tracks at Brisbane Airport have a lateral spread of less than 0.2 nautical miles wide, indicating aircraft using this RNP approach procedure should be narrower than that current flown;
- An annual daily average of 10.8 arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 0.9 arrivals were by Qantas and Jetstar B767 and A330 aircraft of a total 29.5 arrivals by jet aircraft to Runway 27 that used the current ARBEY STAR;
- the three months NFPMS track data showed:
  - 63 percent of all arrivals were along the STARs flight path, of which 34 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and three percent were by Qantas and Jetstar B767 and A330 aircraft;
  - 20 percent of all arrivals conducted a visual approach of which 57 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and one percent were by Qantas and Jetstar B767 and A330 aircraft;
  - 17 percent of all arrivals were provided with radar vectoring of which 31 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and three percent were by Qantas and Jetstar B767 and A330 aircraft; and
  - 54 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to EDSAL waypoint.
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 54.7 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and 2.9 arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 5 shows a maximum of 46 arrivals per day was recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 which is slightly less than the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 27 should be a slight increase over current arrivals but the increase should not be perceptible to the human ear.

The above analysis indicates Qantas 737-800 and Jetstar A320 aircraft account for slightly less than 40 percent of all arrivals that currently follow a concentrated flight path when using the ARBEY STAR for their approach to Runway 27 and their A330 and B767 aircraft account for less than 5 percent of these arrivals. The analysis also shows there should be minimal difference in number of aircraft that follow the ARBEY STAR, are radar vectored or provided with a visual approach to Runway 27 and that these aircraft can still conduct an RNP approach to Runway 27 provided they can join final prior to EDSAL waypoint.

This analysis also showed the concentrated flight path of current arrivals have a spread of approximately 0.5 nautical miles and it is expected the aircraft following this RNP approach procedure will have a maximum spread of 0.2 nautical miles.

Google Earth showed the areas below the visual approach path to join final between EPP NDB and EDSAL waypoint is either rural or industrial. The analysis did show the proposed RNP flight path when turning to join final at EPP NDB will track along the eastern edge of currently followed concentrated flight path when tracking over the residential area of Epping and rural area of Wollert.

Proposed RNAV-U (RNP) RWY 27 and Linked STARs

This proposed RNP approach procedure is designed for aircraft that currently arrive using the LIZZI, BADGR, WAREN and WENDY STARs to join for an RNP approach to Runway 27 at EPP NDB. This proposed RNP approach procedure will also permit aircraft that have also been provided with direct tracking from a distant waypoint to join for an RNP approach at no later than EDSAL waypoint.

An initial analysis of the flight path for the proposed RNAV-U (RNP) RWY 27 approach procedure indicates it will track aircraft along the same flight path that is currently followed by aircraft conducting an approach to Runway 27 that have tracked overhead EPP NDB and there should be minimal difference in the concentration of the aircraft that are using this RNP approach procedure after they have passed EPP NDB.

Analysis of this proposed RNP approach procedure and its linked STARs has been undertaken separately and the results are shown for each of the proposed linked STAR.

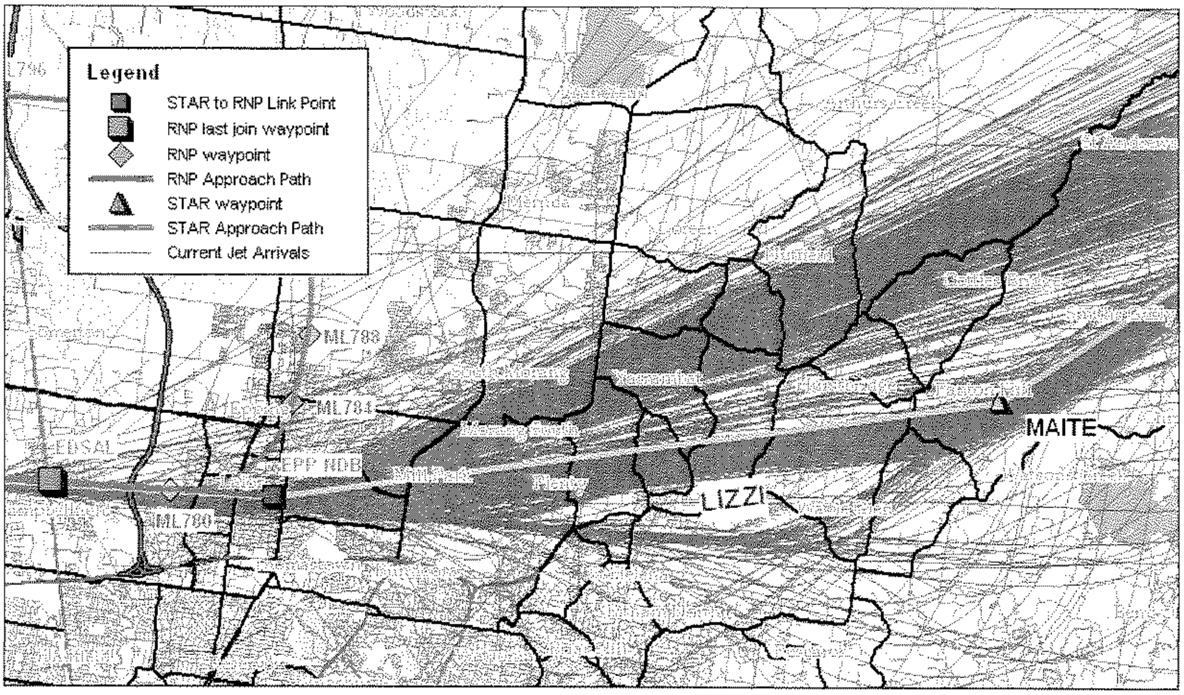
RNAV-U (RNP) RWY 27 and Linked LIZZI UNIFORM STAR:

Figure 13 shows the combined impact of jet aircraft arrivals to Runway 27. Due to the density of these flights a plot showing only arrivals from the north-east that are using the LIZZI STAR and the flight path of the proposed RNAV-U (RNP) RWY 27 and LIZZI UNIFORM STAR are shown in Figure 17. This shows there are three paths used by arrivals that would normally follow the LIZZI STAR, one along the STAR flight path, one for aircraft that have been provided with track shortening from a distant waypoint and the other for aircraft that have been radar vectored for traffic management purposes.

Analysis of the expected change to the impact of aircraft using the LIZZI UNIFORM STAR and the RNAV-U (RNP) RWY 27 approach procedure indicates:

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- the proposed LIZZI ONE UNIFORM STAR has the same flight path as the current LIZZI STAR;
- the proposed RNP approach procedure can be joined at either EPP NDB, waypoint ML780 or EDSAL waypoint;
- information provided by Melbourne Centre indicates they expect there should not be any difference in the number of aircraft that follow the STAR flight path and those that are radar vectored or provided with direct tracking from a distant waypoint.
- information provided by Melbourne Centre indicates there should not be any issues with aircraft altitude as the proposed RNP approach procedure and the LIZZI UNIFORM STAR have the same altitude restriction as required by the current STAR and instrument approach procedures;

Figure 17. RNAV-U (RNP) RWY 27 & LIZZI UNIFORM STAR

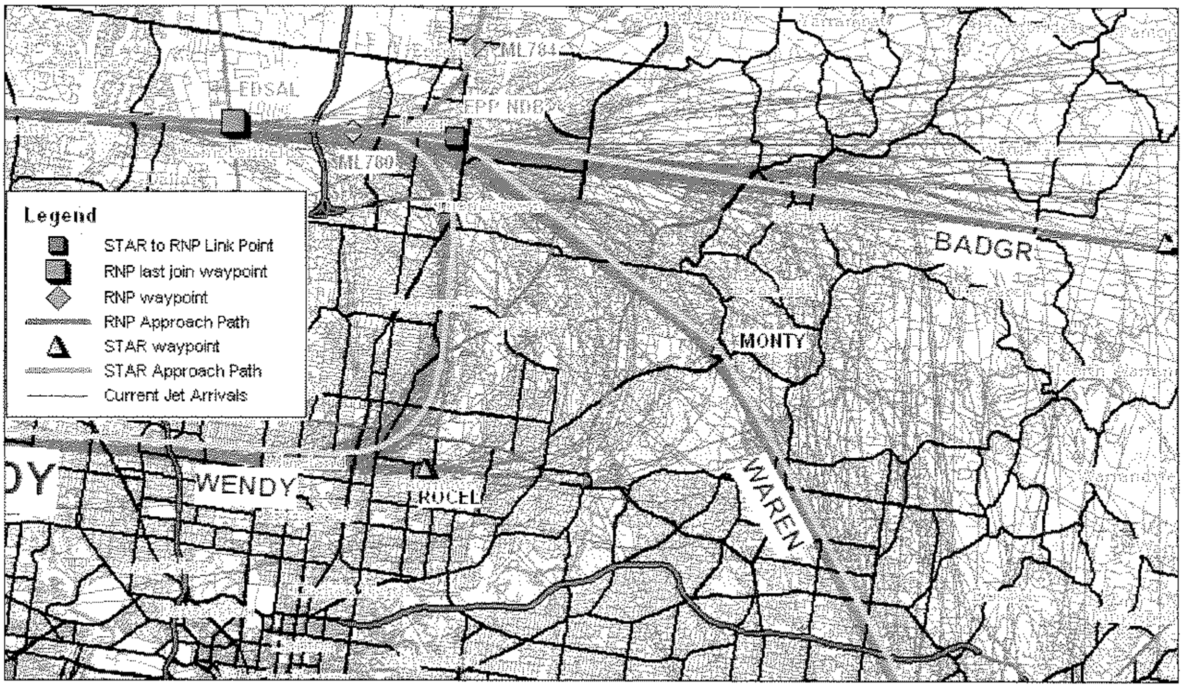


- an annual daily average of 3.6 arrivals by Qantas B737-800 and Jetstar A320 aircraft and 5.1 arrivals were by Qantas and Jetstar B767 and A330 aircraft of a total 23.4 arrivals by jet aircraft to Runway 27 that used the current LIZZI STAR;
- the three months NFPMS track data showed
  - o 98 percent of all arrivals were along the STARs flight path, of which 14 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 23 percent were by Qantas and Jetstar B767 and A330 aircraft;
  - o Two percent of all arrivals conducted a visual approach of which there was less than one percent of all arrivals were by Qantas and Jetstar B737-800, B767, A320 and A330 aircraft;
  - o there were a minimal number of aircraft that were provided with radar vectoring but most of these joined by EPP NDB and their approach path should not affect Qantas and Jetstar aircraft conducting an RNP approach to Runway 27; and
  - o 50 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to EDSAL waypoint.
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 15.5 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and 18.8 arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 5 shows a maximum of 33 arrivals per day was recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 which is slightly less than the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;

- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 27 should be a slight increase over current arrivals but the increase should not be perceptible to the human ear.

The above analysis indicates there should not be any differences in the noise impact from aircraft that are using this propose RNP linked STAR and RNP approach procedure for their approach to Runway 27.

Figure 18. RNAV-U (RNP) RWY 27 & Linked BADGR, WAREN & WENDY STARs



RNAV-U (RNP) RWY 27 and Linked BADGR UNIFORM STAR:

Figure 13 shows the combined impact of jet aircraft arrivals to Runway 27. Due to the density of flights associated with arrivals using the LIZZI STAR a plot showing arrivals from the east, south, south-east and west are shown in Figure 18. Initial analyses of the arrivals from the east that are using the BADGR STAR shows the majority of them follow the STAR, some are provided with direct tracking from a distant waypoint and some have been radar vectored for traffic management purposes.

Analysis of the expected change to the impact of aircraft using the BADGR UNIFORM STAR and the RNAV-U (RNP) RWY 27 approach procedure indicates:

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- the proposed BADGR UNIFORM STAR has the same flight path as the current BADGR STAR;
- the proposed RNP approach procedure can be joined at either EPP NDB, waypoint ML780 or EDSAL waypoint;
- information provided by Melbourne Centre indicates they expect there should not be any difference in the number of aircraft that follow the STARs flight path and those that are radar vectored or provided with direct tracking from a distant waypoint.

- information provided by Melbourne Centre indicates there should not be any issues with aircraft altitude as the proposed RNP approach procedure and the BADGR UNIFORM STAR have the same altitude restriction as required by the current STAR and instrument approach procedures;
- an annual daily average of 0.1 arrivals by Qantas B737-800 and Jetstar A320 aircraft and 0.1 arrivals were by Qantas and Jetstar B767 and A330 aircraft of a total 2.5 arrivals by jet aircraft to Runway 27 that used the current BADGR STAR;
- the three months NFPMS track data showed
  - 99 percent of all arrivals were along the STARs flight path, of which six percent of these were by Qantas and Jetstar B737-800, B767, A320 and A330 aircraft;
  - there were minimal number of arrivals that were either provided with direct tracking or radar vectoring for traffic management purposes and the analysis showed a daily average of less than one arrivals per day by Qantas and Jetstar aircraft that conducted a visual approach and will need to alter their flight path to join final prior to EDSAL waypoint;
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 2 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and no arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 5 shows a maximum of 2 arrivals per day was recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 period which is the same as the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 27 should be a slight increase over current arrivals but the increase should not be perceptible to the human ear.

The above analysis indicates there should not be any differences in the noise impact from aircraft that are using this propose RNP linked STAR and RNP approach procedure for their approach to Runway 27.

RNAV-U (RNP) RWY 27 and Linked WAREN UNIFORM STAR:

Figure 13 shows the combined impact of jet aircraft arrivals to Runway 27. Due to the density of flights associated with arrivals using the LIZZI STAR a plot showing arrivals from the east, south, south-east and west are shown in Figure 18. Initial analysis of the arrivals from the east that are using the WAREN STAR shows the majority of them follow the STAR, some are provided with direct tracking from a distant waypoint and some have been radar vectored for traffic management purposes.

Analysis of the expected change to the impact of aircraft using the WAREN UNIFORM STAR and the RNAV-U (RNP) RWY 27 approach procedure indicates:

- the proposed RNP and STAR procedures do not have any changes to aircraft altitudes that are currently applied;
- the proposed WAREN UNIFORM STAR has the same flight path as the current WAREN STAR;
- the proposed RNP approach procedure can be joined at either EPP NDB, waypoint ML780 or EDSAL waypoint;

- information provided by Melbourne Centre indicates they expect there should not be any difference in the number of aircraft who follow the STAR flight path and those that are radar vectored or provided with direct tracking from a distant waypoint.
- information provided by Melbourne Centre indicates there should not be any issues with aircraft altitude as the proposed RNP approach procedure and the WAREN UNIFORM STAR have the same altitude restriction as required by the current STAR and instrument approach procedures;
- an annual daily average of 2.9 arrivals by Qantas B737-800 and Jetstar A320 aircraft and no arrivals by Qantas and Jetstar B767 and A330 aircraft of a total 6.3 arrivals by jet aircraft to Runway 27 that used the current WAREN STAR;
- the three months NFPMS track data showed
  - 86 percent of all arrivals were along the STAR flight path, of which 38 percent of these were by Qantas B737-800 and Jetstar A320 aircraft and there were no arrivals by Qantas and Jetstar B767 and A330 aircraft;
  - two percent of all arrivals conducted a visual approach of which 44 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and no visual arrival by Qantas and Jetstar B767 and A330 aircraft; and
  - approximately half of the Qantas and Jetstar aircraft that conducted a visual approach to Runway 27 will need to alter their flight path to join for an RNP approach at EDSAL waypoint.
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 17.9 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and no arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 5 shows a maximum of 10 arrivals per day were recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 period, which is approximately half the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- The noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 27 should be a slight increase than current arrivals but the increase should not be perceptible to the human ear.

The above analysis indicates there should not be any differences in the noise impact from aircraft that are using this propose RNP linked STAR and RNP approach procedure for their approach to Runway 27.

RNAV-U (RNP) RWY 27 and Linked WENDY UNIFORM STAR:

Figure 13 shows the combined impact of jet aircraft arrivals to Runway 27. Due to the density of flights associated with arrivals using the ARBEY and LIZZI STARs, a plot showing arrivals from the east, south, south-east and west are shown in Figure 18. An initial analysis of the arrivals from the west that are using the WENDY STAR shows the majority of them follow the STAR and most of the other arrivals have been radar vectored for traffic management purposes with a small number provided with a visual approach to this runway.

Analysis of the expected change to the impact of aircraft using the WENDY UNIFORM STAR and the RNAV-U (RNP) RWY 27 approach procedure indicates:

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;

- the proposed WENDY UNIFORM STAR has the same flight path as the current WENDY STAR;
- the proposed RNP approach procedure can be joined at either EPP NDB, waypoint ML780 or EDSAL waypoint;
- information provided by Melbourne Centre indicates they expect there should not be any difference in the number of aircraft that follow the STAR flight path and those that are radar vectored or provided with direct tracking from a distant waypoint.
- information provided by Melbourne Centre indicates there should not be an issues with aircraft altitude as the proposed RNP approach procedure and the WENDY UNIFORM STAR have the same altitude restriction as required by the current STAR and instrument approach procedures;
- an annual daily average of 0.3 arrivals by Qantas B737-800 and Jetstar A320 aircraft and 0.8 arrivals by Qantas and Jetstar B767 and A330 aircraft of a total 2.3 arrivals by jet aircraft to Runway 27 that used the current WENDY STAR;
- the three months NFPMS track data showed
  - 68 percent of all arrivals were along the STAR flight path, of which 12 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 26 percent were by Qantas and Jetstar B767 and A330 aircraft;
  - four percent of all arrivals conducted a visual approach of which 50 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 25 percent were by Qantas and Jetstar B767 and A330 aircraft;
  - 28 percent of all arrivals were provided with radar vectoring of which there were no arrivals by Qantas B737-800 and Jetstar A320 aircraft and 48 percent of these arrivals were by Qantas and Jetstar B767 and A330 aircraft; and
  - 33 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to EDSAL waypoint;
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 6.3 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and 4.7 arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 5 shows a maximum of 8 arrivals per day were recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 which is slightly less than the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 27 should be a slight increase over current arrivals but the increase should not be perceptible to the human ear.

The above analysis indicates there should not be any differences in the impact of aircraft that are using this propose RNP linked STAR and RNP approach procedure for their approach to Runway 27.

Combined Impact of Runway 27 RNP Approach Procedures and Linked STARs

The above analysis indicates the Qantas and Jetstar aircraft that use these RNP approach procedures and their linked ARBEY, BADGR, LIZZI, WAREN and WENDY STARs should follow the same flight path during their approach to Runway 27. The analysis also showed some aircraft may continue to be provided by ATC with radar vectoring for traffic management purposes and the Qantas and Jetstar aircraft that arrive using the proposed ARBEY STAR can still join for an RNP approach at any of the waypoints between HUMES and EDSAL and all other Qantas and Jetstar arrivals can join for an RNP approach at EPP NDB and EMUZE waypoint.

However, the analysis also showed the aircraft that are currently provided with direct tracking for a visual approach to Runway 27 that may want to join for an RNP approach and have joined final after EDSAL waypoint they will be required to follow a different flight path, resulting in an increase in the number of aircraft overflights of areas who are currently overflown by aircraft following the current STAR.

The analysis also showed that there was an average of 11.7 Qantas and Jetstar arrivals per day that used the ARBEY STAR for their approach to Runway 27 and approximately 15 percent of these arrivals will be required to change their flight path in order to conduct an RNP approach to this runway. The analysis also showed that there was an average of 12.9 Qantas and Jetstar arrivals per day that used the BADGR, LIZZI, WAREN or WENDY STARs for their approach to Runway 16 and only one percent of these aircraft will be required to change their flight path in order to conduct an RNP approach to this runway.

The analysis was not able to determine if there may be a change in the number of aircraft that would conduct a visual approach and join for an RNP approach at BOL NDB or EMUZE waypoint and any subsequent potential change to the noise impact these aircraft may cause.

Savings in Emissions for Proposed Runway 27 RNP Approach Procedure

The above analysis shows there should not be any difference in track miles flown by aircraft using the proposed RNAV-U (RNP) RWY 27 and RNAV-M (RNP) RWY 27 approach procedures and any of their linked STARs as there are no differences between the flight path of the currant STARs and the proposed RNP approach procedure and any of the linked STARs.

However, due to the variation in flight path followed by aircraft that are provided radar vectoring and the number of aircraft that may be radar vectored, analysis to determine if there may be a difference in emissions could not be undertaken.

Proposed Runway 34 RNP Approach Procedures and Linked STARs

Table 1 shows there are four proposed RNP procedures for aircraft arriving on Runway 34 and five proposed linked STARs for arrivals that currently use the ARBEY, DYTES, MICHM, PORTS and WENDY STARs for their approach to Runway 34. Plots of the proposed RNP approach procedures are shown in Attachment C, Figures C6 and C7 and RNP linked STARs are shown in Attachment E, Figures E3, E5, E7, E9 and E11.

In addition, Airservices Australia's Melbourne Centre is planning the following changes for arrivals from the north-east and east to Runway 34:

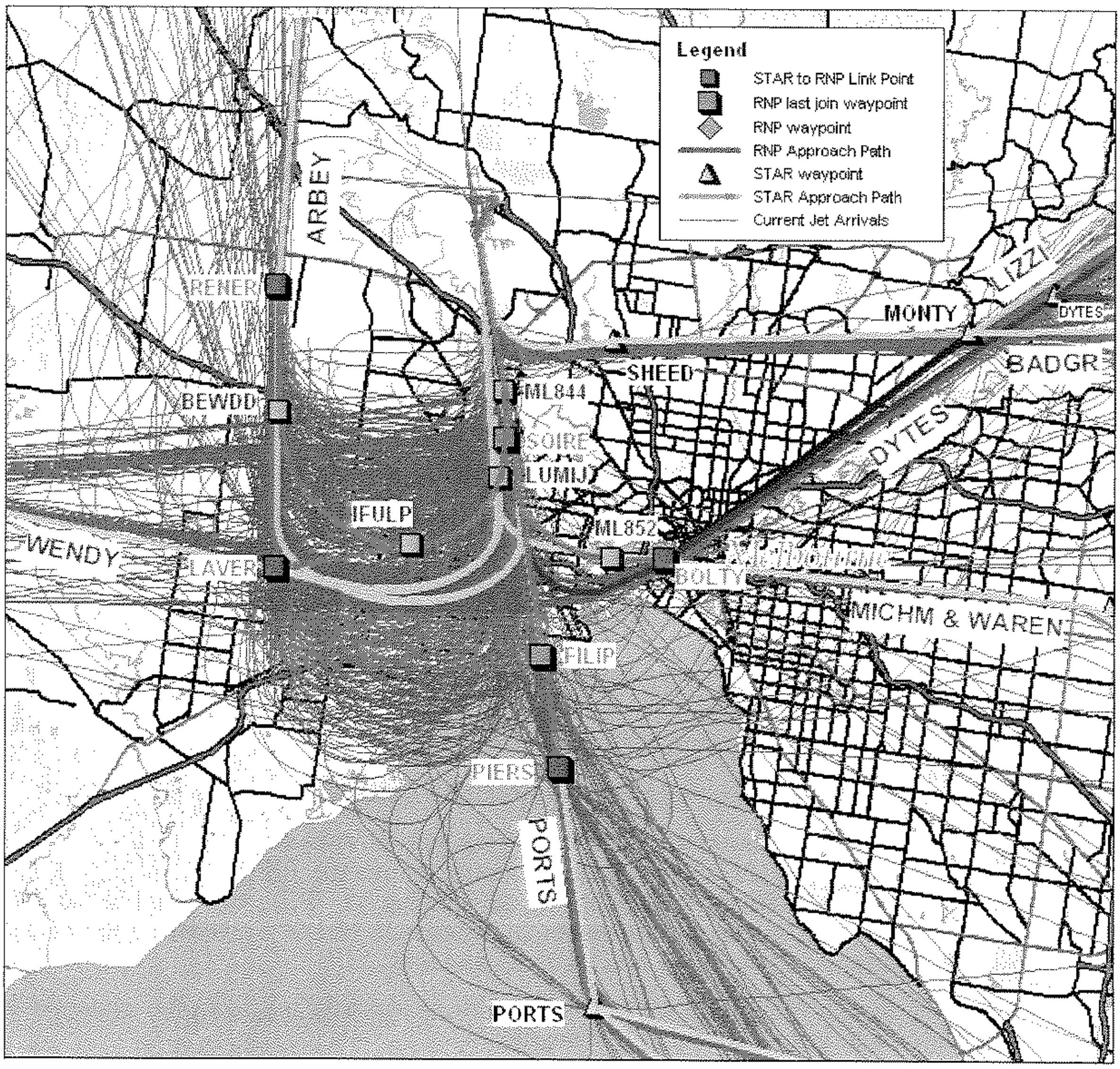
- cancel the DYTES STAR;
- include in the LIZZI STAR and a flight path from LIZZI waypoint to MONTY waypoint, then to BOLTY waypoint;
- include in the BADGR STAR a flight path from BADGR waypoint to MONTY waypoint, then to BOLTY waypoint;
- from BOLTY waypoint both STARs will then allow aircraft to follow the current flight paths for their approach to Runway 34.

Although Airservices plans to implement this change during March 2010, the proposed change in flight path was taken into account for the assessment of the proposed RNP arrivals that currently use the DYTES STAR. For more details see Attachment H, Figures H1, H2 and

H3.

A plot of the proposed RNP approach procedures, their linked STARs and flight tracks of arrivals to Runway 34 during the 1 January to 31 March 2009 period is shown in Figure 19.

Figure 19. Runway 34 RNP and Linked STARs Approach Paths



Attachment C, Figure C6 shows aircraft can join for an RNP approach to Runway 34 at PIERS and FILIP waypoints and Attachment C, Figure C5 shows aircraft can join for an RNP approach to Runway 34 at any point along the RNP approach path until SQIRE waypoint and Figure 19 shows many of the that aircraft have been provided with direct tracking can still join for an RNP approach to this runway. Figure 19 also shows there have been a large number of the aircraft that have been provided with direct tracking for a visual approach to this runway that have joined final after SQIRE waypoint and aircraft that have been radar vectored for traffic management purposes and that the majority of these aircraft can join for an RNP approach to this runway.

Attachment C, Figures C6 and C7 also show aircraft using this procedure are required to be at 1,660 feet at waypoint ML844 and to determine if there may be a difference in aircraft altitude to that which currently occurs an analysis of aircraft altitude using NFPMS flight tracks for the period of 1 March to 31 March 2009 was undertaken at waypoint ML844 and is shown in Figure 20.

Figure 20. Altitude Analysis at Waypoint ML844

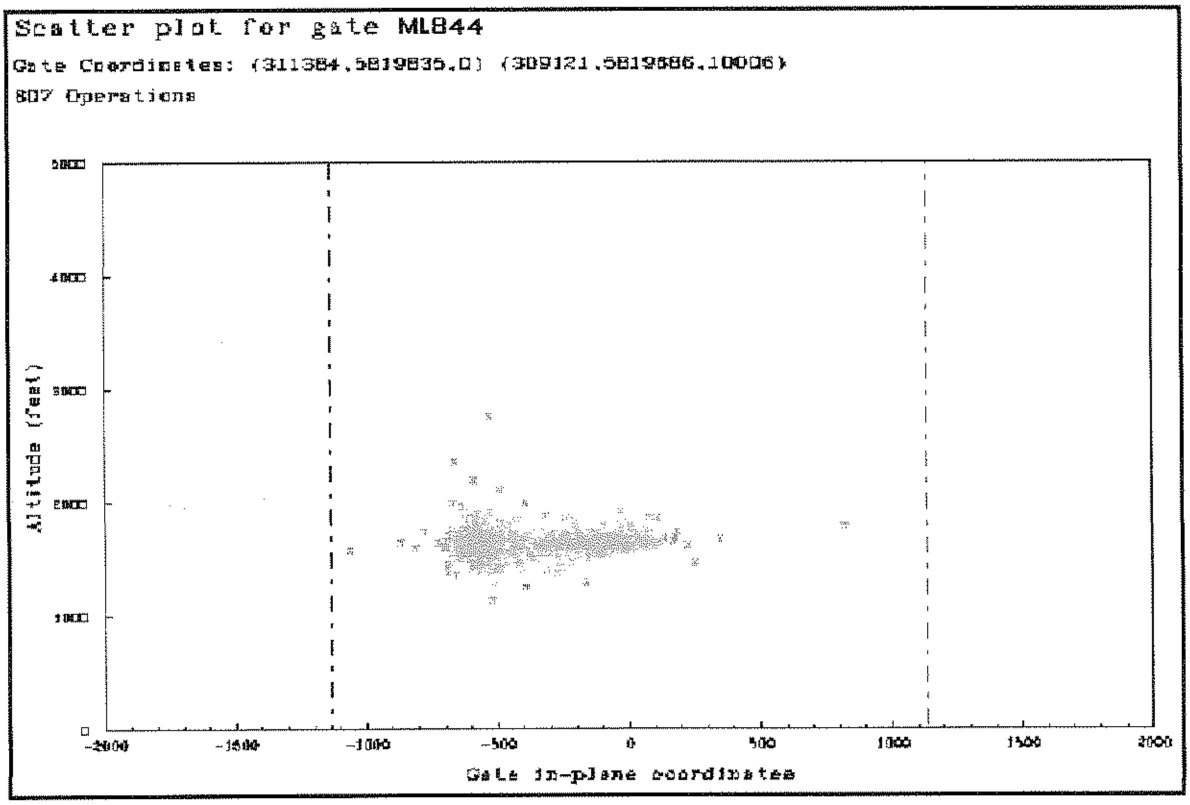


Figure 20 shows the majority of aircraft are between 1,500 feet and 1,700 feet when overflying the site of the proposed waypoint ML844 during their approach to Runway 34. This analysis indicates there should be minimal difference in the altitude of the Qantas and Jetstar aircraft when conducting an RNP approach to this runway when compared to that shown in Figure 20. Analysis of aircraft movements over the 1 May 2008 to 30 April 2009 period was undertaken to provide an indication of the number of arrivals by all jet aircraft and the Qantas and Jetstar aircraft that use the five STARs for their approach procedures to this runway is shown in Table 5.

Table 6. Annual Aircraft Movement Analysis for Runway 34

STAR	ARBEY		BADGR		LIZZI		WAREN		WENDY		Total	
	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP	All AC	RNP
Total Moves	7333	2334	1302	101	6487	2522	2223	1087	2276	969	19621	7013
Ave Daily Moves	20.1	6.4	3.6	0.3	17.8	6.9	6.1	3.0	6.2	2.7	53.8	19.2
Max Daily Moves	109	43	13	3	97	39	24	12	22	10	250	100
Days with Moves	256	159	242	84	253	234	235	230	252	238	274	265
Daily Average when used	28.6	14.7	5.4	1.2	25.6	10.8	9.5	4.7	9.0	4.1	78.2	26.5

Analysis of Table 6 indicates Runway 34 is used for more than 75 percent of days during the 1 May 2008 to 30 April 2009 period and Qantas and Jetstar aircraft arrive on this runway on majority of the days it is used. Table 6 also shows there is a similarity in the number of arrivals by the Qantas and Jetstar aircraft that used each STAR when compared to the total number of jet aircraft arrivals on each STAR.

In addition to the above, further analysis has shown aircraft arriving from the east and south of Melbourne Airport may also be assigned the PORTS STAR for their approach to Runway 34. To determine the movement statistics shown in Table 6 analysis of the three month NFPMS data was undertaken and Table 7 shows the result.

Table 7. 3 MONTH NFPMS Aircraft Movement Analysis for PORTS STAR

STAR	PORTS STAR	
	All AC	RNP
Total Moves	218	88
Ave Daily Moves	2.4	1.0
Max Daily Moves	12	5
Days with Moves	47	43
Daily Average when used	4.6	2.0

Figure 19 shows a high density of aircraft that have used the ARBEY and WENDY STARs for their approach to Runway 34 when turning to join for their final approach. Due to this density of flight tracks of current arrivals to Runway 34 the flight tracks of arrivals were prepared separately with arrivals that used the PORTS STAR shown in Figure 21, arrivals that used the ARBEY STAR shown in Figure 22, arrivals that used the WENDY STAR shown in Figure 25, arrivals that used the DYTES STAR shown in Figure 26 and arrivals that used the MICHM and WAREN STARs shown in Figure 27.

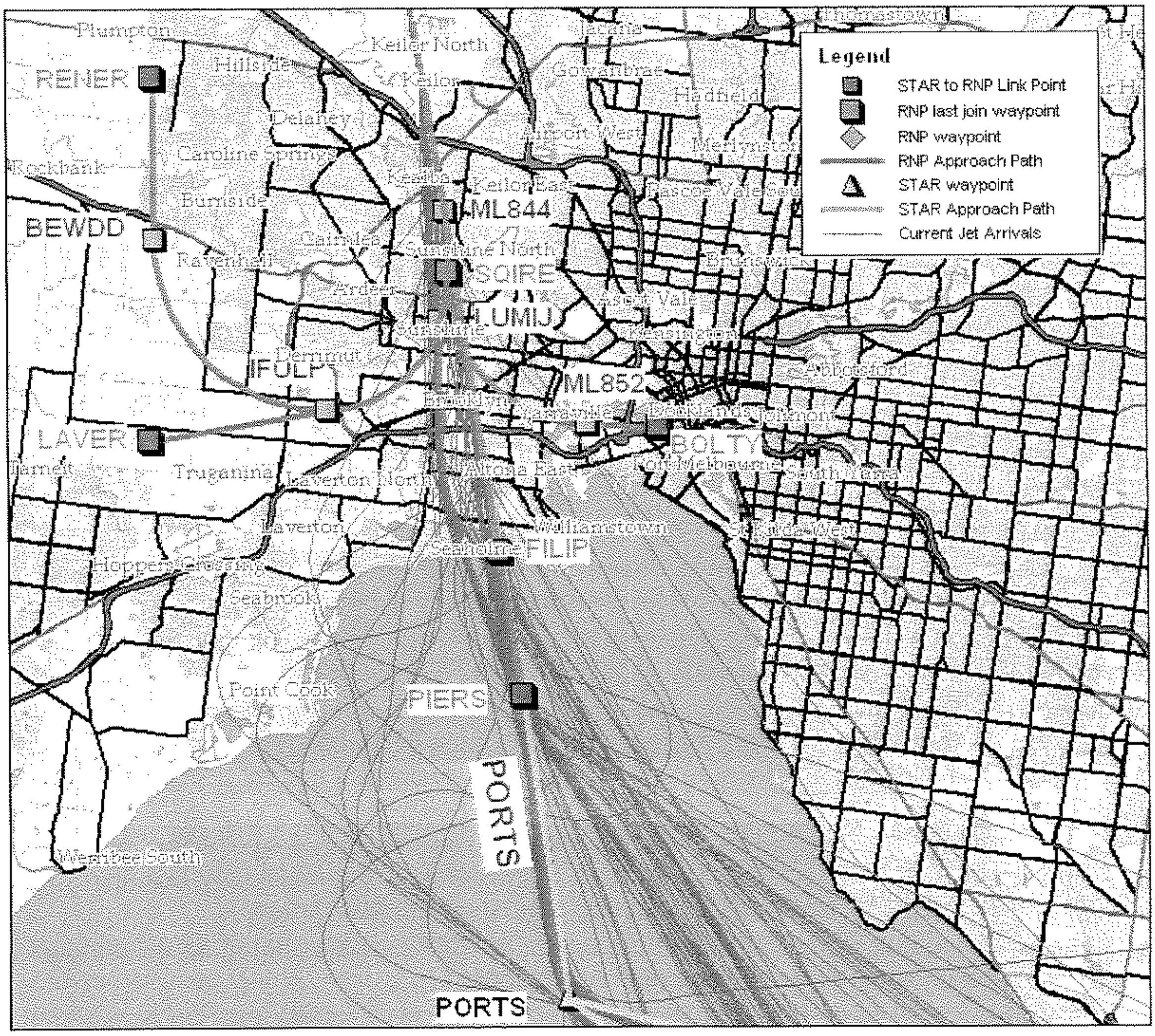
The initial analysis also indicated aircraft using this RNP approach procedure will track over the NFPMS NMT 1 and to the side of NMT 31 during their approach to this runway and a comparison of the noise analysis undertaken for Cairns and Gold Coast airports indicated there no equivalently located NMT at these airports that can be used to provide an indication of what change in noise levels can be expected. However, from the analysis undertaken for Cairns and Gold Coast airports it is expected there should not be a perceptible change in noise levels generated by aircraft conducting an RNP approach to Runway 34 compared to what currently occurs for these aircraft types.

In addition, the analysis of the proposed RNP approach procedures and their linked STARs was undertaken for each set of arrival tracks shown in Figures 19 to 22. In the case of arrivals that used the DYTES STAR, this analysis determined the impact of these arrivals using the RNAV-P (RNP) RWY 34 approach procedure only as Airservices has already assessed and approved the inclusion of a flight path that replicates the DYTES STARs flight path between MONTY and BOLTY waypoints.

RNAV-U (RNP) RWY 34 and Linked PORTS ONE MIKE STAR

Figure 21 shows arrivals from the south and south-east that currently use the PORTS STAR are able to follow the PORTS ONE MIKE STAR and join for an RNP approach to Runway 34 at PIERS waypoint. Figure 19 also show this proposed procedure will track aircraft along the same flight path that is currently followed by arrivals that are using the current PORTS STAR. It also shows that FILIP waypoint is the last waypoint on this approach procedure that aircraft can join for this procedure for an RNP approach to Runway 34. See Attachment C, Figures C6 for a plot of the proposed RNAV-U (RNP) RWY 34 approach procedure and Attachment E, Figure E7 for a plot of the proposed approach path for the RNP linked PORTS STAR.

Figure 21. RNAV-U (RNP) RWY 34 & Linked PORTS STAR



Analysis of the expected change to the impact of aircraft using the PORTS ONE UNIFORM STAR and the RNAV-U (RNP) RWY 34 approach procedure indicates:

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- the proposed PORTS ONE UNIFORM STAR has the same flight path as the current PORTS STAR;
- three approach paths for arrivals using the PORTS STAR, one path for aircraft conducting a VOR RWY 34 approach, another for aircraft using the RNAV-Z (GNSS) RWY 34 approach procedure and another for aircraft conducting a visual approach to this runway;
- the aircraft that currently use the VOR RWY 34 approach procedure will now follow a flight path similar to that followed by aircraft that are conducting an RNAV-Z (GNSS) RWY 34 approach to this runway;
- the proposed RNP approach procedure can be joined at either PIERS or FILIP waypoints;
- information provided by Melbourne Centre indicates they expect there should not be any difference in the number of aircraft that follow the STARs flight path and those that are radar vectored or provided with direct tracking from a distant waypoint.

- the analysis also indicated there should not be any issues with aircraft altitude as the proposed RNP approach procedure and the PORTS ONE UNIFORM STAR have the same altitude requirements of the current STAR and instrument approach procedures;
- the PORTS STAR is designed to provide arriving aircraft from the east and the south of Melbourne Airport an alternative approach procedure for their approach to Runway 34;
- due to the variation in approach path available for aircraft arriving from the east and south it is not possible to report on annual daily average arrival by Qantas and Jetstar aircraft;
- the three months NFPMS track data showed
  - a daily average of 1.0 arrivals by Qantas and Jetstar aircraft of a total 2.4 arrivals by jet aircraft to Runway 34 that used the current PORTS STAR,
  - 64 percent of all arrivals were along the STARs flight path, of which 23 percent of these were by Qantas B737-800 and Jetstar A320 aircraft and no arrivals by Qantas and Jetstar B767 and A330 aircraft;
  - 26 percent of all arrivals conducted a visual approach of which nine percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft;
  - eight percent of all arrivals were provided with radar vectoring of which four percent were arrivals by Qantas B737-800 and Jetstar A320 aircraft; and
  - 19 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final after FILIP waypoint.
- the Qantas and Jetstar aircraft that conduct an RNP approach to Runway 34 will increase the number of arrivals that currently conduct a VOR RWY 34 approach to this runway;
- analysis of the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 17.9 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and no arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 7 shows a maximum of 5 arrivals per day was recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 which is approximately one third of the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis showed the noise generated by an aircraft conducting an RNP approach to Runway 34 should not alter from that experienced from current arrivals.

The above analysis indicates there may be a difference in the impact of aircraft that are using this propose RNP linked STAR and RNP approach procedure for their approach to Runway 34 to that which currently occurs due to the extra flights which will be following the visual/GNSS approach path to this runway but it is expected the extent of the increase should not be perceptible to the residents below its flight path.

Proposed RNAV-P (RNP) RWY 34 and Linked STARs

These proposed RNP approach procedures are designed for aircraft that currently arrive using the ARBEY, DYTES, MICHM, PORTS, WAREN and WENDY STARs and LIZZI and BADGR STARs when the DYTES STAR is cancelled. These proposed RNP procedures will also permit aircraft that have also been provided with direct tracking from a distant waypoint to join for an RNP approach at no later than SQIRE waypoint.

An initial analysis of the proposed flight paths for the RNAV-P (RNP) RWY 34 approach procedures indicates they are designed in the majority of cases to track aircraft along the flight path currently followed by aircraft conducting an approach to this runway. However, it did show the proposed flight path for aircraft arriving using the ARBEY ONE PAPA STAR and

WENDY UNIFORM STAR will follow a slightly different flight path to that currently followed by aircraft that are tracking for a VOR RWY 34 approach or RNAV-Z (GNSS) RWY 34 to this runway and it is expected the Qantas and Jetstar aircraft that currently following the north and west will follow the RNP approach procedure and linked ARBEY or WENDY STARs.

Analysis of this proposed RNP approach procedure and its linked STARs has been undertaken separately and the results are shown for each of the proposed linked STAR.

RNAV-P (RNP) RWY 34 and Linked ARBEY PAPA STAR:

Figure 22 shows the flight tracks of arrivals to Runway 34 that have been following the current ARBEY STAR, the flight path of the current ARBEY STAR and the proposed RNAV-U (RNP) RWY 34 approach flight path. Figure 22 also shows the flight path of the current STAR separates into two flight paths, one for aircraft who are conducting a VOR RWY 34 approach to this runway and the other is for aircraft conducting a RNAV-Z (GNSS) RWY 34 approach to this runway.

Figure 22. RNAV-P (RNP) RWY 34 & Linked ARBEY STAR

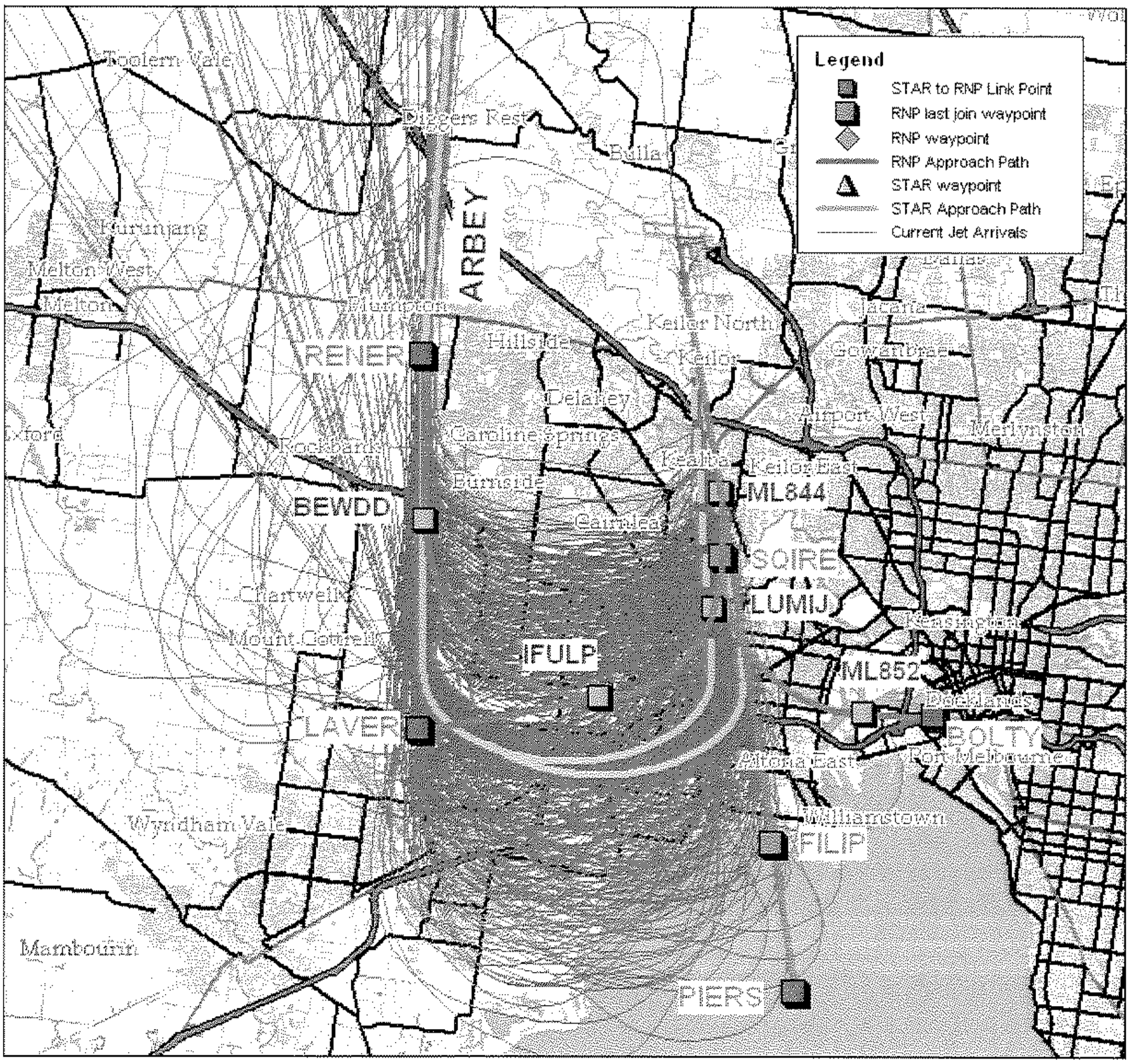


Figure 22 shows there have been many aircraft that have been provided with track shortening from a distant waypoint, radar vectored for traffic management purposes or allowed to turn early and conduct a visual approach to this runway. It should be noted the LAVER waypoint shown in Figure 22 is also a flyby waypoint for the ARBEY STAR as well as a joining point for the RNAV-P (RNP) RWY 34 that is linked to the WENDY STAR. See Attachment C, Figures C7 for a plot of the proposed RNAV-P (RNP) RWY 34 approach procedure and Attachment E, Figure E1 for a plot of the proposed approach path for the RNP linked ARBEY STAR.

The analysis of the proposed RNP approach path after passing BEWDD waypoint will follow a different flight path to that followed by aircraft that are conducting a VOR or RNAV (GNSS) approach to this runway. To determine if the proposed flight path will cause any concern to the residents living below its flight path plots using Google Earth were prepared showing the proposed RNP approach path and flight tracks of current arrivals that have used the ARBEY STAR. These plots are shown in Figures 21 and 22.

Figure 23. RNAV-P (RNP) RWY 34 – ARBEY STAR – Approach Path

Figure 24. Aircraft Flight Tracks Associated with ARBEY STAR

Analysis of the proposed flight path and the expected change to its impact as shown in Figures 22 and 23 indicated:

- Figure 23 shows the proposed approach path after passing BEWDD waypoint tracks over open then industrial areas of Derrimut, Laverton North and Brooklyn until it passes Sunshine Road, where it will track over some residential areas until it joins final at waypoint ML844;
- Figure 24 shows the areas below the section of the proposed RNP approach path between Sunshine Road and waypoint ML844 are currently overflown by aircraft that are conducting a VOR approach, RNAV (GNSS) approach or visual approach to Runway 34;
- The areas below the approach path between proposed waypoints LUMIJ and SQIRE has limited overflights and subject to aircraft noise from the arrivals conducting a VOR or RNAV (GNSS) approach to Runway 23;
- Analysis of the altitude of current arrivals between Sunshine Road and SQIRE waypoint indicated the majority of aircraft are about 2,500 feet AMSL when overhead Sunshine Road and 2,200 feet just north of the Western Freeway;
- A comparison of RNP approach tracks at Brisbane Airport indicated a lateral spread of less than 0.2 nautical miles wide, indicating aircraft using this RNP approach procedure should follow a narrow approach path when tracking between BEWDD and SQUIR waypoints; and
- Currently aircraft using the VOR RWY 34 approach procedure have an approximate lateral spread of 0.22 nautical miles wide and the RNAV (GNSS) approach procedure has an approximate lateral spread of 0.16 nautical miles wide.
- Figure 24 also shows current arrivals overfly the residential area of Altona North during their approach to Runway 34;

The above analysis and analysis of the proposed RNAV-P (RNP) RWY 34 approach procedure and its linked ARBEY ONE PAPA STAR indicated the following:

- the proposed RNP and STAR procedures do not have any changes to aircraft altitudes that are currently applied;
- the proposed ARBEY ONE PAPA STAR has the same flight path as the current ARBEY STAR;
- the proposed RNP approach path follows a different approach path to that currently followed by aircraft conducting a VOR RWY 34 approach, an RNAV-Z (GNSS) RWY 34 approach or a visual approach to this runway between BEWDD and LUMIJ waypoints;
- the proposed RNP approach procedure can be joined at any of these waypoints: - BEWDD, IFULP, LUMIJ and SQUIR;
- the aircraft that are provided with a visual approach turn just after they have passed RENER waypoint and prior to LAVER waypoint;
- the number of Qantas and Jetstar aircraft that follow this proposed RNP approach procedure be monitored to check similar number of arrivals use it to that which currently conduct a VOR approach, RNAV (GNSS) approach or a visual approach to this runway;
- the aircraft that have been radar vectored have an extended downwind leg before they turn for a VOR approach, RNAV (GNSS) approach or a visual approach to this runway;
- information provided by Melbourne Centre indicates they expect there should not be any difference in the number of aircraft that follow the STAR flight path and those that are radar vectored or provided with direct tracking from a distant waypoint.
- although there will be an increase in the number of arrivals by Qantas and Jetstar aircraft who are conducting an RNP approach to Runway 34 along the flight path between SQIRE waypoint and touchdown on Runway 34 the areas below this section of the flight path are also impacted on by the arrivals that are conducting a current VOR RWY 34 approach to this runway;
- an annual daily average of 5.9 arrivals by Qantas B737-800 and Jetstar A320 aircraft and 0.5 arrivals by Qantas and Jetstar B767 and A330 aircraft of a total 20.1 arrivals by jet aircraft to Runway 34 that used the current ARBEY STAR;
- the three months NFPMS track data showed
  - 65 percent of all arrivals were along the STARs flight path, of which 24 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and two percent were by Qantas and Jetstar B767 and A330 aircraft;
  - 20 percent of all arrivals conducted a visual approach of which 41 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and five percent were by Qantas and Jetstar B767 and A330 aircraft;
  - 15 percent of all arrivals were provided with radar vectoring of which five percent of these arrivals were arrivals by Qantas B737-800 and Jetstar A320 aircraft and there were no Qantas and Jetstar B767 and A330 aircraft that were radar vectored;
  - 58 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to SQIRE waypoint;
- the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 53.3 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and 2.4 arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;

- Table 6 shows a maximum of 43 arrivals per day was recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 which is approximately 75 percent of the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 34 should not alter from that experienced from current arrivals when overflying the noise monitoring sites.

The above analysis noted the flight path of proposed RNP approach procedure will follow a different flight path to that currently followed by aircraft who are conducting a VOR or RNAV (GNSS) approach to Runway 34. However it did note the following:

- the RNP approach procedure is mainly over open or industrial areas;
- the residential areas it does overfly are currently overflown or impacted by arrivals that are conducting a VOR or RNAV (GNSS) approach to Runway 34;
- there should not be a change to aircraft altitude;
- a daily average of 6.4 arrivals by Qantas and Jetstar aircraft may follow this flight path; and
- the residential area of Altona North should have a reduction in number of overflights due to Qantas and Jetstar aircraft following the RNP approach path.

RNAV-P (RNP) RWY 34 and Linked WENDY UNIFORM STAR:

Figure 25 shows the flight tracks of arrivals to Runway 34 that have arrived from the west, the flight path of the current WENDY STAR and the proposed RNAV-U (RNP) RWY 34 approach flight path. Figure 25 also shows the flight tracks of the current arrivals separated into three flight paths, one for aircraft that are conducting a VOR RWY 34 approach, one for aircraft conducting a RNAV-Z (GNSS) RWY 34 approach and the other for aircraft that have been provided with direct tracking so they can conduct a visual approach to Runway 34. It also shows that some aircraft been provided with track shortening from a distant waypoint or radar vectored for traffic management purposes.

See Attachment C, Figures C7 for a plot of the proposed RNAV-P (RNP) RWY 34 approach procedure and Attachment E, Figure E8 for a plot of the proposed approach path for the RNP linked WENDY STAR.

Analysis of this proposed RNP approach procedure indicates the proposed flight path will follow a different flight path after the aircraft have passed LAVER waypoint where they will track to IFULP waypoint, then follow the same RNP approach flight path proposed for arrivals using the ARBEY ONE PAPA STAR. To determine if this proposed flight path may increase the impact of aircraft overflights on the areas below the proposed flight path a plot was prepared using Google Earth which also shows the proposed RNP approach path and flight tracks of arrivals that used the WENDY STAR and is shown in Figure 26.

Figure 25. RNAV-P (RNP) RWY 34 and WENDY STAR

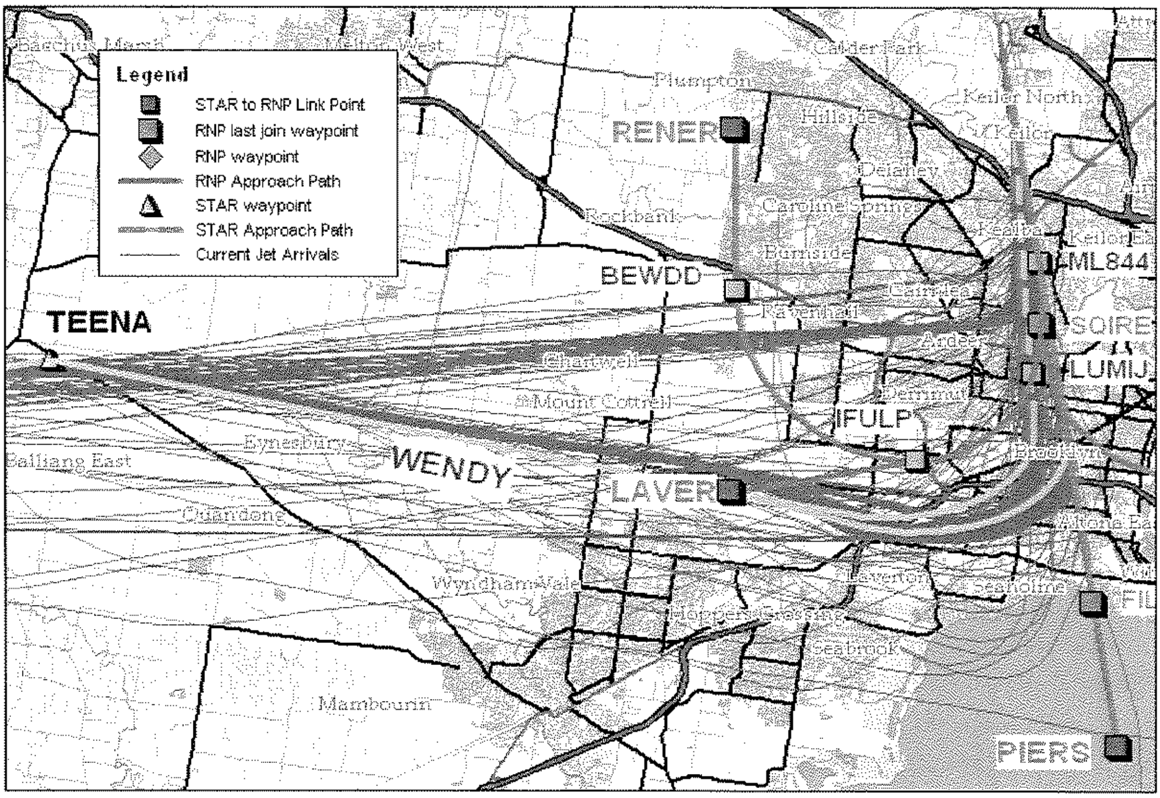


Figure 26. Aircraft Flight Tracks Associated with WENDY STAR

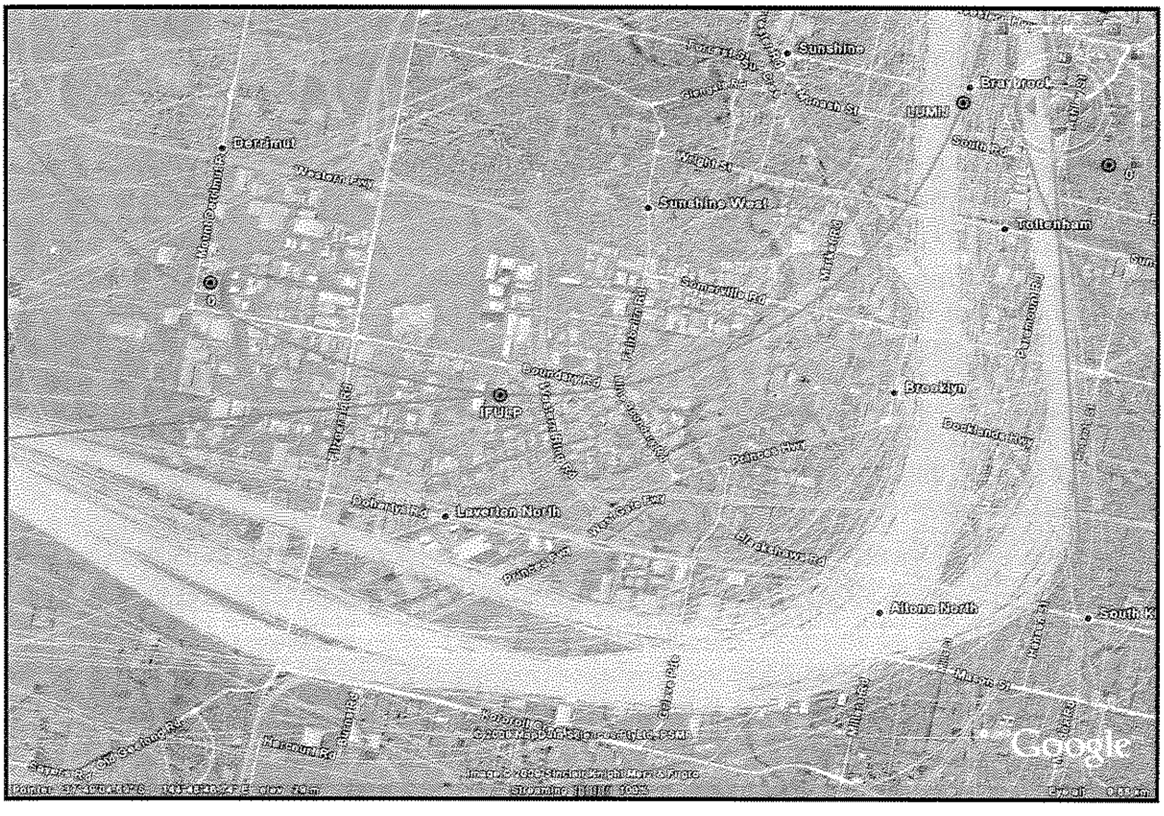


Figure 26 shows the proposed flight path after LAVER waypoint is mainly industrial until the aircraft are beginning to line up for their final approach which will be over mainly residential. Based on this plot the following analysis determined:

- After passing LAVER waypoint Figure 26 shows a small number of arrivals follow a similar flight path to that proposed for this RNP approach to Runway 34;
- Figure 26 shows the areas below the section of the proposed RNP approach path between Sunshine Road and waypoint ML844 is already overflown by aircraft that are conducting a VOR approach, RNAV (GNSS) approach or visual approach to Runway 34;
- A comparison of RNP approach tracks at Brisbane Airport indicated a lateral spread of less than 0.2 nautical miles wide, indicating aircraft using this RNP approach procedure should follow a narrow approach path when tracking between LAVER and SQUIR waypoints; and
- Currently aircraft using the VOR RWY 34 approach procedure have an approximate lateral spread of 0.22 nautical miles wide and the RNAV (GNSS) approach procedure has an approximate lateral spread of 0.16 nautical miles wide.

Analysis of the proposed flight path for aircraft using the WENDY UNIFORM STAR and the linked RNAV-P (RNP) RWY 34 approach procedure indicates:

- the proposed RNP and STAR procedures do not have any changes to aircraft altitude that are currently applied;
- the proposed WENDY ONE STAR has the same flight path as the current WENDY STAR until LAVER waypoint;
- the proposed RNP approach path follows a different approach path to that currently followed by aircraft conducting a VOR RWY 34 approach, an RNAV-Z (GNSS) RWY 34 approach or a visual approach to this runway between LAVER and LUMIJ waypoints;
- the proposed RNP approach procedure can be joined at either of these waypoints: - IFULP, LUMIJ and SQUIR;
- the aircraft that are provided with a visual approach track direct from TEENA waypoint to join final;
- a limited number of aircraft have been radar vectored and they have an extended approach path prior to joining for a VOR approach or RNAV (GNSS) approach to this runway;
- the number of Qantas and Jetstar aircraft that follow this proposed RNP approach procedure be monitored to check similar number of arrivals use it to that which currently conduct a VOR approach, RNAV (GNSS) approach or a visual approach to this runway;
- information provided by Melbourne Centre indicates they expect there should not be any difference in the number of aircraft who follow the STAR flight path and those that are radar vectored or provided with direct tracking from a distant waypoint.
- the Qantas and Jetstar aircraft that conduct an RNP approach to Runway 34 will increase the number of arrivals along a portion of the flight path followed by aircraft conducting a VOR RWY 34 approach to this runway;
- an annual daily average of 0.7 arrivals by Qantas B737-800 and Jetstar A320 aircraft and 2.0 arrivals by Qantas and Jetstar B767 and A330 aircraft of a total 6.2 arrivals by jet aircraft to Runway 34 that used the current ARBEY STAR;
- the three months NFPMS track data showed

  - 81 percent of all arrivals were along the STARs flight path, of which 16 percent of these were by Qantas B737-800 and Jetstar A320 aircraft and 18 percent were by Qantas and Jetstar B767 and A330 aircraft;
  - 14 percent of all arrivals conducted a visual approach of which six percent of these arrivals by Qantas B737-800 and Jetstar A320 aircraft and 44 percent by Qantas and Jetstar B767 and A330 aircraft;
  - 5 percent of all arrivals were provided with radar vectoring of which one percent of these arrivals were arrivals by Qantas B737-800 and Jetstar A320 aircraft and one percent were arrivals by Qantas and Jetstar B767 and A330 aircraft that were radar vectored;
  - 17 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to SQIRE waypoint;
- the Qantas and Jetstar listing of scheduled movements shown in Attachment A indicates a potential of 6.3 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and 4.7 arrivals per day by Qantas and Jetstar B767 and A330 aircraft using this approach procedure;
- Table 6 shows a maximum of 10 arrivals per day was recorded by Qantas and Jetstar aircraft during the 1 May 2008 to 31 April 2009 which is similar to the number of arrivals by Qantas and Jetstar aircraft shown in Attachment A;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis showed the noise generated by aircraft conducting an RNP approach to Runway 34 should not alter to that currently experienced from current arrivals.

The above analysis noted the proposed RNP approach procedure that will be linked to the WENDY STAR will track aircraft over areas that currently have limited number of overflights. However, it also indicates the majority of the flight path is either over open or industrial areas and where it is over residential areas they are currently affected by aircraft conducting a VOR or GNSS approach to Runway 34. It also indicated a daily average of less than one arrival per day by current RNP approved Qantas and Jetstar aircraft that will be using this procedure and two arrivals per day by the A330 and B767 aircraft.

RNAV-P (RNP) RWY 34 and Linked DYTES and MICHM PAPA STARs

Figure 27 shows the flight tracks of arrivals to Runway 34 that have been following the current DYTES and MICHM STARs, the flight path of the current DYTES and MICHM STARs and the proposed RNAV-U (RNP) RWY 34 approach flight path. In addition, Melbourne Centre has separately proposed the cancelling of the DYTES STAR and modifying the BADGR and LIZZI STARs to include a flight path between MONTY and BOLTY waypoints that will follow a similar flight path to that currently followed by aircraft that are currently using the DYTES STAR. To cover this proposed change, Figure 27 also shows the proposed flight paths for the BADGR PAPA and LIZZI PAPA STARs.

Figure 27. RNAV-P (RNP) RWY 34 & BADGR, DYTES, LIZZI and MICHM STARs

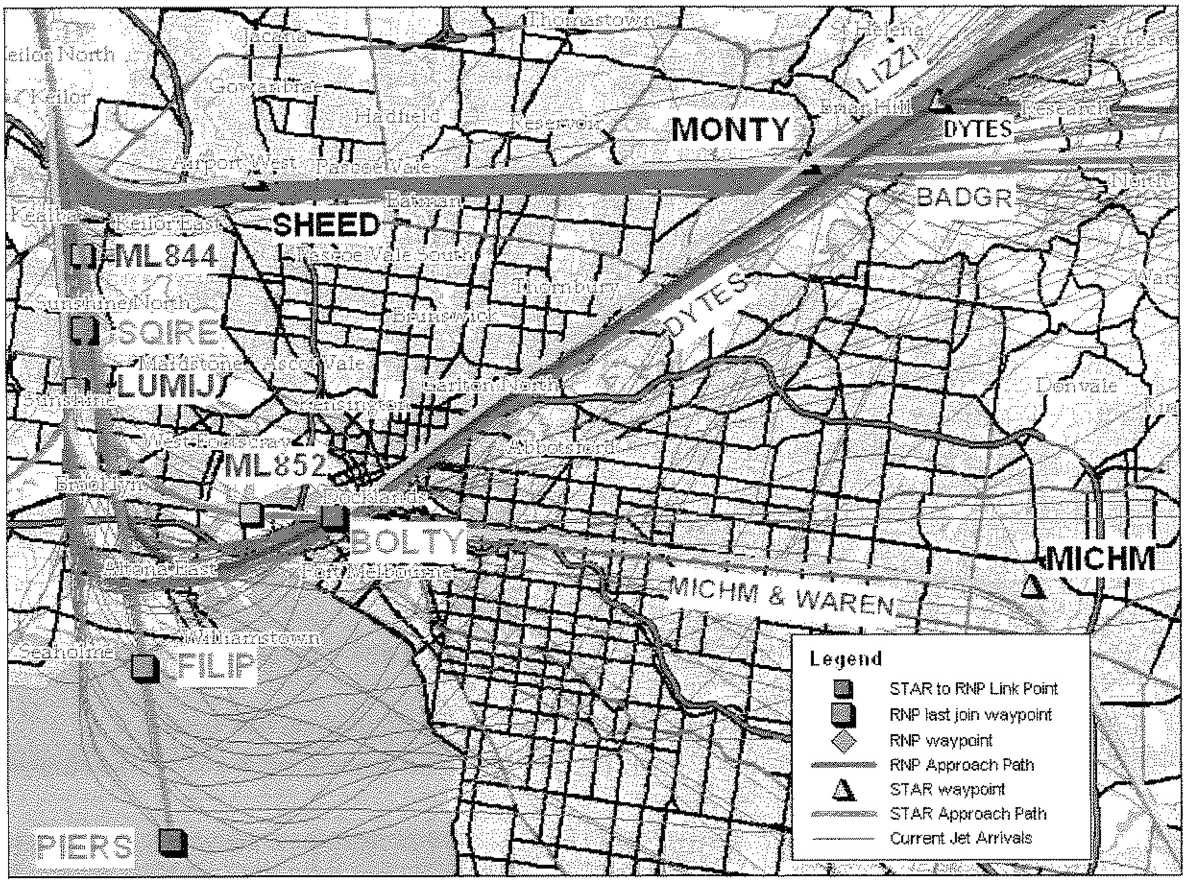


Figure 27 also shows the flight tracks of the current arrivals, particularly aircraft using the DYTES STAR; separate into two flight paths, one for aircraft that are conducting a VOR RWY 34 approach to this runway and the other for aircraft conducting a RNAV-Z (GNSS) RWY 34 approach to Runway 34. It also shows aircraft that have been provided with track shortening from a distant waypoint, radar vectored for traffic management purposes, those aircraft that track for a VOR or GNSS approach to Runway 34.

It also shows that some of the aircraft that used the MICHM STAR have been provided with a visual approach that have tracked them to join at or after BOLTY waypoint and arrivals that used the BADGR and LIZZI STARs that have when provided with a visual approach to this runway have tracked overhead Essendon Airport then turning right to land on Runway 34.

See Attachment C, Figures C7 for a plot of the proposed RNAV-P (RNP) RWY 34 approach procedure and Attachment E, Figure E5 for a plot of the proposed approach path for the RNP linked DYTES STAR and Attachment E, Figures E4, E6 and E7 for a plot of the proposed approach path for the RNP linked BADGR, LIZZI and MICHM STARs.

Analysis of the proposed RNP linked DYTES STAR and the proposal for this STAR to be replaced by the BADGR and LIZZI STARs indicates:

- the environmental assessment of the proposed change indicated the following:
  - a daily average of 2.5 arrivals per day that use the DYTES STAR during the 1 July 2008 to 30 June 2009 period;
  - less than half of these arrivals were by Qantas and Jetstar aircraft

   - the DYTES STAR was used for 158 days during this period for an approach to this runway, an average of 4.2 arrivals per day;
   - the majority if arrivals when tracking between DYTES and BOLTY waypoints are on descent from 6,000 feet to 4,000 feet;
   - a displacement of 0.8 kilometres; and
   - some arrivals that have been provided with the LIZZI or BADGR STARs have been radar vectored to track via BOLTY waypoint after passing MONTY waypoint.
- the above extract from the environmental assessment of the proposed cancelling of the DYTES STAR indicates the proposed change should not cause any significant change to aircraft impact to that which is currently experienced.
- the proposed RNP approach procedure and BADGR, DYTES and LIZZI STARs have the same altitude requirements as the current STARs; and
- some aircraft have been radar vectored for traffic management purposes or provided with track direct from a distant waypoint to BOLTY waypoint.

Analysis of the proposed RNP linked MICHM STAR indicates;

- the proposed MICHM PAPA STAR has the same flight path as the current MICHM STAR;
- some aircraft have been radar vectored for traffic management purposes or provided with track direct from a distant waypoint to BOLTY waypoint; and
- some aircraft have been provided with direct tracking to join for a VOR or GNSS approach to Runway 34.

Analysis of the proposed RNAV-P (RNP) RWY 34 approach procedure indicates:

- the proposed RNP approach procedure can also be joined at ML852 and SQUIR waypoints;
- proprietary mapping shows the areas below the proposed flight path between BOLTY and ML852 waypoints is mainly industrial and the areas below the segment between waypoints ML852 and SQUIR is mainly residential, which currently has limited number of jet overflights;
- a limited number of aircraft that have been radar vectored can join for an RNP approach at ML852 and SQUIR waypoints;
- information provided by Melbourne Centre indicates they expect there should not be any difference in the number of aircraft that follow the STARs flight path and those that are radar vectored or provided with direct tracking from a distant waypoint.
- an increase in the number of arrivals by Qantas and Jetstar aircraft that are conduct an RNP approach along the same the flight path of the GNSS approach procedure;
- there should be a reduction in the impact of arriving aircraft for the areas of Altona East and Brooklyn, which lie below the flight path of the VOR RWY 34 approach procedure
- approximately 10 percent of the Qantas and Jetstar arrivals that use the BADGR, DYTES, MONTY or MICHM STARS track via BOLTY waypoint for their approach to Runway 34;
- based on this 10 percent usage of the STARS that track via BOLTY waypoint an estimated annual daily average 0.6 arrivals were by Qantas and Jetstar B737-800 and Jetstar A320 aircraft and 0.4 arrivals by Qantas and Jetstar B767 and A330 aircraft of a total 2.8 arrivals by jet aircraft to Runway 34;
- the three months NFPMS track data showed
   - 38 percent of all arrivals via BOLTY waypoint were along the STARs flight path, of which nine percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and 13 percent were by Qantas and Jetstar B767 and A330 aircraft;

  - 39 percent of all arrivals conducted a visual approach of which 57 percent of these arrivals were by Qantas B737-800 and Jetstar A320 aircraft and no arrivals were by Qantas and Jetstar B767 and A330 aircraft;
  - 5 percent of all arrivals were provided with radar vectoring of which six percent of these arrivals were arrivals by Qantas and Jetstar aircraft;
  - 66 percent of the Qantas and Jetstar arrivals that conducted a visual approach will need to alter their flight path to join final prior to SQIRE waypoint;
- based on the above analysis, it is estimated from the Qantas and Jetstar scheduled movements shown in Attachment A, a potential of 3.5 arrivals per day by Qantas B737-800 and Jetstar A320 aircraft and 1.5 arrivals per day by Qantas and Jetstar B767 and A330 aircraft will track via BOLTY for an approach to Runway 34;
- Qantas advice that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- noise analysis shows the noise generated by aircraft who follow the DYTES STAR may vary slightly when it is cancelled and the modified BADGR and LIZZI STARs are introduced, but the extent of the change is expected to not be perceptible to the residents living below the new flight path; and
- noise analysis shows the noise generated by aircraft that are conducting an RNP approach to Runway 34 may change the impact currently experienced from aircraft tracking between BOLTY waypoint and SQIRE waypoint as this section of the proposed flight path is over areas that currently have limited overflights.

The above analysis noted the proposed RNP approach procedure that will be linked to the BADGR UNIFORM, LIZZI ONE PAPA and MICHM ONE PAPA STARs will track aircraft over areas that currently have limited number of overflights. However, it also indicated an average of less than one arrival per day by the Qantas and Jetstar aircraft that will be using this procedure. This analysis also indicated there were 14 days during a 12 month period when there were in excess of 10 arrivals per day that tracked via BOLTY waypoint for their approach to this runway with a maximum of 52 arrivals on one, which consisted of 9 arrivals by B737-800 and A320 aircraft and 12 arrivals by B767-300 and A330 aircraft and a daily average of 3.5 and 4.3 arrivals by these aircraft types

Combined Impact of RNAV-P (RNP) RWY 34 Approach Procedure

The above analysis indicates Qantas and Jetstar aircraft using the proposed ARBEY ONE PAPA STAR and the proposed RNP approach procedure will follow a different flight path to that currently followed by aircraft that are using the ARBEY STAR after they have passed BEWDD waypoint. The analysis showed the proposed change to the flight path will track aircraft over open or industrial areas and a residential area that is currently overflown by arrivals to this runway. The analysis also showed arrivals that currently use the WENDY STAR will follow a similar flight path for their passed IFULP waypoint and made a similar analysis of their impact when tracking between IFULP and SQIRE waypoints. It also showed a daily average of less than one arrival by Qantas and Jetstar aircraft that conducted a visual approach and will need to alter their flight path to join final prior to SQIRE waypoint;

The analysis also showed the proposed flights for arrivals that currently use the, DYTES STAR (BADGR and LIZZI STARs) and MICHM STAR will also differ to that currently flown but the analysis showed there should be minimal change to noise impact as it showed currently there is minimal daily use of this procedure as the majority of arrivals to Runway 34 from the east and north-east track via Essendon Airport for a visual approach to this runway.

Analysis of Emissions Savings for Proposed Runway 16 RNP Approach Procedure

The above analysis shows there may be a difference in track miles flown by aircraft using any of the proposed Runway 34 RNP approach procedures and an analysis to determine if the potential change in emissions was undertaken. This analysis indicated the following:

- An arrival using the ARBEY STAR should have a reduction of approximately 3 nautical miles for aircraft who currently conduct a VOR approach to Runway 34 and 4 nautical miles for those aircraft who currently conduct a GNSS approach to this runway;
- An arrival using the WENDY STAR should have a reduction of approximately 1 nautical miles for aircraft who currently conduct a VOR approach to Runway 34 and 2 nautical miles for those aircraft who currently conduct a GNSS approach to this runway; and
- An arrival using the DYTES (BADGR and LIZZI) and MICHM STARs should have a reduction of approximately 6 nautical miles.

Based on the estimated reduction on track miles and the daily average number of arrivals of Qantas and Jetstar aircraft that currently follow the STAR and track to join for a VOR or GNSS approach to Runway 34 it was calculated using the "rule of thumb" principle that there should be an annual saving of approximately 138,500 kilogram of CO_2.

Community Consultation

Australia Pacific Airports (Melbourne) Pty Ltd chairs the Melbourne Airport Noise Abatement Committee (NAC) at which community concerns about the impact of the Melbourne Airport and aircraft operations at this airport have on the surrounding community are considered.

At an NAC meeting held on 11 August 2009 a presentation was made on the introduction of RNP approach procedures for use by Qantas and Jetstar aircraft. Following this meeting response from Melbourne Airport has been received which indicated a generally positive response to the proposed change to the RNP approach paths that are linked to the ARBEY and WENDY STARs due to a major portion of their approach path being over non-residential and industrial areas to the south of Melbourne Airport.

Findings

Based on the information obtained from Qantas, Jetstar, Airservices Australia ATC Project Implementation Office and Melbourne ATC a proposal to implement RNP approach procedures at Melbourne Airport for use by Qantas B737-800 and A330 aircraft and Jetstar A320 and A330 aircraft and their future B787 aircraft has been undertaken and the following findings have been made.

General Findings

- previous experience has shown aircraft following an RNP approach procedure have a lateral spread of 0.2 nautical miles wide, indicating the lateral spread of aircraft using RNP approach procedure should be narrower than that current flown by aircraft who are joining for their final approach;
- there should be minimal difference in the lateral spread of aircraft when following an RNP approach procedures during the final segment where the approach path is aligned with runway centreline;
- current arrivals are already concentrated to some extent along their flight paths due to the use of the existing RNAV procedures;
- the effect of the increased concentration on the proposed RNP flight paths is likely to be reduced because:

  - aircraft will be able to join the RNP approach procedures at a number of different locations along the track; and
  - aircraft will continue to be provided with direct tracking from a distant waypoint during their approach to Melbourne Airport;
- advice from Qantas that approximately 25 percent of its RNP capable aircraft do not conduct an RNP approach when these procedures are available;
- the analysis showed there should be minimal differences in the noise levels associated with the aircraft that are using the proposed RNP procedures should not be perceptibly different from that currently experience by these aircraft types for the majority of the proposed RNP approach paths.

Runway 09 RNP Approach Procedures

- a daily overage of less than one arrival per day by all jet aircraft of which Qantas and Jetstar aircraft accounted for less than half; and
- this runway was used for a total of 33 days during the 12 months analysis period with a daily average of 8.0 arrivals by all jet aircraft 4.3 arrivals by Qantas and Jetstar aircraft on these days;

Runway 09 RNP Approach Procedures – RNAV-M (RNP) RWY 09

- annual daily overage of 0.5 arrivals by all jet aircraft and 0.2 by Qantas and Jetstar aircraft;
- aircraft arriving using the ARBEY STAR used this runway for a total of 24 days during the 12 months analysis period and Qantas and Jetstar aircraft had a daily average of 3.5 arrivals on these days;
- the proposed RNP linked STARs follow the same flight paths as the current STARs.
- the proposed RNP approach follows a different flight path to that currently flown; and
- the areas overflown by this proposed RNP approach procedure is mainly rural and some rural residential areas.

Runway 09 RNP Approach Procedures – RNAV-P (RNP) RWY 09

- an annual daily average of approximately 0.2 by all jet aircraft that used the MONTY, WAREN or WENDY STARs for their approach to Runway 09 and 0.1 arrival per day by Qantas and Jetstar aircraft;
- aircraft arriving using the MONTY, WAREN or WENDY STARs used this runway for a total of 15 days during the 12 month analysis period and Qantas and Jetstar aircraft had a daily average of 2.3 arrivals on these days;
- each of the three proposed RNP approach paths will track aircraft over rural areas that currently have limited overflights, except for a small section below the RNP approach path that is linked to the WENDY STAR which will be mainly over a industrial area of Melton;
- the proposed RNP linked MONTY, WAREN or WENDY STARs all follow the same flight path as the current STAR; and
- there should be a reduction in CO_2 emissions by aircraft using these RNP approach procedures.

Runway 16 RNP Approach Procedures

- a daily average of 116.5 arrivals per day by all jet aircraft that landed on Runway 16 of which the Qantas and Jetstar aircraft accounted for a daily average of 55.5 arrivals per day;

- this runway was used for a total of 289 days during the 12 months analysis period with a daily average of 149.4 arrivals by all jet aircraft and 55.5 arrivals by Qantas and Jetstar aircraft;
- the proposed RNP linked STARS will enable arriving aircraft using the ARBEY, BADGR, LIZZI, WAREN and WENDY STARs to join for an RNP approach to Runway 16 without requiring ATC intervention.
- there is no difference in the alignment of the approach path for this RNP approach procedure to that currently followed by aircraft that have tracked via Bolinda (BOL) NDB or the proposed EMUZE waypoint for their approach to Runway 16;
- there is no difference in altitude requirements for aircraft following this RNP approach procedure to that currently flown;
- there should be a slight reduction in noise generated by aircraft using an RNP approach procedure to land on Runway 16 but the reduction in noise levels generated should not be perceptible to the residents living below their approach path; and
- an annual average of 24.8 Qantas and Jetstar arrivals per day use the BADGR, LIZZI, WAREN and WENDY STARs for their approach to Runway 16 and approximately 18 percent of these conducted a visual approach which will require them to change their flight path in order to conduct an RNP approach to this runway.

Runway 16 – RNAV-U (RNP) RWY 16 – ARBEY STAR

- the proposed ARBEY UNIFORM STAR follows the same flight path as the current ARBEY STAR;
- it is expected that ATC will continue to radar vector aircraft for traffic management purposes during their approach to Runway 16 with the majority of these aircraft joining by BOL NDB or EMUZE waypoint;
- the aircraft that have been provided with direct tracking from a distant waypoint are expected to continue accepting this approach path to join at BOL NDB;
- there should not be a difference in noise impact of Qantas and Jetstar aircraft that are using this RNP approach procedure to that currently experienced; and
- there should not be a perceptible change in the impact of aircraft to that currently experienced due to current extensive use of Runway 16 for arriving aircraft.

Runway 16 – RNAV-U (RNP) RWY 16 – BADGR UNIFORM STAR

- the proposed BADGR UNIFORM STAR follows the same flight path as the current BADGR STAR;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EMUZE waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final after EMUZE waypoint will not be able to join for an RNP approach to this runway unless they change their flight path, resulting in a change in aircraft noise impact;
- an annual daily average of less than 0.3 arrivals by Qantas and Jetstar aircraft, a maximum of 3 arrivals on any one day by these aircraft and a daily average of 1.2 arrivals on the 98 days the runway was used by Qantas and Jetstar aircraft;
- one percent of the Qantas and Jetstar arrivals using the BADGR STAR were provided with direct tracking for a visual approach to Runway 16; and

- the majority of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 16 will be required to change there approach path in order to conduct an RNP approach to this runway.

Runway 16 – RNAV-U (RNP) RWY 16 – LIZZI UNIFORM STAR

- the proposed LIZZI UNIFORM STAR follows the same flight path as the current LIZZI STAR;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EMUZE waypoint can still accept direct tracking and still join for an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have join final after EMUZE waypoint will not be able to join for an RNP approach to this runway unless they change their flight path, resulting in a change in aircraft noise impact;
- an annual daily average of 15.3 arrivals per day by Qantas and Jetstar aircraft, a maximum of 39 arrivals on any one day by these aircraft and a daily average of 21.0 arrivals on the 267 days the runway was used by Qantas and Jetstar aircraft;
- 39 percent of the Qantas and Jetstar arrivals using the LIZZI STAR were provided with direct tracking for a visual approach to Runway 16; and
- 90 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 16 will be required to change their approach path in order to conduct an RNP approach to this runway.

Runway 16 – RNAV-U (RNP) RWY 16 – WAREN UNIFORM STAR

- the proposed WAREN UNIFORM STAR follows the same flight path as the current WAREN STAR;
- the Qantas and Jetstar aircraft that are conducting an approach to Runway 16 via BOL NDB should not alter the noise impact currently experienced when conducting an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EMUZE waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final after EMUZE waypoint will not be able to join for an RNP approach to this runway unless they change their flight path, resulting in a change in aircraft noise impact;
- an annual daily average of 4.9 arrivals by Qantas and Jetstar aircraft, a maximum of 13 arrivals on any one day by these aircraft and a daily average of 6.9 arrivals on the 257 days the runway was used by Qantas and Jetstar aircraft;
- 45 percent of the Qantas and Jetstar arrivals using the WAREN STAR were provided with direct tracking for a visual approach to Runway 16; and
- 81 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 16 will be required to change there approach path in order to conduct an RNP approach to this runway;

Runway 16 – RNAV-U (RNP) RWY 16 – WENDY UNIFORM STAR

- the proposed WENDY UNIFORM STAR follows the same flight path as the current WENDY STAR;
- the Qantas and Jetstar aircraft that are conducting an approach to Runway 16 via BOL NDB should not alter the noise impact currently experienced when conducting an RNP approach to this runway;

- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EMUZE waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 4.2 arrivals by Qantas and Jetstar aircraft, a maximum of 11 arrivals on any one day by these aircraft and a daily average of 5.6 arrivals on the 273 days the runway was used by Qantas and Jetstar aircraft;
- 22 percent of the Qantas and Jetstar arrivals using the WENDY STAR were provided with direct tracking for a visual approach to this runway; and
- 75 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 16 will be required to change their flight path in order to conduct a visual approach to this runway.

Runway 27 RNP Approach Procedures

- a daily average of 64.0 arrivals per day by all jet aircraft that landed on Runway 27 of which the Qantas and Jetstar aircraft accounted for a daily average of 24.8 arrivals per day;
- an annual average of 11.7 Qantas and Jetstar arrivals per day use the ARBEY STAR for their approach to Runway 16 and approximately 15 percent of these conducted a visual approach which will require them to change their flight path in order to conduct an RNP approach to this runway;
- an annual average of 12.9 Qantas and Jetstar arrivals per day use the BADGR, LIZZI, WAREN and WENDY STARs for their approach to Runway 16 and approximately one percent of these conducted a visual approach which will require them to change their flight path in order to conduct an RNP approach to this runway;
- this runway was used for a total of 351 days during the 12 months analysis period with a daily average of 66.5 arrivals by all jet aircraft and 34.5 arrivals by Qantas and Jetstar aircraft;
- the proposed RNP linked STARS will enable aircraft arriving using the ARBEY, BADGR, LIZZI, WAREN and WENDY STARs to join for an RNP approach to Runway 27 without requiring ATC intervention;
- there is a slight difference in the alignment of the approach path for the proposed RNAV-M (RNP) RWY 27 approach procedure to that currently followed by aircraft that have tracked via Epping (EPP) NDB for their approach to Runway 27;
- there is no difference in the alignment of the approach path for the proposed RNAV-U (RNP) RWY 27 approach procedure to that currently followed by aircraft that have tracked via Epping (EPP) NDB or the proposed EDSAL waypoint for their approach to Runway 27;
- there is no difference in altitude requirements for aircraft following this RNP approach procedure to that currently flown; and
- there may be a slight increase in noise generated by aircraft using an RNP approach procedure to land on Runway 27 but the level of the increase in noise levels should not be perceptible to the residents living below the approach path.

Runway 27 – RNAV-M (RNP) RWY 27 – ARBEY MIKE STAR

- the proposed ARBEY MIKE STAR follows the same flight path as the current ARBEY STAR;
- this proposed RNP approach procedure will track aircraft along the eastern edge of the current approach path of those aircraft that are following the current ARBEY STAR;

- the Qantas and Jetstar aircraft that are conducting an approach to Runway 27 via EPP NDB should not alter the impact currently experienced when conducting an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EDSAL waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 11.7 arrivals by Qantas and Jetstar aircraft, a maximum of 46 arrivals on any one day by these aircraft and a daily average of 15.9 arrivals on the 269 days the runway was used by Qantas and Jetstar aircraft;
- 20 percent of the Qantas and Jetstar arrivals using the ARBEY STAR were provided with direct tracking for a visual approach to Runway 27; and
- 54 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 27 will be required change to their flight path for an RNP approach to this runway.

Runway 27 – RNAV-U (RNP) RWY 27 – LIZZI UNIFORM STAR

- the proposed LIZZI UNIFORM STAR follows the same flight path as the current LIZZI STAR;
- the Qantas and Jetstar aircraft that are conducting an approach to Runway 27 via EPP NDB should not alter the noise impact currently experienced when conducting an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EDSAL waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 8.7 arrivals by Qantas and Jetstar aircraft, a maximum of 33 arrivals on any one day by these aircraft and a daily average of 11.8 arrivals on the 271 days the runway was used by Qantas and Jetstar aircraft;
- only 2 percent of the Qantas and Jetstar arrivals using the LIZZI STAR were provided with direct tracking for a visual approach to Runway 27;
- 50 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 27 will be required change to their flight path for an RNP approach to this runway.

Runway 27 – RNAV-U (RNP) RWY 27 –BADGR UNIFORM STAR

- the proposed BADGR UNIFORM STAR follows the same flight path as the current BADGR STAR;
- the Qantas and Jetstar aircraft that are conducting an approach to Runway 27 via EPP NDB should not alter the noise impact currently experienced when conducting an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EDSAL waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 0.2 arrivals by Qantas and Jetstar aircraft, a maximum of 2 arrivals on any one day by these aircraft and a daily average of 1.1 arrivals on the 62 days the runway was used by Qantas and Jetstar aircraft;
- a minimal number of Qantas and Jetstar arrivals using the BADGR STAR were provided with direct tracking for a visual approach to Runway 27 and the majority of these will not be required to change their flight path in order to conduct an RNP approach to Runway 27.

Runway 27 – RNAV-U (RNP) RWY 27 – WAREN UNIFORM STAR

- the proposed WAREN UNIFORM STAR follows the same flight path as the current WAREN STAR;
- the Qantas and Jetstar aircraft that are conducting an approach to Runway 27 via EPP NDB should not alter the noise impact currently experienced when conducting an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EDSAL waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 2.9 arrivals by Qantas and Jetstar aircraft, a maximum of 10 arrivals on any one day by these aircraft and a daily average of 3.6 arrivals on the 289 days the runway was used by Qantas and Jetstar aircraft;
- only 2 percent of the Qantas and Jetstar arrivals using the WAREN STAR were provided with direct tracking for a visual approach to Runway 27;
- approximately a half of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 27 will be required to their flight path for an RNP approach to this runway.

Runway 27 – RNAV-U (RNP) RWY 27 – WENDY UNIFORM STAR

- the proposed WENDY UNIFORM STAR follows the same flight path as the current WENDY STAR;
- the Qantas and Jetstar aircraft that are conducting an approach to Runway 27 via EPP NDB should not alter the noise impact currently experienced when conducting an RNP approach to this runway;
- the aircraft that have been provided with direct tracking from a distant waypoint and have joined final prior to EDSAL waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 1.1 arrivals by Qantas and Jetstar aircraft, a maximum of 8 arrivals on any one day by these aircraft and a daily average of 2.1 arrivals on the 186 days the runway was used by Qantas and Jetstar aircraft;
- only 4 percent of the Qantas and Jetstar arrivals using the WENDY STAR were provided with direct tracking for a visual approach to Runway 27; and
- 33 percent of the Qantas and Jetstar arrivals that were conducted a visual approach to Runway 27 will be required to their flight path for an RNP approach to this runway.

Runway 34 RNP Approach Procedures

- a daily average of 53.8 arrivals per day by all jet aircraft that landed on Runway 34 of which the Qantas and Jetstar aircraft accounted for a daily average of 19.2 arrivals per day;
- this runway was used for a total of 265 days during the 12 months analysis period with a daily average of 78.2 arrivals by all jet aircraft and 35.5 arrivals by Qantas and Jetstar aircraft;
- the proposed RNP linked STARS will enable arriving aircraft using the ARBEY, DYTES, MICHM, PORTS, WAREN and WENDY STARs to join for an RNP approach to Runway 34 without requiring ATC intervention.
- there is no difference in altitude requirements for aircraft following this RNP approach procedure to that currently flown; and
- no change is expected in the noise impact from aircraft using an RNP approach procedure to land on Runway 34 to that currently experienced from the Qantas and Jetstar aircraft that are arriving on Runway 34.

Runway 34 – RNAV-U (RNP) RWY 34 – PORTS UNIFORM STAR

- currently arrivals can conduct a straight in approach to Runway 34, GNSS approach to this runway or a VOR approach to this runway;
  - arrivals via PORTS waypoint that have conducted a visual or GNSS approach to Runway 34 will follow the same flight path when conducting an RNP approach to this runway; and
  - arrivals via PORTS waypoint that have conducted a VOR approach to Runway 34 will follow a different flight path when conducting an RNP approach to this runway;
- the aircraft who have been provided with direct tracking from a distant waypoint and have joined final prior to FILIP waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- a three month daily average of 1.0 arrivals by Qantas and Jetstar aircraft, a maximum of 43 arrivals on any one day by these aircraft and a daily average of 2.0 arrivals on the 43 days the runway was used by Qantas and Jetstar aircraft;
- 33 percent of the Qantas and Jetstar arrivals using the ARBEY STAR were provided with direct tracking for a visual approach to Runway 34; and
- 19 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 34 will be required to their flight path for an RNP approach to this runway.

Runway 34 – RNAV-P (RNP) RWY 34 – ARBEY MIKE STAR

- there will be a difference in the alignment of the approach path for the proposed RNAV-P (RNP) RWY 34 approach procedure to that currently followed by aircraft that have tracked via the ARBEY STAR for their approach to Runway 34;
- the proposed RNP approach path will track aircraft over open or industrial areas until it joins the existing approach path for arrivals to Runway 34;
- the Qantas and Jetstar aircraft that conduct an RNP approach to Runway 34 will reduce the noise impact of aircraft on the residential area of Altona North;
- the aircraft who have been provided with direct tracking from a distant waypoint and have joined final prior to SQIRE waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 6.4 arrivals by Qantas and Jetstar aircraft, a maximum of 43 arrivals on any one day by these aircraft and a daily average of 14.7 arrivals on the 159 days the runway was used by Qantas and Jetstar aircraft;
- 46 percent of the Qantas and Jetstar arrivals using the ARBEY STAR were provided with direct tracking for a visual approach to Runway 34;
- The number of arrivals that conduct an RNP approach, radar vectored or provided with track shortening for a visual approach to Runway 34 be monitored; and
- 58 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 34 will be required to their flight path for an RNP approach to this runway.

Runway 34 – RNAV-P (RNP) RWY 34 – WENDY MIKE STAR

- there will be a difference in the alignment of the approach path for the proposed RNAV-P (RNP) RWY 34 approach procedure to that currently followed by aircraft that have tracked via the WENDY STAR for their approach to Runway 34;
- the proposed RNP approach path will track aircraft over open or industrial areas until it joins the existing approach path for arrivals to Runway 34;
- the Qantas and Jetstar aircraft that conduct an RNP approach to Runway 34 will reduce the noise impact of aircraft on the residential area of Altona North;

- the aircraft who have been provided with direct tracking from a distant waypoint and have joined final prior to SQIRE waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 2.7 arrivals by Qantas and Jetstar aircraft, a maximum of 10 arrivals on any one day by these aircraft and a daily average of 4.1 arrivals on the 238 days the runway was used by Qantas and Jetstar aircraft;
- 14 percent of the Qantas and Jetstar arrivals using the WENDY STAR were provided with direct tracking for a visual approach to Runway 34;
- The number of arrivals that conduct an RNP approach, radar vectored or provided with track shortening for a visual approach to Runway 34 be monitored; and
- 17 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 34 will be required to their flight path for an RNP approach to this runway.

Runway 34 - RNAV-P (RNP) RWY 34 – BADGR, DYTES and MICHM STARS

- there will be a difference in the alignment of the approach path for the proposed RNAV-P (RNP) RWY 34 approach procedure to that currently followed by aircraft who have tracked via the BADGR, DYTES and MICHM STARS for their approach to Runway 34;
- the proposed RNP approach path will track aircraft over industrial and some residential areas until it joins the existing approach path for arrivals to Runway 34;
- there should be a slight reduction in number of Qantas and Jetstar aircraft that are following the flight path for the VOR RWY 34 approach procedure;
- the aircraft who have been provided with direct tracking from a distant waypoint and have joined final prior to SQIRE waypoint can still be provided with direct tracking and still join for an RNP approach to this runway;
- an annual daily average of 1.0 arrivals by Qantas and Jetstar aircraft, a maximum of 10 arrivals on any one day by these aircraft and a daily average of 2.8 arrivals on the 43 days this runway was used by Qantas and Jetstar aircraft;
- 39 percent of the Qantas and Jetstar arrivals using the WENDY STAR were provided with direct tracking for a visual approach to Runway 34; and
- 66 percent of the Qantas and Jetstar arrivals that conducted a visual approach to Runway 34 will be required to their flight path for an RNP approach to this runway.

Environment and Climate Change has undertaken an environmental assessment of Qantas proposed RNP approach procedures for Melbourne Airport and Airservices Australia proposed RNP linked STARs for aircraft to use when arriving at Melbourne Airport and considers the proposed change should result in a minimal change to the impact of aircraft for the residents around Melbourne Airport due to:

- the majority of the proposed procedures replicating existing flight paths;
- any changes to flight paths being mainly over non-residential or industrial areas;
- the expected change to the impact of aircraft due to the reduced lateral spread of flight tracks when following an RNP approach procedure should not alter the noise impact of aircraft during the final approach as current arrivals have a similar concentration;
- the expected narrowing of the lateral spread of aircraft when following an RNP approach procedure prior to joining for the final approach segment occurs away from the airport when the majority of aircraft should be above 3,000 feet and aircraft will be tracking over non-residential or industrial areas;

- where there is a proposed change to the current flight path and it will track over residential areas it is expected there will be a relative low number of arrivals that will follow that flight path;
- each of the proposed RNP approach procedures can be joined by an aircraft intending to conduct an RNP approach at more than one joining point; and
- ATC can continue to use radar vectoring for traffic management purposes and provide to aircraft direct tracking from a distant waypoint and the aircraft can join for an RNP approach at any of the designated joining points;
- The continued use of radar vectoring and direct tracking will maintain some of the current track dispersal; and
- The Melbourne Airport Noise Abatement Committee has indicated a positive response to the proposed RNP approach procedures, particularly the proposed RNP approach path for arrivals that will use the linked ARBEY and WENDY STARs for their approach to Runway 34.

Based on this assessment Environment and Climate Change considers the proposal is not significant in terms of environmental or environmental business risk provided the following recommendations are followed.

Recommendations

The following recommendations are made:

1. The Melbourne Airport Noise Abatement Consultative Committee is to be provided with the outcomes of this environmental assessment by the proponent.
2. The general public is to be notified of the proposed changes via an appropriate medium e.g. local newspapers, radio, etc.
3. Monitoring of complaints received by Airservices Australia's Noise Enquiry Unit for a period of one year after implementation to determine if the use of these procedures by Qantas and Jetstar aircraft has any unanticipated environmental impact on residential areas.
4. If the introduction of these RNP approach procedures results in any unexpected adverse environmental impact or if the RNP procedures are to be used by additional aircraft types or operators then further environmental assessments will be required.

Attachment A

Table A1. Qantas and Jetstar RNP Capable Aircraft Operations into Melbourne

Departure Airport	Dom/Int	Airline	Aircraft	STAR	Daily Arrivals	Arrivals per STAR
Adelaide	Domestic	Qantas	737-800	ARBEY	9.14	
Alice Springs	Domestic	Qantas	737-800	ARBEY	1.00	
Brisbane	Domestic	Qantas	737-800	ARBEY	14.71	
Broome	Domestic	Qantas	737-800	ARBEY	0.29	
Cairns	Domestic	Qantas	737-800	ARBEY	1.00	26.14
Canberra	Domestic	Qantas	737-800	LIZZI	1.71	
Sydney	Domestic	Qantas	737-800	LIZZI	8.14	9.86
Hobart	Domestic	Qantas	737-800	WAREN or PORTS	1.29	1.29
Perth	Domestic	Qantas	737-800	WENDY	0.57	0.57
Total		**Qantas**	**737-800**		37.86	37.86
Darwin	Domestic	Qantas	767-300	ARBEY	1.50	1.50
Sydney	Domestic	Qantas	767-300	LIZZI	16.50	16.50
Perth	Domestic	Qantas	767-300	WENDY	4.70	4.70
Total		**Qantas**	**767-300**		22.70	22.70
Sydney	Domestic	Qantas	A330	LIZZI	1.43	1.43
Perth	Domestic	Qantas	A330	WENDY	1.71	1.71
Total		**Qantas**	**A330**		3.14	3.14
Total	**Domestic**	**Qantas**			63.70	63.70
Adelaide	Domestic	Jetstar	A320	ARBEY	3.14	
Cairns	Domestic	Jetstar	A320	ARBEY	2.00	
Darwin	Domestic	Jetstar	A320	ARBEY	2.86	
Gold Coast	Domestic	Jetstar	A320	ARBEY	11.14	
Hamilton Island	Domestic	Jetstar	A320	ARBEY	2.00	
Maroochydore	Domestic	Jetstar	A320	ARBEY	3.14	
Townsville	Domestic	Jetstar	A320	ARBEY	0.86	25.14
Ballina	Domestic	Jetstar	A320	LIZZI	6.00	
Sydney	Domestic	Jetstar	A330	LIZZI	0.86	6.86
Hobart	Domestic	Jetstar	A320	WAREN or PORTS	8.00	
Launceston	Domestic	Jetstar	A320	WAREN or PORTS	6.00	14.00
Perth	Domestic	Jetstar	A320	WENDY	4.00	4.00
Total	**Domestic**	**Jetstar**	**A320**		50.00	50.00
Total	**Domestic**				113.70	113.70
Auckland	International	Qantas	737-800	BADGR	2.00	2.00
Bangkok	International	Jetstar	A320	ARBEY	1.43	1.43
Christchurch	International	Jetstar	A320	WAREN	2.57	2.57
Total			**A320**		4.00	4.00
Bangkok	International	Jetstar	A330	ARBEY	0.86	
Denpasar	International	Jetstar	A320	ARBEY	0.57	1.43
Total			**A320**		1.43	1.43
Total	**International**				7.43	7.43
Grand Total					121.13	121.13

Attachment B

ARMS Standard Report on Risks Selected

14 Sep 2009 09:26
(ARMS Version 5.000.027)

ATC (ex ATM) (Aviation Ops), VIC, MELBOURNE/GEELONG, Melbourne airspace (within 60NM)

Risk ID: 191942
Site: ML RNP STARs
Division: ATC (ex ATM) (Aviation Ops)
Function: Air Traffic Control
Activity Group: Flight Path development
Activity: STARS proposal development
Hazard: Noise
Impact: Public concern
Risk Type: Proposal
Risk Description:
Minimal risk - all STARs follow current tracks. Only RNP approach exception is the RWY 34-P. The western approach tracks over industrial areas on the base leg as opposed to current RNAV-Z (GNSS) and VOR approaches that overfly residential areas.
Current Risk Control for Proposal:
Melbourne STARs - additional STARs to join proposed RNP approaches.
All proposed STARs follow existing flight paths to the point where the new RNP approach is joined.
Worst case scenario:
No likely risk.
Causal Factors:
These STAR tracks are in current use. RWY 34 RNP-P is the only different termination and it overflies industrial areas instead of current approaches over residential areas.
Likelihood: Likely
Consequence: Insignificant
Risk: Class C
Assessment Notes:
Assessment Approved: Pending environmental clearance **Screening by:** meagher_pj
Is Significant: No
Environmental Impact Assessment Significance: Unknown
Notes:
Updated STARs attached 18/05/09:

(1) BADGR, LIZZI & WAREN STARs - WPT names added to replace RNP numbered points (no change to coordinates). RWY 34 M arrivals deleted - there will not be RNP approaches via the existing RWY 34 arrival overhead Essendon.

(2) WENDY arrival: WPT names added to replace RNP numbered points (no change to coordinates).

(3) ADMS diagram updated.

14/08/09 - Draft STAR plates updated.
17/08/09 - Draft WAREN & WENDY STARs updated - editorial only.
09/09/09 - Draft BADGR, WAREN & WENDY STARs updated - the short RWY 16 RNP approaches have been removed.
Legislation: Not Defined
Standards: Not Defined
Considerations: Not Defined
Objectives and Targets: Not Defined
Incidents: Not Defined

Attachment C

Figure C1. Proposed RNAV-M (RNP) RWY 09 Approach

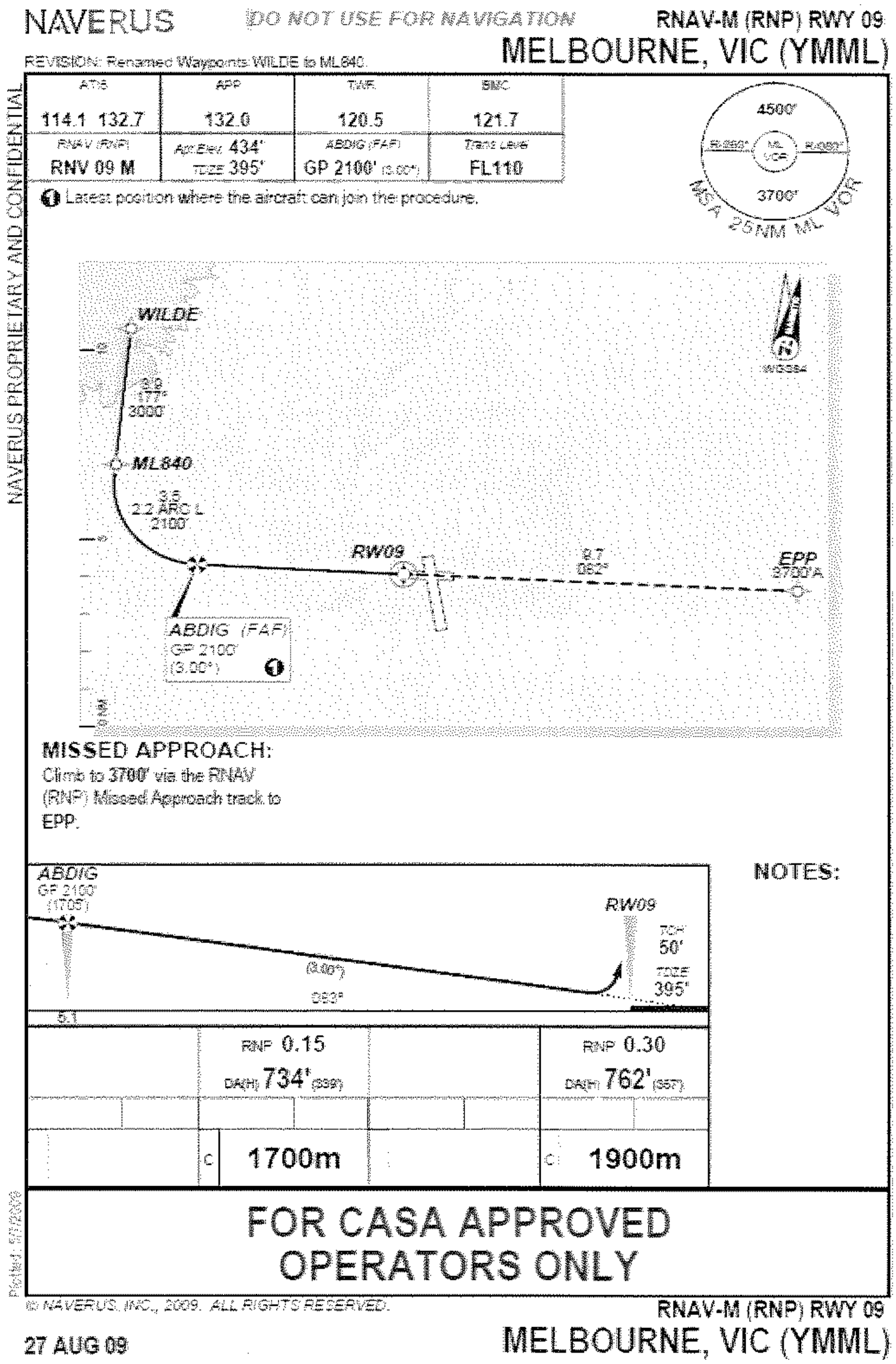


Figure C2. Proposed RNAV-P (RNP) RWY 09 Approach

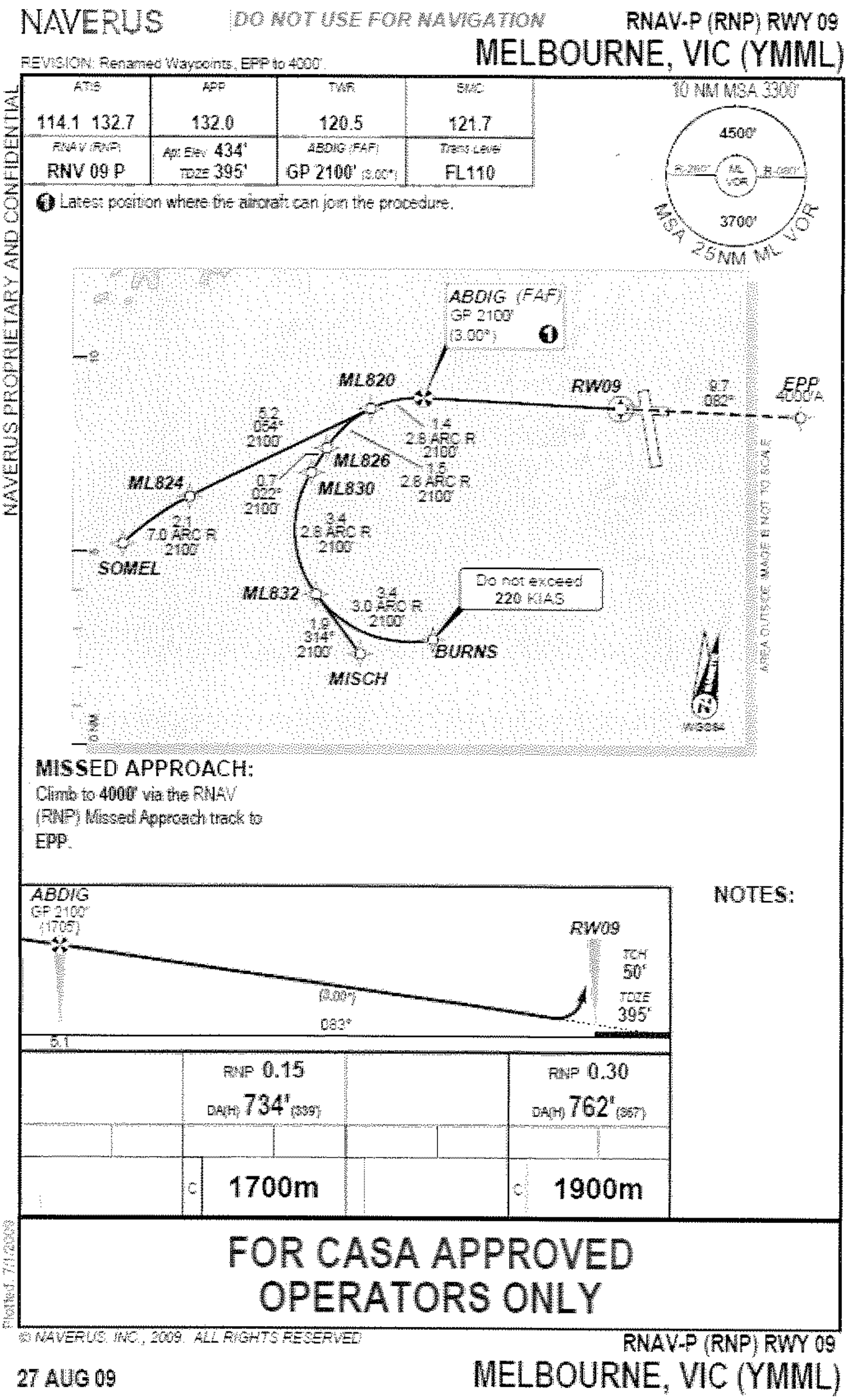


Figure C3. Proposed RNAV-U (RNP) RWY 16 Approach

NAVERUS DO NOT USE FOR NAVIGATION **RNAV-U (RNP) RWY 16**

MELBOURNE, VIC (YMML)

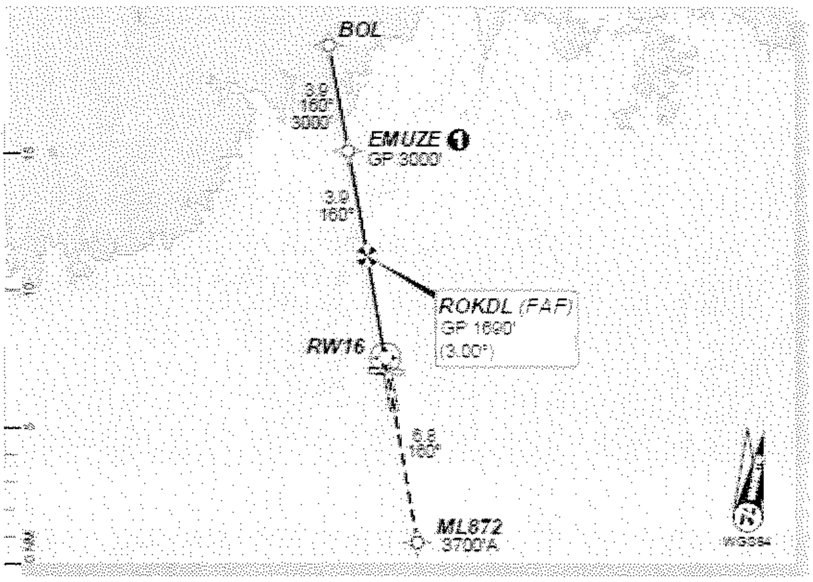
REVISION: Renamed Waypoints and removed FAF Ballflag.

NAVERUS PROPRIETARY AND CONFIDENTIAL

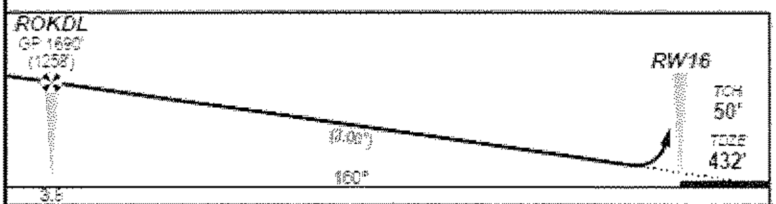
ATIS	APP	TWR	SMC
114.1 132.7	132.0	120.5	121.7
RNAV (RNP) RNV 16 U	Apt Elev 434' TDZE 432'	ROKDL (FAF) GP 1690' (3.00°)	Trans Level FL110

MSA 25NM ML VOR: 4500' / 3700' (R-260° / R-080°)

❶ Latest position where the aircraft can join the procedure.



MISSED APPROACH:
Climb to 3700' via the RNAV (RNP) Missed Approach track to ML872.



NOTES:

RNP 0.10		RNP 0.15		RNP 0.20		RNP 0.30	
DA(H) 783' (351')		DA(H) 799' (367')		DA(H) 809' (377')		DA(H) 856' (424')	
FULL	HIALS out	FULL	HIALS out	FULL	HIALS out	FULL	HIALS out
C 900m	1800m	C 1000m	1900m	C 1000m	2000m	C 1300m	2200m

FOR CASA APPROVED OPERATORS ONLY

Plotted 5/7/2009

RNAV-U (RNP) RWY 16

27 AUG 09 MELBOURNE, VIC (YMML)

Figure C4. Proposed RNAV-U (RNP) RWY 27 Approach

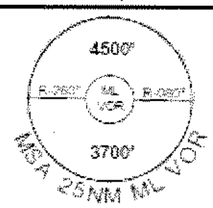
NAVERUS DO NOT USE FOR NAVIGATION **RNAV-U (RNP) RWY 27**

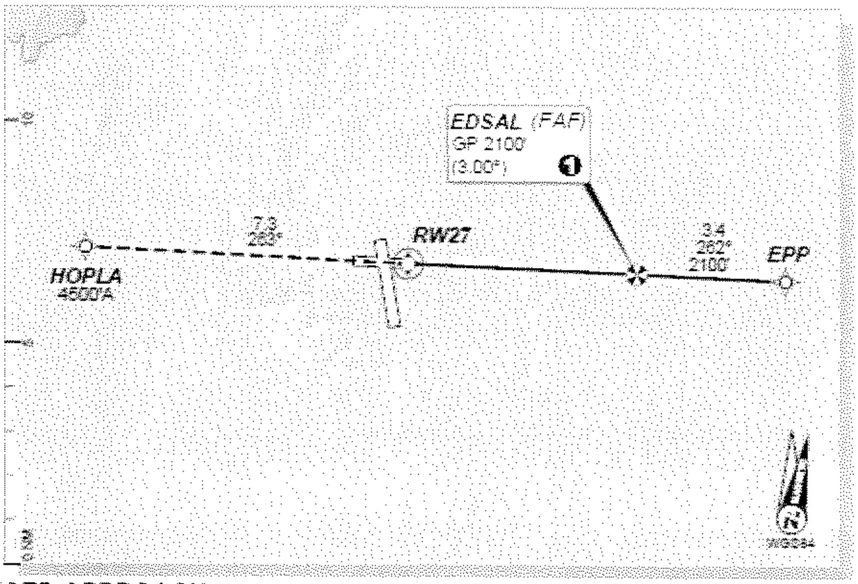
REVISION: Renamed Waypoint **MELBOURNE, VIC (YMML)**

NAVERUS PROPRIETARY AND CONFIDENTIAL

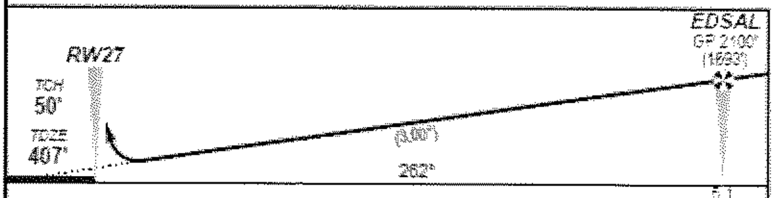
ATIS	APP	TWR	SMC
114.1 132.7	132.0	120.5	121.7
RNAV (RNP)	Apt Elev 434' TDZE 407'	EDSAL (FAF)	Trans Level
RNV 27 U		GP 2100' (3.00°)	FL110

❶ Latest position where the aircraft can join the procedure.





MISSED APPROACH:
Climb to **4500'** via the RNAV (RNP) Missed Approach track to **HOPLA**.



NOTES:

RNP 0.10		RNP 0.15		RNP 0.20		RNP 0.30	
DA(H) 766' (359')		DA(H) 788' (381')		DA(H) 813' (406')		DA(H) 964' (557')	
FULL	HIALS out	FULL	HIALS out	FULL	HIALS out	FULL	HIALS out
C 900m	1900m	C 1100m	2000m	C 1200m	2100m	C 2100m	3000m

FOR CASA APPROVED OPERATORS ONLY

Plotted: 5/12/2009

27 AUG 09 **RNAV-U (RNP) RWY 27**
MELBOURNE, VIC (YMML)

Figure C5. Proposed RNAV-M (RNP) RWY 27 Approach

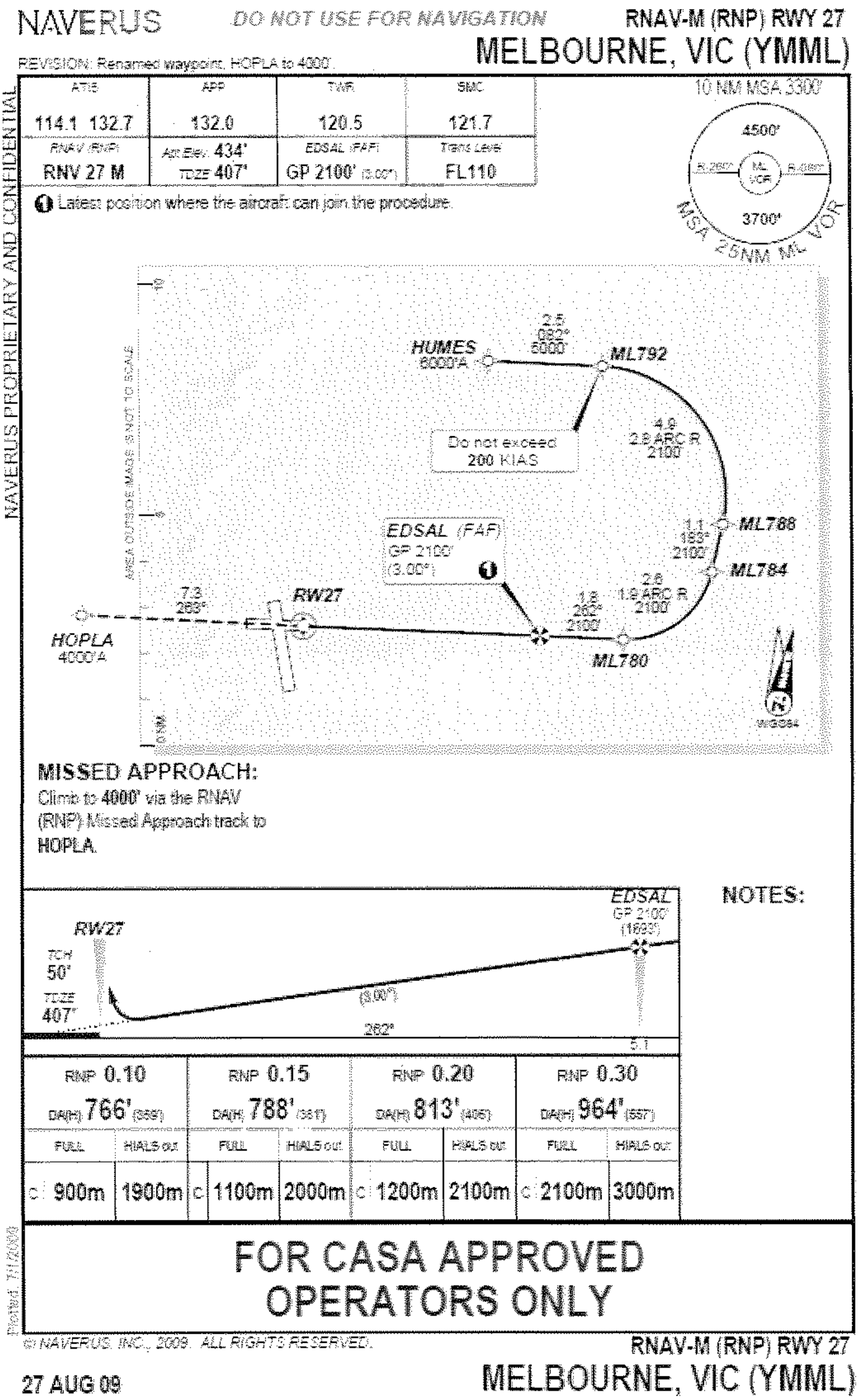


Figure C6. Proposed RNAV-U (RNP) RWY 34 Approach

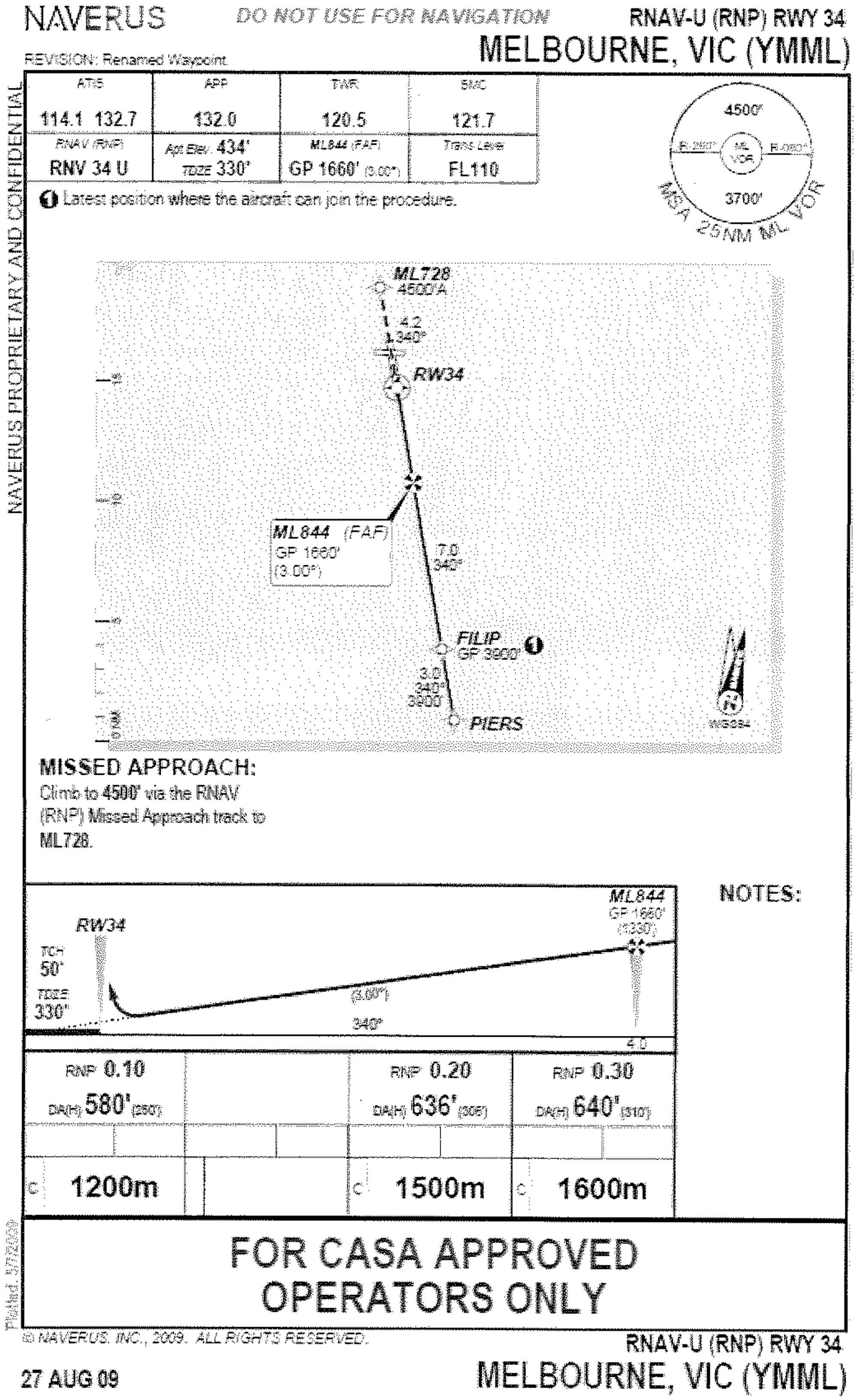
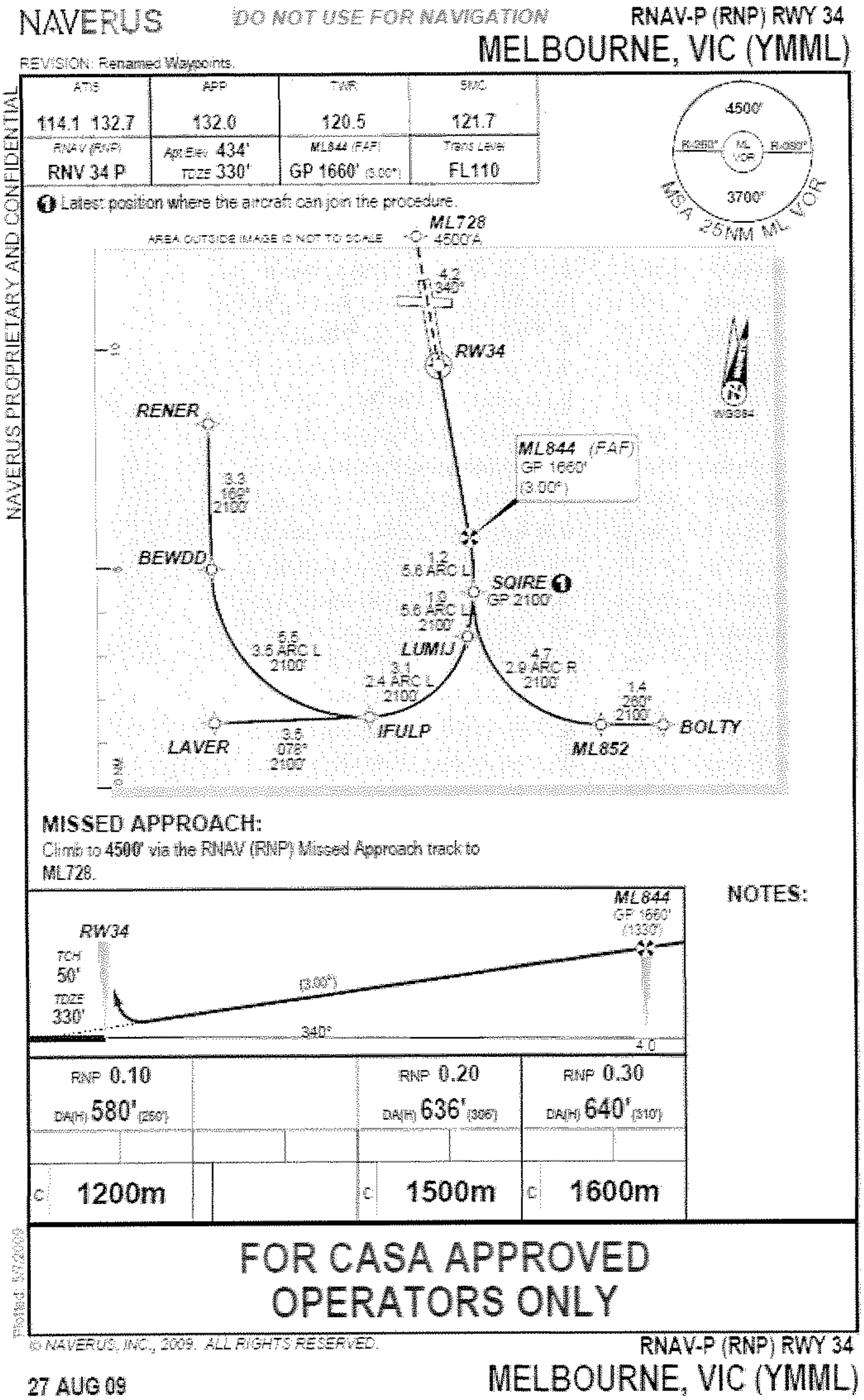


Figure C7. Proposed RNAV-P (RNP) RWY 34 Approach



Attachment D

Table D1. Naverus Proposed RNP Waypoint Coordinates

Identifier	Type	Airport	Latitude	Longitude
ABDIG	waypoint	YMML	S37-39-16.02	E144-42-53.86
BEWDD	waypoint	YMML	S37-45-39.73	E144-43-45.02
DONNI	waypoint	YMML	S37-35-46.78	E144-57-14.84
EDSAL	waypoint	YMML	S37-40-04.35	E144-57-19.56
EMUZE	waypoint	YMML	S37-31-36.11	E144-48-37.92
FILIP	waypoint	YMML	S37-52-02.54	E144-52-30.15
IFULP	waypoint	YMML	S37-49-09.21	E144-48-09.30
KALLO	waypoint	YMML	S37-32-13.32	E144-53-47.51
LNDOF	waypoint	YMML	S37-32-59.54	E144-51-33.41
LUMIJ	waypoint	YMML	S37-47-21.94	E144-51-02.62
ML732	waypoint	YMML	S37-34-42.48	E144-49-32.35
ML736	waypoint	YMML	S37-35-58.99	E145-00-41.84
ML740	waypoint	YMML	S37-50-16.69	E145-00-41.27
ML744	waypoint	YMML	S37-49-25.73	E144-47-09.47
ML748	waypoint	YMML	S37-46-53.17	E144-41-33.96
ML756	waypoint	YMML	S37-35-27.73	E144-38-22.41
ML760	waypoint	YMML	S37-34-00.33	E144-38-51.36
ML764	waypoint	YMML	S37-30-21.93	E144-42-15.30
ML768	waypoint	YMML	S37-48-06.38	E144-40-11.07
ML772	waypoint	YMML	S37-51-11.44	E144-59-48.36
ML776	waypoint	YMML	S37-29-23.23	E144-42-17.42
ML780	waypoint	YMML	S37-40-11.34	E144-59-34.91
ML784	waypoint	YMML	S37-38-45.59	E145-02-03.30
ML788	waypoint	YMML	S37-37-44.00	E145-02-22.98
ML792	waypoint	YMML	S37-34-14.70	E144-59-12.30
ML796	waypoint	YMML	S37-34-04.72	E144-56-07.44
ML798	waypoint	YMML	S37-35-59.61	E144-49-28.43
ML800	waypoint	YMML	S37-34-59.88	E144-49-30.34
ML820	waypoint	YMML	S37-39-30.57	E144-41-11.38
ML824	waypoint	YMML	S37-41-40.08	E144-35-13.55
ML826	waypoint	YMML	S37-40-30.24	E144-39-43.56
ML828	waypoint	YMML	S37-42-50.27	E144-32-58.58
ML830	waypoint	YMML	S37-41-07.17	E144-39-12.82
ML832	waypoint	YMML	S37-44-16.27	E144-39-15.85
ML836	waypoint	YMML	S37-45-30.52	E144-43-00.91
ML840	waypoint	YMML	S37-36-50.08	E144-40-25.02
ML844	waypoint	YMML	S37-45-06.49	E144-51-12.08
ML852	waypoint	YMML	S37-49-27.99	E144-54-47.86
ML856	waypoint	YMML	S37-29-27.81	E145-01-46.32
ML864	waypoint	YMML	S37-42-24.09	E144-50-41.74

ML868	waypoint	YMML	S37-43-53.95	E144-52-57.53
ML872	waypoint	YMML	S37-45-57.72	E144-51-21.56
ML876	waypoint	YMML	S37-42-26.68	E145-06-04.93
RML01	waypoint	YMML	S37-35-15.42	E145-03-57.99
RML02	waypoint	YMML	S37-34-55.60	E144-55-11.60
RML03	waypoint	YMML	S37-45-42.00	E144-48-06.03
RML04	waypoint	YMML	S37-46-45.07	E144-48-07.03
RML05	waypoint	YMML	S37-45-55.79	E144-44-12.98
RML06	waypoint	YMML	S37-42-08.47	E144-52-53.11
RML07	waypoint	YMML	S37-46-33.87	E144-54-54.38
RML08	waypoint	YMML	S37-37-02.52	E144-58-58.05
RML09	waypoint	YMML	S37-38-17.45	E144-59-44.19
RML10	waypoint	YMML	S37-36-13.32	E144-41-59.94
RML11	waypoint	YMML	S37-35-33.17	E144-46-15.01
RML12	waypoint	YMML	S37-45-47.24	E145-01-08.54
RML13	waypoint	YMML	S37-36-29.70	E144-50-46.39
RML14	waypoint	YMML	S37-44-11.99	E145-00-19.47
RML15	waypoint	YMML	S37-36-30.24	E144-56-07.38
RML16	waypoint	YMML	S37-35-58.22	E144-53-10.56
RML17	waypoint	YMML	S37-35-33.90	E144-52-57.33
RML18	waypoint	YMML	S37-45-03.11	E144-59-02.61
RML19	waypoint	YMML	S37-48-02.75	E144-38-52.84
RML20	waypoint	YMML	S37-42-33.03	E144-42-21.77
RML21	waypoint	YMML	S37-42-34.57	E144-42-56.99
RML22	waypoint	YMML	S37-42-02.02	E144-42-38.30
RML23	waypoint	YMML	S37-37-07.24	E144-43-05.92
RML24	waypoint	YMML	S37-45-17.25	E145-01-10.66
RML25	waypoint	YMML	S37-43-26.50	E144-47-45.80
RML26	waypoint	YMML	S37-43-41.34	E144-41-17.79
RML27	waypoint	YMML	S37-42-39.92	E144-42-09.38
SQIRE	waypoint	YMML	S37-46-20.98	E144-51-15.52
WOLER	waypoint	YMML	S37-34-32.05	E145-01-26.38
YANYN	waypoint	YMML	S37-33-20.64	E145-09-26.86

Attachment E

Figure E1. Proposed Rwy 16 and 34 RNP Approach Procedures and Linked STARs

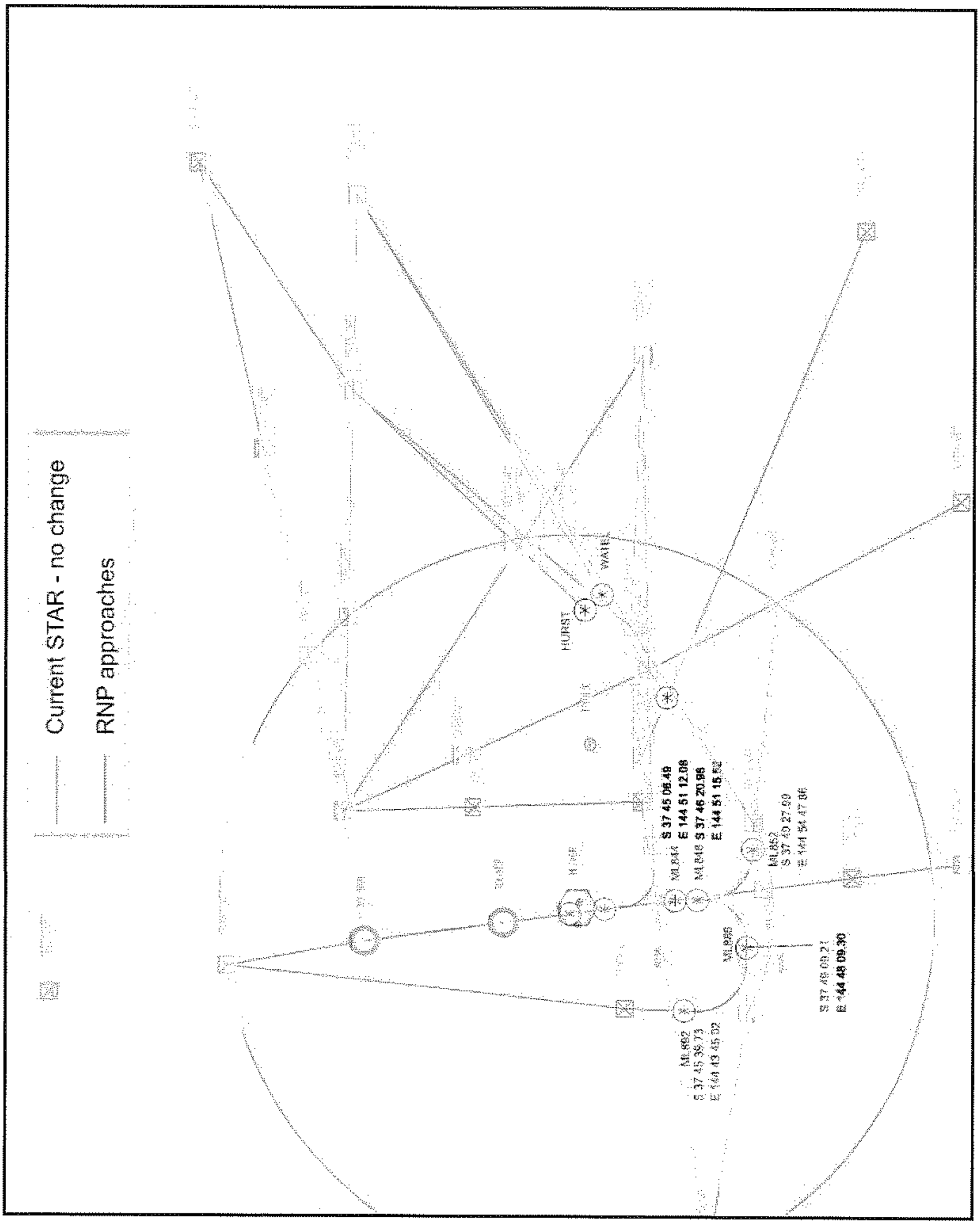


Figure E2. Proposed Rwy 09 and 27 RNP Approach Procedures and Linked STARs

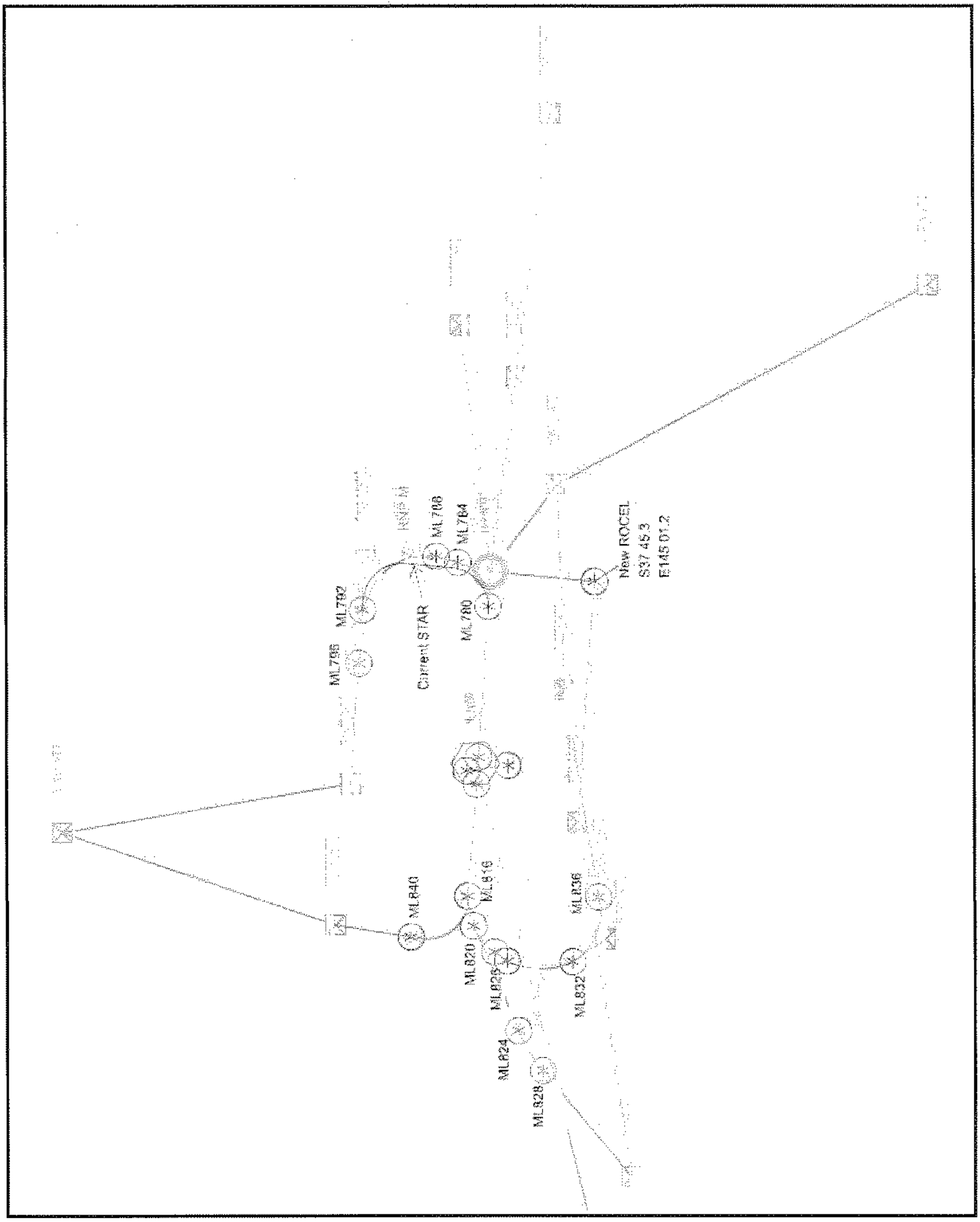
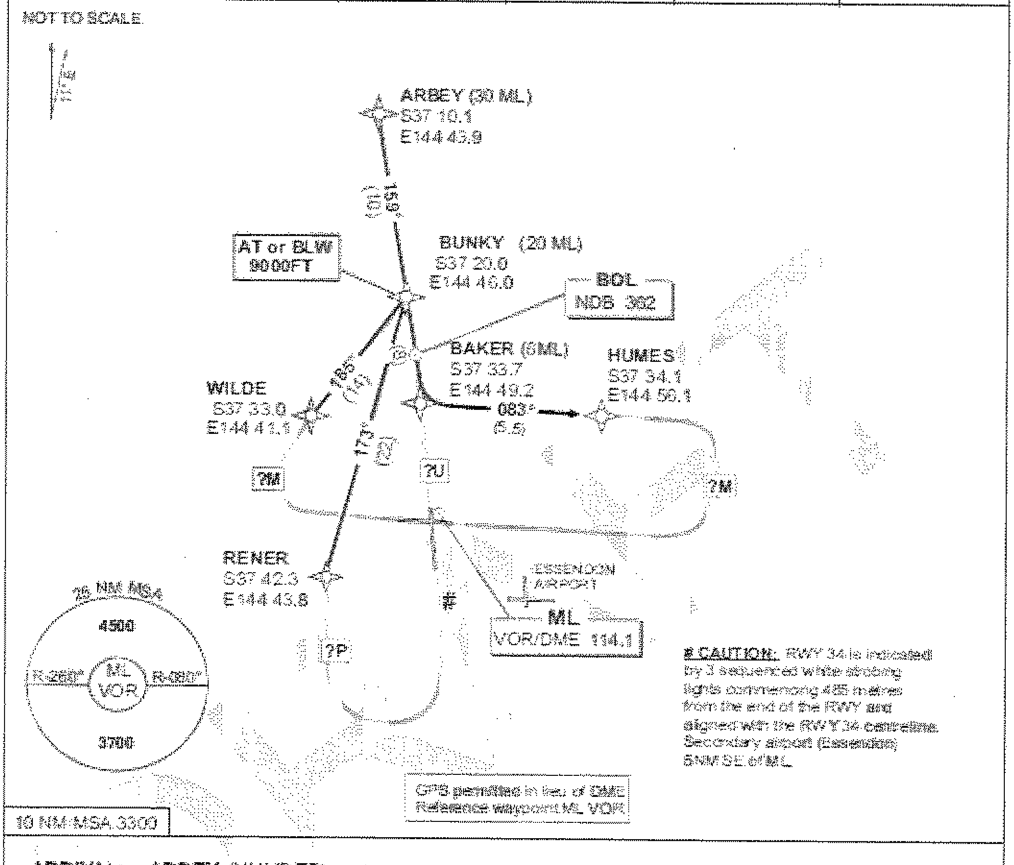


Figure E3. Proposed ARBEY (NUMBER) MIKE – PAPA - UNIFORM STAR

STANDARD ARRIVAL ROUTE
ARBEY *(NUMBER)* ONE MIKE - PAPA -
UNIFORM ARRIVALS (RNAV)
MELBOURNE, VIC (YMML)

DRAFT



ARRIVAL: ARBEY *(NUMBER)*
- From ARBEY track 159° to BUNKY
  Cross BUNKY AT or BLW 9000FT; then:

RWY 09 MIKE:
- Turn RIGHT, track 185° to WILDE.
- Track via RNAV-M (RNP) RWY 09

RWY 16 UNIFORM:
- Track 159° to BOL
- Track via RNAV-U (RNP) RWY 16

RWY 27 MIKE:
- Track 159° to BAKER
- Turn LEFT, track 083° to HUMES
- Track via RNAV-M (RNP) RWY 27

 # RWY 34 PAPA:
- From ARBEY track 159° to BUNKY
  Cross BUNKY AT or BLW 9000FT
- Turn RIGHT, track 173° to RENER
- Track via RNAV-P (RNP) RWY 34

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600; comply with vertical navigation requirements, but not below MSA
- Track via latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5

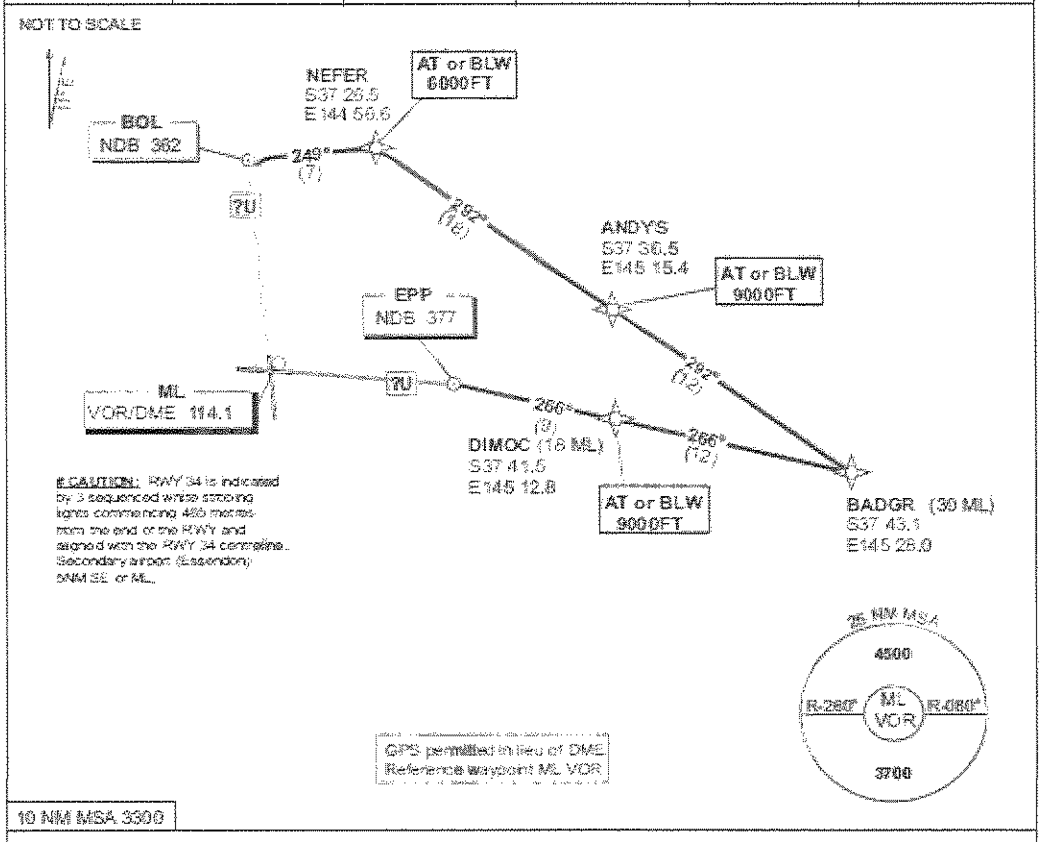
New procedure

DRAFT 2.0 13.08.2009

Figure E4. Proposed BADGR (NUMBER) UNIFORM STAR

DRAFT

STANDARD ARRIVAL ROUTE
BADGR *(NUMBER)* UNIFORM ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)



ARRIVAL: BADGR *(NUMBER)*

RWY 16 UNIFORM:
. From BADGR track 292° to NEFER
Cross ANDYS AT or BLW 9000FT
Cross NEFER AT or BLW 6000FT
. Turn LEFT, track 249° to BOL
. Track via RNAV-U (RNP) RWY 16

RWY 27 UNIFORM:
. From BADGR track 266° to EPP
Cross DIMOC AT or BLW 9000FT
. Track via RNAV-U (RNP) RWY 27

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600: comply with vertical navigation requirements, but not below MSA
- Track via latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5

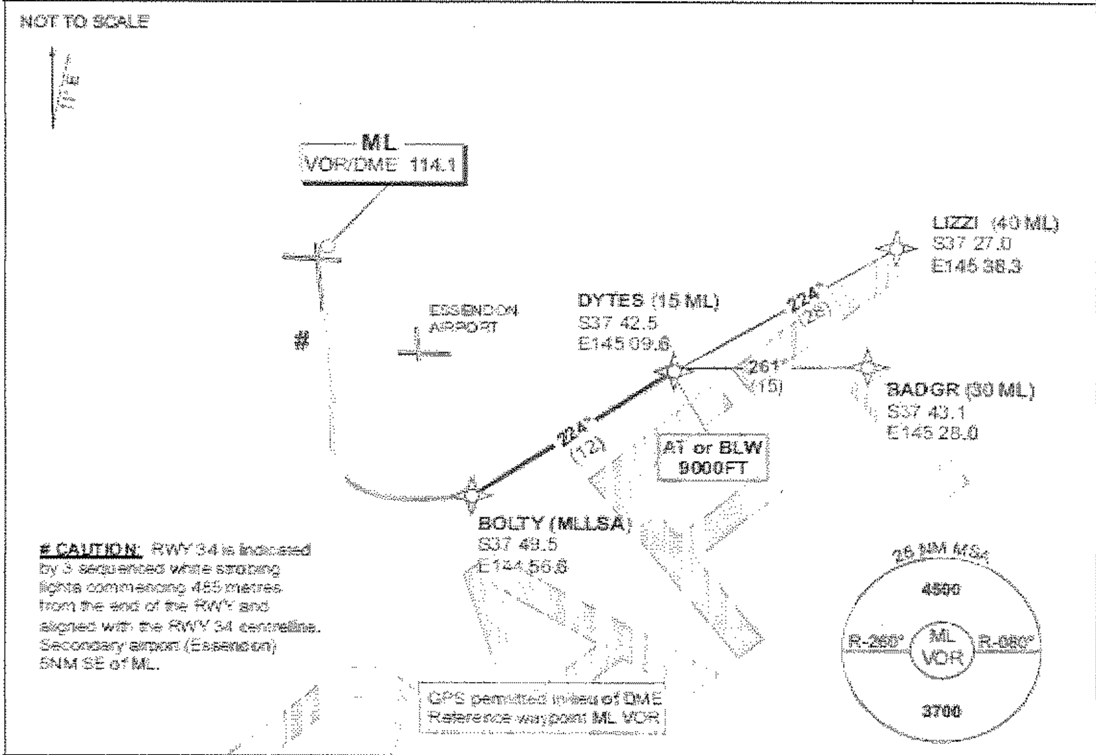
New procedure

DRAFT 3.0 19.08.2009

Figure E5. Proposed DYTES (NUMBER) PAPA STAR

STANDARD ARRIVAL ROUTE
DYTES ONE PAPA ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)

DRAFT



TRANSITIONS:

LIZZI: From LIZZI to DYTES:
. Track 224° to DYTES
. Then follow ARRIVAL instructions.

BADGR: From BADGR to DYTES:
. Track 261° to DYTES.
. Then follow ARRIVAL instructions.

ARRIVAL: DYTES ONE PAPA

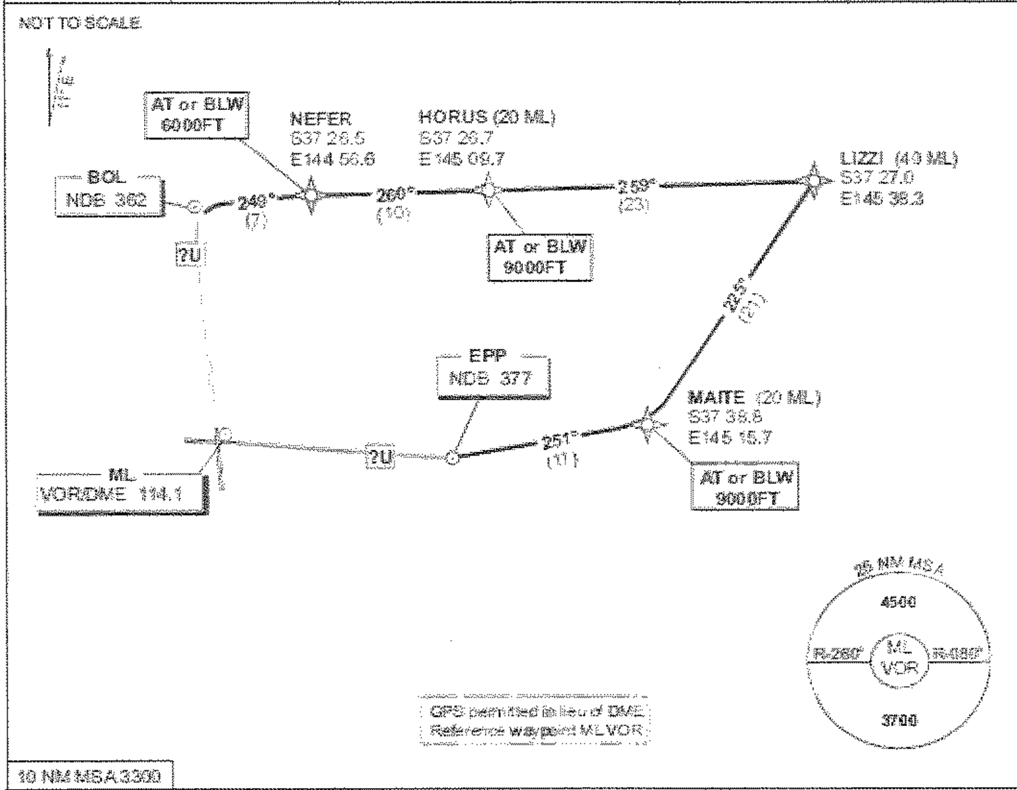
 # RWY 34: From DYTES:
Cross DYTES AT or BLW 9000FT
. Track 224° to BOLTY.
. Track via RNAV-P (RNP) RWY 34

DRAFT 1.0 15.06.2007

Figure E6. Proposed LIZZI (NUMBER) UNIFORM STAR

STANDARD ARRIVAL ROUTE
LIZZI *(NUMBER)* UNIFORM ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)

DRAFT



ARRIVAL: LIZZI *(NUMBER)*

RWY 16 UNIFORM:
- From LIZZI track 259° to HORUS
  Cross HORUS AT or BLW 9000FT
- Track 260° to NEFER
  Cross NEFER AT or BLW 6000FT
- Turn LEFT, track 249° to BOL
- Track via RNAV-U RNP RWY 16

RWY 27 UNIFORM:
- From LIZZI track 225° to MAITE
  Cross MAITE AT or BLW 9000FT
- Turn RIGHT, track 251° to EPP
- Track via RNAV-U (RNP) RWY 27

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600; comply with vertical navigation requirements, but not below MSA.
- Track via latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5

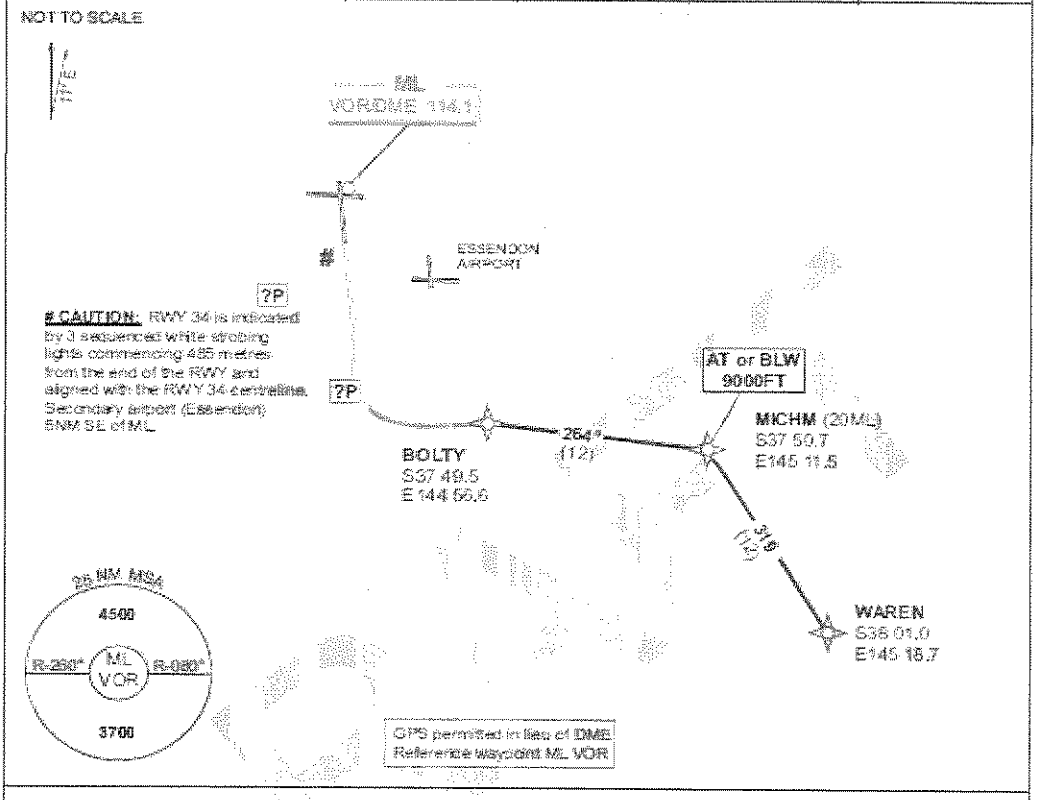
New procedure

DRAFT 3.0 19.08.2009

Figure E7. Proposed MICHM (NUMBER) PAPA STAR

STANDARD ARRIVAL ROUTE
MICHM *(NUMBER)* PAPA ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)

DRAFT



TRANSITION:

WAREN:
. From WAREN to MICHM:
. Track 319° to MICHM
. Then follow ARRIVAL instructions.

ARRIVAL: MICHM *(NUMBER)*

 # RWY 34 PAPA:
. From MICHM:
Cross MICHM AT or BLW 9000FT
. Track 264° to BOLTY
. Track via RNAV-P (RNP) RWY 34

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600; comply with vertical navigation requirements, but not below MSA.
- Track via latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5

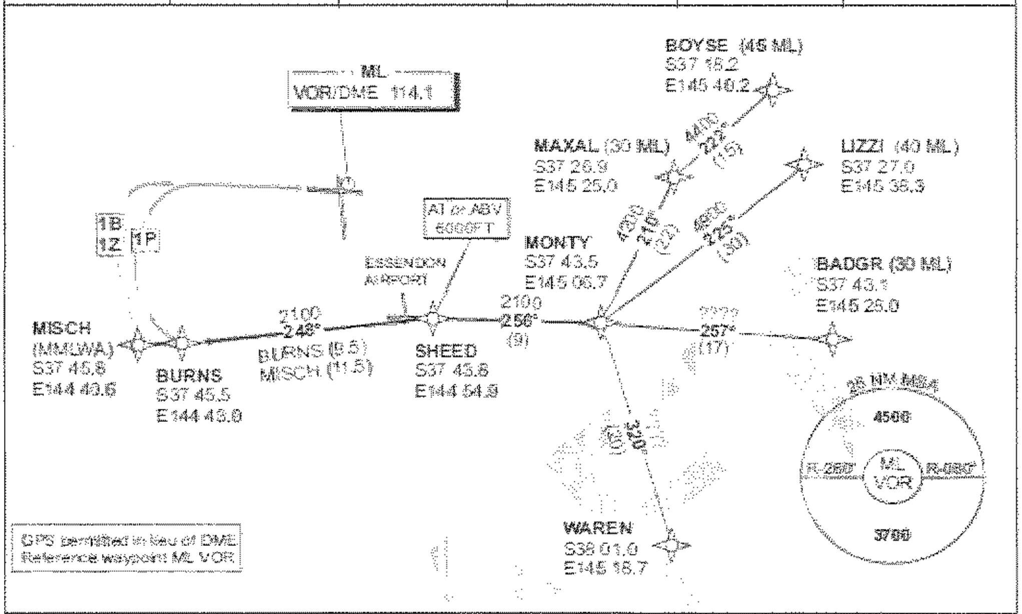
New procedure

DRAFT 2.0 30.07.2009

Figure E8. Proposed MONTY (NUMBER) BRAVO - PAPA - ZULU STARs

DRAFT

STANDARD ARRIVAL ROUTE
MONTY *(NUMBER)* BRAVO - PAPA - ZULU ARRIVALS (RNAV)
MELBOURNE, VIC (YMML)



TRANSITIONS:

BOYSE: (NON-JET)
From BOYSE to MONTY:
. Track 222° to MAXAL
. Turn LEFT, track 210° to MONTY
. Then follow ARRIVAL instructions

LIZZI:
From LIZZI to MONTY:
. Track 225° to MONTY
. Then follow ARRIVAL instructions

BADGR:
From BADGR to MONTY:
. Track 257° to MONTY
. Then follow ARRIVAL instructions

WAREN:
From WAREN to MONTY:
. Track 320° to MONTY
. Then follow ARRIVAL instructions

ARRIVAL: MONTY *(NUMBER)*:
. Track 256° to SHEED
Cross SHEED AT or ABV 6000FT, then

RWY 09 BRAVO:
. Turn LEFT, track 248° to MISCH
. Track via 10 DME arc for VOR RWY 09

RWY 09 PAPA:
. Turn LEFT, track 248° to BURNS
. Track via RNAV-P (RNP) RWY 09

RWY 09 ZULU:
. Turn LEFT, track 248° to MISCH
. Track via RNAV-Z (GNSS) RWY 09

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600, comply with vertical navigation requirements, but not below MSA
- Track via latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5

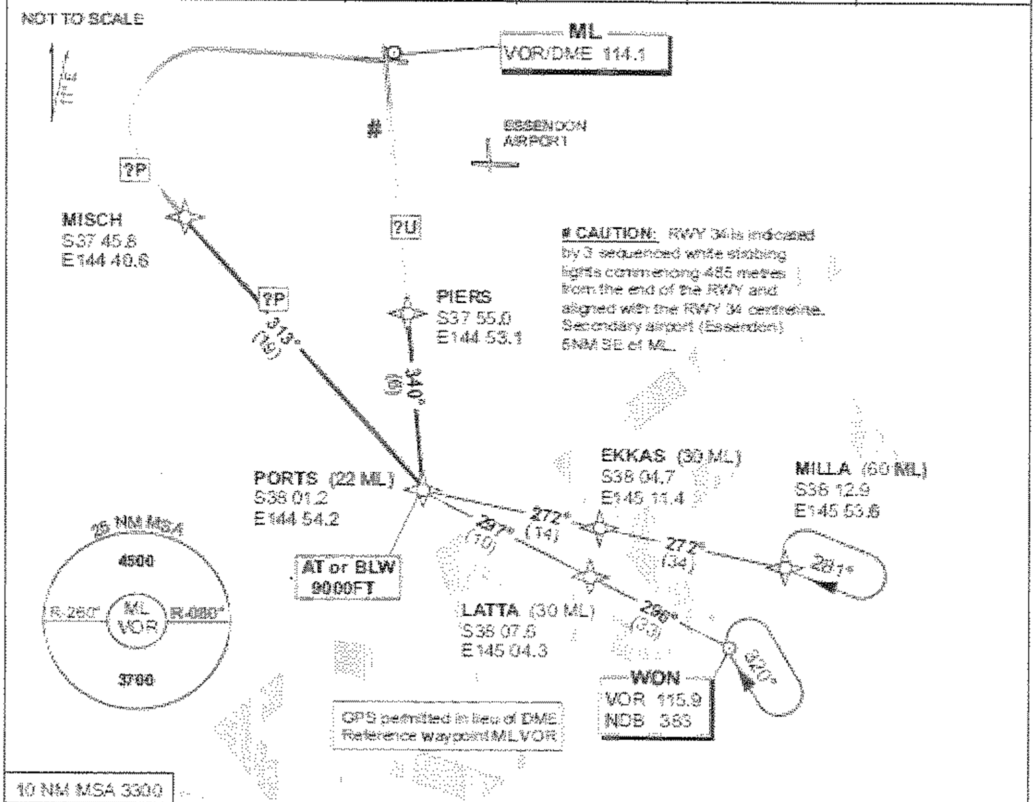
Changes: revised procedure

DRAFT 1.2 17.06.2009

Figure E9. Proposed PORTS (NUMBER) PAPA - UNIFORM STAR

STANDARD ARRIVAL ROUTE
PORTS *(NUMBER)* PAPA - UNIFORM ARRIVALS (RNAV)
MELBOURNE, VIC (YMML)

DRAFT



TRANSITIONS:

MILLA:
From MILLA to PORTS:
- Track 272° to EKKAS
- Then track 272° to PORTS
- Then follow ARRIVAL instructions.

WONTHAGGI (WON):
From WON to PORTS:
- Track 296° to LATTA
- Track 297° to PORTS
- Then follow ARRIVAL instructions

ARRIVAL: **PORTS *(NUMBER)***

RWY 09 PAPA:
- From PORTS:
  Cross PORTS AT or BLW 9000FT
- Turn RIGHT, track 313° to MISCH
- Track via RNAV-P (RNP) RWY 09

RWY 34 UNIFORM:
- From PORTS:
  Cross PORTS AT or BLW 9000FT
- Turn RIGHT, track 340° to PIERS
- Track via RNAV-U (RNP) RWY 34

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600; comply with vertical navigation requirements, but not below MSA
- Track via latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5

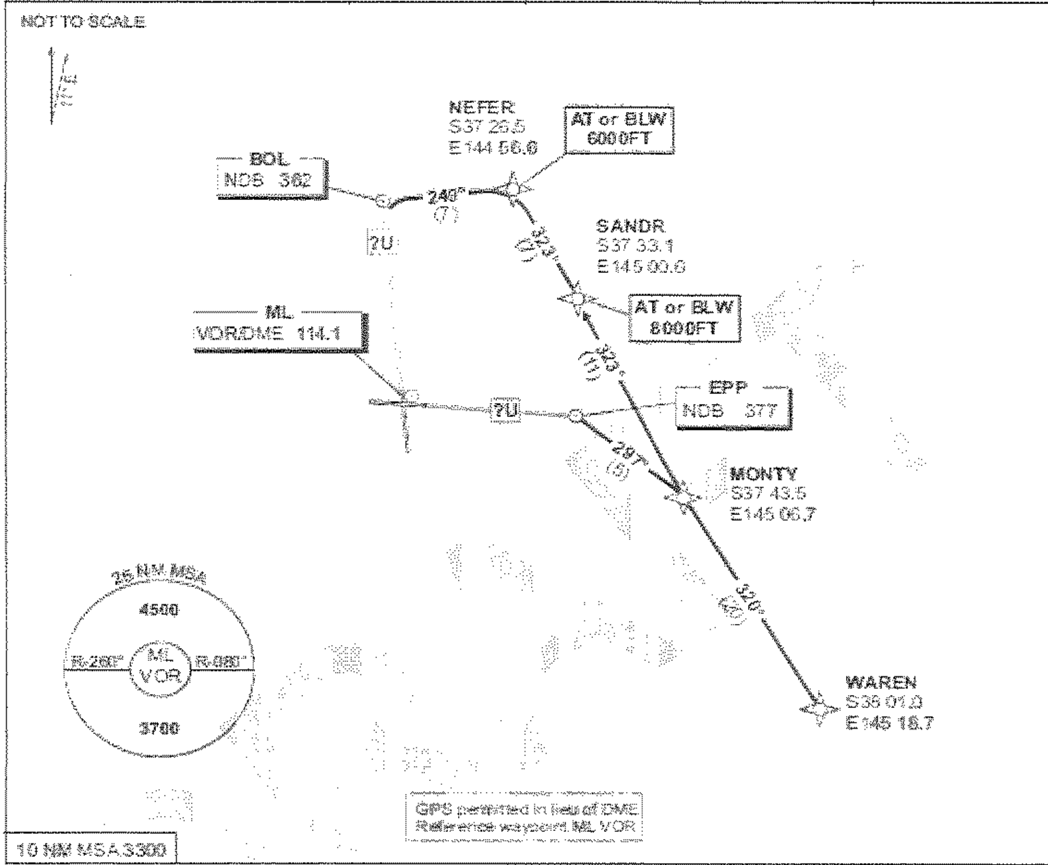
New procedure

DRAFT 2.0 30.07.2009

Figure E10. Prop WAREN (NUMBER) UNIFORM STAR

DRAFT

STANDARD ARRIVAL ROUTE
WAREN *(NUMBER)* UNIFORM ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)



ARRIVAL: WAREN *(NUMBER)*

RWY 16 UNIFORM:
. From WAREN track 320° to MONTY
. Track 323° to NEFER
  Cross SANDR AT or BLW 8000FT
  Cross NEFER AT or BLW 6000FT
. Turn LEFT, track 240° to BOL
. Track via RNAV-U (RNP) RWY 16

RWY 27 UNIFORM:
. From WAREN track 320° to MONTY
. Turn LEFT, track 297° to EPP
. Track via RNAV-U (RNP) RWY 27

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
-Squawk 7600; comply with vertical navigation requirements, but not below MSA
-Track via latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5

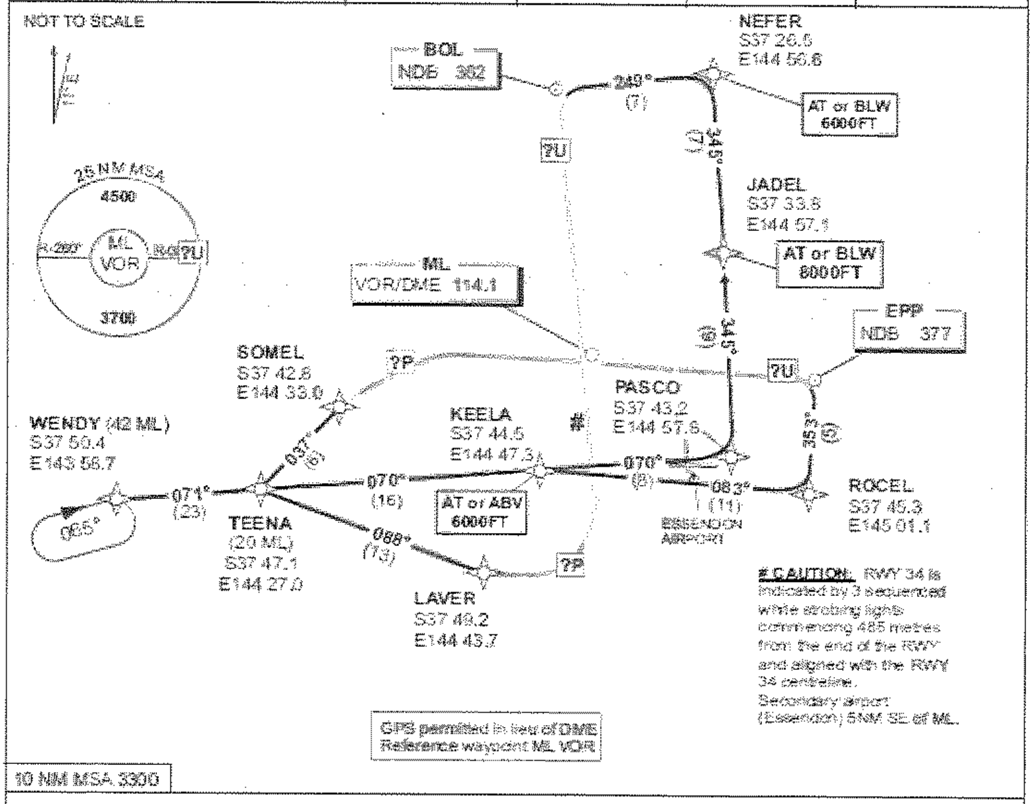
New procedure

DRAFT 3.0 19.08.2009

Figure E11. Prop WENDY (NUMBER) PAPA - UNIFORM STAR

STANDARD ARRIVAL ROUTE
WENDY *(NUMBER)* PAPA - UNIFORM ARRIVALS (RNAV)
MELBOURNE, VIC (YMML)

DRAFT



ARRIVAL: WENDY *(NUMBER)*
. From WENDY track 071° to TEENA, then:

RWY 09 PAPA:
. Turn LEFT track 037° to SOMEL
. Track via RNAV-P (RNP) RWY 09

 # RWY 34 PAPA:
. Turn RIGHT track 088° to LAVER
. Track for RNAV-P (RNP) RWY 34

RWY 27 UNIFORM:
. Track 070° to KEELA
Cross KEELA at or ABV 6000FT
. Turn RIGHT, track 083° to ROCEL
. Turn LEFT, track 353° to EPP
. Track via RNAV-U (RNP) RWY 27

RWY 16 UNIFORM:
. Track 070° to KEELA
Cross KEELA at or ABV 6000FT
. Track 070° to PASCO
. Turn LEFT, track 345° to NEFER
Cross JADEL AT or BLW 8000FT
Cross NEFER AT or BLW 6000FT
. Turn LEFT track 249° to BOL
. Track via RNAV-U (RNP) RWY 16

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600; comply with vertical navigation requirements, but not below MSA
- Track via latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5

New procedure

DRAFT 3.0 19.08.2009

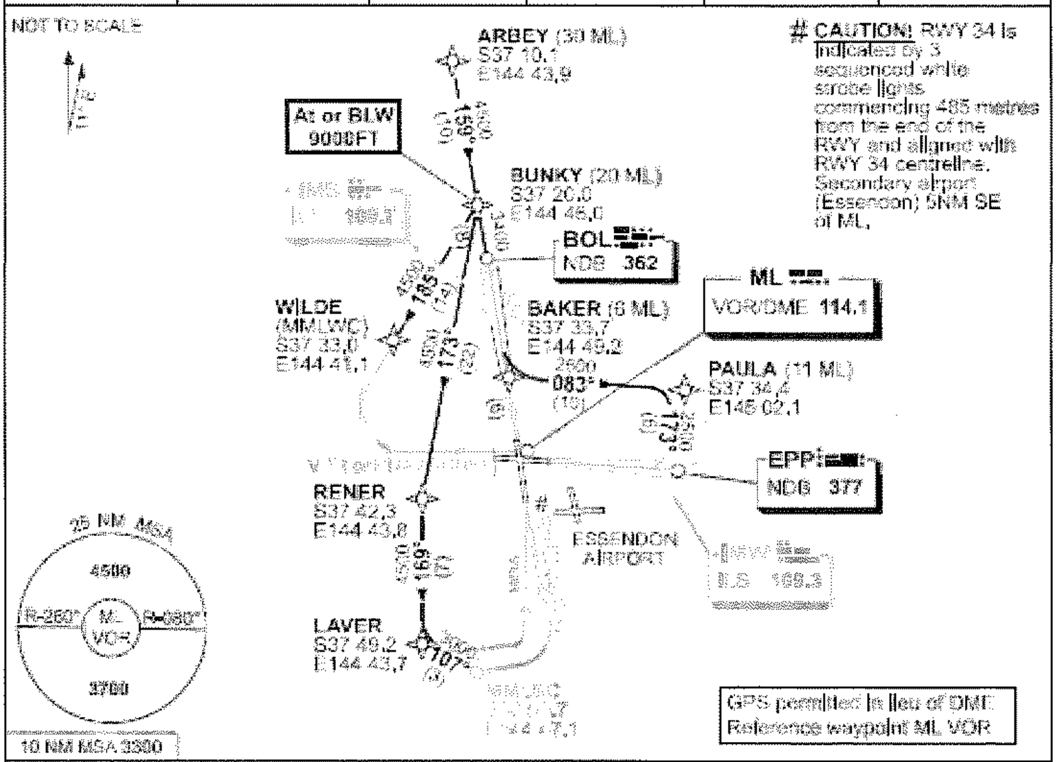
Attachment F

Figure F1. Current ARBEY SIX STAR

4 JUN 2009

STANDARD ARRIVAL ROUTE (STAR)
ARBEY SEVEN ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)

ATIS	APP/DEP	TWR	SMC		
114.1 132.7	118.9 132.0	120.5	121.7		



ARRIVAL: **ARBEY SEVEN**
From ARBEY track 159° to BUNKY. **Cross BUNKY AT or BLW 9000FT, then:**

RWY 09:
- Turn RIGHT, track 185° to WILDE.
- Track via 10 DME arc for VOR RWY 09 approach
- or on request, Track via RNAV-Z (GNSS) RWY 09 approach.

RWY 16:
- Track 159° to BOL NDB. Intercept RWY 16 LOC.

RWY 27:
- Track 159° to BAKER then turn LEFT, track 083° to PAULA.
- Turn RIGHT, track to EPP-NDB to intercept RWY 27 LOC.

 # RWY 34:
- Turn RIGHT, track 173° to RENER.
- Turn LEFT, track 169° to LAVER.
- Turn LEFT, track via 11 DME arc for VOR RWY 34 approach
- or on request, Track 107° to MMLSC for RNAV-Z (GNSS) RWY 34 approach.

COMMUNICATIONS FAILURE ; PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- IF UNDER PILOT NAVIGATION track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.
- IF UNDER RADAR VECTOR, maintain vector for 2 minutes, then fly the most suitable instrument approach (straight in where possible) to the nominated runway in accordance with ERSA EMERG 1.5.

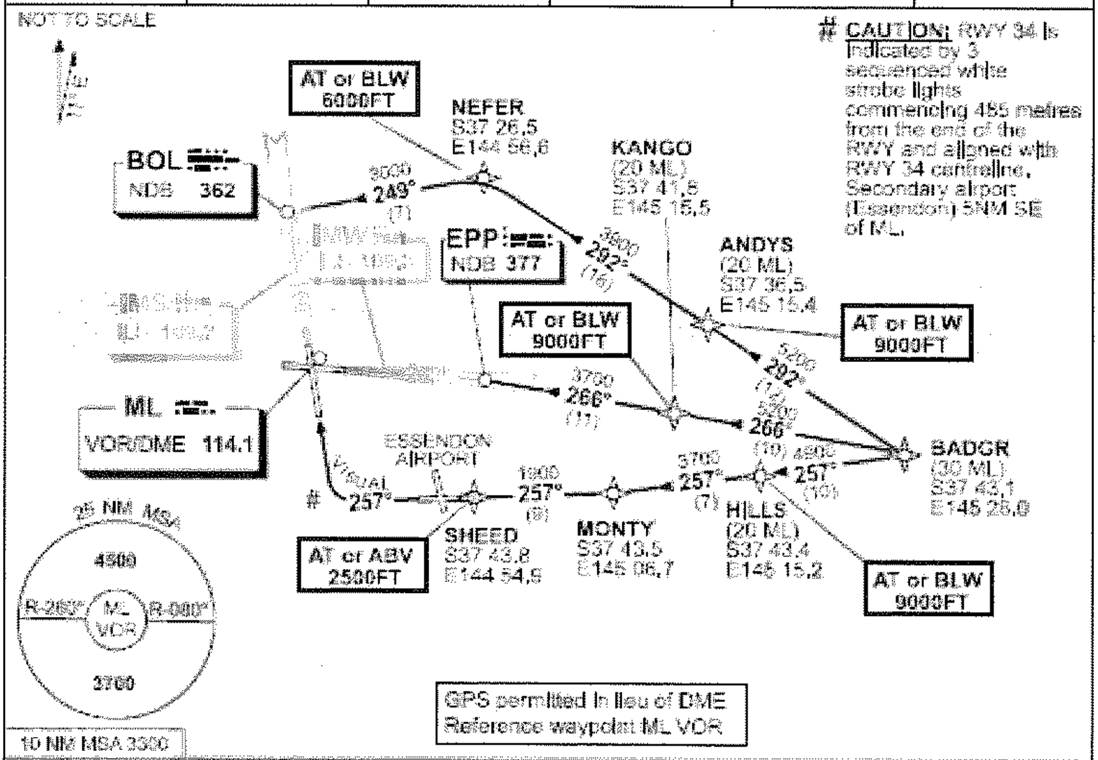
Changes: PROC NAME, MMLSC, ARR RWY 34, Editorial. MMLSR01-119

Figure F2. Current BADGR THREE STAR

STANDARD ARRIVAL ROUTE (STAR)
BADGR THREE ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)

4 JUN 2009

ATIS	APP	TWR	SMC		
114.1 132.7	132.0	120.5	121.7		



ARRIVAL: BADGR THREE

RWY 16: From BADGR track 292° to NEFER, **Cross** ANDYS AT or BLW 9000FT.
Cross NEFER AT or BLW 6000FT.
From NEFER turn LEFT, track 249° to BOL-NDB to intercept RWY 16 LOC.

RWY 27: From BADGR track 266° to EPP-NDB. Cross KANGO AT or BLW 9000FT.
Intercept RWY 27 LOC.

RWY 34: From BADGR track 257° to MONTY. **Cross** HILLS AT or BLW 9000FT.
From MONTY track 257° to SHEED. **Cross** SHEED AT or ABV 2500FT.
From SHEED track 257° for visual intercept of final RWY 34.

NOTE: If not visual at SHEED track 257° to intercept ML R-166° and carry out VOR RWY 34 missed approach procedure.

COMMUNICATIONS FAILURE : PROCEDURE IN IMC

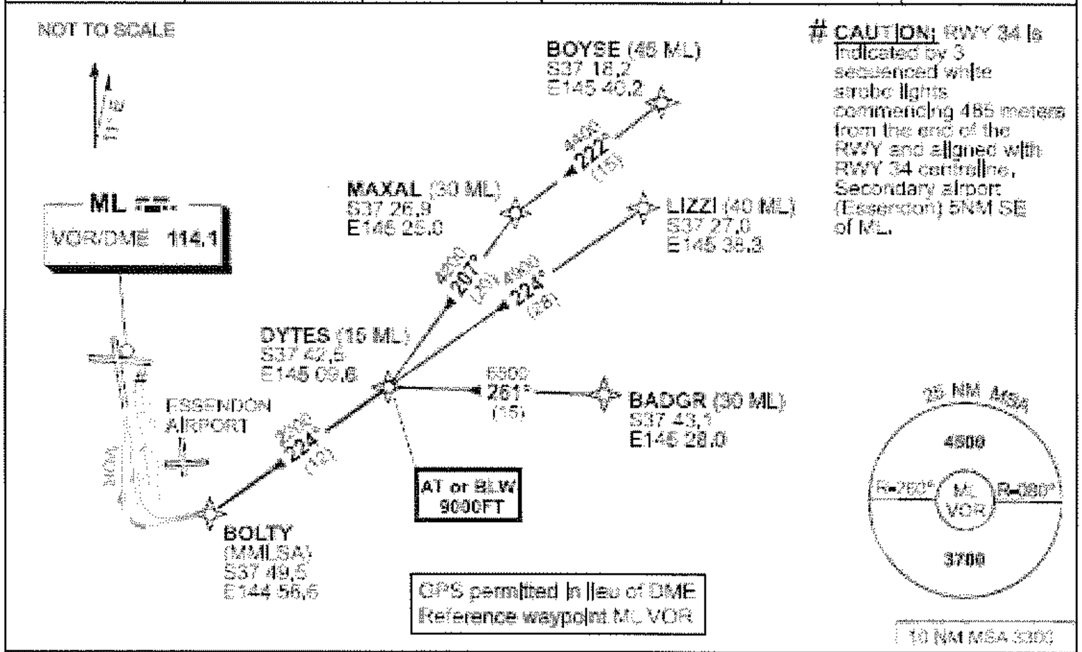
- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- IF UNDER PILOT NAVIGATION track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.
- IF UNDER RADAR VECTOR, maintain vector for 2 minutes, then fly the most suitable instrument approach (straight in where possible) to the nominated runway in accordance with ERSA EMERG 1.5.

Changes: Editorial. MMLSR02-119

Figure F3. Current DYTES THREE STAR

STANDARD ARRIVAL ROUTE (STAR)
DYTES THREE ARRIVAL (RNAV)
27 AUG 2009 **MELBOURNE, VIC (YMML)**

ATIS	APP	TWR	SMC		
114.1 132.7	132.0	120.5	121.7		



TRANSITIONS:

BOYSE: From BOYSE to DYTES:
- Track 222° to MAXAL
- Turn LEFT track 207° to DYTES
- Then follow ARRIVAL instructions.

LIZZI: From LIZZI to DYTES:
- Track 224° to DYTES
- Then follow ARRIVAL instructions.

BADGR: From BADGR to DYTES:
- Track 261° to DYTES
- Then follow ARRIVAL instructions.

ARRIVAL: DYTES THREE

 # RWY 34: From DYTES: Cross DYTES AT or BLW 9000FT
- Track 224° to BOLTY
- Track via 11 DME arc for VOR RWY 34 approach;
- or on request: Track via RNAV-Z (GNSS) RWY 34 approach.

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

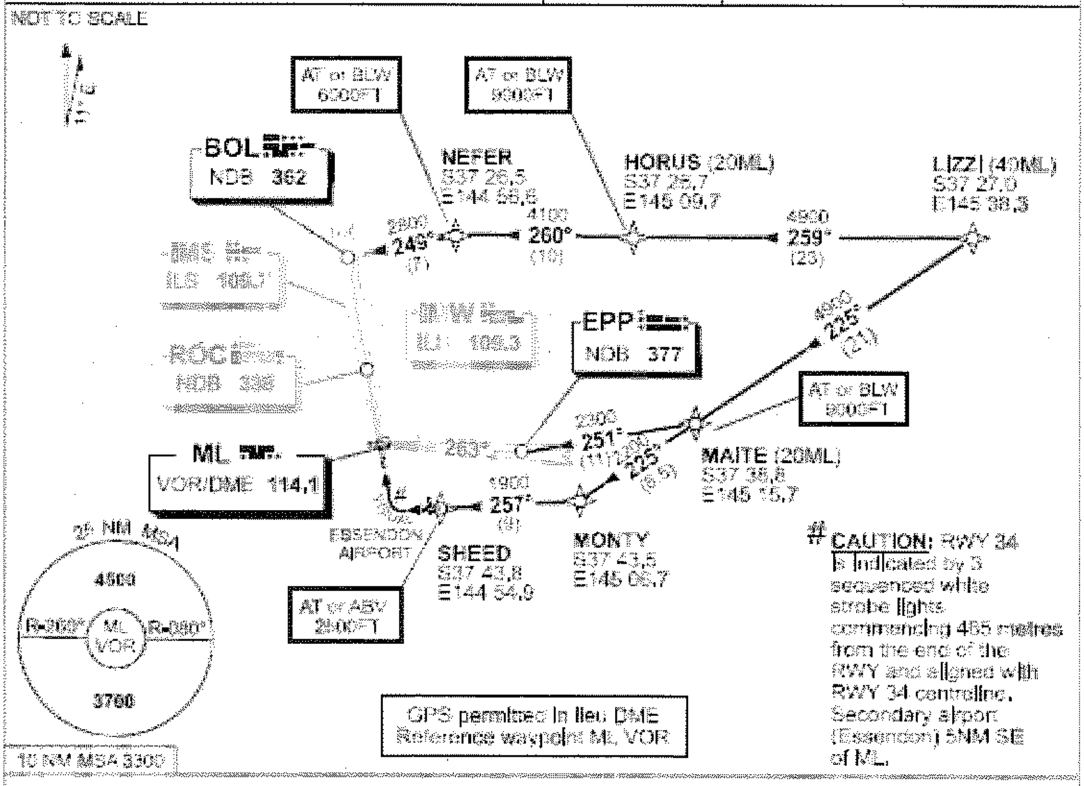
Changes: LSALT BADGR-DYTES. Editorial. MMLSR09-120

Figure F4. Current LIZZI TWO STAR

STANDARD ARRIVAL ROUTE (STAR)
LIZZI TWO ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)

13 MAR 2008

ATIS	APP	TWR	SMC		
114.1 132.7	132.0	120.5	121.7		



ARRIVAL: LIZZI TWO

RWY 16: From LIZZI track 259° to HORUS. **Cross** HORUS AT or BLW 9000FT.
From HORUS track 260° to NEFER. **Cross** NEFER AT or BLW 6000FT.
From NEFER track 249° to BOL-NDB to intercept RWY 16 LOC.

RWY 27: From LIZZI track 225° to MAITE. **Cross** MAITE AT or BLW 9000FT.
From MAITE track 251° to EPP-NDB, intercept RWY 27 LOC.

RWY 34: From LIZZI track 225° to MONTY. **Cross** MAITE AT or BLW 9000FT.
From MONTY turn RIGHT, track 257° to SHEED. **Cross** SHEED AT or ABV 2500FT.
From SHEED track 257° for visual intercept of final RWY 34.

NOTE: If not visual at SHEED track 257° to intercept ML R-166° and carry out VOR RWY 34 missed approach procedure.

COMMUNICATIONS FAILURE : PROCEDURE IN IMC

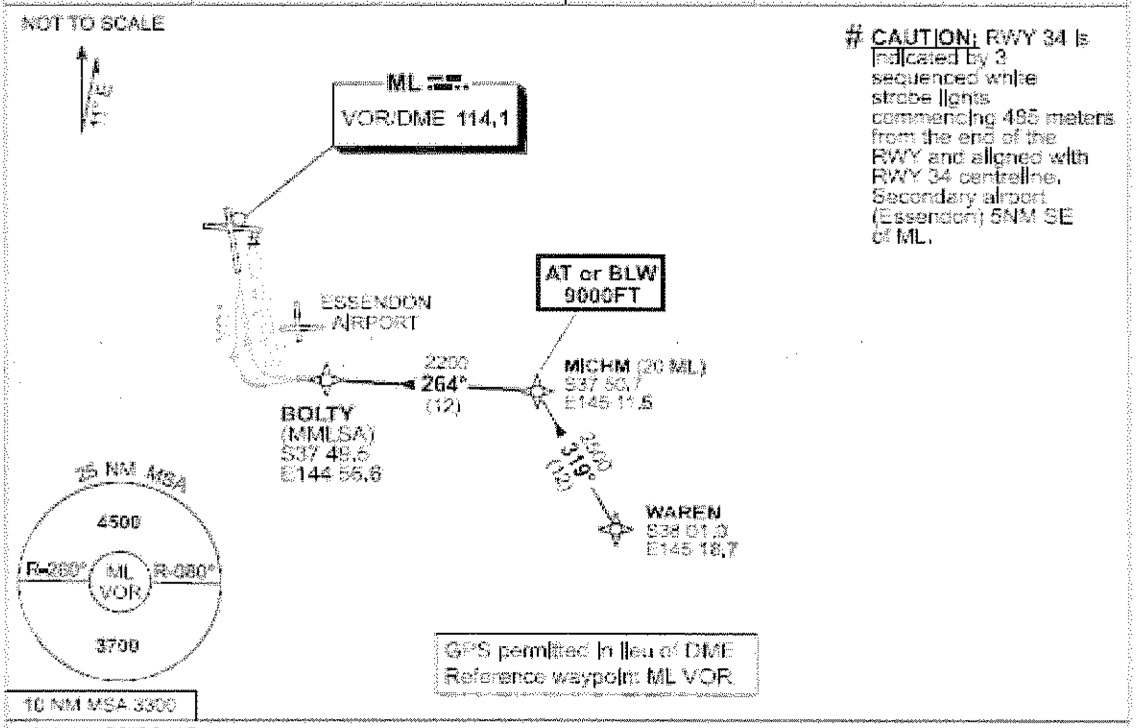
- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- IF UNDER PILOT NAVIGATION track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.
- IF UNDER RADAR VECTOR, maintain vector for 2 minutes, then fly the most suitable instrument approach (straight-in where possible) to the nominated runway in accordance with ERSA EMERG Section 1.5.

Changes: LS ALTS, LLZ TO LOC, Editorial. MMLSR05-114

Figure F5. Current MICHM FIVE STAR

STANDARD ARRIVAL ROUTE (STAR)
MICHM FIVE ARRIVAL (RNAV)
13 MAR 2008 **MELBOURNE, VIC (YMML)**

ATIS	APP	TWR	SMC		
114.1 132.7	132.0	120.5	121.7		



TRANSITIONS:

WAREN: From WAREN TO MICHM:

- Track 319° to MICHM
- Then follow ARRIVAL instructions

ARRIVAL: **MICHM FIVE**

RWY 34: From MICHM:

Cross MICHM AT or BLW 9000FT, then

- Turn LEFT, track 264° to BOLTY
- Track via 11 DME arc for VOR RWY 34 approach;
- or on request: Track via RNAV-Z (GNSS) RWY 34 approach

COMMUNICATIONS FAILURE : PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- IF UNDER PILOT NAVIGATION track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.
- IF UNDER RADAR VECTOR, maintain vector for 2 minutes, then fly the most suitable instrument approach (straight in where possible) to the nominated runway in accordance with ERSA EMERG 1.5.

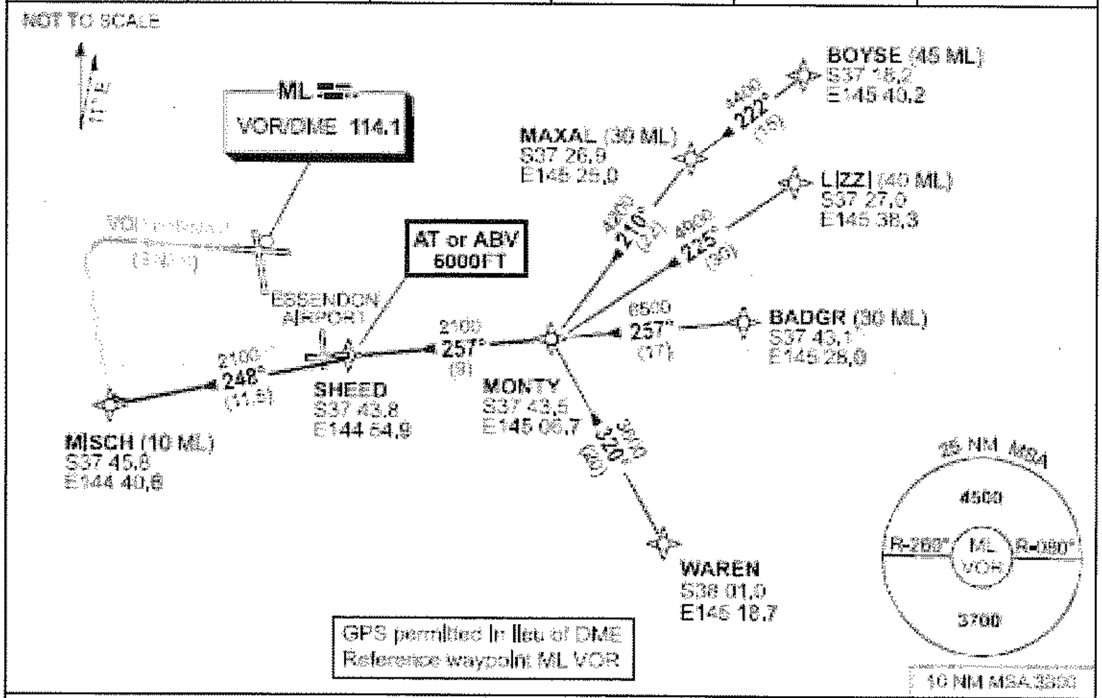
Changes: PROC NAME, COMM FAIL PROC, LSALT, Editorial. MMLSR08-114

Figure F6. Current MONTY THREE STAR

STANDARD ARRIVAL ROUTE (STAR)
MONTY THREE ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)

27 AUG 2009

ATIS	APP	TWR	SMC		
114.1 132.7	132.0	120.5	121.7		



TRANSITIONS:

BOYSE: **(NON-JET)**
From BOYSE to MONTY:
From BOYSE track 222° to MAXAL
From MAXAL turn LEFT, track 210° to MONTY, then follow ARRIVAL Instructions

LIZZI: From LIZZI to MONTY:
From LIZZI track 225° to MONTY, then follow ARRIVAL Instructions

BADGR: From BADGR to MONTY:
From BADGR track 257° to MONTY, then follow ARRIVAL Instructions

WAREN: From WAREN to MONTY:
From WAREN track 320° to MONTY, then follow ARRIVAL Instructions

ARRIVAL: **MONTY THREE**

RWY 09: From MONTY track 257° to SHEED. **Cross** SHEED AT or ABV 6000FT.
Turn LEFT, track 248° to MISCH. From MISCH turn RIGHT then:
Track via 10 DME arc for VOR RWY 09 approach;
or on request: Track via RNAV-Z (GNSS) RWY 09 approach.

COMMUNICATIONS FAILURE: PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

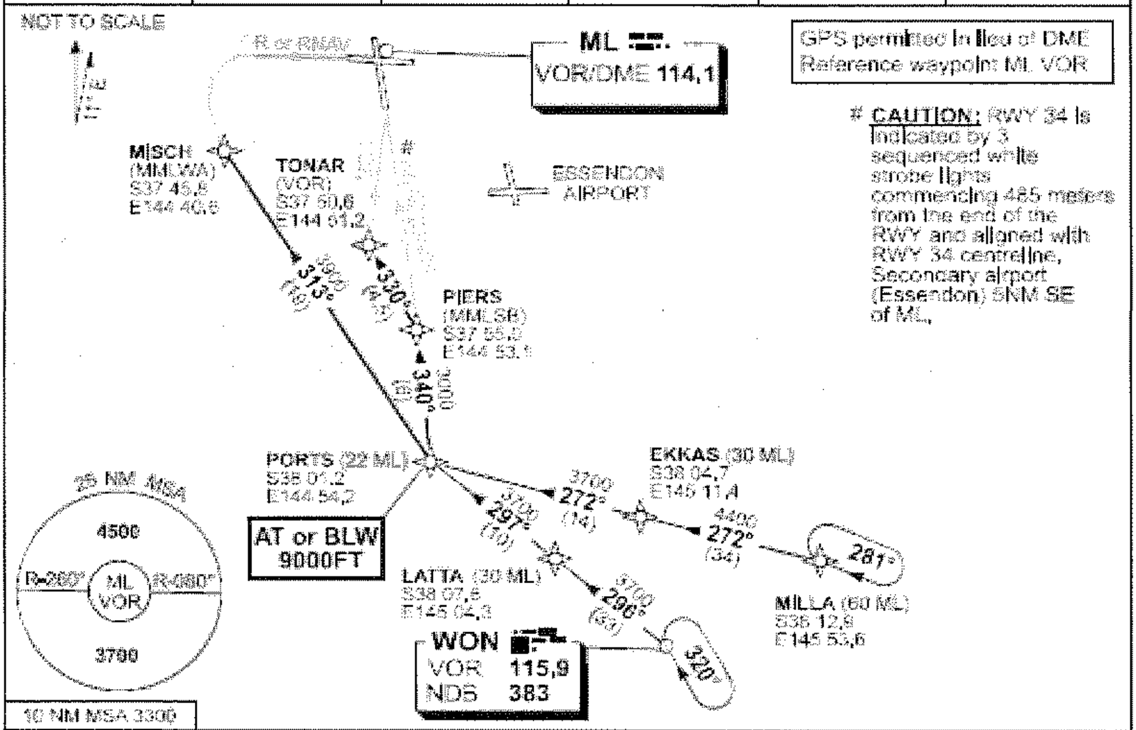
Changes: LSALTS, Editorial.

MMLSR10-120

Figure F7. Current PORTS TWO STAR

STANDARD ARRIVAL ROUTE (STAR)
PORTS TWO ARRIVAL
13 MAR 2008 **MELBOURNE, VIC (YMML)**

ATIS	APP/DEP	TWR	SMC		
114,1 132,7	129,4	120,5	121,7		



TRANSITIONS:

MILLA: (RNAV) From MILLA to PORTS:
- Track 272° to EKKAS,
- Track 272° to PORTS,
- Then follow ARRIVAL instruction.

WONTHAGGI: (WON) From WON VOR to PORTS:
- Track 296° to LATTA,
- Track 297° to PORTS,
- Then follow ARRIVAL instruction.

ARRIVAL: PORTS TWO

From PORTS: **Cross** PORTS AT or BLW 9000FT; then

RWY 09:
- Turn RIGHT, track 313° to MISCH,
- Track via 10 DME arc for VOR RWY 09 approach;
- or on request, Track via RNAV-Z (GNSS) RWY 09 approach.

 # RWY 34:
- Turn RIGHT track 340° to PIERS
- Turn LEFT, track 330° to TONAR for VOR RWY 34 approach;
- or on request, Track 340° to PIERS for RNAV-Z (GNSS) RWY 34 approach.

COMMUNICATIONS FAILURE : PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- IF UNDER PILOT NAVIGATION track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.
- IF UNDER RADAR VECTOR, maintain vector for 2 minutes, then fly the most suitable instrument approach (straight in where possible) to the nominated runway in accordance with ERSA EMERG 1.5.

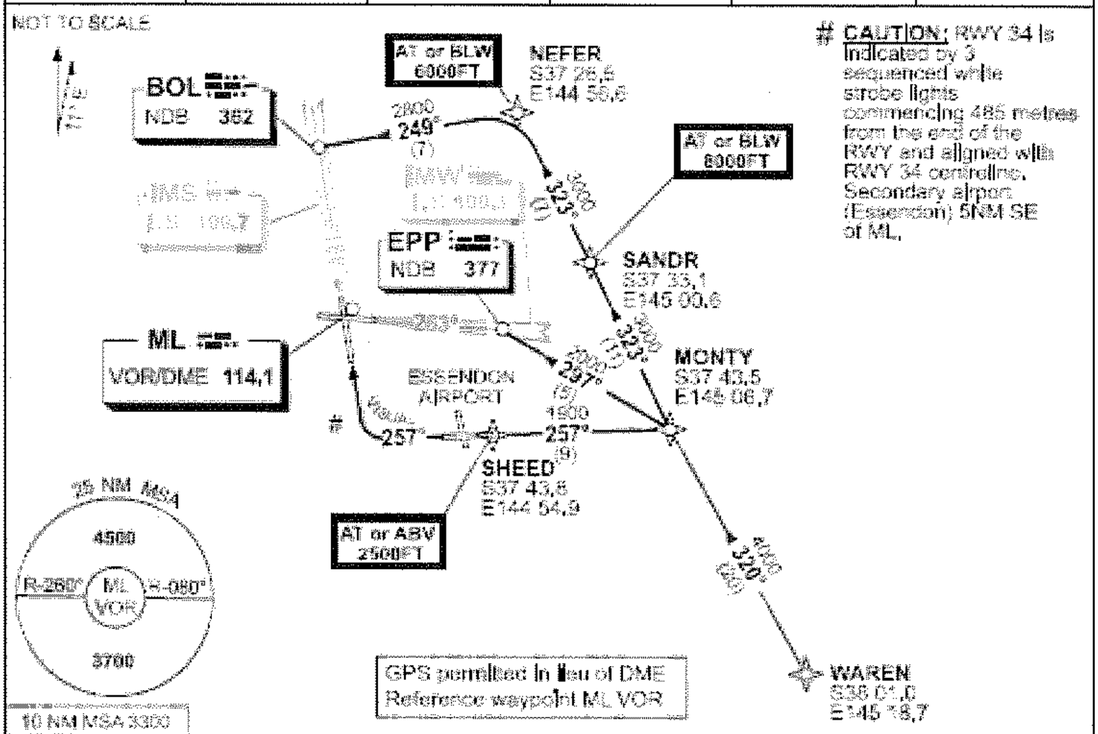
Changes: PROC NAME, COMM FAIL PROC. MMLSR02-114

Figure F8. Current WAREN NINE STAR

4 JUN 2009

**STANDARD ARRIVAL ROUTE (STAR)
WAREN NINE ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)**

ATIS	APP	TWR	SMC		
114,1 132,7	132,0	120,5	121,7		



ARRIVAL: WAREN NINE

From WAREN track 320° to MONTY

RWY 16: From MONTY track 323° to NEFER. **Cross** SANDR AT or BLW 8000FT.
Cross NEFER AT or BLW 6000FT.
From NEFER turn LEFT, track 249° to BOL-NDB to intercept RWY 16 LOC.

RWY 27: From MONTY track 297° to EPP-NDB to intercept RWY 27 LOC.

RWY 34: From MONTY turn LEFT, track 257° to SHEED. **Cross** SHEED AT or ABV 2500FT.
From SHEED track 257° for visual intercept of final RWY 34.

NOTE: If not visual at SHEED track 257° to intercept ML R-166° and carry out VOR RWY 34 missed approach procedure.

COMMUNICATIONS FAILURE : PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- IF UNDER PILOT NAVIGATION track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.
- IF UNDER RADAR VECTOR, maintain vector for 2 minutes, then fly the most suitable instrument approach (straight in where possible) to the nominated runway in accordance with ERSA EMERG 1.5.

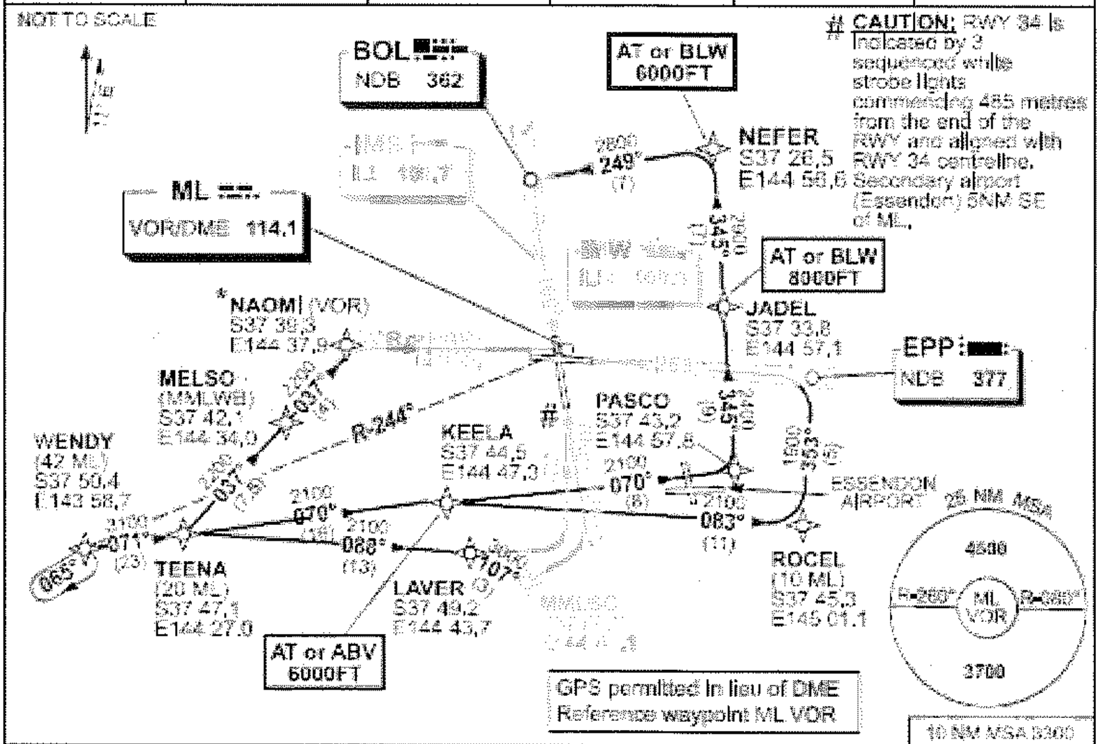
Changes: Editorial. MMLSR06-119

Figure F9. Current WENDY THREE STAR

STANDARD ARRIVAL ROUTE (STAR)
WENDY FOUR ARRIVAL (RNAV)
MELBOURNE, VIC (YMML)

4 JUN 2009

ATIS	APP	TWR	SMC		
114.1 132.7	129.4 132.0	120.5	121.7		



ARRIVAL: WENDY FOUR
From WENDY track 071° to TEENA; then:

RWY 09:
- Turn LEFT, track 037° to MELSO.
- Track 037° to NAOMI for VOR RWY 09 approach,
- or on request: Track 037° to MELSO for RNAV-Z (GNSS) RWY 09.

*NOTE: NAOMI is NOT part of RNAV-Z (GNSS) RWY 09 approach.

RWY 16:
- Track 070° to KEELA. **Cross** KEELA AT or ABV 6000FT.
- Track 070° to PASCO, then turn LEFT track 345° to JADEL. **Cross** JADEL AT or BLW 8000FT.
- Track 345° to NEFER. **Cross** NEFER AT or BLW 6000FT.
- Turn LEFT, track 249° to BOL NDB to intercept RWY 16 LOC.

RWY 27:
- Track 070° to KEELA. **Cross** KEELA AT or ABV 6000FT.
- Turn RIGHT, track 083° to ROCEL.
- Turn LEFT, track 353° to EPP NDB to intercept RWY 27 LOC.

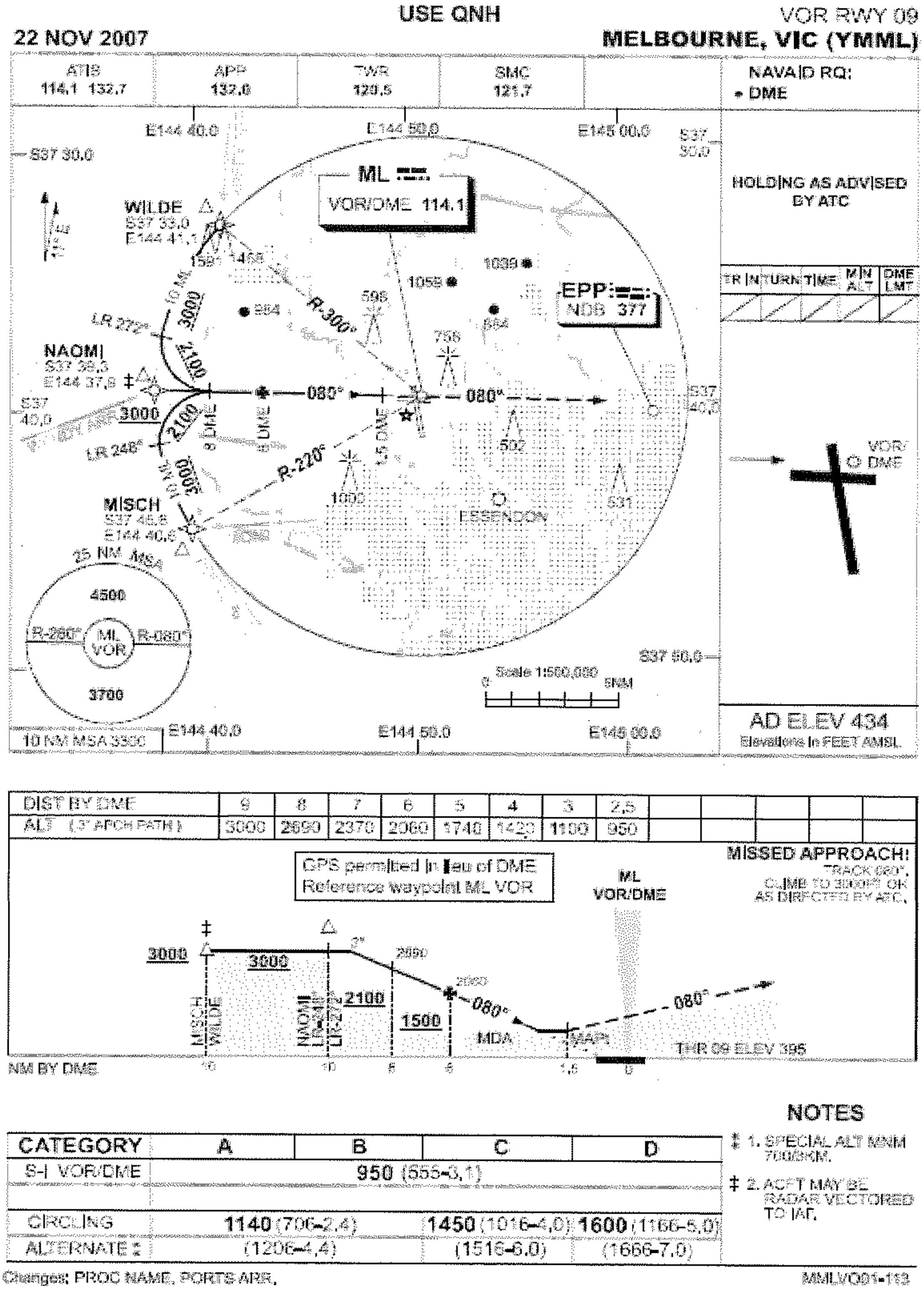
 # RWY 34:
- Turn RIGHT track 088° to LAVER.
- Track via 11 DME arc for VOR RWY 34 approach,
- or on request: Track 107° to MMLSC for RNAV-Z (GNSS) RWY 34 approach.

COMMUNICATIONS FAILURE: PROCEDURE IN IMC
- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

Changes: PROC NAME, MMLSC, ARR RWY 34, Editorial. MMLSR07-119

Attachment G

Figure G1. Current VOR RWY 09



DIST BY DME	9	8	7	6	5	4	3	2.5
ALT (3° APCH PATH)	3000	2690	2370	2060	1740	1420	1100	950

CATEGORY	A	B	C	D
S-I VOR/DME	950 (555-3.1)			
CIRCLING	1140 (706-2.4)		1450 (1016-4.0)	1600 (1166-5.0)
ALTERNATE ‡	(1206-4.4)		(1516-6.0)	(1666-7.0)

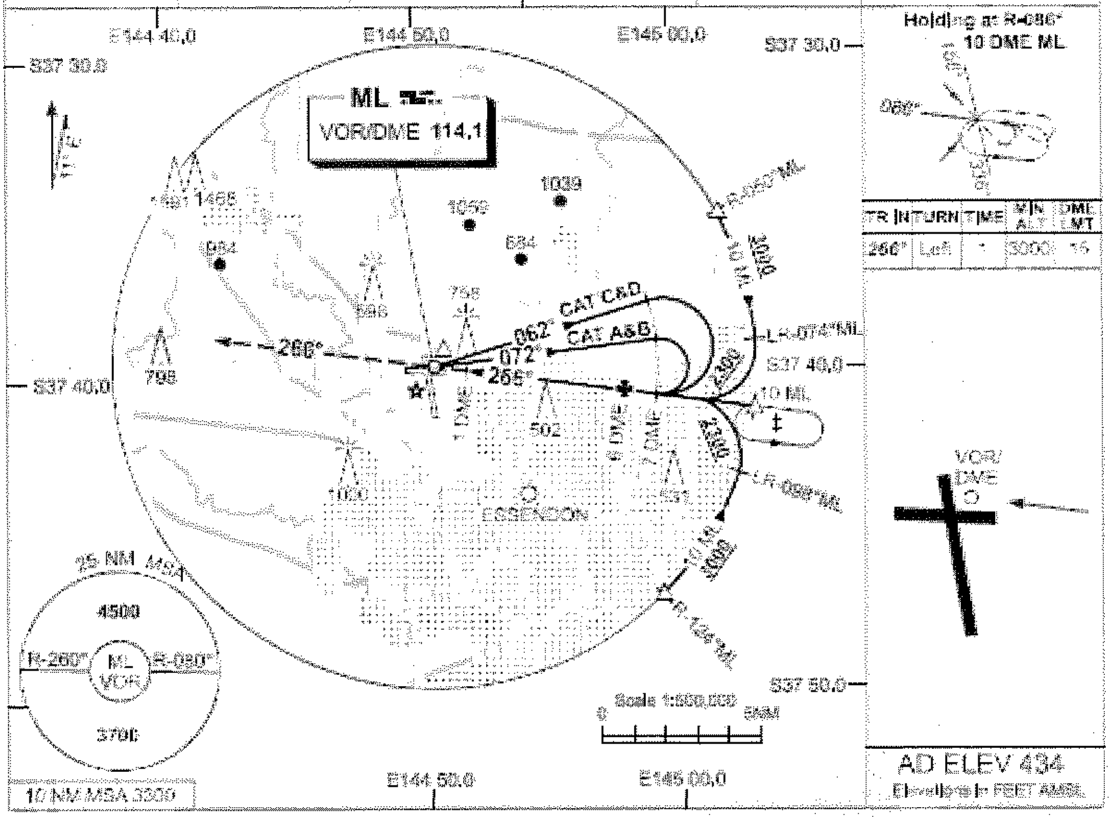
Figure G2. Current VOR RWY 27

USE QNH

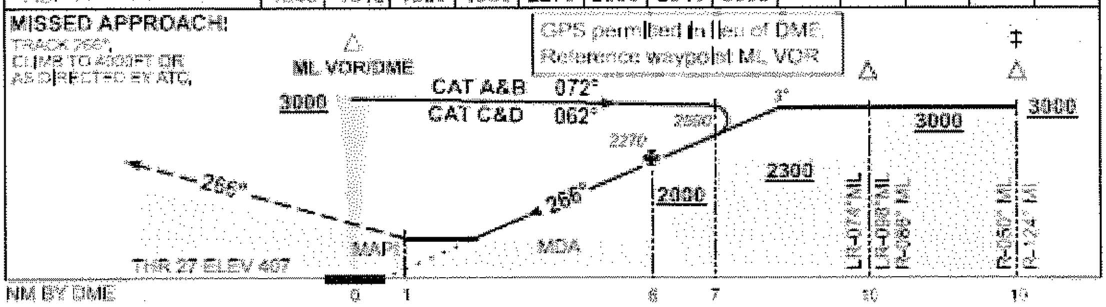
VOR RWY 27
MELBOURNE, VIC (YMML)

4 JUN 2009

ATIS	APP	TWR	SMC		NAVAID RQ:
114,1 132,7	132,0	120,5	121,7		• DME



DIST BY DME	2,1	3	4	5	6	7	8	8,3					
ALT (3° APCH PATH)	1040	1310	1630	1950	2270	2590	2910	3000					



NOTES

CATEGORY	A	B	C	D
S-I VOR/DME	1040 (633-3,6)			
CIRCLING	1140 (706-2,4)		1450 (1016-4,0)	1600 (1166-5,0)
ALTERNATE ‡	(1206-4,4)		(1516-6,0)	(1666-7,0)

‡ 1. SPECIAL ALT MNM NOT APPLICABLE.

‡ 2. ACFT MAY BE RADAR VECTORED TO IAF.

Changes: NOTE 1.

MMLVO02-119

Figure G3. Current ILS or LOC RWY 27

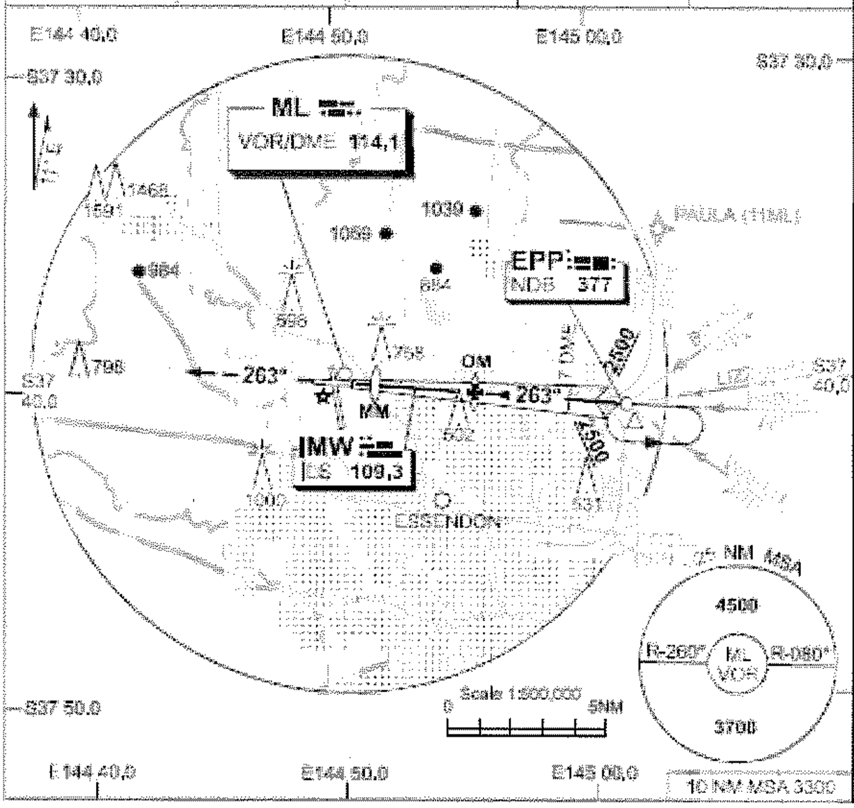
USE QNH

4 JUN 2009

ILS or LOC RWY 27

MELBOURNE, VIC (YMML)

ATIS	APP	TWR	SMC		NAVAID RQ:
114,1 132,7	132,0	120,5	121,7		• DME (LOC ONLY)



Holding at EPP NDB

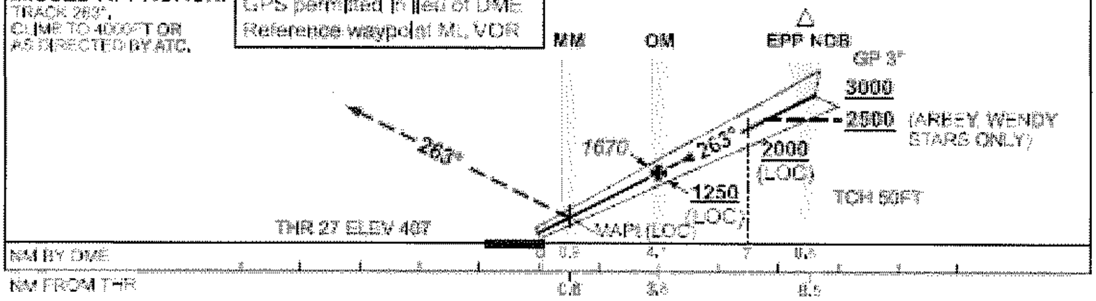
TR	INTURN	TIME	MIN ALT	DME LMT
263°	Left	1	3000	14

AD ELEV 434
Elevations in FEET AMSL

DME DIST	0,6	1	1,6	2	3	4,1	5	6	7	8,3
ALT (3° APCH PATH)	610	690	880	1010	1320	1670	1960	2280	2600	3000

MISSED APPROACH:
TRACK 263°,
CLIMB TO 4000FT OR
AS DIRECTED BY ATC.

GPS permitted in lieu of DME
Reference waypoint ML VOR



NOTES

1. SPECIAL ALTN MNM 700/2,5 KM.

CATEGORY	A	B	C	D
S-I ILS		610 (203) 0,8 550 RVR		
S-I LOC/DME		880 (473-1,7)		
CIRCLING	1140 (706-2,4)		1450 (1016-4,0)	1600 (1166-5,0)
ALTERNATE ‡	(1206-4,4)		(1516-6,0)	(1666-7,0)

Changes: RVR.

MMLII02-119

Figure G4. Current ILS-Y or LOC-Y RWY 16

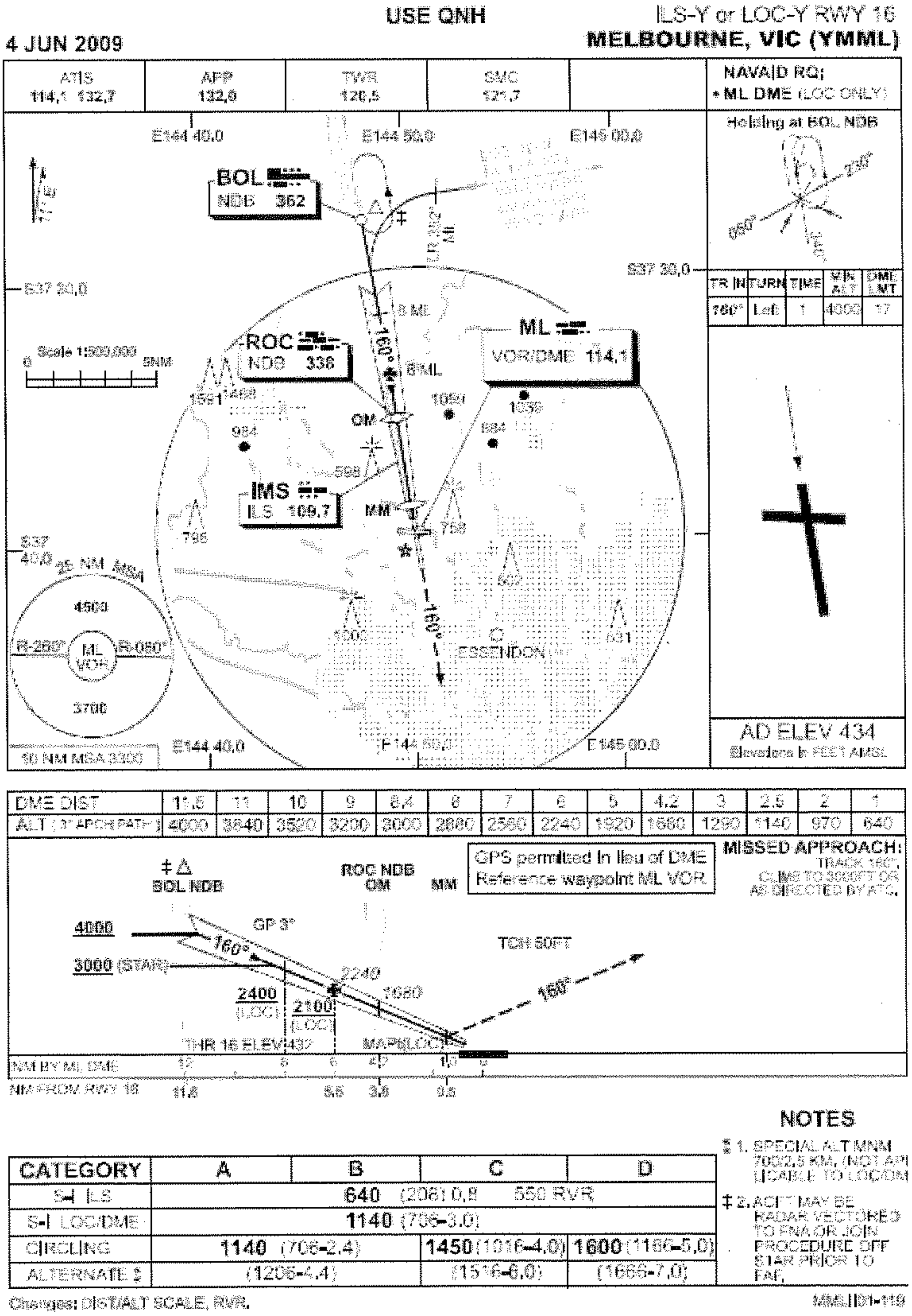


Figure G5. Current ILS-Z or LOC-Z RWY 16

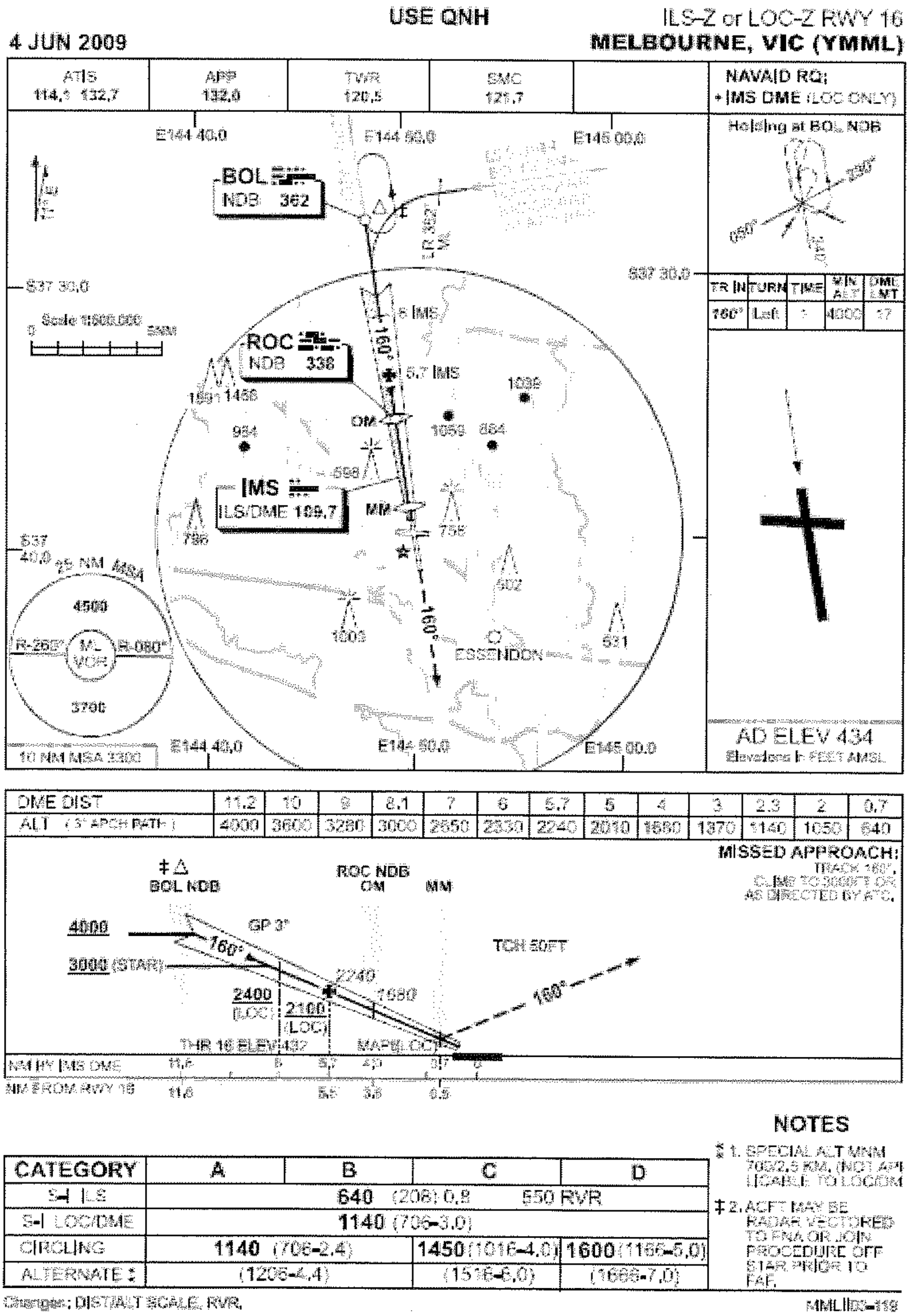


Figure G6. Current VOR RWY 34

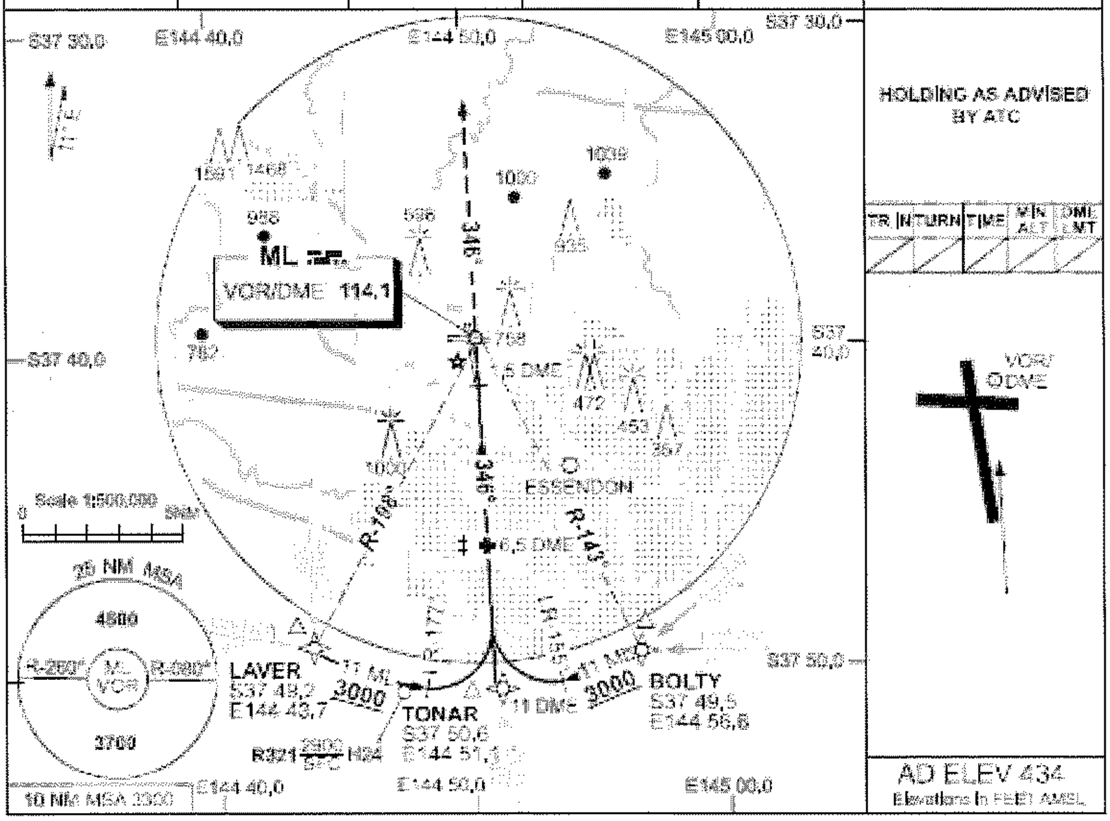
USE QNH

VOR RWY 34

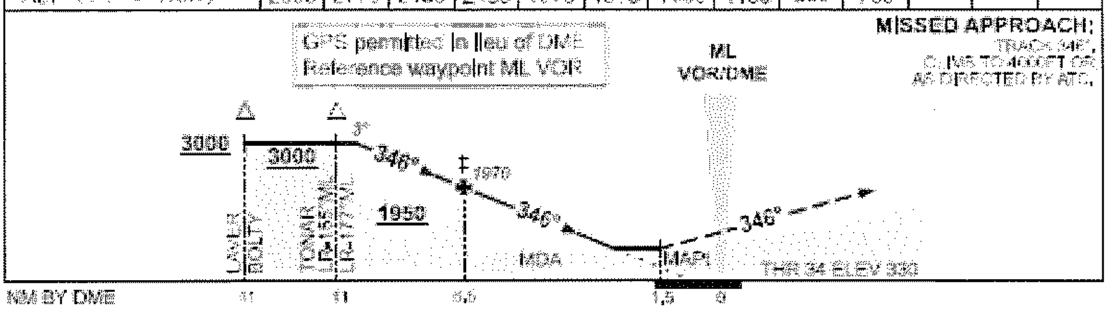
27 AUG 2009

MELBOURNE, VIC (YMML)

ATIS	APP	TWR	SMC		NAVAID RQ:
114,1 132,7	132,0	120,5	121,7		• DME



DIST BY DME	9,7	9	8	7	6,5	6	5	4	3	2,7			
ALT (3° APCH PATH)	2990	2770	2450	2130	1970	1810	1490	1180	860	760			



NOTES

CATEGORY	A	B	C	D
S-I VOR/DME	760 (430-2,4)			
CIRCLING	1140 (706-2,4)		1450 (1016-4,0)	1600 (1166-5,0)
ALTERNATE ‡	(1206-4,4)		(1516-6,0)	(1666-7,0)

‡ 1. SPECIAL ALT MNM 700/2,5KM.

‡ 2. ACFT MAY BE RADAR VECTORED TO IAF.

Changes: DIST ALT TABLE, CROSSING HT.

MMLVO03-120

Figure G7. Current RNAV-Z (GNSS) RWY 09

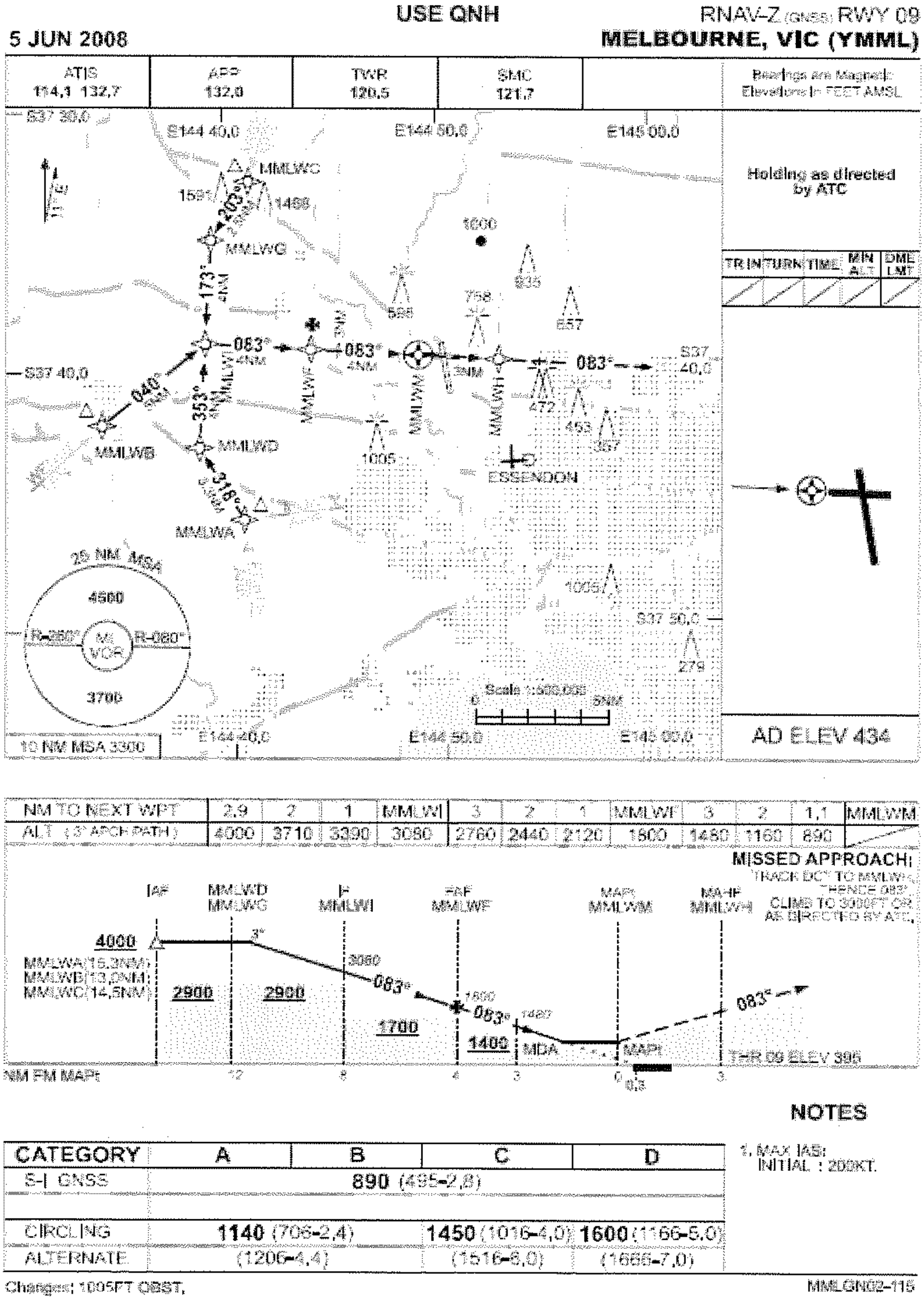


Figure G8. Current RNAV-Z (GNSS) RWY 34

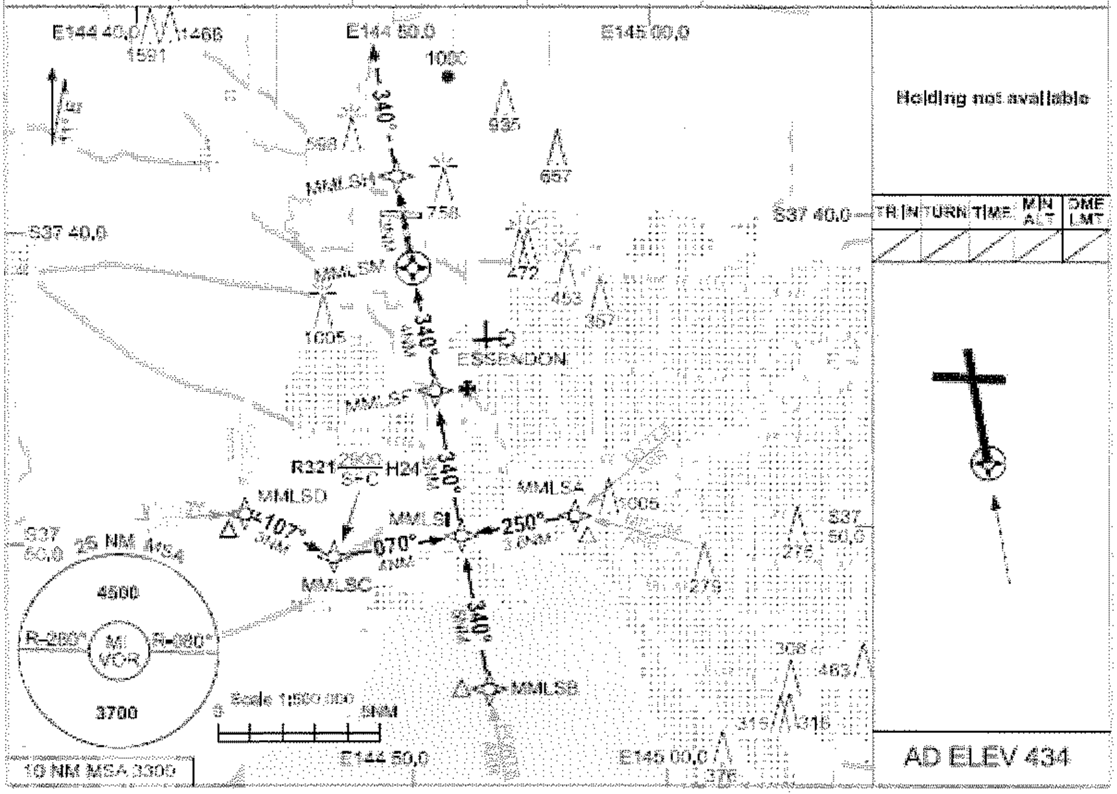
USE QNH

RNAV-Z (GNSS) RWY 34

5 JUN 2008

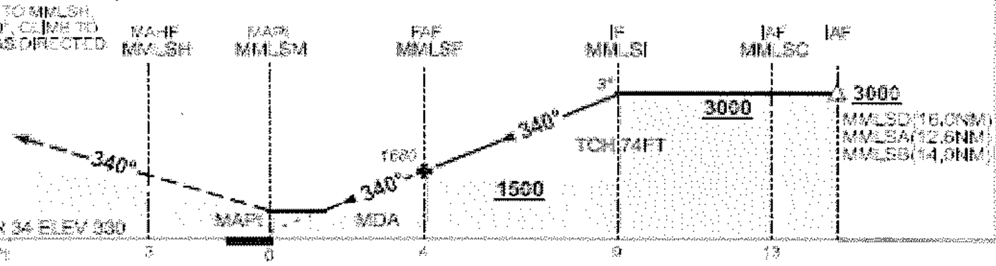
MELBOURNE, VIC (YMML)

ATIS	APP	TWR	SMC		
114.1 132.7	132.0	120.5	121.7		Bearings are Magnetic Elevations in FEET AMSL



NM TO NEXT WPT	MMLSM	1.2	2	3	MMLSF	1	2	3	4	4.2		
ALT (3° APCH PATH)		780	1040	1360	1680	2000	2310	2630	2950	3000		

MISSED APPROACH:
TRACK 007 TO MMLSH, THENCE 340°, CLIMB TO 4000FT OR AS DIRECTED BY ATC.



NOTES

1. MAX IAS: INITIAL ; 200KT.

CATEGORY	A	B	C	D
S-I GNSS	780 (450-2.5)			
CIRCLING	1140 (706-2.4)		1450 (1016-4.0)	1600 (1166-5.0)
ALTERNATE	(1206-4.4)		(1516-6.0)	(1666-7.0)

Changes: 1005FT OBST.

MMLGN01-115

Attachment H

Figure H1. Proposed Changes to Approach Paths for Arrivals from North-east

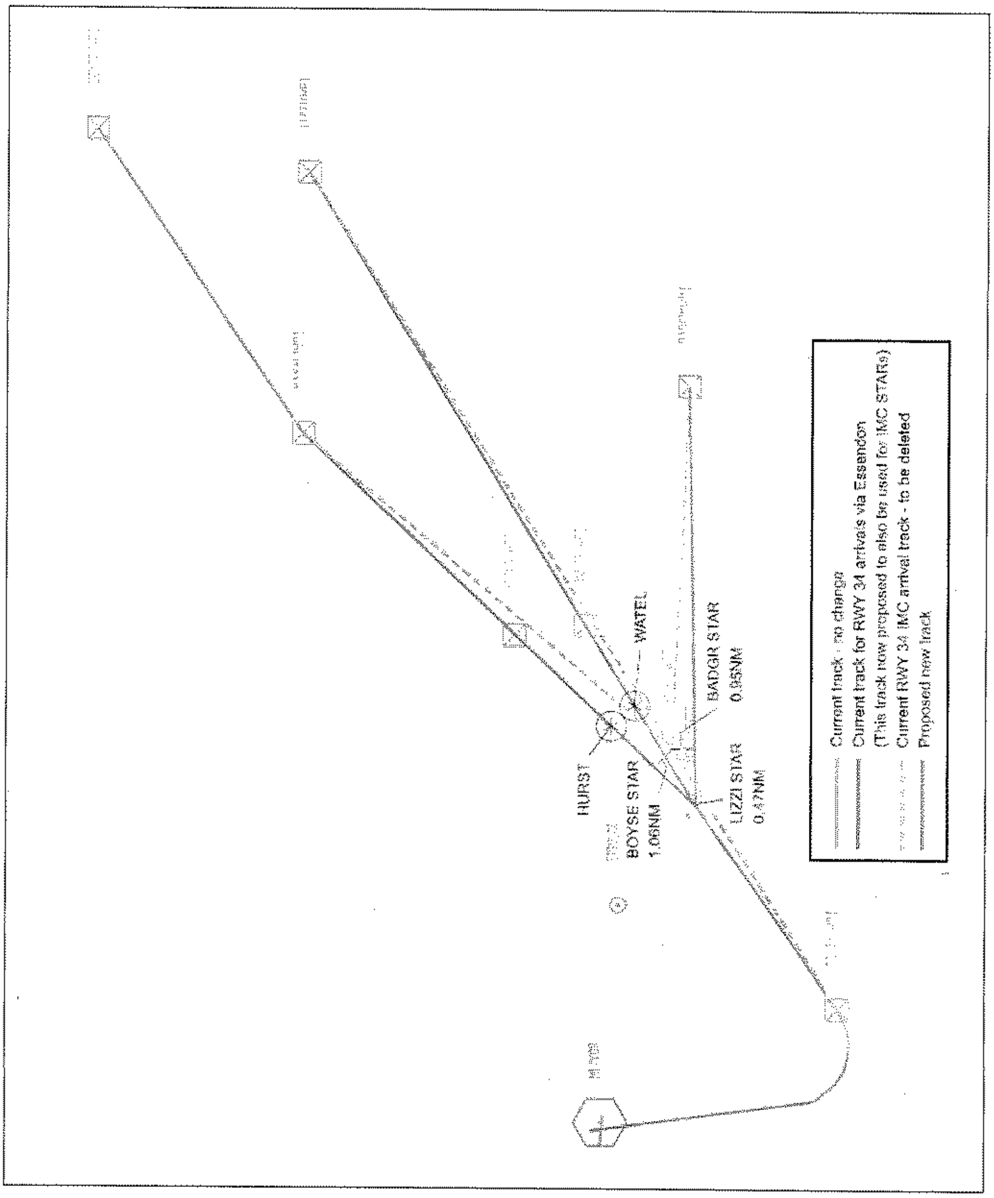


Figure H2. Enlargement 1 of Proposed Changes for Arrivals from North-east

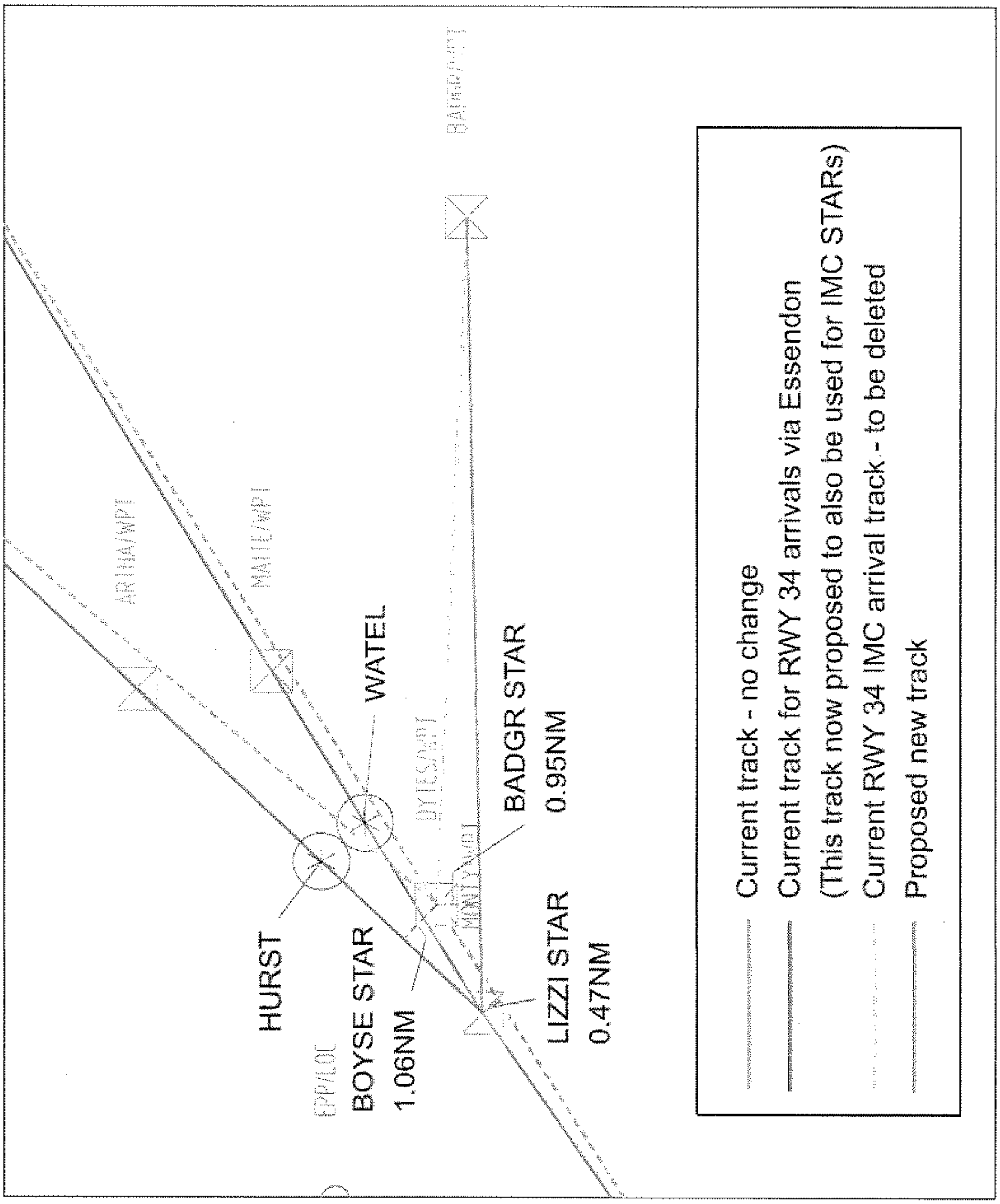
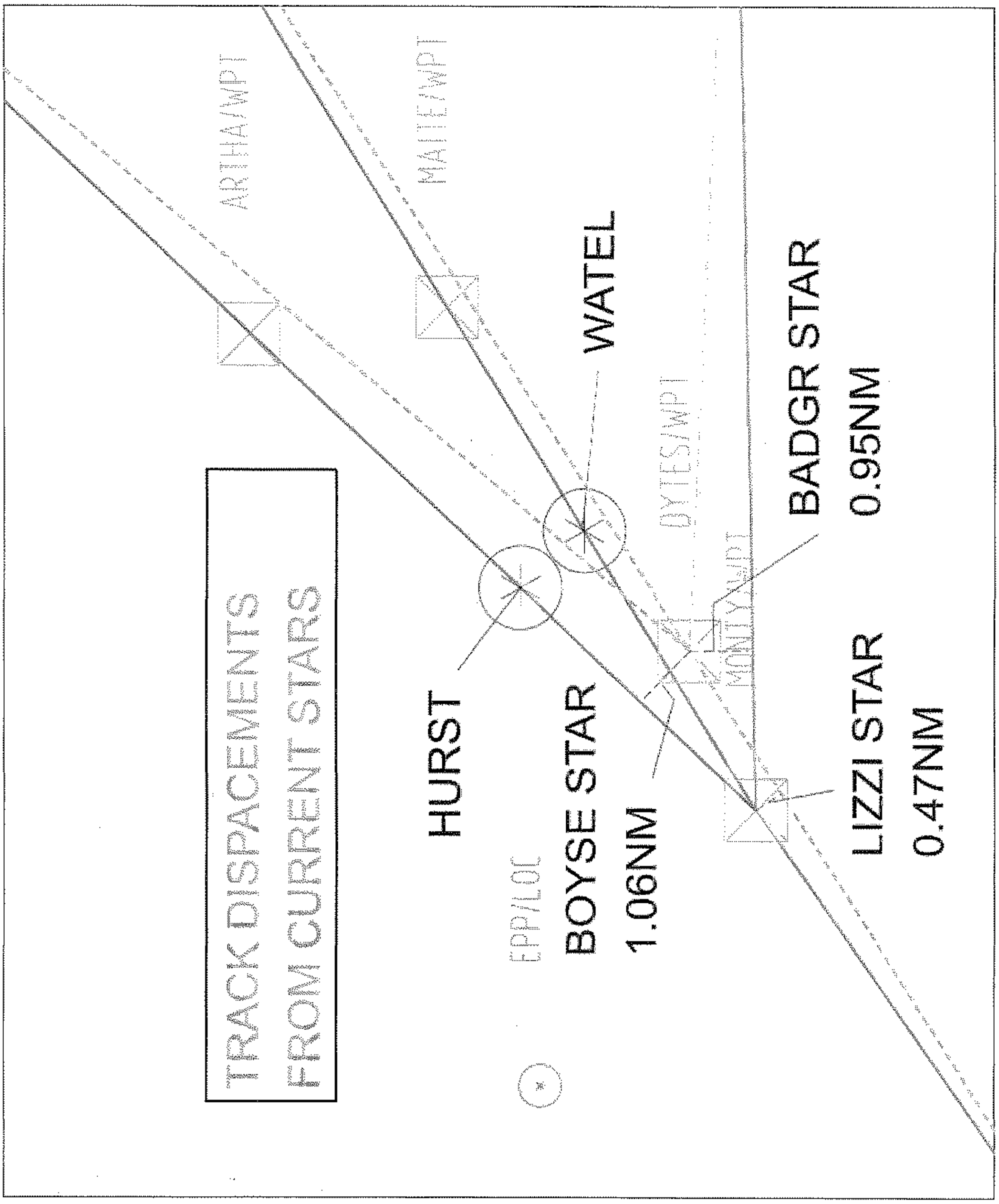
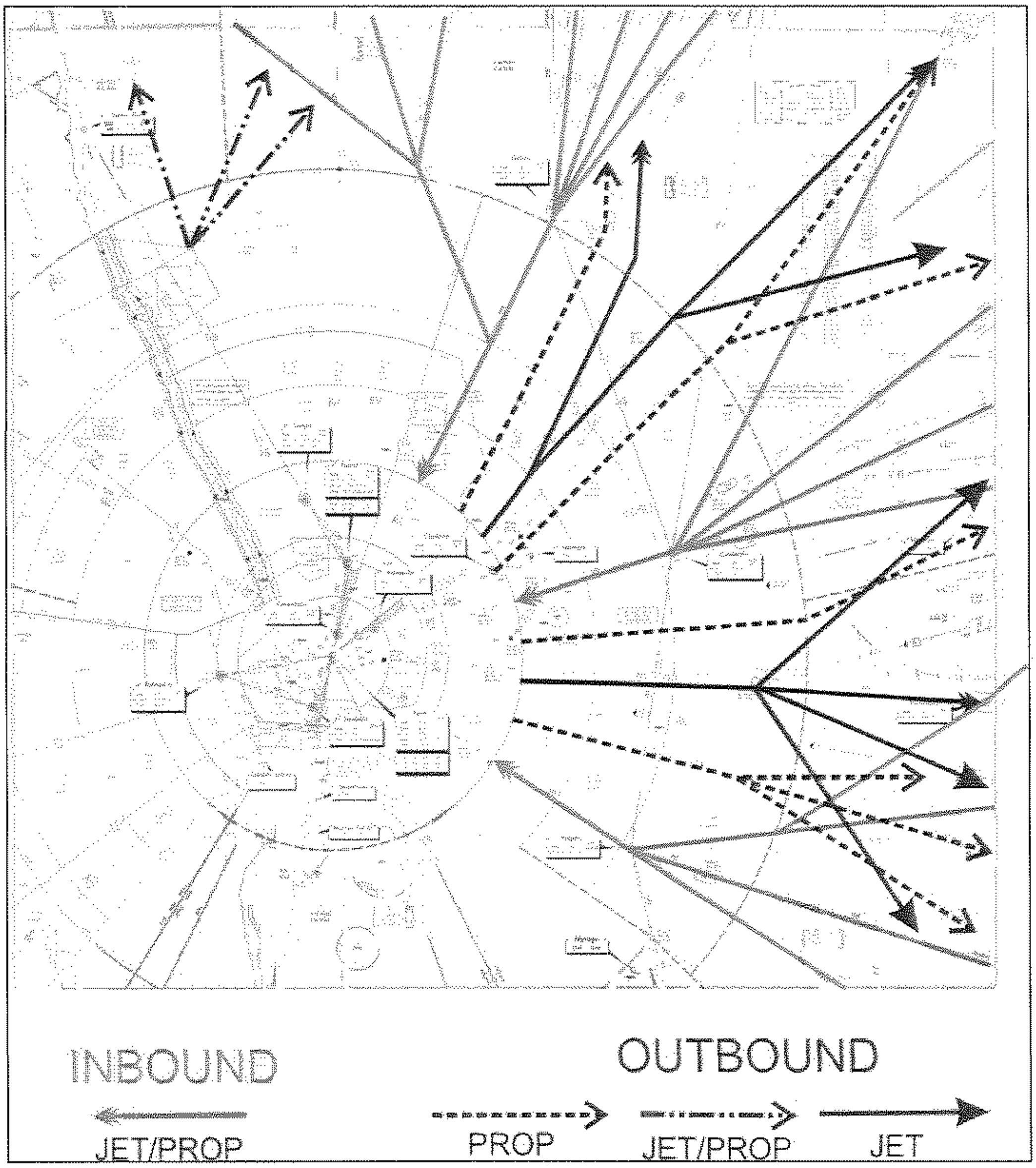


Figure H3. Enlargement 2 of Proposed Changes for Arrivals from North-east

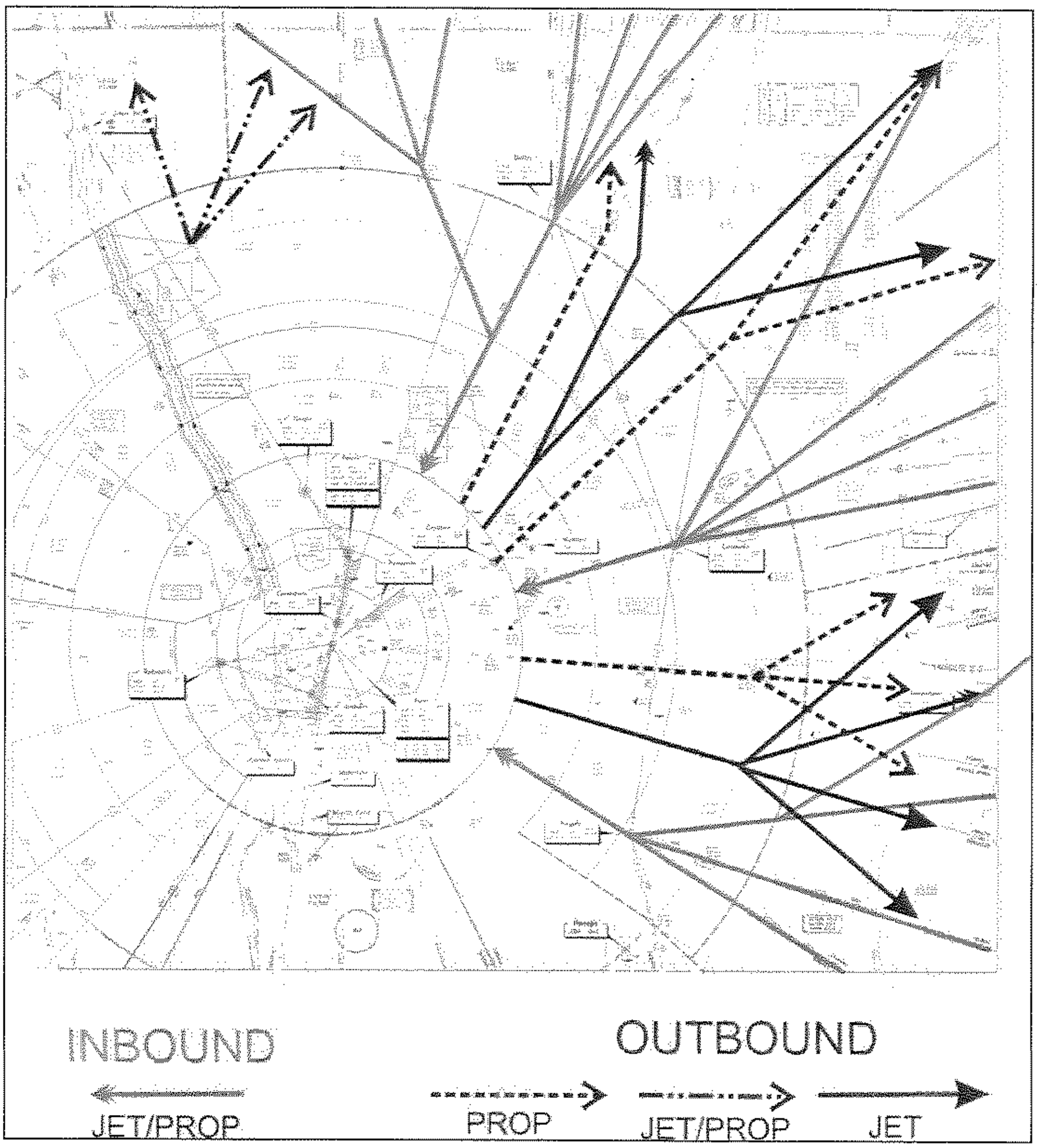


Q20 - Attachment B

Route Structure Proposal 1

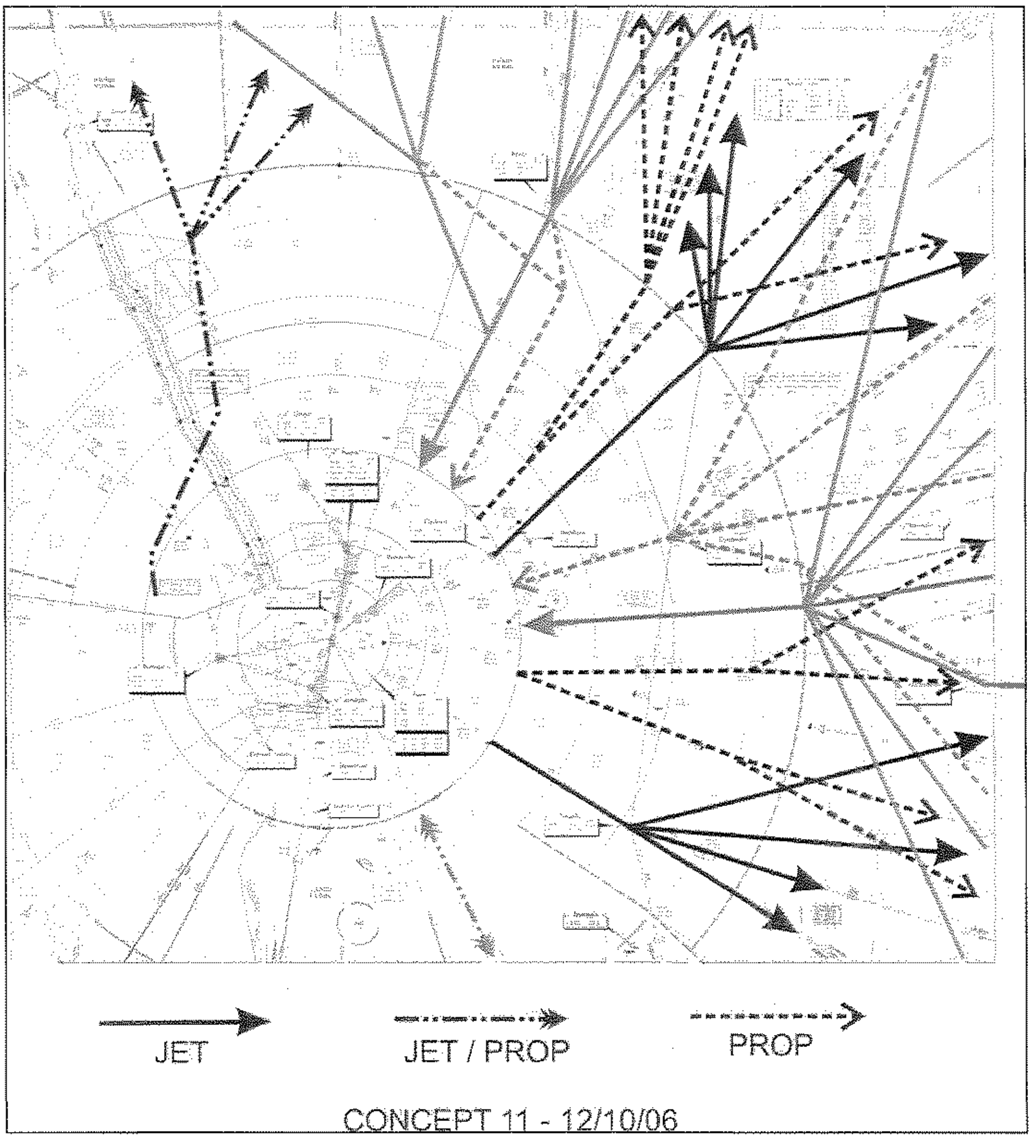


Route Structure Proposal 2

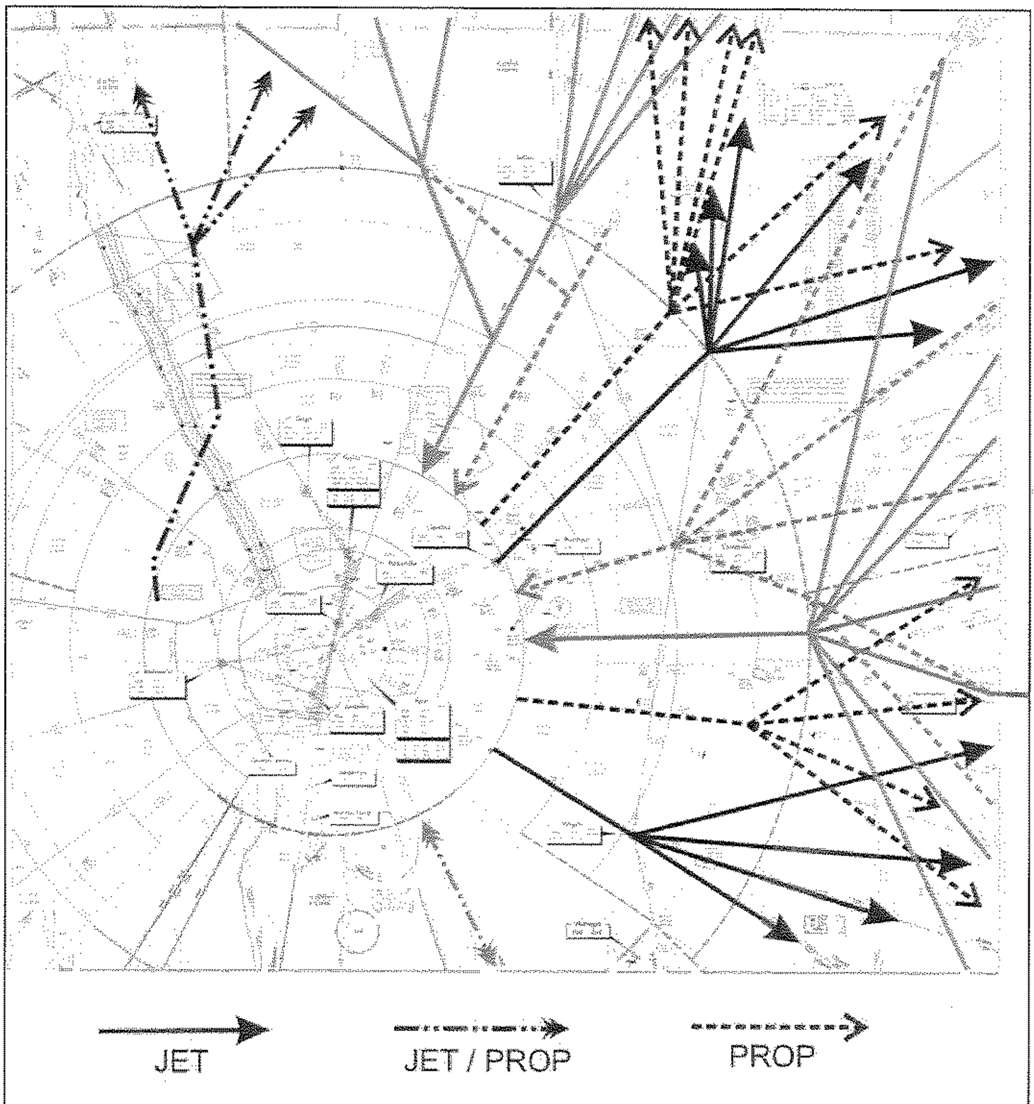


Q20 - Attachment B

Route Structure Proposal 3



Route Structure Proposal 3A



Proposal 3A - 6/11/06

Runway 21 STAR

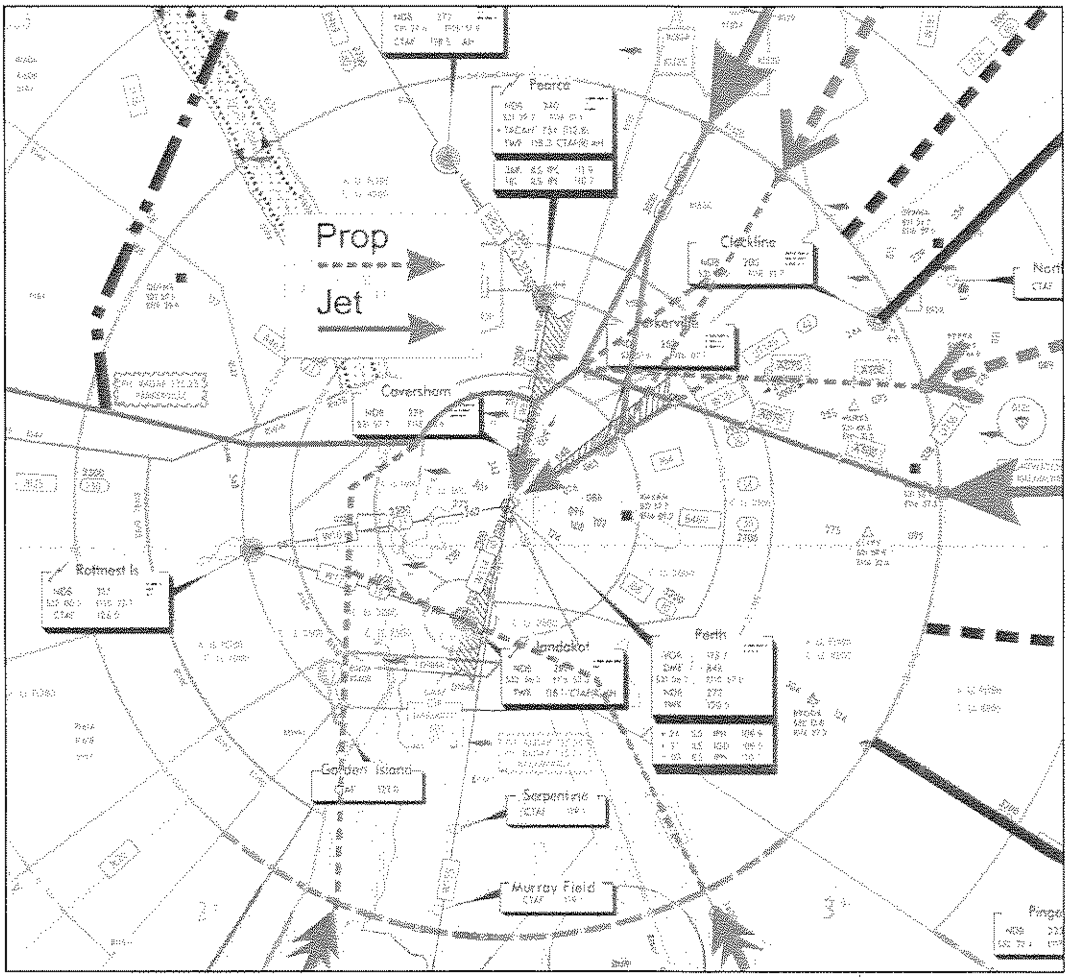


Figure 1

Runway 21 SID

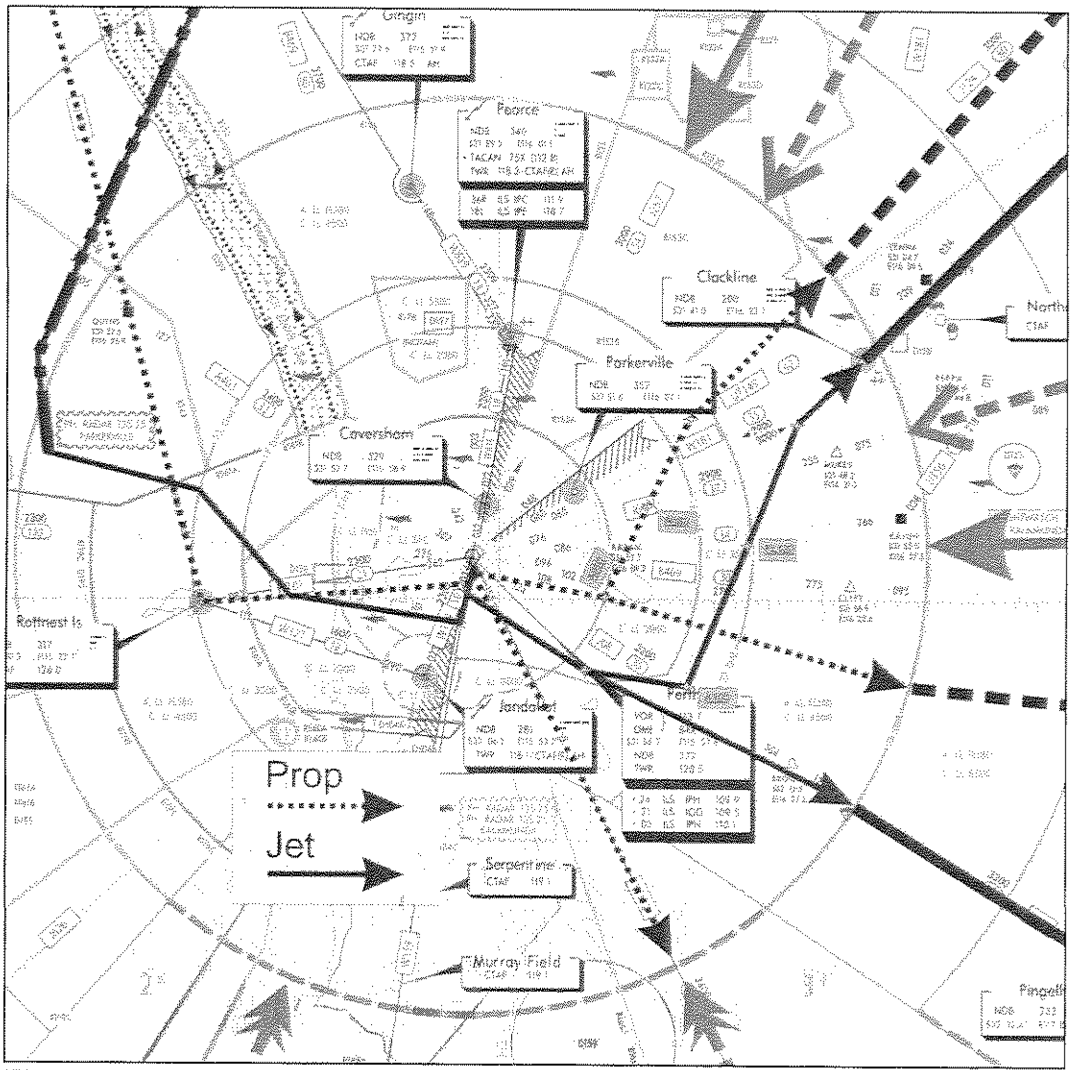


Figure 2

Q20 – Attachment C

Runway 03 Instrument STAR

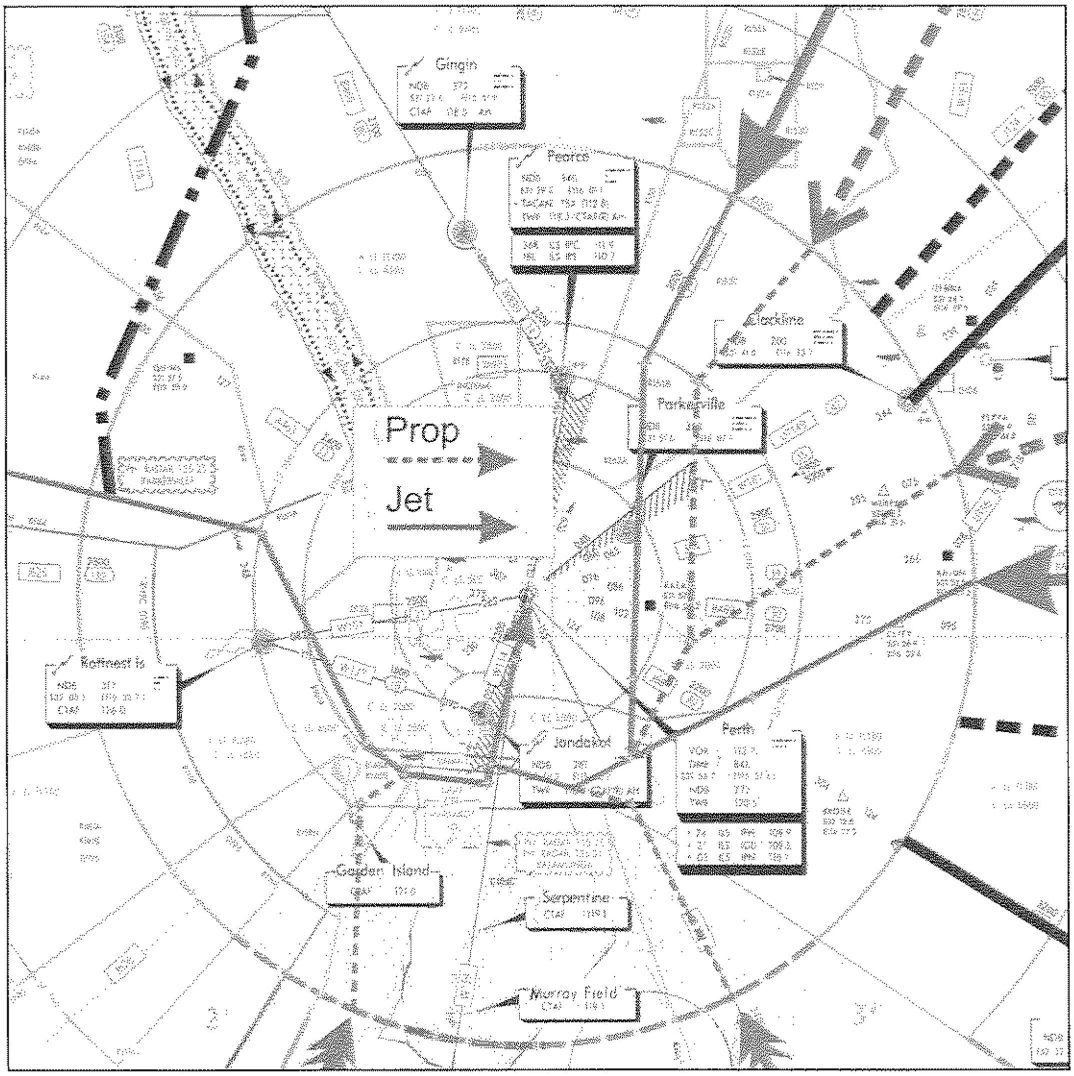


Figure 3

Q20 – Attachment C

Runway 03 Visual STAR

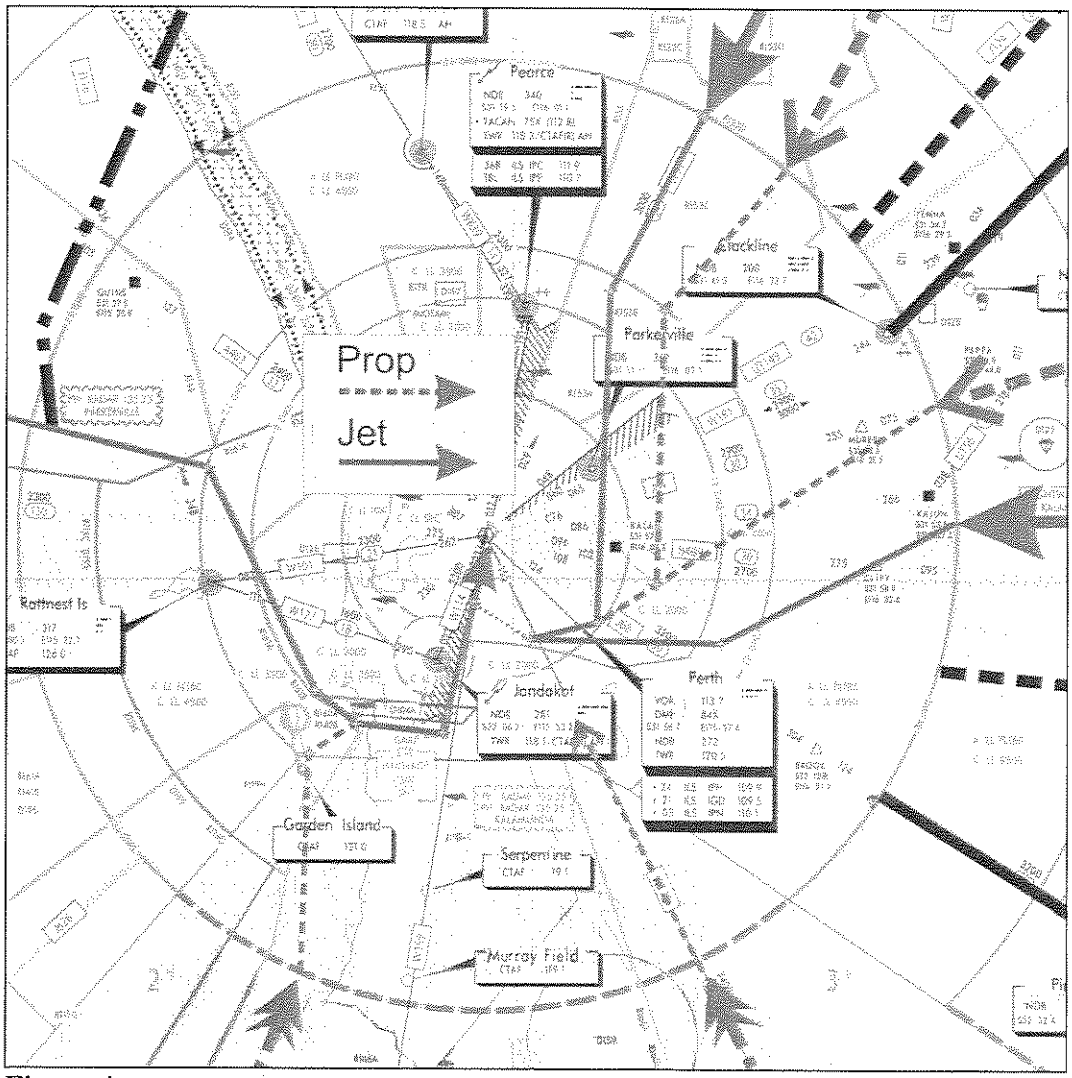
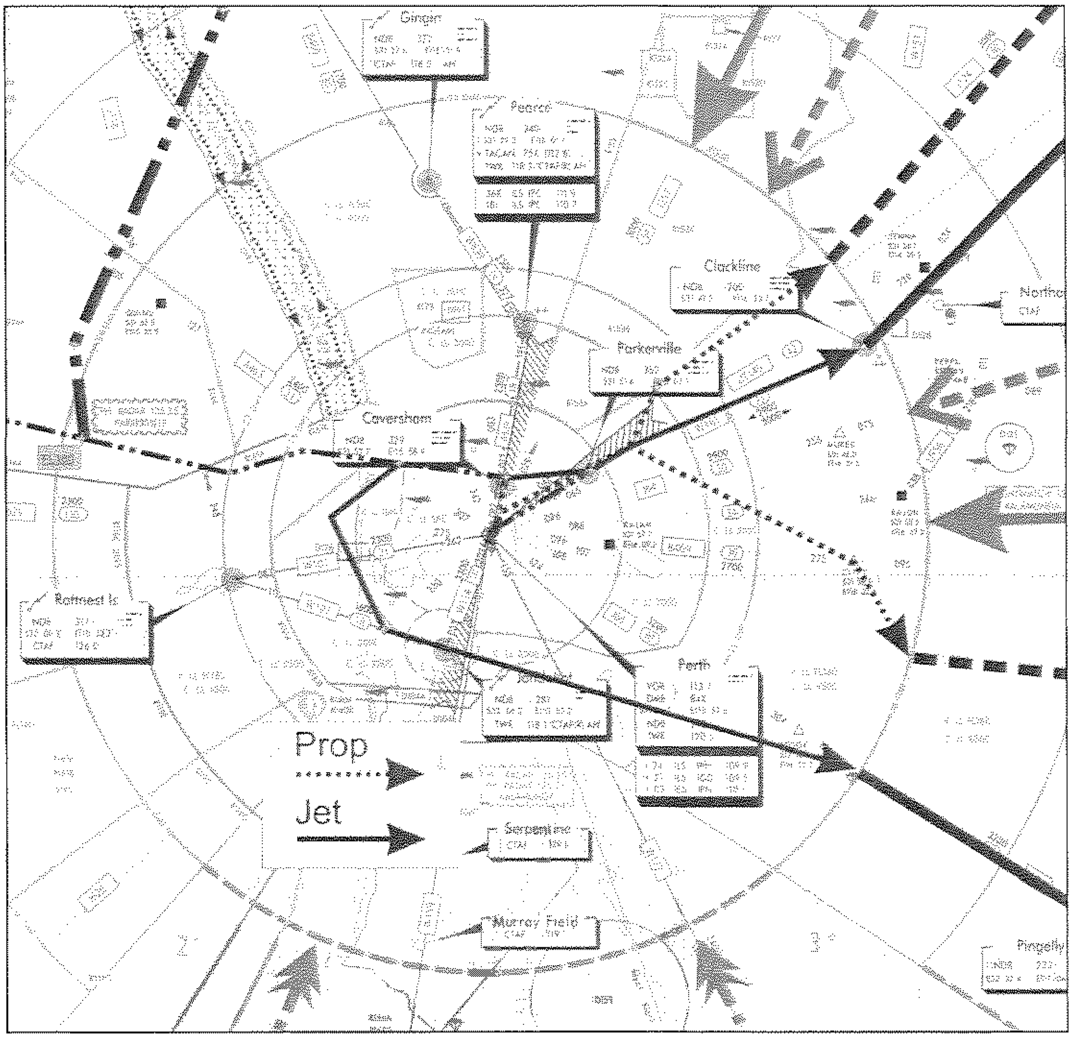


Figure 4

Runway 03 SID



AIRSERVICES AUSTRALIA

Environmental Assessment
Perth Route Review - Revised Air Routes Proposal
ARMS 176868

Introduction

The Airservices Australia *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise* provides some fundamental principles to be used in environmental assessments. To the extent that higher order principles have been satisfied and there remains a need to decide on operational arrangements, there are a hierarchical set of operational standards and procedures to be considered. These principles and hierarchical set of standards ought to be applied by the proponent of the change to operational situations (normally Air Traffic Management or Airport Services).

Once these principles and standards have been applied to the change proposal, it is then necessary to establish the likely environmental impact of the proposed changes.

Is Referral to Environment Services Required?

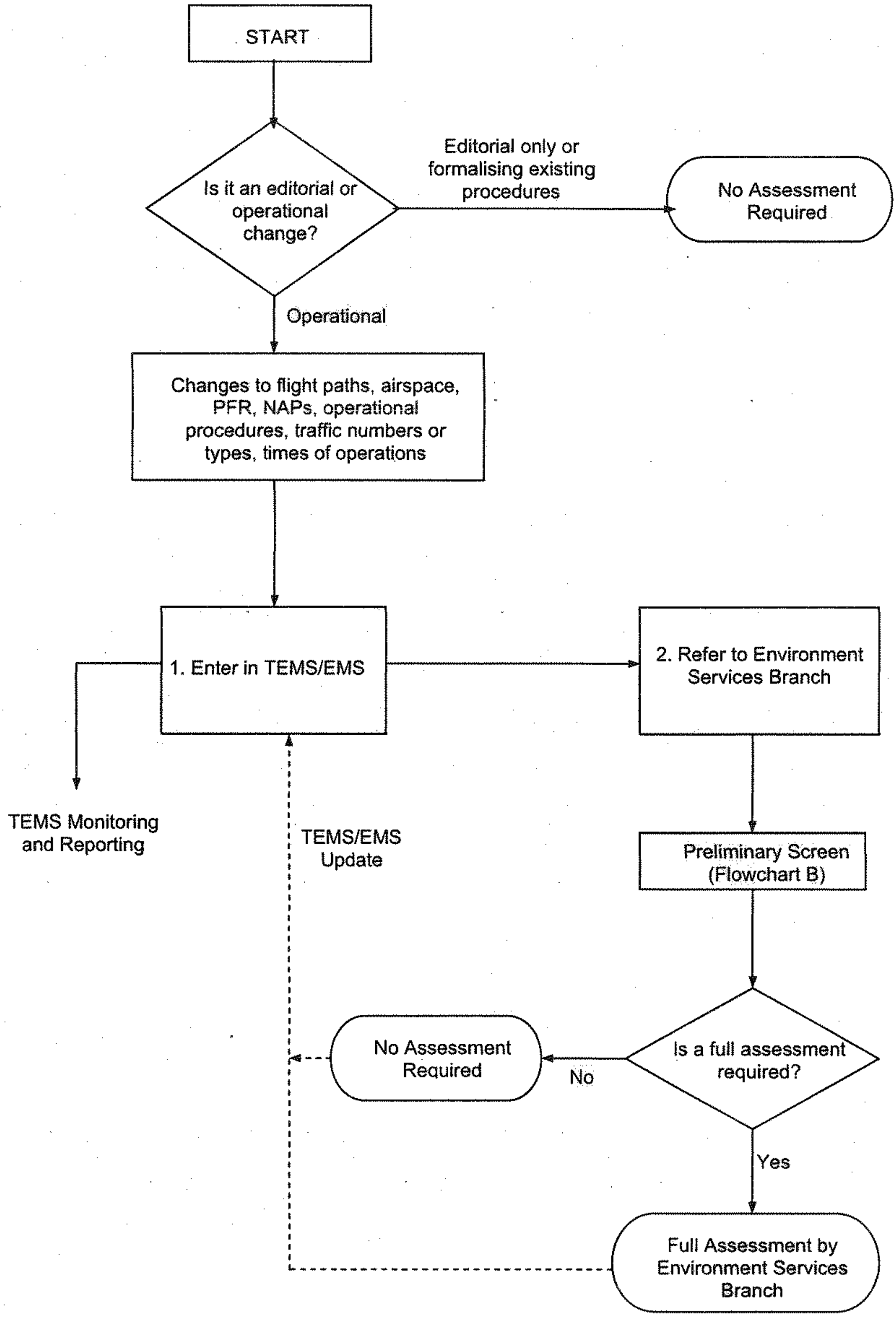
Flowchart A shows that the proposal required assessment and was referred to the Environment Services Branch, and the analysis shown in Flowchart B was applied.

The Environment Services Branch Assessment Process

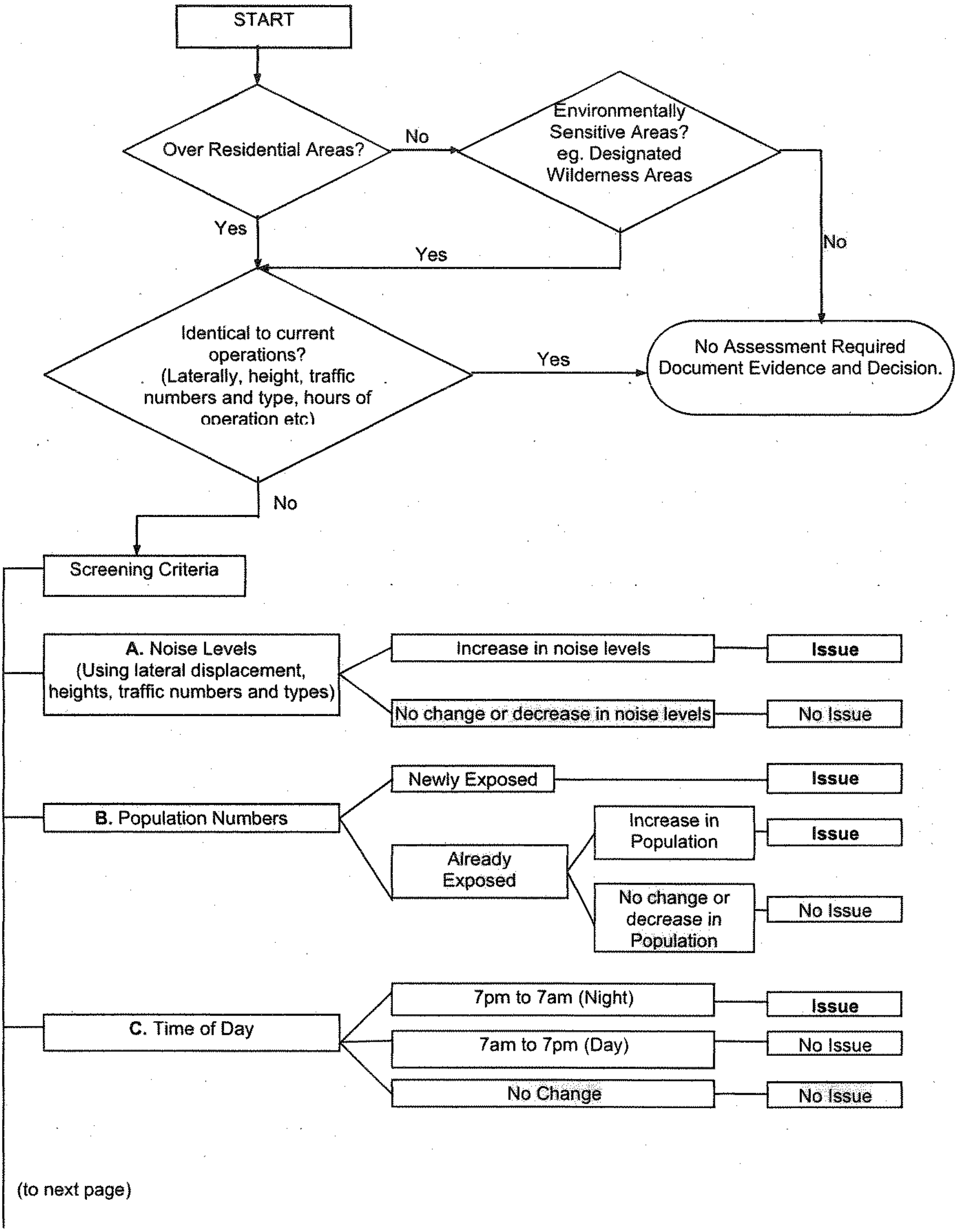
To determine whether a full environmental assessment of a proposed change is required, Environment Services Branch will undertake preliminary assessment of the likely environmental impact using the process outlined in Flowchart B. This process uses a number of assessment criteria such as noise levels, population numbers affected, time of day, emissions and visual pollution to determine whether there is likely to be an environmental impact.

These criteria feed into an assessment matrix, which highlight the areas of concern. If a full environmental assessment of the change is required, then the criteria of concern (ie the “issues”) will be further investigated.

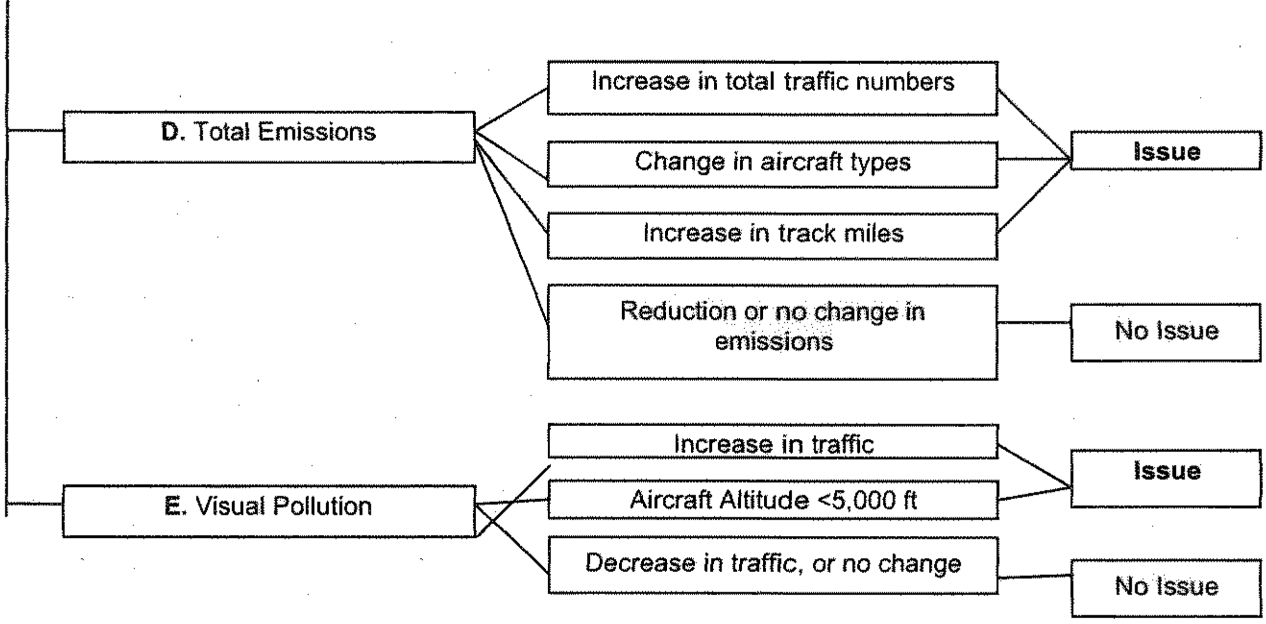
Flowchart A – Initial Assessment Process (Proponent)



Flowchart B - Preliminary Assessment (Environment Services Branch)



(from last page)



Environmental Assessment Matrix

Assessment Criteria		Issue	No Issue
A	Noise Levels		✓
B	Population - Newly Exposed		✓
	Population - Already Exposed		✓
C	Time of Day		✓
D	Total Emissions		✓
E	Visual Pollution		✓

The environmental impacts associated with the changes in upper air routes are addressed in the assessments of the individual SID and STAR procedures which have been changed.

Refer to ARMS Risk ID 173660, 174341, 175081, 175353, 175575, 176121, 176187, 176868

Full Assessment under EPBC Act to determine "significance"

~~Required~~ / Not Required

Signed ______________ [redacted] _14_/11_/_2007_ Date

ARMS 173660
Environmental Assessment of the Proposed Amendment to Perth SID West Runway 03

The proposal is to amend the tracking of jet departures from Runway 03 to the north-west. It is required for a safer route structure in the corridor of airspace immediately east of R155 in accordance with design standards.

Aircraft to the north-west will only use the proposed SID when unable to transit R155, which is normally active 8am to 5pm Monday to Friday, plus during RAAF night flying operations, held on an ad-hoc basis. Outside these hours, there will be no change to aircraft operations as a result of this proposal.

Runway 03 is not the preferred runway for departures at Perth, and there are more departures from Runway 21. Figure 1 indicates that the proposed SID replicates an existing SID (KEELS 2) for that part of the SID which is over land.

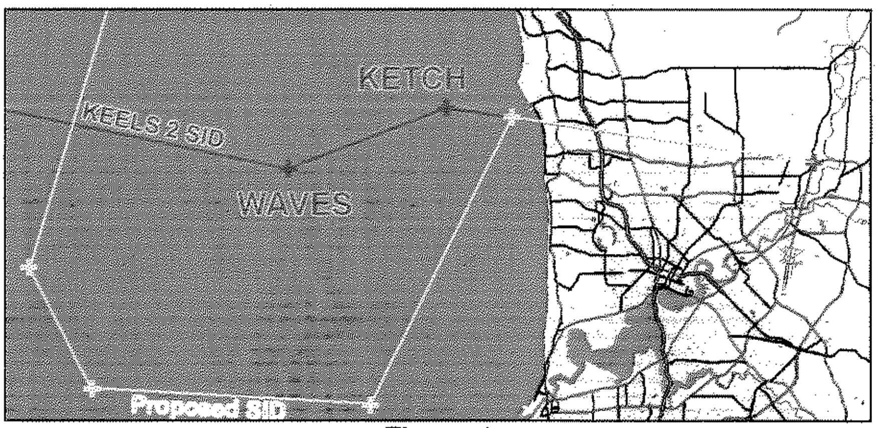


Figure 1

KEELS 2 is used by aircraft bound to South Africa and Mauritius, as shown in Figure 2.

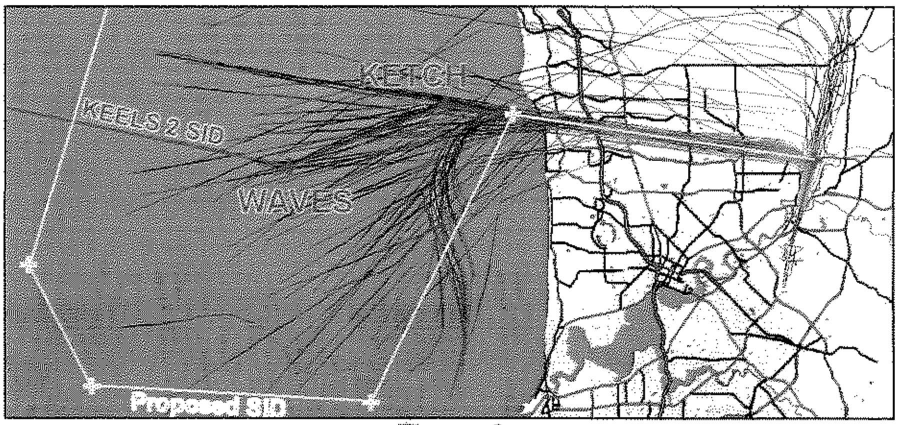


Figure 2

Aircraft to the north-west during June 2007 are shown in Figure 3. Those transitting R155 will continue to do so, and those aircraft which have tracked east of R155, due to the active status of R155, will follow the proposed SID.

Figure 3

The changes to this SID have been assessed under the Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise as follows:

Total Noise Dose
Principle 1: Noise abatement procedures should be optimized to achieve the lowest possible overall impact on the community. The environmental impact of the proposed SID is minimised if flights continue to track via R155 whenever possible. While this is the current practice, the arrangement is not a requirement of the Perth Noise Abatement Procedures, so there is no certainty that it will continue. Statistics for June 2007 showed of the 388 departures from Runway 03, 28% followed the SID via ALWYN and MODYN and 72% tracked through R155. Provided aircraft continued to track via R155 when it is available, only the 28% (110 flights in June) would track via the proposed SID. This is approximately 26 per week.

Spatial Distribution of the Noise Dose
Principle 2: Noise should be concentrated as much as possible over non-residential areas. The area affected by the proposed change is residential and has a history of noise complaints from aircraft using the KEELS SID, especially Beechboro, Malaga and Ballajura. Aircraft range in height when overflying these suburbs but are typically between 2,000 and 3,000

feet. Statistics for the period 30 July 2006 to 30 June 2007 show there were 132 flights (mostly A340s and B767s) on this SID with destinations Johannesburg and Mauritius. This is an average of approximately 2.5 per week.

These flights do not routinely track via R155 when it is not active, although 15% of the tracks did not follow the SID. For the period 1 May to 30 June 2007 all the flights occurred at noise sensitive times (around midnight) and about half on weekends. For the previous 10 months the flights using the SID were most commonly during the day, with only 15% around midnight. About half of the flights occurred on weekends.

Under the proposal, there will be an additional 26 aircraft per week on this route, which is more than a tenfold increase. These will generally be at less sensitive times of the day (8am to 5pm Monday to Friday) as during the noise sensitive periods they will continue to track via R155.

Principle 3: Noise exposure should be fairly shared whenever possible. The area affected by the proposed change is not presently overflown by large numbers of arrivals or other departures.

Principle 4: No suburb, group or individual can demand or expect to be exempt from aircraft noise exposure. The area affected by the proposed change is not presently overflown by large numbers of arrivals or other departures, but does receive a low level of overflight.

Upper and Lower Limits of Noise Exposure
Principle 5: Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 Leq $_{24}$ and there are less than 50 overflights per day. The noise is significant based on the numbers of flights that can be expected on the route – it is less than 50 overflights per day but more than 40 Leq $_{24}$.

Principle 6: No residential area should receive more than 60 Leq $_{24}$, i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021. The noise is less than 60 Leq $_{24}$.

Principle 7: There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A). This principle is met.

Timing / Historical issues
Principle 8: When comparing options, operations that are conducted at night or on weekends should be treated as being more sensitive than

those which occur during the daytime or on weekdays. The proposal does not offer options, as the current procedure is no longer an option due to safety considerations. However, an option whereby flights to the west (Johannesburg and Mauritius) are tracked further north after departure so that the noise sensitive areas of Beechboro, Malaga and Ballajura are not overflown when R155 is inactive should be developed for consideration. While not relevant to the flights displaced by the proposal (which relate specifically to the period when R155 is active), such a route could offset the impacts which will result from the proposal. If such an alternative existed, the total impact of aircraft on the KEELS SID and the proposed SID combined may not be significantly greater than the impact of aircraft on the KEELS SID at present. Without this development, however, the increase of traffic on the route of the KEELS SID is potentially significant, due to the low level of overflight at present and the history of noise sensitivity in the area.

Principle 9: *Both short-term and long-term noise exposure should be taken into account in deciding between options.* Not applicable.

Principle 10: *Options which allow for a gradual change from the current to planned procedures should be given preference.* Not applicable.

Principle 11: *In deciding between mutually exclusive, but otherwise equivalent options, involving (i) the overflight of an area which has previously been exposed to aircraft noise for a considerable period of time (and which a large proportion of residents would therefore have been aware of the noise before moving in); or (ii) a newly exposed area, option (i) should be chosen.* Not applicable.

Reciprocal Flightpaths

Principle 12: To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the runway in the reciprocal direction. The area affected by the proposed change is not presently overflown by large numbers of arrivals or other departures.

Conclusion

The practice of tracking via R155 outside the hours of activation should be formalised and included in the section Preferred Flight Paths in the Noise Abatement Procedures, to ensure that it continues, as this assessment and others are based on the current practice of tracking aircraft through this airspace when it is available.

The environmental impacts of the proposed amendments to Runway 03 SID West have been assessed as potentially significant due to an increase in the number of flights over areas known to be noise sensitive from 2.5 per week to 26 per week, by large jet aircraft on climb and below 3,000 feet. It is recommended that an alternative route through R155 for departures to the west be devised in lieu of use of the KEELS SID in noise sensitive periods to offset this impact. Although the additional aircraft resulting from this proposal considerably outnumber the flights that could be redirected through R155, they occur at non-sensitive times of day compared to the existing flights around midnight, so it is expected that there would be an environmental benefit to the affected communities. In terms of environmental impact, a night operation is equivalent to four operations at non-sensitive times.

The attached diagram shows the KEELS SID, the proposed SID, and low impact tracks that should be considered for developing alternative tracking for aircraft when R155 is inactive.

Provided that night flights are routed through R155 (approximating one of the routes suggested in the attached diagram) whenever this airspace is available for domestic flights (no military night training), the environmental impacts of the proposal are not significant. These routes ensure that aircraft will be typically above 6,000 feet when overflying residential areas, resulting in noise impacts less than 40 Leq_{24}.

It is further recommended that this requirement is included in the published noise abatement procedures to ensure it is adhered to in the future.

[redacted]
Aviation Environment Specialist
Environment Brach

3 October 2007

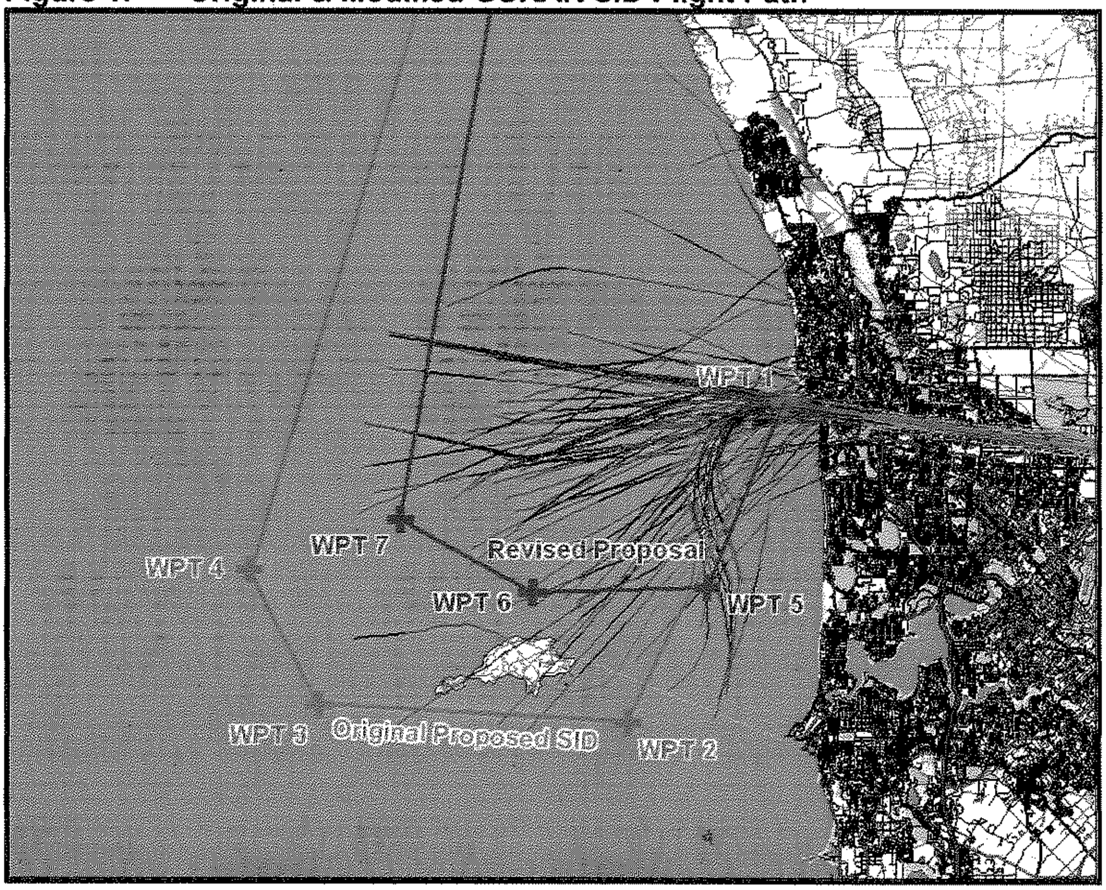
Addendum 1 to ARMS Entry 173660

Environmental Assessment of the Proposed Amendment to Perth SID West Runway 03

Following approval being provided for the proposed GURAK ONE (RNAV) SID in October 2007 a modification to the flight path of the proposed procedure has been proposed. The original proposal was for aircraft after crossing the coast line track to turn left and track south of Rottnest Island, a distance of approximately 1 nautical mile, before turning right to track towards their destination. A copy of the revised procedure is shown in Attachment 1 to this Addendum.

The revised proposal is to overcome the possible issue of aircraft being perceived as overflying Rottnest Island by tracking them to the north of the island, a distance of approximately 2 nautical miles. Figure 1 shows the proposed modification to the original proposal.

Figure 1. Original & Modified GURAK SID Flight Path



The waypoints shown in Figure 1 are to be fly-by waypoints, resulting in aircraft beginning their turn prior to the waypoint and joining the next segment after passing the waypoint. The use of fly-by waypoint would have resulted in aircraft tracking closer to Rottnest Island when following the original proposed flight path and further away from the island when following the modified proposal.

As the original proposal has considered number of aircraft departures when following the proposed procedure, further analysis of the number of aircraft who may follow the modified route has not been undertaken. As the modifications to the original flight path are over water, analysis of number of people impacted on and noise generated or altitude of the aircraft was not undertaken

Conclusion

Based on the above analysis of the proposed modifications to the approved GURAK ONE (RNAV) SID, Environment Operations has considered the implications of the proposed modifications to this SID and considers the modifications to this proposal should not have any environmental business risks and is not significant within the meaning of the EPBC Act 1999.

[redacted]
Aviation Environment Specialist
Environment Operations

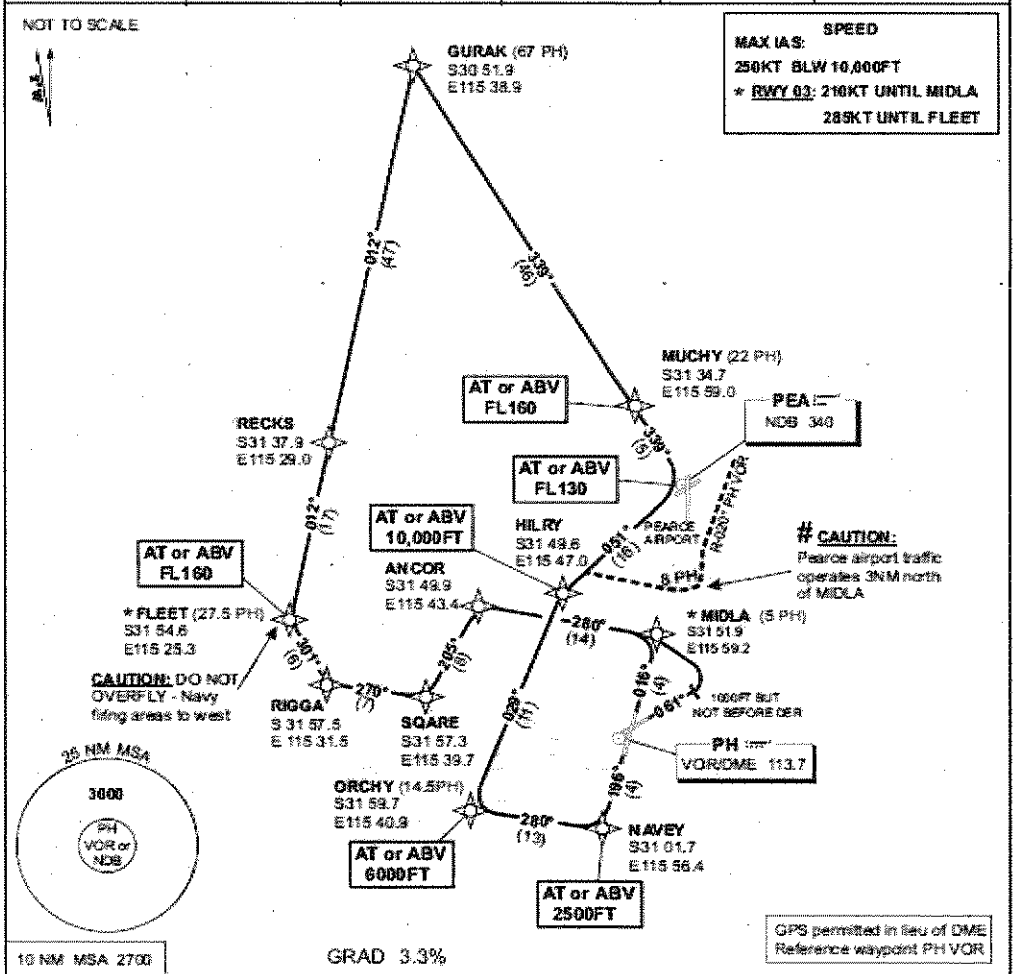
17 January 2008

Attachment A to Addendum 1

STANDARD INSTRUMENT DEPARTURES
GURAK ONE (RNAV)
PERTH, WA (YPPH)

DRAFT

ATIS			ACD	SMC	TWR	DEP	
113.7	123.8	272	118.55	121.7	120.5	118.7	



GURAK ONE DEPARTURE

RWY 03

. Track 016° to MIDLA #
. Turn LEFT, track 280° to ANCOR
. Turn LEFT, track 205° to SQARE
. Turn RIGHT, track 270° to RIGGA
. Turn RIGHT, track 301° to FLEET
  Cross FLEET AT or ABV FL160
. Turn RIGHT, track 012° to RECKS
. Track 012° to GURAK
  thence as cleared

RWY 21

. Track 196° to NAVEY
  Cross NAVEY AT or ABV 2500FT
. Turn RIGHT, track 280° to ORCHY
  Cross ORCHY AT or ABV 6000FT
. Turn RIGHT, track 029° to HILRY
  Cross HILRY AT or ABV 10,000FT
. Turn RIGHT, track 051° to PEA NDB
  Cross PEA NDB AT or ABV FL130
. Turn LEFT, track 339° to MUCHY
  Cross MUCHY AT or ABV FL160
. Track 339° to GURAK
  thence as cleared

New procedure

ARMS 175081
Environmental Assessment of the Proposed Amendment to Perth STARs from the North to Runways 03 & 06

The proposal is to amend the tracking of jet and non-jet arrivals from the north to Runways 03 and 06. Figure 1 shows the existing STARs NORTY 4 (in yellow), and the proposed STARs JULIM (jets), CONDL (non-jets) and GOSNL (visual).

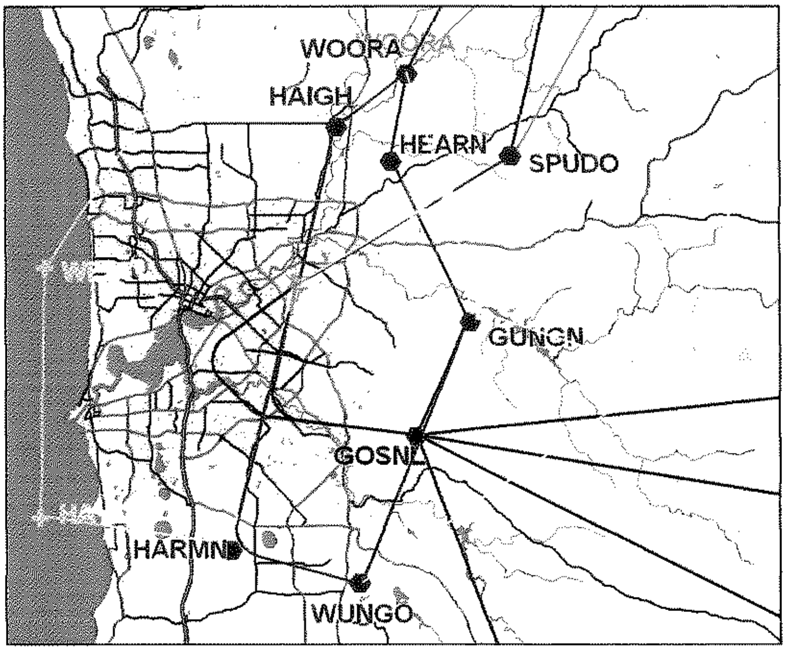


Figure 1

The change is to route all arrivals from the north to the east of Perth, whereas slightly more than half of the arrivals from the north (via NORTY 4 STAR) previously approached the airport from the west and the others (via PINJA 5 STAR) approached from the east.

This has been proposed because of an identified safety requirement to standardise tracking irrespective of runway selection.

The changes to these STARS have been assessed under the Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise as follows:

> **Total Noise Dose**
> *Principle 1: Noise abatement procedures should be optimized to achieve the lowest possible overall impact on the community.* The proposed STARs have been assessed in conjunction with other SID and STAR changes implemented at the same time to ensure this has been achieved.

Spatial Distribution of the Noise Dose

Principle 2: Noise should be concentrated as much as possible over non-residential areas. There are areas between HEARN and GUNGN and between GUNGN and WUNGO newly overflown by arrivals from the north, but these areas benefit from other SID and STAR changes brought in simultaneously with this proposal.

Principle 3: Noise exposure should be fairly shared whenever possible. This proposal has maximised this where possible.

Principle 4: No suburb, group or individual can demand or expect to be exempt from aircraft noise exposure. The areas affected by the proposed change are already exposed to aircraft noise from arrivals, departures and overflights.

Upper and Lower Limits of Noise Exposure

Principle 5: Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 Leq $_{24}$ and there are less than 50 overflights per day. The noise in the affected areas is not significant based on the numbers of flights that can be expected on the route – it is less than 50 overflights per day and less than 40 Leq $_{24}$.

Principle 6: No residential area should receive more than 60 Leq $_{24}$, i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021. The noise is less than 60 Leq $_{24}$.

Principle 7: There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A). This principle is met.

Timing / Historical issues

Principle 8: When comparing options, operations that are conducted at night or on weekends should be treated as being more sensitive than those which occur during the daytime or on weekdays. Not applicable.

Principle 9: *Both short-term and long-term noise exposure should be taken into account in deciding between options.* Not applicable.

Principle 10: *Options which allow for a gradual change from the current to planned procedures should be given preference.* Not applicable.

Principle 11: *In deciding between mutually exclusive, but otherwise equivalent options, involving (i) the overflight of an area which has* *previously been exposed to aircraft noise for a considerable period of time (and which a large proportion of residents would therefore have been aware of the noise before moving in); or (ii) a newly exposed area, option (i) should be chosen.* Not applicable.

Reciprocal Flightpaths
Principle 12: To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the runway in the reciprocal direction. The areas affected by the proposed changes between HEARN and GUNGN and between GUNGN and WUNGO will be overflown by fewer numbers of departures as a result of other SID changes. .

Conclusion

Based on the analysis above, the environmental impact of the proposal is not considered to be significant.

[redacted]
Aviation Environment Specialist
Environment Brach

ARMS 174341
Environmental Assessment of the Proposed Amendment to Perth STARs from East Runways 03 & 06

Runway 03 ILS

The proposal is to amend the tracking of jet and non-jet ILS arrivals to Runway 03 from the east. Figure 1 shows the existing STAR via BROOK and the proposed STARs via BEVLY (jets), DAYLR (non-jets) and GRENL (non-jets).

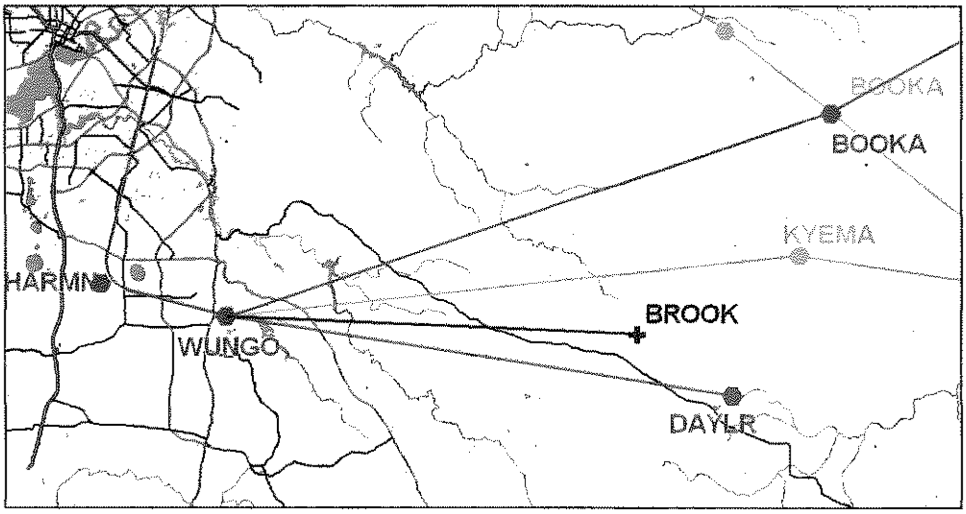


Figure 1

Runways 03 and 06 Visual

The proposal is to amend the tracking of jet and non-jet visual arrivals to Runways 03 and 06 from the east. Figure 2 shows the existing STARs via GOSSI and BARET and the proposed STAR via GOSNL for all visual arrivals.

Figure 2 shows that the proposed base leg on the Runway 03 approach (GOSNL 1 STAR, prior to turning onto the centreline, is further south than the base leg of the existing GOSSI 3 STAR. The change is necessary as the existing track is too close and the turn onto final too acute. The proposed track approximates the existing BARET 1 STAR at the point of intercept.

Arriving traffic is spread over an area which includes the areas most affected by the change to the base leg of the STAR, although it is expected that these areas will have an increase in the number of overflights.

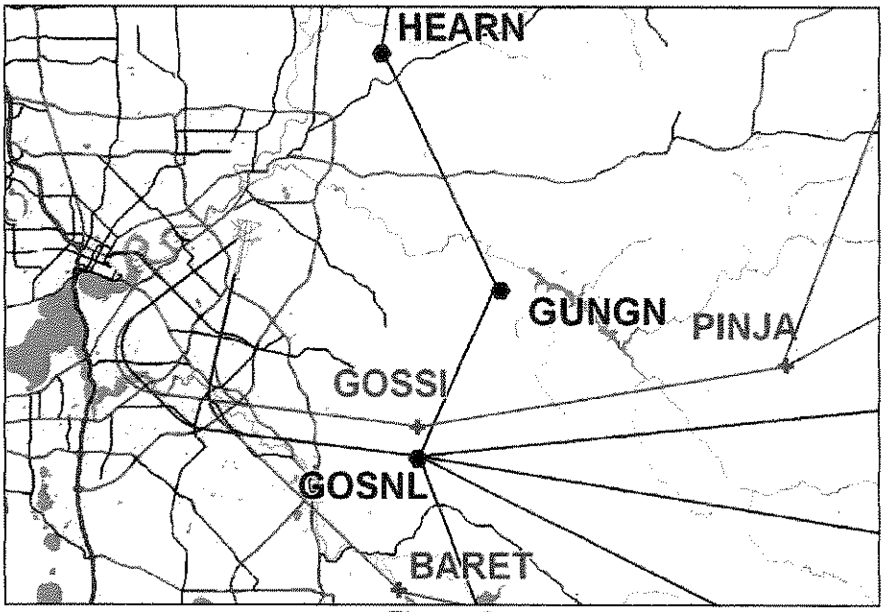


Figure 2

The changes to these STARS have been assessed under the Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise as follows:

Total Noise Dose
Principle 1: Noise abatement procedures should be optimized to achieve the lowest possible overall impact on the community. The proposed STARs will not change the impact on the community.

Spatial Distribution of the Noise Dose
Principle 2: Noise should be concentrated as much as possible over non-residential areas. The final approaches and base legs of approaches to Runways 03 and 06 cannot be positioned away from non-residential areas. The proposal does not worsen the existing situation.

Principle 3: Noise exposure should be fairly shared whenever possible. The areas most affected by the proposed changes (Maddington, Thornlie and Langford) will not be overflown by departures when these procedures are in use. They are exposed to departures to the east when Runway 21 is in use, although most turn east to the north of these areas. The areas of Beckenham and Kenwick will be overflown by fewer arrivals as a result of the proposal, and these areas are heavily overflown by departures.

Principle 4: No suburb, group or individual can demand or expect to be exempt from aircraft noise exposure. The areas affected by the proposed change are already exposed to aircraft noise from arrivals, departures and overflights.

Upper and Lower Limits of Noise Exposure

Principle 5: Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 Leq $_{24}$ and there are less than 50 overflights per day. The noise is significant based on the numbers of flights that can be expected on the route – it is less than 50 overflights per day but more than 40 Leq $_{24}$.

Principle 6: No residential area should receive more than 60 Leq $_{24}$. i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021. The noise is less than 60 Leq $_{24}$.

Principle 7: There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A). This principle is met.

Timing / Historical issues

Principle 8: When comparing options, operations that are conducted at night or on weekends should be treated as being more sensitive than those which occur during the daytime or on weekdays. Not applicable.

Principle 9: *Both short-term and long-term noise exposure should be taken into account in deciding between options.* Not applicable.

Principle 10: *Options which allow for a gradual change from the current to planned procedures should be given preference.* Not applicable.

Principle 11: *In deciding between mutually exclusive, but otherwise equivalent options, involving (i) the overflight of an area which has previously been exposed to aircraft noise for a considerable period of time (and which a large proportion of residents would therefore have been aware of the noise before moving in); or (ii) a newly exposed area, option (i) should be chosen.* Not applicable.

Reciprocal Flightpaths

Principle 12: To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the runway in the reciprocal direction. The area affected by the proposed change is not presently overflown by large numbers of arrivals or other departures. The proposal will mean that the area under the base leg of the existing GOSSI STAR, which receives considerable overflight of jet departures to the east, will have fewer overflights of arrivals.

Conclusion

Based on the analysis above, the environmental impact of the proposal is not considered to be significant.

[redacted]
Aviation Environment Specialist
Environment Brach

ARMS 175353
Environmental Assessment of the Proposed Amendment to Perth STARs Runways 21 & 24

The proposal is to amend the tracking of jet and non-jet arrivals to Runways 21 and 24. Figure 1 shows the existing STARs PINJA 5 (via KAL and PRL for Runway 24), PEPPA 4 (via WOORA and HAIGH for Runway 21 and via SPUDO for Runway 24) and TASKA 7 (via WOORA and HAIGH for Runway 21 and via WOORA and PRL for Runway 24) and the proposed STARs BEVLY(jets), JULIM (jets), GRENL (non-jets) and CONDL (non-jets).

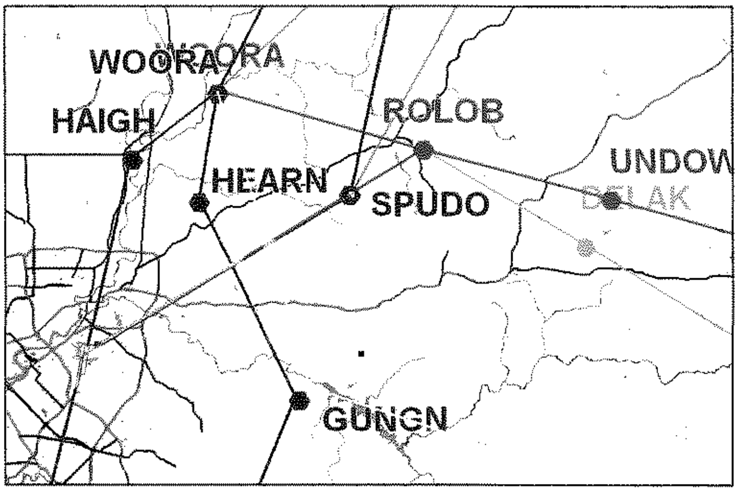


Figure 1

There are no changes to tracking within 15 nautical miles of Perth, except for the removal of the tracks WOORA to PRL and PINJA to KAL to PRL.

The fixed route structure and revised tracks will enable continuous descent arrivals ate lower power settings which will reduce fuel burn and emissions.

As a result, there is not considered to be any adverse environmental impact from this proposal.

[redacted]

Aviation Environment Specialist
Environment Brach

ARMS 175575
Environmental Assessment of the Proposed Amendment to Perth non-jet SIDs Runway 03/06

The proposal is to amend the tracking of non-jet departures from Runways 03 and 06 to the north-east, east and to the south. The new SIDs are part of a general route review aimed at providing greater separation assurance between arrival and departure routes.

Runway 21 is the preferred runway for departures at Perth, and there are more departures from Runway 21 than from Runways 03 and 06 together.

SIDs to the south

The proposed SIDs to the south (SWANN 1 and JANDO 1) introduce a left turn after take-off to eliminate the safety risk inherent in a right turn due to conflicts with arrival tracks to Runway 03. They are new procedures. Previously, departures to the south did not follow SIDs, and most aircraft turned right after take-off and headed south, while these SIDs will result in aircraft tracking to the east of the airport, and replicate an existing jet SID (KEELS 2) for the initial 12 nautical miles of their routes. Tracks over a 12 month period and the proposed SID routes are shown in Figure 1

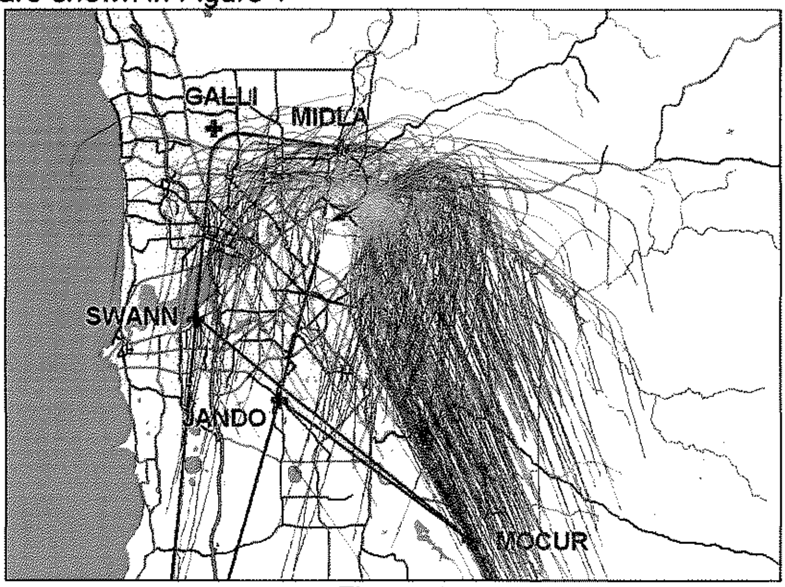


Figure 1

SIDs to the north-east

The proposed SID to the north-east (RAVON 1 shown in light blue) replaces the existing SPUDO 4 SID (dark blue), with a minor change to the initial tracking from Runway 03 as shown in Figure 2.

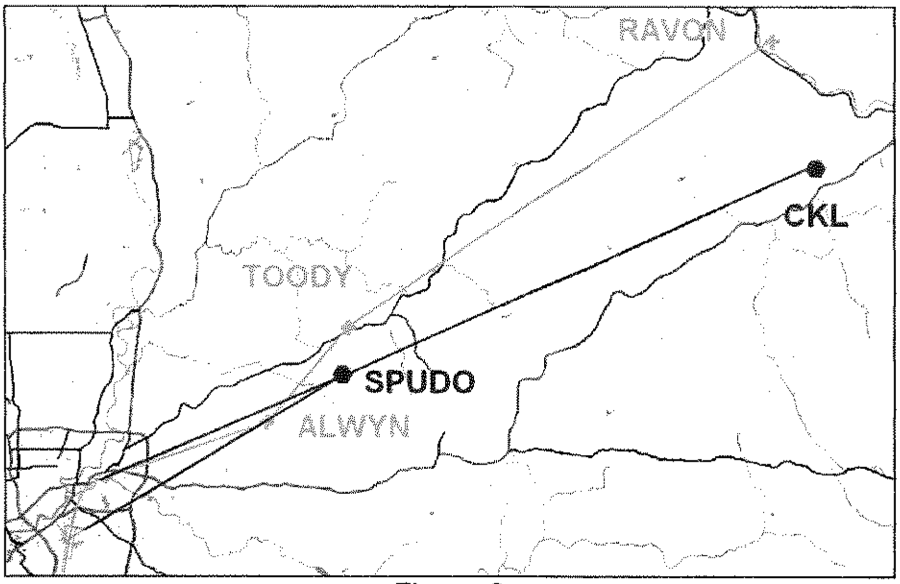


Figure 2

As Figure 3 indicates, the spread of tracks of aircraft following the SPUDO 4 SID overlaps the initial track to ALWYN in the RAVON SID.

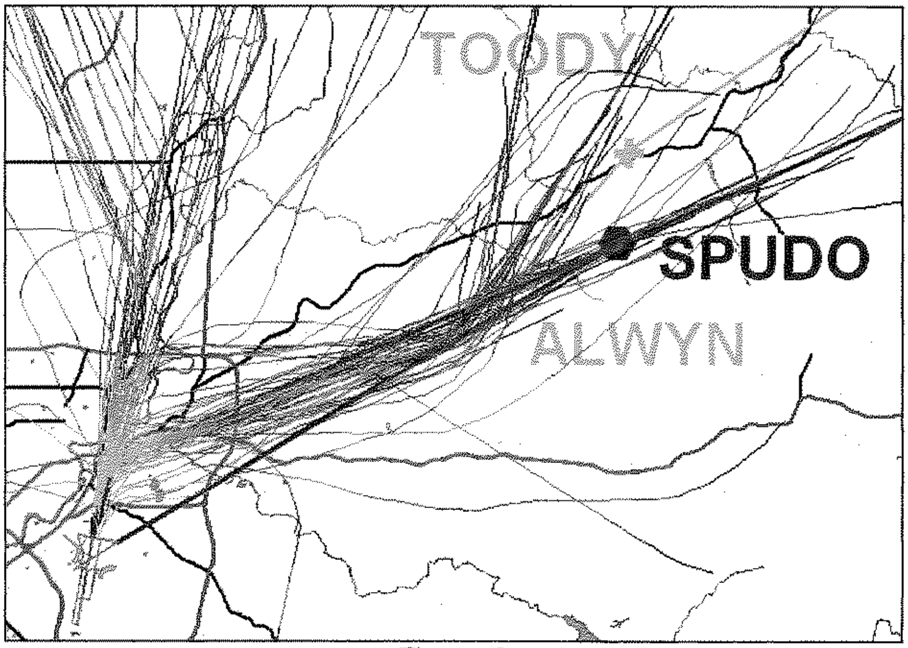


Figure 3

SIDs to the east

The proposed SID to the east (PIKIL 1 shown in light blue) replaces the existing MELBA 3 and BADJA 3 SIDs (dark blue), with a minor change to the initial tracking from Runway 03 as shown in Figure 4. As Figure 5 indicates, the majority of tracks to the east use Runway 06 in preference to Runway 03.

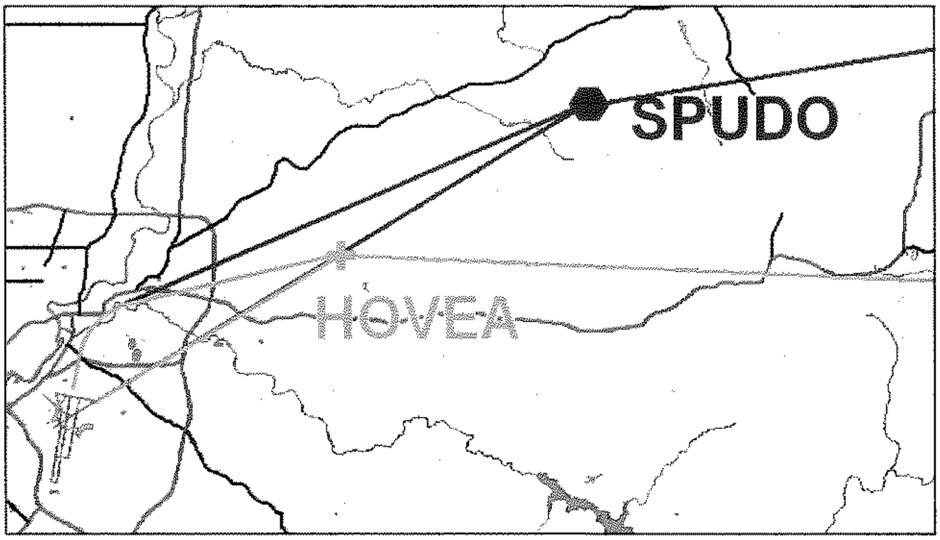


Figure 4

The spread of tracks of aircraft following the MELBA 3 and BADJA 3 SIDs overlap the initial track to HOVEA in the RAVON SID while over built up areas to the north-east of the airport. The Parkerville area is oveflown by the proposed SID and aircraft will be generally at or above 6,000 feet at this stage of their flight.

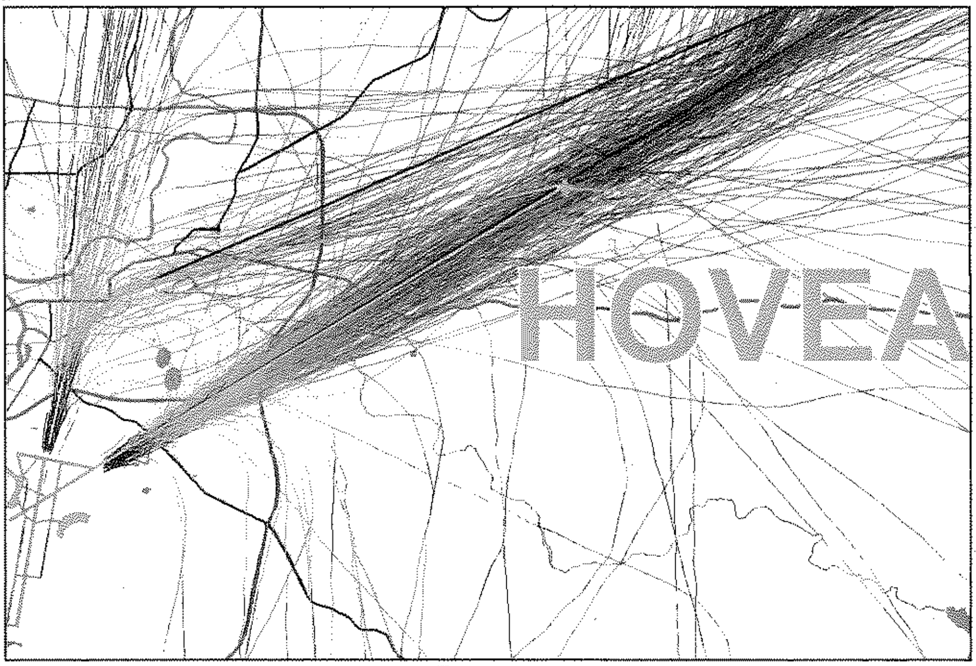


Figure 5

The changes to these SIDs have been assessed under the Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise as follows:

Total Noise Dose

Principle 1: Noise abatement procedures should be optimized to achieve the lowest possible overall impact on the community. The routes selected have aimed to replicate existing routes where possible. The SIDs to the south achieve this for the initial tracking but the track from GALLI to SWANN and then MANDU or MOCUR is new. The areas overflown are currently subject to large numbers of non-jet activity. The numbers of flights likely to use the new SID average about one per day, and the environmental impact of that number of aircraft is not significant.

The SIDs to the north-east and east do not change the existing impact on the community, as the new routes approximate the existing routes while the aircraft are at low levels of flight.

Spatial Distribution of the Noise Dose

Principle 2: Noise should be concentrated as much as possible over non-residential areas. It is not possible to devise routes which would not overfly any built up areas. The new SIDs to the south track over more built up areas than they would do if aircraft turned right and tracked east of the airport as most aircraft heading south do now, but this is not an option due to the positioning of the arrival routes.

Principle 3: Noise exposure should be fairly shared whenever possible. Areas affected by the current KEELS SID to the north and north-west of the airport will receive a small increase in activity. The impact of this will be offset by a reduction in jets using this route at night, which will result from other proposals being introduced concurrently with these proposals. As the route review is aimed at providing greater separation assurance between arrival and departure routes, there is an increased degree of noise sharing, in that areas affected by departures are less affected by arrivals to Runway 03.

Principle 4: No suburb, group or individual can demand or expect to be exempt from aircraft noise exposure. The areas most affected by the proposed changes are presently overflown by large numbers of non-jet aircraft, but not jet flight paths.

Upper and Lower Limits of Noise Exposure

Principle 5: Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 Leq $_{24}$ and there are less than 50 overflights per day. The noise is not significant based on the numbers of flights that can be expected on the routes – it is less than 50 overflights per day and less than 40 Leq $_{24}$.

Principle 6: No residential area should receive more than 60 Leq $_{24}$, i.e., no residential area should receive more noise exposure than that which is *considered "unacceptable" for residential housing under Australian Standard AS2021.* The noise is less than 60 Leq 24.

Principle 7: There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A). This principle is met.

Timing / Historical issues

Principle 8: When comparing options, operations that are conducted at night or on weekends should be treated as being more sensitive than those which occur during the daytime or on weekdays. The proposal does not offer options, as the current procedure is no longer an option due to safety considerations.

Principle 9: *Both short-term and long-term noise exposure should be taken into account in deciding between options.* Not applicable.

Principle 10: *Options which allow for a gradual change from the current to planned procedures should be given preference.* Not appropriate in this instance, as the changes are being introduced to address identified safety issues.

Principle 11: *In deciding between mutually exclusive, but otherwise equivalent options, involving (i) the overflight of an area which has previously been exposed to aircraft noise for a considerable period of time (and which a large proportion of residents would therefore have been aware of the noise before moving in); or (ii) a newly exposed area, option (i) should be chosen.* Not applicable.

Reciprocal Flightpaths

Principle 12: To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the runway in the reciprocal direction. The area affected by the proposed change is not presently overflown by large numbers of arrivals or other departures.

Conclusion

Based on the analysis above, the environmental impact of the proposal is not considered to be significant.

[redacted]

Aviation Environment Specialist
Environment Brach
23 October 2007

ARMS 176121
Environmental Assessment of the Proposed Amendment to Perth SID Runway 21 Jet

The proposal is to amend the tracking of jet departures from Runway 21 to the north, east and north-east.

Runway 21 is the preferred runway for departures at Perth, and there are more departures from Runway 21. The proposed SIDs replicates existing SIDs (BROOK 2, CLIFY 6 and NAMBU 4) for that part of the SID which is over built-up areas to the north, east and west of the airport. To the south the proposed AMANA SID extends approximate ½ to 1 n mile further south on runway heading before turning east, although the spread of aircraft following the existing SIDs meant that many of the departures turned at this point or further south.

Figure 1 shows the existing and proposed routes.

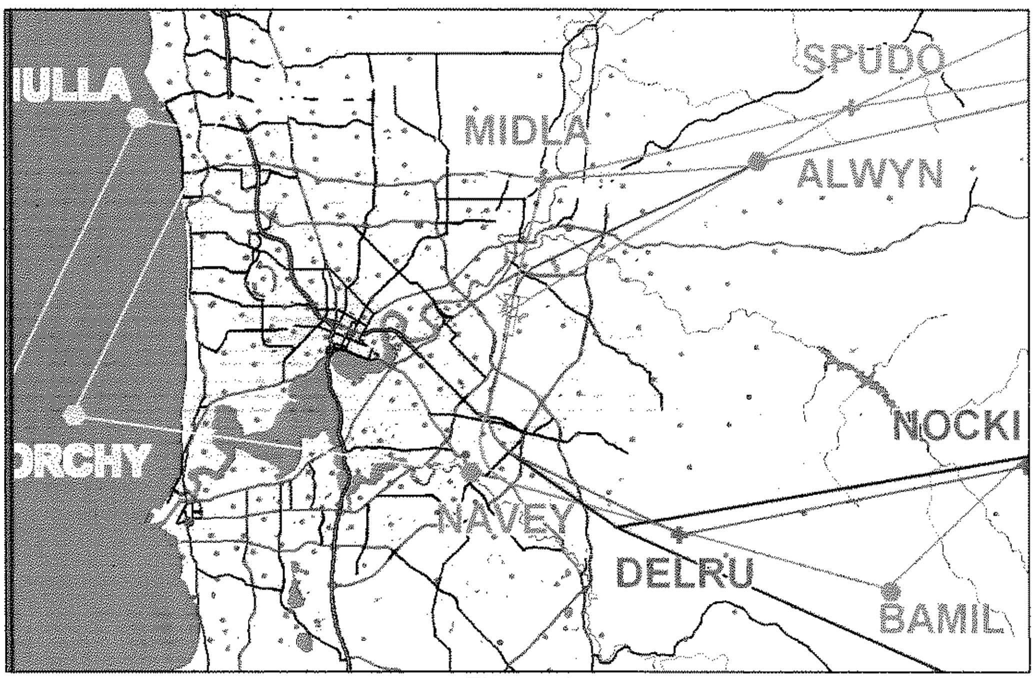


Figure 1

The changes to these SIDs have been assessed under the Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise as follows:

Total Noise Dose
Principle 1: Noise abatement procedures should be optimized to achieve the lowest possible overall impact on the community. The routes selected have aimed to replicate existing routes where possible. The area to the south which may have some impact is currently subject to large numbers

of jet activity. The numbers of flights likely to take a very different flight track as a result of the proposal is estimated to be about five per day, and the environmental impact of that number of aircraft is not significant.

The SIDs to the north do not change the existing impact on the community, as the new routes approximate the existing routes until well north of Perth.

Spatial Distribution of the Noise Dose
Principle 2: Noise should be concentrated as much as possible over non-residential areas. It is not possible to devise routes which would not overfly any built up areas. The new SIDs to the south do not change the extent to which non-residential areas are overflown.

Principle 3: Noise exposure should be fairly shared whenever possible. Not applicable.

Principle 4: No suburb, group or individual can demand or expect to be exempt from aircraft noise exposure. The area most affected by the proposed changes is on the extended runway centreline.

Upper and Lower Limits of Noise Exposure
Principle 5: Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 Leq $_{24}$ and there are less than 50 overflights per day. The proposal does not change the noise exposure of the area to a significant extent.

Principle 6: No residential area should receive more than 60 Leq $_{24}$, i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021. The noise is less than 60 Leq $_{24}$.

Principle 7: There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A). This principle is met.

Timing / Historical issues
Principle 8: When comparing options, operations that are conducted at night or on weekends should be treated as being more sensitive than those which occur during the daytime or on weekdays. The proposal does not offer options, as the current procedure is no longer an option due to safety considerations.

Principle 9: *Both short-term and long-term noise exposure should be taken into account in deciding between options.* Not applicable.

Principle 10: *Options which allow for a gradual change from the current to planned procedures should be given preference.* Not appropriate in this instance, as the changes are being introduced to address identified safety issues.

Principle 11: *In deciding between mutually exclusive, but otherwise equivalent options, involving (i) the overflight of an area which has previously been exposed to aircraft noise for a considerable period of time (and which a large proportion of residents would therefore have been aware of the noise before moving in); or (ii) a newly exposed area, option (i) should be chosen.* Not applicable.

Reciprocal Flightpaths
Principle 12: To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the runway in the reciprocal direction. This is not an option for the area on the extended runway centreline.

Conclusion

Based on the analysis above, the environmental impact of the proposal is not considered to be significant.

[redacted]
Aviation Environment Specialist
Environment Brach

ARMS 176187
Environmental Assessment of the Proposed Amendment to Perth SID Runway 21 non-jet

The proposal is to amend the tracking of non-jet departures from Runway 21 to the south, east and north-east.

Runway 21 is the preferred runway for departures at Perth, and there are more departures from Runway 21. The proposed SIDs replicate existing SIDs (ROTAP 4 and KAJUN 7) for destinations to the east and north-east. To the south the proposed CANRI and JANDO SIDs replace ad hoc tracking, as there are no existing SIDs.

Figure 1 shows the existing and proposed routes and 12 months of flight tracks to the south.

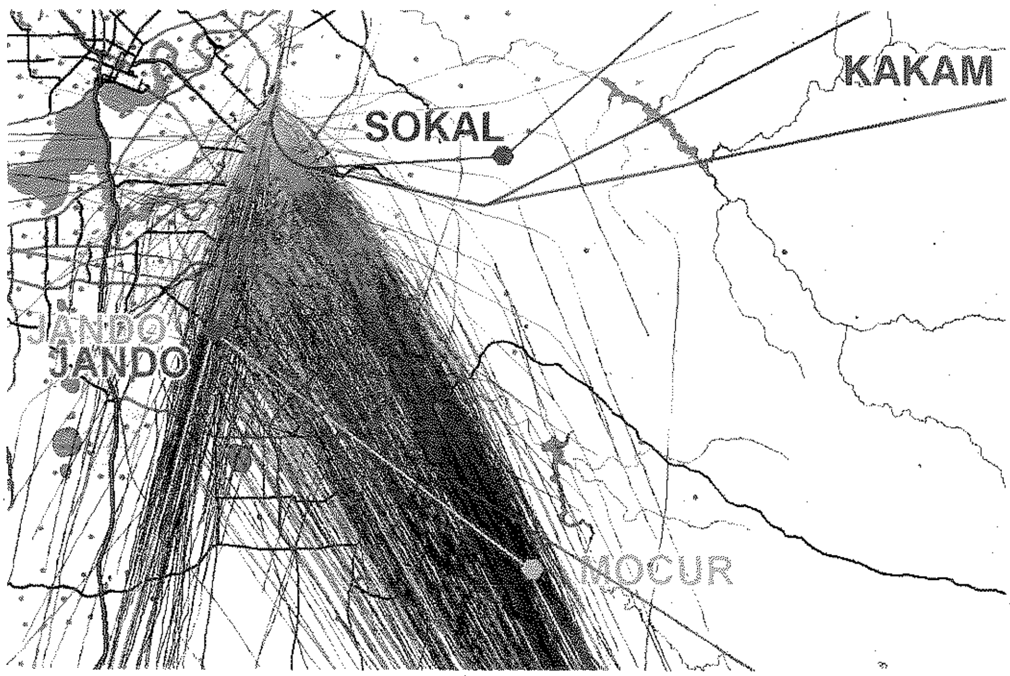


Figure 1

The changes to these SIDs have been assessed under the Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise as follows:

Total Noise Dose

Principle 1: Noise abatement procedures should be optimized to achieve the lowest possible overall impact on the community. The routes selected have aimed to replicate existing routes where possible.

The SIDs to the east and north-east do not change the existing impact on the community, as the new routes approximate the existing routes until well north of Perth. The proposed SID to the south lies within the spread of existing tracks, especially south of JANDO.

Spatial Distribution of the Noise Dose

Principle 2: Noise should be concentrated as much as possible over non-residential areas. It is not possible to devise routes which would not overfly any built up areas. The new SIDs to the south do not change the extent to which non-residential areas are overflown.

Principle 3: Noise exposure should be fairly shared whenever possible. Not applicable.

Principle 4: No suburb, group or individual can demand or expect to be exempt from aircraft noise exposure. Not applicable.

Upper and Lower Limits of Noise Exposure

Principle 5: Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 Leq $_{24}$ and there are less than 50 overflights per day. The proposal does not change the noise exposure of any area to a significant extent.

Principle 6: No residential area should receive more than 60 Leq $_{24}$, i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021. The noise is less than 60 Leq $_{24}$.

Principle 7: There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A). This principle is met.

Timing / Historical issues

Principle 8: When comparing options, operations that are conducted at night or on weekends should be treated as being more sensitive than those which occur during the daytime or on weekdays. The proposal does not offer options, as the current procedure is no longer an option due to safety considerations.

Principle 9: *Both short-term and long-term noise exposure should be taken into account in deciding between options.* Not applicable.

Principle 10: *Options which allow for a gradual change from the current to planned procedures should be given preference.* Not appropriate in this instance, as the changes are being introduced to address identified safety issues.

Principle 11: *In deciding between mutually exclusive, but otherwise equivalent options, involving (i) the overflight of an area which has previously been exposed to aircraft noise for a considerable period of time (and which a large proportion of residents would therefore have been aware of the noise before moving in); or (ii) a newly exposed area, option (i) should be chosen.* Not applicable.

Reciprocal Flightpaths
Principle 12: To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the runway in the reciprocal direction. This is not an option for the area on the extended runway centreline.

Conclusion

Based on the analysis above, the environmental impact of the proposal is not considered to be significant.

[redacted]
Aviation Environment Specialist
Environment Brach

ARMS 175693
Environmental Assessment of the Proposed Amendment to Perth SID East/AMANA SID Runway 03/06

The proposal is to amend the tracking of jet departures from Runways 03 and 06 to the east and north-east.

Runway 21 is the preferred runway for departures at Perth, and there are more departures from Runway 21. The proposed SIDs replicates existing SIDs (BINDI 8 and BIU 5) for that part of the SID which is over built-up areas to the north-east of the airport.

The proposed SIDs differ from the existing SIDs in that when tracking from MIDLA to ALWYN aircraft overfly Stratton, whereas the track from MIDLA direct to SPUDO meant aircraft were approximately 0.5 nautical miles north of Stratton. Jets are between 3,000 and 5,000 feet on climb when over or abeam Stratton.

The changes to this SID have been assessed under the Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise as follows:

Total Noise Dose
Principle 1: Noise abatement procedures should be optimized to achieve the lowest possible overall impact on the community.

Spatial Distribution of the Noise Dose
Principle 2: Noise should be concentrated as much as possible over non-residential areas..

Principle 3: Noise exposure should be fairly shared whenever possible. .

Principle 4: No suburb, group or individual can demand or expect to be exempt from aircraft noise exposure. .

Upper and Lower Limits of Noise Exposure
Principle 5: Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 Leq_{24} and there are less than 50 overflights per day. .

Principle 6: No residential area should receive more than 60 Leq_{24}, i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021. The.

Principle 7: There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A). .

Timing / Historical issues
Principle 8: When comparing options, operations that are conducted at night or on weekends should be treated as being more sensitive than those which occur during the daytime or on weekdays. .

Principle 9: *Both short-term and long-term noise exposure should be taken into account in deciding between options.* .

Principle 10: *Options which allow for a gradual change from the current to planned procedures should be given preference.* .

Principle 11: *In deciding between mutually exclusive, but otherwise equivalent options, involving (i) the overflight of an area which has previously been exposed to aircraft noise for a considerable period of time (and which a large proportion of residents would therefore have been aware of the noise before moving in); or (ii) a newly exposed area, option (i) should be chosen.* .

Reciprocal Flightpaths
Principle 12: To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the runway in the reciprocal direction. .

Conclusion

Based on the analysis above, the environmental impact of the proposal is not considered to be significant.

[redacted]
Aviation Environment Specialist
Environment Brach

AIRSERVICES AUSTRALIA

Environmental
Post Implementation Review
of
Changes associated with the Western Australian Route Review Project (WARRP)

May 2010

	NAME	POSITION	SIGNATURE	DATE
Approved By:	Stephen Angus	General Manager Safety & Environment		20 May 2010
Reviewed By:	Paula McMahon	Manager Environment & Climate Change	P McMahon	20 May 2010
Prepared by:	Ken Owen	Environment Initiatives & Services Manager Environment & Climate Change	K. Owen	20 May 2010

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Airservices Australia

Head Office 25 Constitution Avenue
Canberra City ACT 2601
Australia

GPO Box 367
Canberra ACT 2601

Phone 02 6268 4111
Fax 02 6268 5683

Contents

Executive Summary

The Western Australian Route Review Project (WARRP) was established to implement changes identified by the Airservices Australia Breakdown of Separation (BoS) Review Team and to reduce complexity and increase operational safety and efficiency. This resulted in the implementation of a number of changes to departure and arrival routes in the Perth Terminal Area in November 2008. The outcome of these changes has been some new areas being regularly overflown by aircraft.

Consultation was undertaken by Airservices with stakeholders including individual airport consultative committee members between August 2006 and February 2007. Information regarding the proposal was also available on Airservices Australia's web site.

Environmental assessments of the proposed changes were completed in October 2007 with the finding that the changes were not likely to result in a significant impact.

The WARRP proposals were implemented on 20 November 2008. There has been an increase in the number of aircraft noise complaints from Perth since February 2009 which has been attributed to WARRP related flight path changes by the complainants, local politicians and local media.

An environmental Post Implementation Review (PIR) has been conducted. The purpose of the PIR was to determine if the changes have been implemented as proposed and if the environmental outcomes are as expected. In addition the PIR reviews any other environmental outcomes that have arisen.

The environmental PIR found the implementation of WARRP has resulted in the following:

- The proposed changes have generally been implemented as proposed and the environmental outcomes have been as expected.
- There have been some unexpected environmental outcomes, such as the greater than expected increase in departures over Beechboro, which have resulted in an increase in the number of noise complaints from residents around Perth airport and beyond.

The outcomes of the detailed review of areas of key concern based on community response are:

Perth Standard Instrument Departure (SID) West Runway 03 procedure

While the noise from individual aircraft overflights has not changed due to any changes in aircraft types or differences in altitudes, particularly jets, the PIR has shown that there has been a greater than expected increase in the number of flights on this departure track. This is likely to be due to the continued growth in air traffic at Perth Airport and decreased availability of access to the Pearce military areas due to increase military flying, particularly at night. Further work is being undertaken to formalise the existing practice of tracking departures via R155/156 (Pearce military areas) outside the hours of activation, particularly for heavy International departures during the noise sensitive night period. This was a recommendation in the original environmental assessment and is expected to mitigate the noise impact and provide respite to residents in areas such as Beechboro, Malaga and Ballajura.

Perth SID East/AMANA SID Runways 03/06

The PIR has determined that there has been an increase in jet traffic over the Stoneville area and jet and turboprop traffic over the Chidlow area following the implementation of this departure procedure. The departures over the Stoneville area have been confined to a narrow flight path with some aircraft at altitudes which could result in noise from aircraft exceeding a single event maximum sound level of 70 decibels (dB(A)) on the ground.

The departures in the vicinity of Chidlow have also increased however these flights have a much broader lateral spread and are at altitudes such that noise levels are likely to be below 70 dB(A) at ground level.

Perth Standard Arrival Routes (STARs) from the North Runways 03 & 06

The PIR has determined that there has been an increase in jet traffic over the Glen Forrest and other areas on this arrival route, much of which did not have arrival traffic before the implementation of the WARRP changes. Some jet aircraft may be at 3,200 feet (960m) AGL which may expose the community to noise levels above 70 dB(A), however in most cases noise levels are expected to be below this. However the altitude range of turboprops was such that even allowing for the elevation of Glen Forrest means they were all above 3,000 feet AGL which is the height at which turboprop aircraft noise is less than 70 dB(A). While there is a relatively large number of aircraft contained within a narrow flight path, most aircraft on the route will have a noise level of below 70 dB(A) therefore a significant impact is not expected.

Perth STARs Runways 21 & 24

The PIR has determined that there has been an increase in jet and turboprop traffic over the Stoneville and Chidlow areas following the implementation of this arrival procedure.

This review found that aircraft noise levels from some jet arrivals over the Stoneville area are likely to exceed 70 dB(A), however the numbers analysed for the busy day are not likely to result in a significant impact. While some of the arrivals over Chidlow may exceed this noise level, most of the arrival traffic is on the BEVLY STAR to the north of most of the residential areas of Chidlow and likely to have less impact.

There are a number of flights over the main part of Childow as aircraft fly from a distant waypoint direct to SPUDO waypoint for traffic sequencing. However this is not new and existed prior to the implementation of the WARRP changes. The increase in traffic on this arrival route has also been influenced by the growth in traffic at Perth Airport and is not totally attributable to the changes implemented in November 2008.

As a result of the PIR the following recommendations are made:

- Perth ATC should:
    - continue the work to implement departure tracks though the Pearce military areas as much as possible when they are deactivated and available for civil aircraft operations. The use of such departure tracks, particularly for heavy International aircraft departing for destinations to the Middle East, South Africa and Mauritius during the more noise sensitive night and early morning periods should provide respite to areas north-west of the airport such as Beechboro, Malaga and Ballajura.

- investigate practicable options to track aircraft further north of areas such as Beechboro, Malaga and Ballajura to further mitigate the effects of aircraft noise on these communities at other times of the day.
- investigate available options to keep arriving aircraft as high as possible over areas such as Chidlow, Stoneville and Glen Forrest with the aim of keeping jet aircraft above 5,000 feet (1,500m) AGL and turboprop aircraft above 3,000 feet (750) AGL for as long as practicable. This would ensure maximum noise levels do not exceed 70 dB(A), particularly during the more noise sensitive night period. (Night should be considered to be from 7pm to 7am which is consistent with Australian Standard AS2021 and used in the development of Australian Noise Exposure Forecasts (ANEF).
- investigate the formal adoption of Continuous Descent Operations for arriving jet aircraft, particularly during the more sensitive night period, to further mitigate the noise exposure on communities underlying the arrival routes.
- investigate practicable options to reduce the concentration and raise the altitude of jet departures on the Perth SID East/AMANA SID Runways 03/06 to mitigate the noise exposure to the underlying community.
- revise DAP NAP 2 Preferred Flight Paths to remove reference to the use of a track from 30nautical miles east direct to Parkerville in order to be consistent with the change implemented in early 2010. This would mitigate noise on communities in the Stoneville area and to the south of the Chidlow area.

- Environment & Climate Change:
  - should consider additional temporary noise monitoring in the Glen Forrest and Stoneville areas to quantify the noise exposure experienced by these communities in order to assist the development of further potential mitigation measures.

Environmental Post Implementation Review of Changes associated with the Western Australian Route Review Project (WARRP)

Background

The Western Australian Route Review Project (WARRP) was established to implement changes identified by the Airservices Australia Breakdown of Separation (BoS) Review Team and to reduce complexity and increase operational safety and efficiency. This saw the implementation of a number of changes to departure and arrival routes in the Perth Terminal Area in November 2008. These changes have resulted in some new areas being overflown by aircraft.

Consultation was undertaken by Airservices with stakeholders including individual airport consultative committee members between August 2006 and February 2007. Information regarding the proposal was also available on Airservices web site.

The proposed changes were recorded in Airservices environmental risk management database (ARMS) as nine individual changes that were subject to environmental assessment prior to implementation. The environmental assessments of the proposed changes were completed in October 2007 with the finding that the changes were not likely to result in a significant impact.

The WARRP proposals were implemented on 20 November 2008. Since February 2009 there has been an increase in the number of aircraft noise complaints from Perth which has been attributed to WARRP related flight path changes by the complainants, local politicians and local media.

The Post Implementation Report (PIR) was prepared in 2010 to allow for a full twelve months of operational data following implementation of the changes, including seasonal variations.

Methodology

The PIR used Airservices Australia's Noise and Flight Path Monitoring System (NFPMS) to provide aircraft flight tracks and movement data for the calendar year 2009. The period was chosen as it provided a full twelve months of data to allow for variations to flight paths and runway use caused by seasonal variations.

These flight track data were used to determine if aircraft are following the new procedures and were compared with the flight paths of aircraft movements prior to the introduction of the new procedures in November 2008. The analysis included the lateral and vertical spread of aircraft using the new procedures.

The PIR also includes an analysis of Perth aircraft noise complaints data obtained from the Noise Enquiry Unit (NEU).

Where noise data was not available, recognised aircraft noise modelling techniques were also used to quantify the noise impacts from the WARRP changes on selected locations.

The PIR addresses each of the WARRP related changes that have resulted in large number of complaints in terms of the location of flights paths, numbers and times of aircraft operations and the level of complaint following implementation. Procedures associated with increased noise complaints have been subjected to aircraft noise analysis where appropriate.

The PIR used 12 months of data from January to December 2009 to enable seasonal variations in operations at Perth Airport to be taken into account. Data from 2008 was also used to allow a comparison with pre WARPP operations to be made. In general aircraft movements in January 2009 were used for the post WARRP flight paths while those for

January 2008 were used for the pre WARRP comparison. However it is important to note that runway use in Perth is seasonal therefore specific days in 2009 showing high use of particular runways were also used. Generally, the days selected were 21 January 2009, which showed the highest numbers of movements on Runways 21 and 24, and 5 August 2009, which showed the highest number of movements on Runway 03 and 06. Some data from July 2008 and July 2009 were also used to ensure that an appropriate sample of aircraft movements was considered taking into account the seasonal nature of runway use at Perth Airport.

The NFPMS captures aircraft movements up to 10,000 feet (3,000m) AMSL therefore in calculating the number of flights over a particular area for this review there may have been flights above 10,000 feet (3,000m) that have not been identified. However aircraft above this altitude are not likely to result in single event maximum noise levels above 70 dB(A) at ground level, with most resulting in a noise level of less than 60 dB(A), and hence should not cause a significant noise impact on underlying communities.

This review also used Airservices' *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise* to determine the likely effect on communities overflown by aircraft as a result of the implementation of WARRP. This document sets out a number of criteria that are used in determining whether the impacts of aircraft operations are likely to have a significant environmental impact or not. These criteria include:

- Single event maximum noise levels from aircraft overflights should not exceed 70 dB(A)
- A 24 hour noise exposure of less than 40 Leq per day and there are less than 50 overflights per day
- Where overflight of residential areas is unavoidable, procedures should ensure jet aircraft are above 5,000 feet (1,500m) as far as practicable and turboprops are above 3,000 feet (750m)

A copy of *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise* is included in Attachment B.

Review of WARRP related changes

There were a number of individual changes to procedures that were related to WARRP. The details of the changes are summarised in Table 1.

Table 1 Summary of WARRP Environmental Assessments

Procedure	Summary of change	Environmental implications	Assessment outcome	ARMS reference
Perth Standard Instrument Departure (SID) West Runway 03	The proposal amended the tracking of jet departures from runway 03 to the north-west. This track is used when transit through military airspace to the north of Perth Airport is not available	Proposal identified a potential increase of 26 aircraft per week on the track over the previous average of less than 3 aircraft per week. While most flights were expected to occur during less sensitive day time hours, a number of heavy	The environmental assessment recommended continued use of military airspace when available, particularly for night time flights to destinations to the north-west, to minimise the potential impact of the change. The development of an	173660

		departures to South Africa and Mauritius were identified using the route during more sensitive night time hours.	option to track aircraft further north of the Beechboro, Malaga and Ballajura areas and formalisation of the use of military airspace outside RAAF hours of activation were recommended to further mitigate any environmental impact. No significant impact expected.	
Perth Standard Arrival Routes (STARs) from the East Runways 03 & 06	The proposal amended the tracking of jet and non-jet visual arrivals to runways 03 & 06 from the East. The change would move aircraft on the base leg further south.	Arriving aircraft already over flew the area affected by the changed which was already exposed to noise from arrivals and departures at Perth Airport as well as other overflights	Some areas were expected to receive less overflights while others would experience an increase. Areas exposed to an increase would however experience a reduction in departure flights due to other WARRP related changes. No significant impact expected.	174341
Perth STARs from the North Runways 03 & 06	The proposal amended the tracking of jet and non-jet arrivals to runways 03 & 06. All arrivals from the north would track to the east of Perth. Prior to the change more than half of these aircraft arrived from the west while others approached from the east.	Arriving aircraft from the north would overfly areas that had not previously experienced these arrivals. However the areas would be exposed to less departure overflights as a result of the WARRP changes.	Areas to the west of Perth would experience a reduction in overflights. The areas to the east newly overflown would also experience a reduction in departures. Therefore no significant impact was expected.	175081
Perth STARs Runways 21 & 24	The proposal amended the tracking of jet and non-jet arrivals to runways 21 & 24.	The proposal involved no changes within 15 nautical miles (28km) of Perth Airport other than the removal of two track segments associated with waypoint PRL.	As a result of the minimal changes close to Perth Airport and the facilitation of continues descent approaches, resulting in less noise and emissions, no significant impact was expected.	175353
Perth Non-Jet SIDs Runways	The proposal amended the tracking of non-jet	The proposal replicated the existing routes to	The areas overflown by the SID to the south would experience an	175575

03 and 06	departures from runways 03 & 06 for destinations to the north-east, east and south.	the maximum extent practicable. With the exception of a minor change for Runway 03 departures close to the airport, the routes to the north-east and east were expected to be within the existing spread of aircraft tracks. The new SID to the south would track all departures to the west of the airport where previously most tracked to the east. However the increase in non-jet departures was expected to be low (an average of less than one per day.) The areas to the west of the airport would also receive a decrease in the number of jet arrivals due to other WARRP related changes.	average of less than one overflight per day while no change to the routes to the north-east and east were expected while aircraft were at low altitude. Therefore no significant impact was expected.	
Perth SID East/AMANA SID Runways 03/06	The proposal amended the tracking of jet departures from runways 03 & 06 for destinations to the east & north-east.	The proposal replicated the existing routes to the maximum extent practicable, particularly over built up areas to the north-east of the airport. However the changes were likely to move the track 0.5 nautical miles (925m) to the south over Stratton.	Aircraft in the vicinity of Stratton would be between 3000 and 5000 feet above ground level and climbing. Therefore noise levels were not considered to be significant.	175693
Perth Jet SID Runway 21	The proposal amended the tracking of jet departures from runway 21 for destinations to the north, east & north-east.	The proposal replicated the existing routes to the maximum extent practicable, particularly over built up areas to the north, east & west of the airport. To the	No changes in over flights were expected over built up areas therefore no significant impact was expected.	176121

		south the proposed AMANA SID extends 0.5 to 1 nautical mile (925 – 1852m) further south on Runway heading, however this change was still within the existing lateral spread of aircraft with may departures actually extending further south.		
Perth Non-Jet SID Runway 21	The proposal amended the tracking of non-jet departures from runway 21 for destinations to the south, east & north-east.	The proposal replicated the existing routes to the maximum extent practicable. The SIDs to the east & north-east do not change existing routes until well north of Perth. To the south the proposed SID replaced the existing ad hoc tracking and was not expected to change the extent to which residential areas were overflown.	No changes in over flights were expected over built up areas therefore no significant impact was expected.	176187

The results of these assessments indicated that while there would be some new areas overflown and some increased use of existing arrival and departure procedures, particularly associated with Perth SID West Runway 03 (173660) and Perth STARs from North Runways 03 & 06 (174241), no significant environmental impacts were expected due to:

- The numbers of aircraft involved expected to be less than the number required to result in a significant noise impact as referred to in the *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise*;
- The altitude at which aircraft would overfly the new communities (generally above 5000ft above ground level (AGL), which is an altitude above which noise from jet aircraft should pose minimal disturbance to underlying communities; and
- The community consultation that had occurred with the airport community consultative committee, through which Airservices has traditionally managed community consultation for these types of projects, and the public availability of information on the proposed changes on Airservices website.

Flight tracks

The Perth Airport aircraft flight tracks for January 2008 prior to the implementation of the WARRP changes are shown in Figures 1 - 6. The flight tracks for January 2009 which have resulted from the implementation of the changes are shown in Figures 7 – 12.

The flight track figures for both periods show departures for jet aircraft such as the Boeing and Airbus passenger jets used by major airlines, Fokker 100 aircraft used for mining flights and small corporate jets; turboprop aircraft such as Fokker 50, Dash 8, Cessna 441 aircraft; and piston engine aircraft such as twin engine Cessna and Piper aircraft as well as smaller single engine general aviation aircraft. The aircraft flight track diagrams show that the changes relate primarily to the jet and turboprop aircraft with no notable changes to the smaller numbers of piston engine aircraft operating at Perth Airport. Therefore this review focused on the jet and turboprop flight path changes and the smaller piston engine operations were not considered further.

Copies of the current approach and departure procedures at Perth Airport are included in Attachment C.

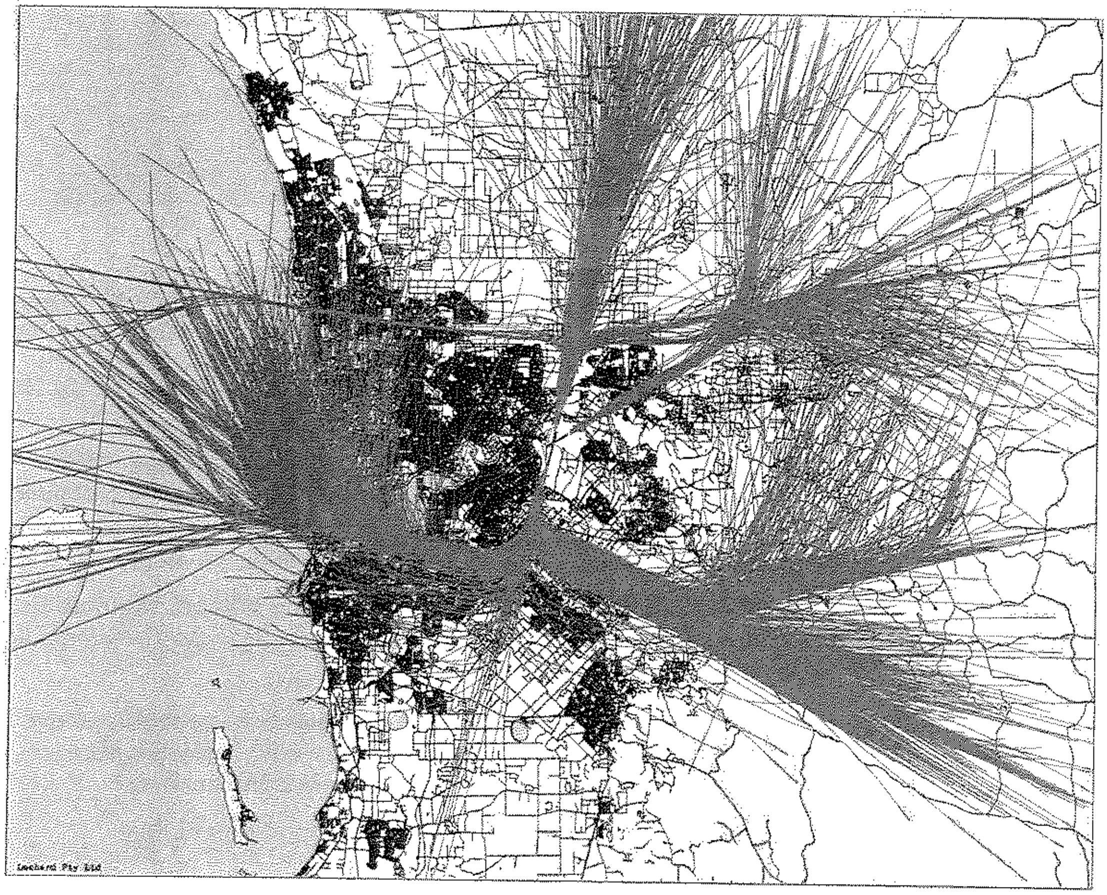

Figure 1 Jet aircraft departures for January 2008

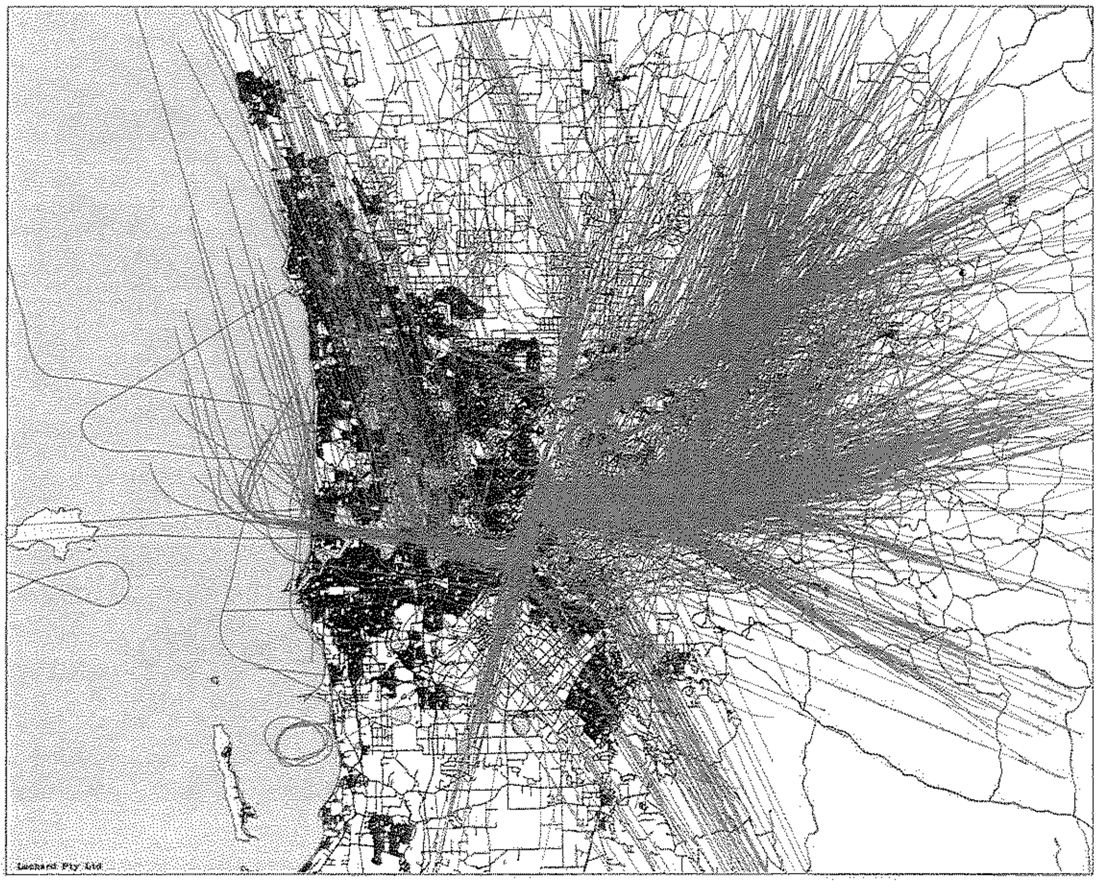

Figure 2 Turboprop aircraft departures for January 2008

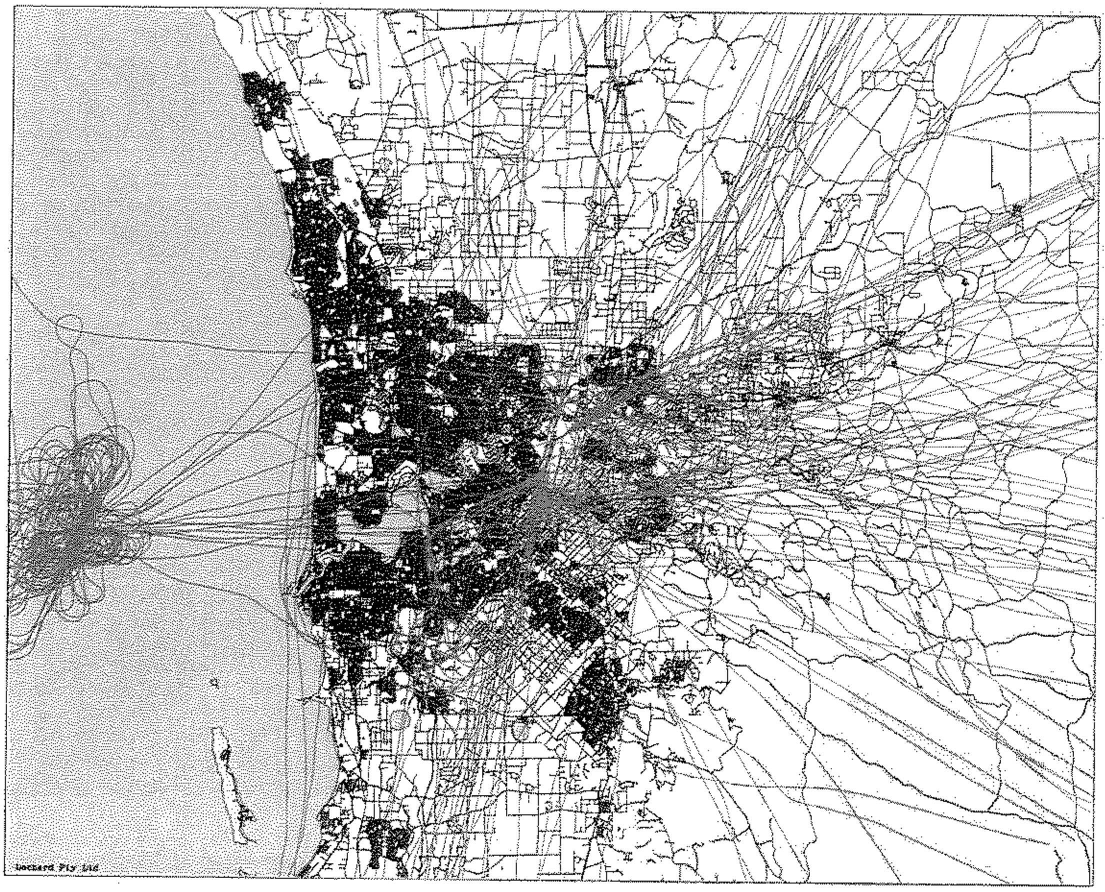

Figure 3 Piston engine aircraft departures for January 2008

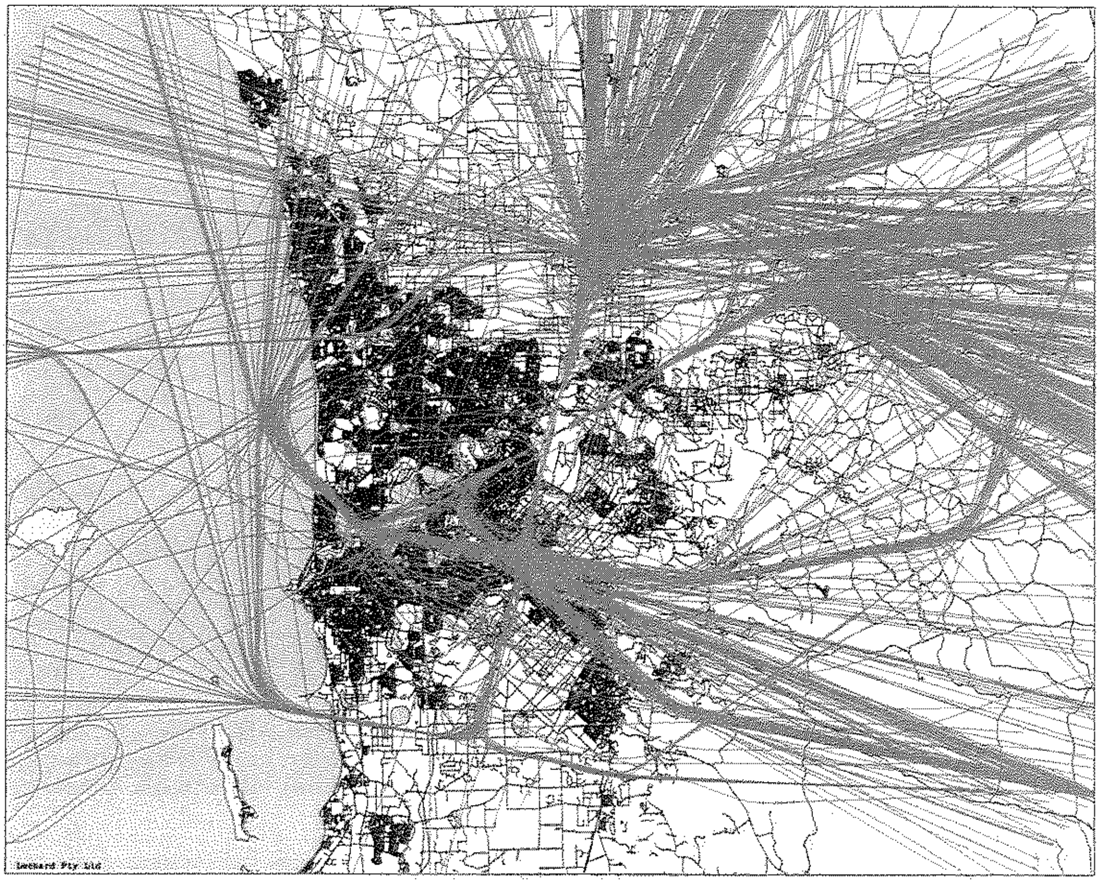

Figure 4 Jet aircraft arrivals for January 2008

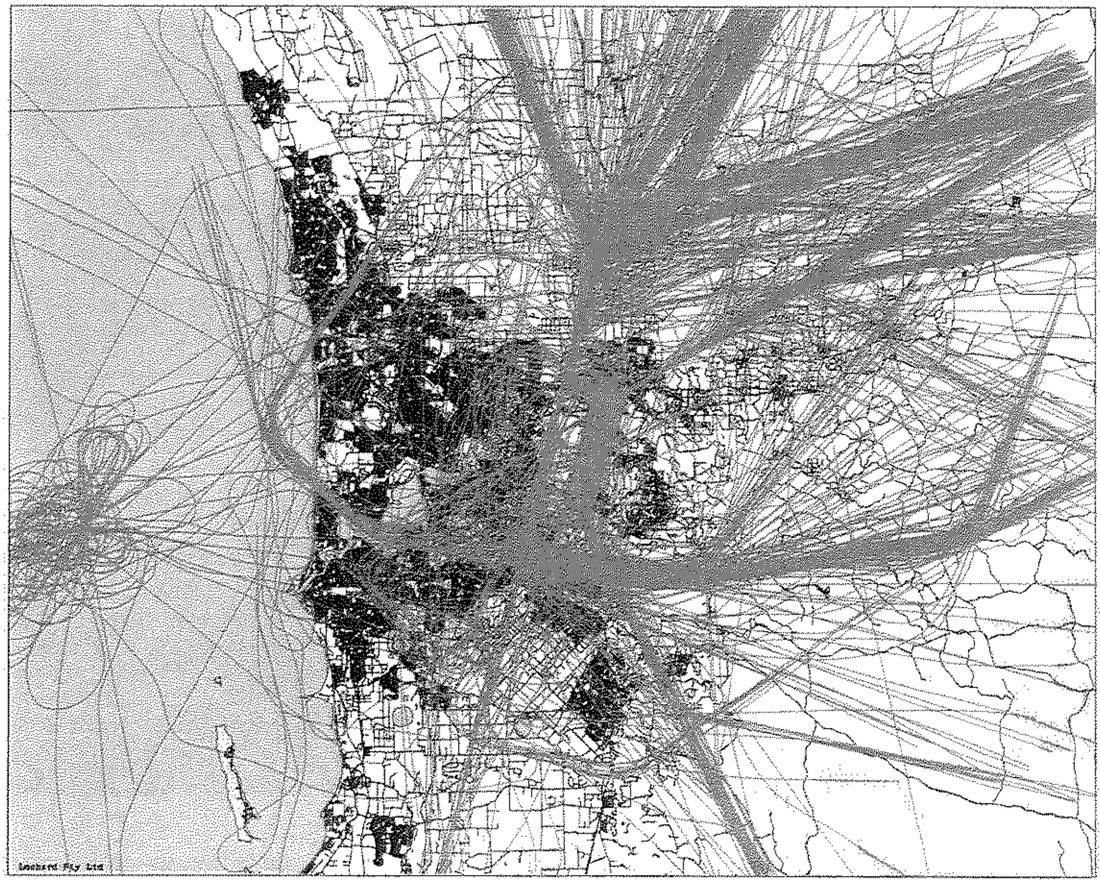

Figure 5 Turboprop aircraft arrivals for January 2008

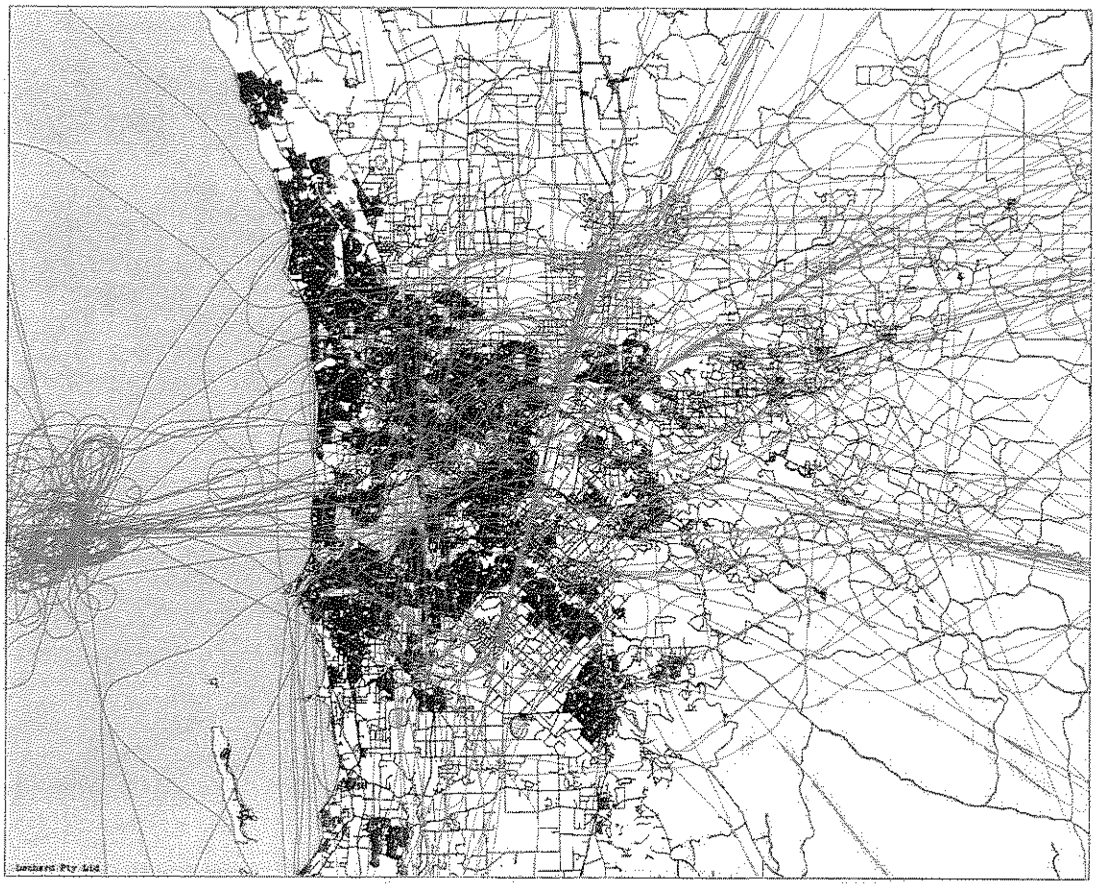

Figure 6 Piston engine aircraft arrivals for January 2008

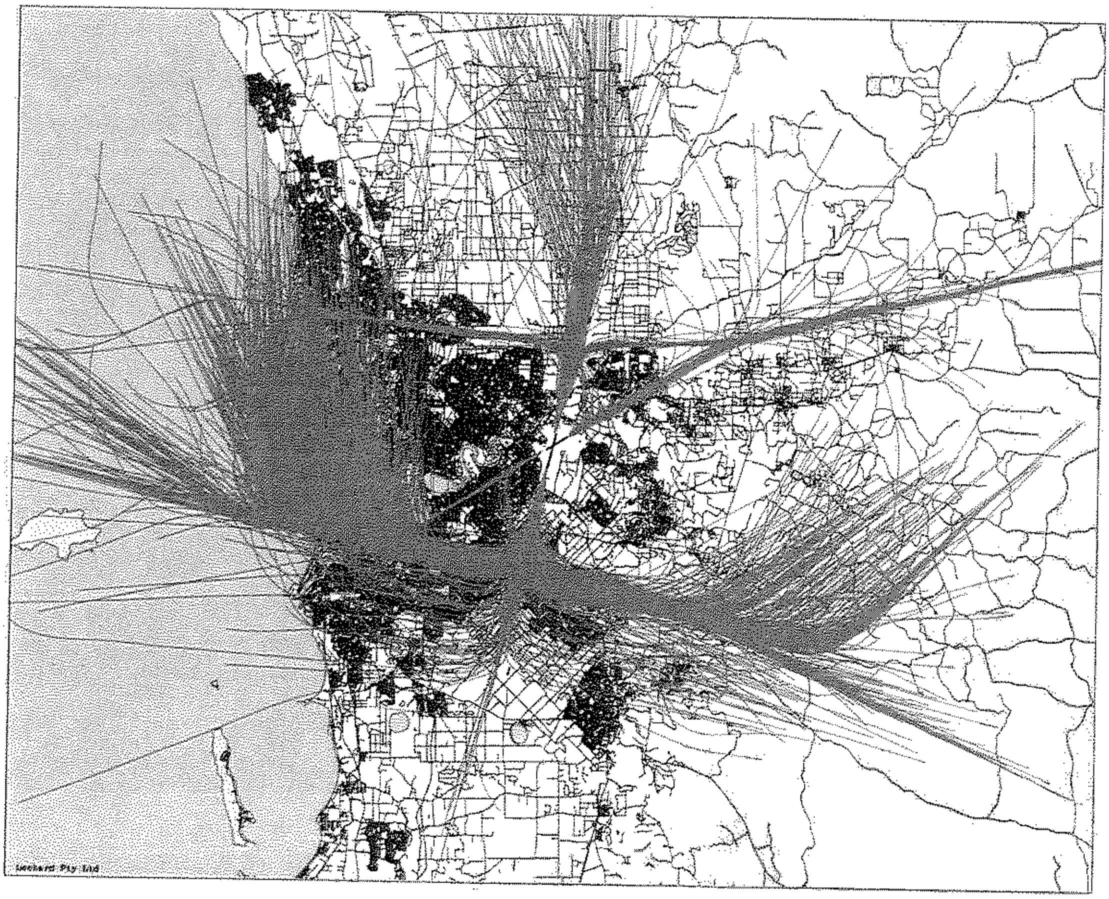

Figure 7 Jet aircraft departures for January 2009

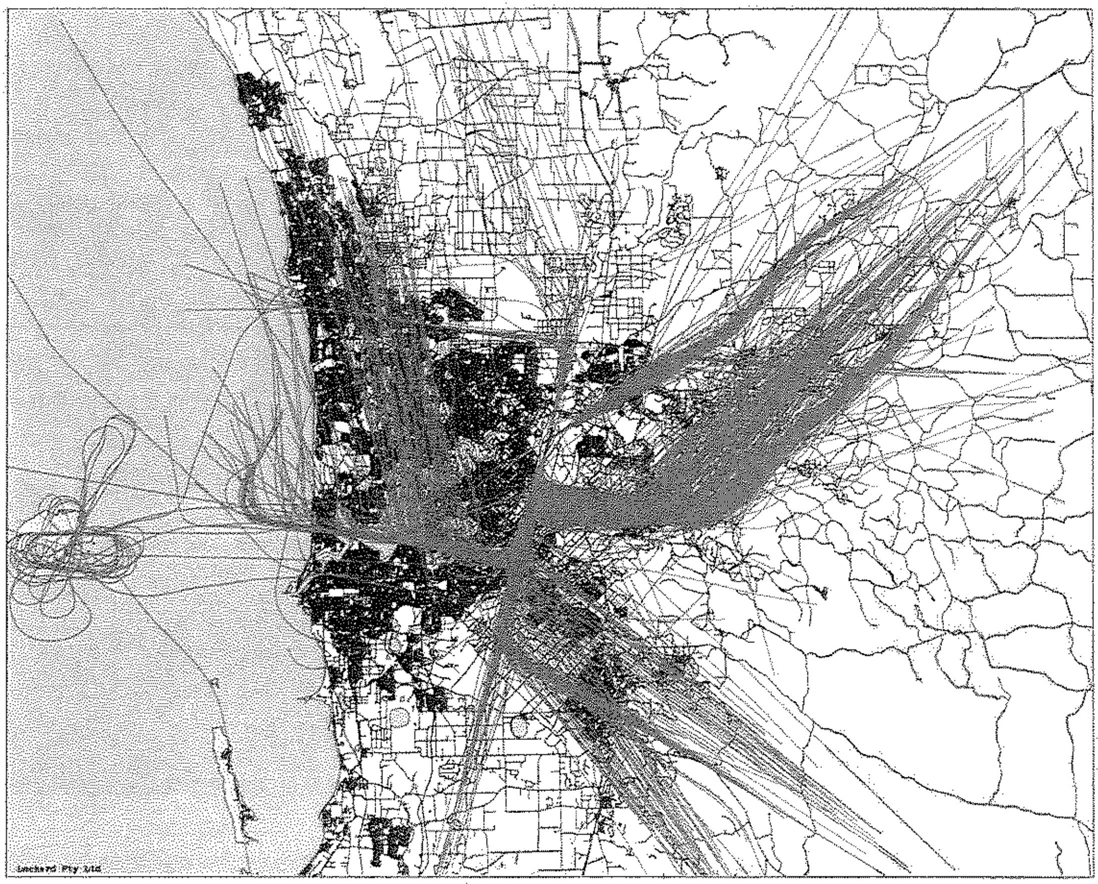

Figure 8 Turboprop aircraft departures for January 2009

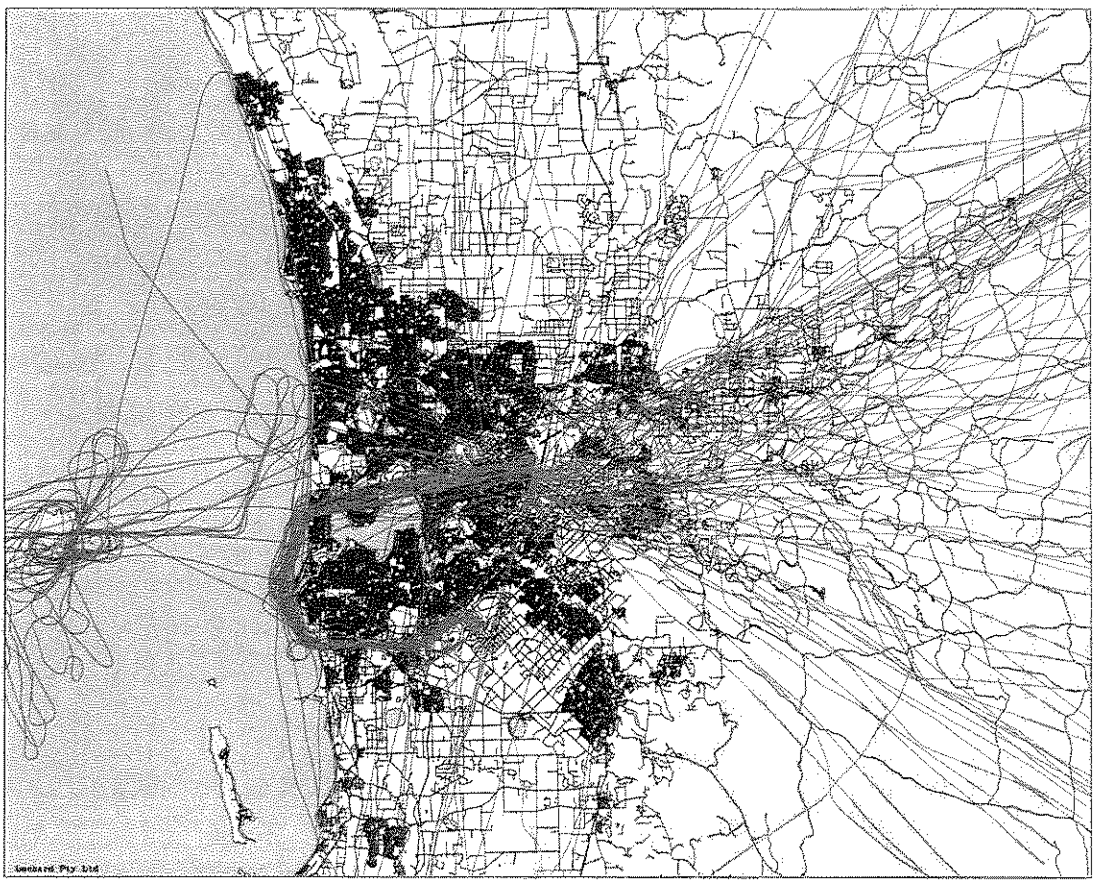

Figure 9 Piston engine aircraft departures for January 2009

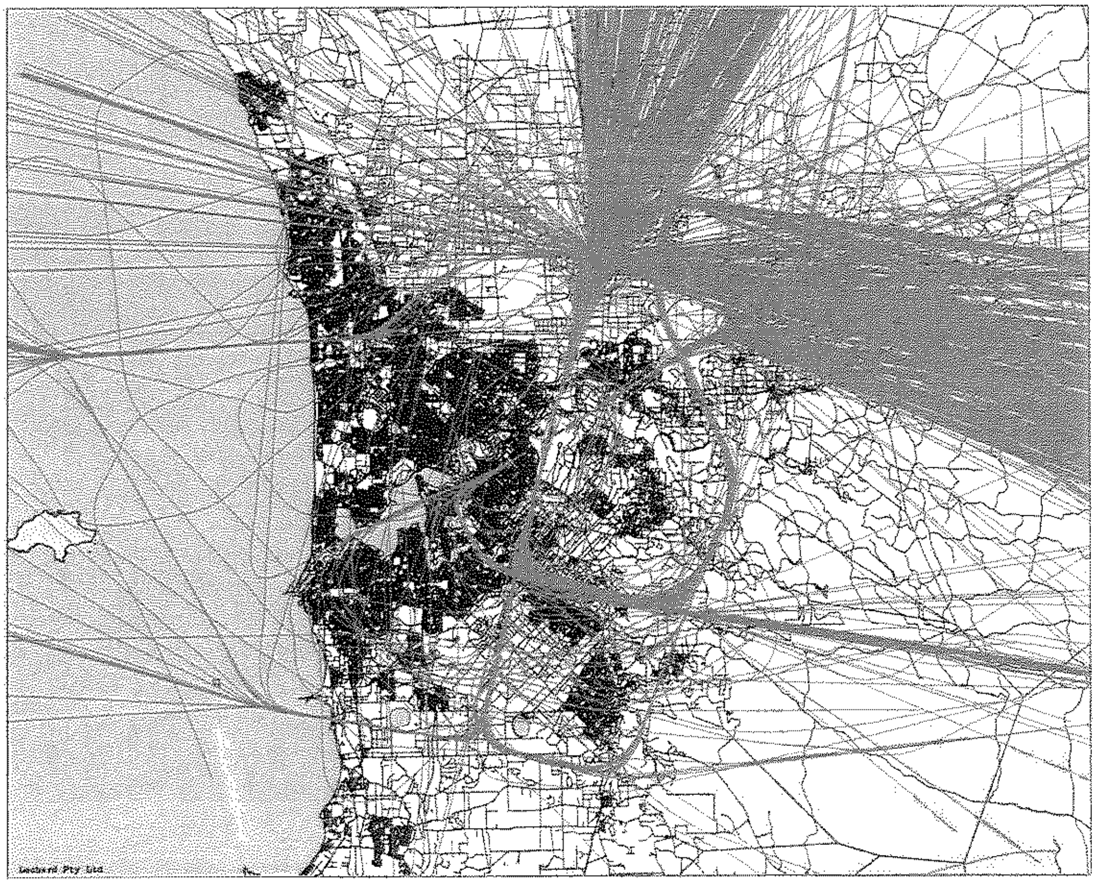

Figure 10 Jet aircraft arrivals for January 2009

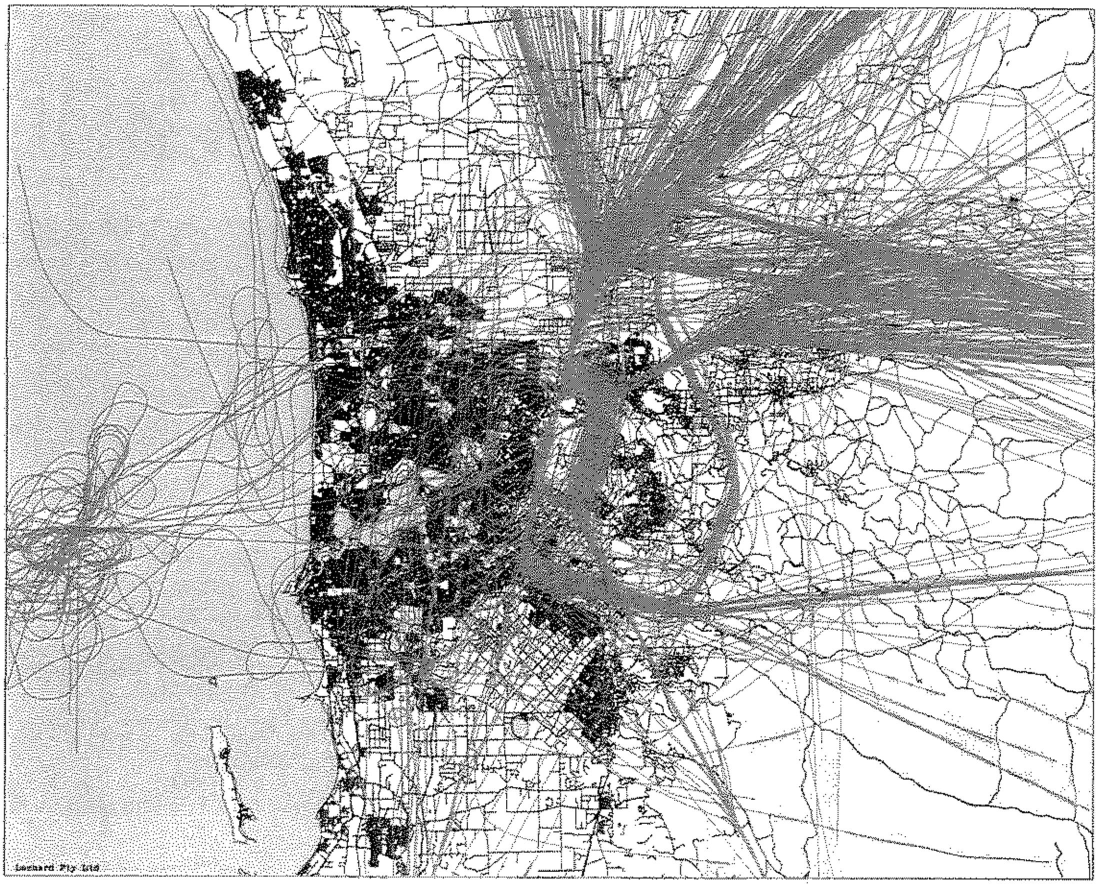

Figure 11 Turboprop aircraft arrivals for January 2009

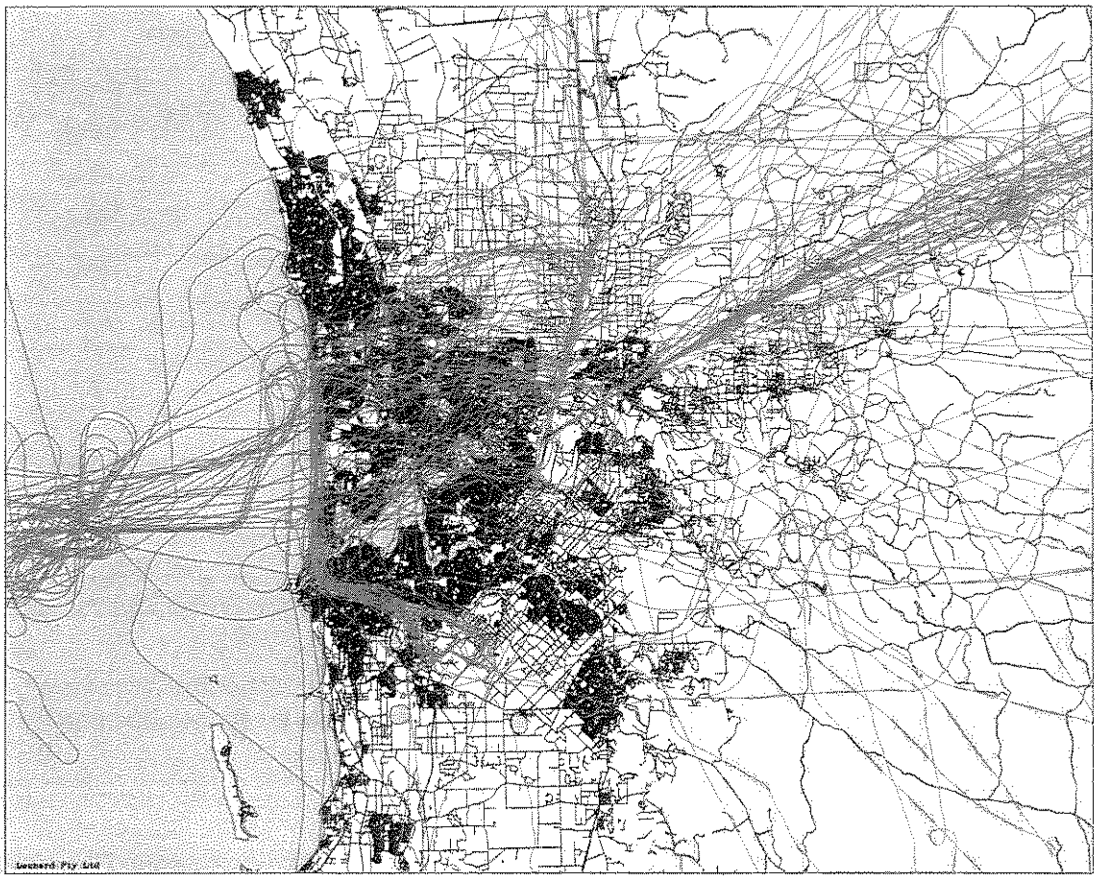

Figure 12 Piston engine aircraft arrivals for January 2009

Aircraft movement numbers

There has been considerable growth in air traffic at Perth in recent years, particular in support of the mining industry, which was a key factor behind WARRP. In 2009 Perth Airport's domestic passenger numbers reached levels not forecast until 2015. This increase of traffic on the departure and arrival routes at Perth has also resulted in increased noise on communities around the airport.

Another key factor has been the change in the type of aircraft operating at Perth Airport. Table 2 indicates that there has been an increase in the number of jet movements at Perth while there has been a corresponding decrease in turboprops movements as well as an overall increase in movements.

Table 2 Comparison of aircraft movements – April 2008 compared to April 2009

	April 2008	April 2009	Change in number	% Change
Jet arrivals	2,960	3,447	487	16%
Jet departures	2,933	3,438	505	17%
Turboprop arrivals	1,503	1,239	-264	-18%
Turboprop departures	1,425	1,199	-226	-16%
Totals	8,821	9,323	502	6%

Complaints Data

Noise complaint statistics were analysed for Perth Airport for the period January – December 2009 and compared with the 12 months November 2007 – October 2008 in order to make a comparison before and after the implementation of the WARRP changes in November 2008.

The analysis showed that there has been an increase in the number of Perth noise complaints which have been attributed to the WARRP changes by the complainants, local politicians and local media.

The complaints data for the calendar year 2009 shows a total of 5,921 complaints from 673 complainants compared to 438 complaints from 221 complainants for the twelve months from November 2007 to October 2008.

The increase in complaints has come predominantly from areas in the Perth Hills area up to 20-30km from the airport. Suburbs that show high numbers of complaints include High Wycombe & Glen Forrest to the east and Chidlow & Stoneville to the north-east. Complaints have also increased from Beechboro to the north-west of the airport. In 2009 these five locations recorded 4,878 complaints (82%) from 162 complainants (24%). The highest number of complaints came from Chidlow, with 3,930 complaints (66%) from 22 complainants (3%).

Between December 2008 and March 2010, the overall number of aircraft noise complaints from Perth was 8,098 of which two-thirds were from two individuals. During the same period there were 5,427 complaints from the Chidlow area. Of these, 98% were from two individuals. The complaints data for 2009 are shown in Table 3.

Table 3 Perth Airport Recorded Complaints vs Complainants, by Suburb for the period 1st January to 31st December 2009

Suburb	Complaints	Complainants
Not Specified	31	24
Applecross	5	4
Ardross	1	1
Armadale	2	2
Ascot	4	4
Balga	1	1
Ballajura	27	15
Banjup	6	2
Banksia Grove	1	1
Baskerville	1	1
Bassendean	5	4

Bateman	1	1
Bayswater	4	3
Beckenham	4	3
Bedford	1	1
Bedfordale	6	3
Beechboro	302	55
Beldon	1	1
Bellevue	1	1
Belmont	47	21
Bentley	3	3
Bickley	36	14
Booragoon	1	1
Boya	2	2
Bullsbrook	1	1
Byford	1	1
Canning Vale	6	4
Cannington	11	9
Carlisle	7	5
Carmel	7	5
Caversham	4	2
Chidlow	3930	22
Cloverdale	8	6
Como	2	2
Copley	1	1
Cottesloe	1	1
Dalkeith	8	3
Darling Downs	2	2
Darlington	34	22
Duncraig	10	5
East Victoria Park	5	1
Edgewater	1	1
Ellenbrook	3	2
Ferndale	14	13
Forrestdale	3	2
Forrestfield	2	1
Gidgegannup	4	1
Girrawheen	7	4
Glen Forrest	261	60
Gooseberry Hill	3	2
Greenmount	94	8
Greenwood	1	1
Guildford	67	28
Hazelmere	1	1
Helena Valley	6	6
Henley Brook	5	2
High Wycombe	110	13
Highgate	3	1
Hilton	1	1
Hovea	4	3
Jane Brook	8	2
Kalamunda	34	14
Karnup	1	1
Karrinyup	1	1
Kelmscott	5	5
Kensington	12	6

Kenwick	2	2
Kewdale	9	7
Kingsley	1	1
Langford	41	11
Lathlain	3	3
Leeming	1	1
Lesmurdie	8	5
Lower Chittering	54	4
Maddington	3	3
Mahogany Creek	9	2
Maida Vale	4	3
Manning	6	2
Marangaroo	2	1
Maylands	1	1
Middle Swan	1	1
Midland	1	1
Mirrabooka	2	2
Morley	6	1
Mosman Park	1	1
Mount Helena	8	7
Mount Lawley	1	1
Mount Pleasant	1	1
Mullaloo	1	1
Mundaring	4	2
Nedlands	1	1
Noranda	2	2
Padbury	2	2
Parkerville	27	14
Parkwood	5	5
Paulls Valley	19	6
Perth	2	2
Pickering Brook	9	1
Queens Park	17	15
Redcliffe	9	7
Riverton	18	10
Rivervale	12	7
Roleystone	25	15
Rossmoyne	1	1
Salter Point	9	5
Sawyers Valley	2	2
Scarborough	1	1
Shelley	8	4
Sorrento	1	1
South Guildford	20	11
South Perth	5	4
St James	1	1
Stoneville	275	12
Subiaco	1	1
Swan View	13	5
The Vines	7	2
Thornlie	7	3
Trigg	2	1
Upper Swan	1	1
Victoria Park	4	3
Viveash	11	2

Walliston	5	4
Wandi	1	1
Warwick	1	1
Waterford	10	1
Watermans Bay	1	1
Wembley Downs	1	1
West Leederville	1	1
Westminster	1	1
Willetton	4	4
Wilson	26	7
Wooroloo	1	1
TOTAL	**5921**	**673**

The areas showing the greatest increase in complaints indicates that the issues of concern were associated with the Perth SID West Runway 03 procedure, Perth SID East/AMANA SID Runways 03/06, Perth STARs from North Runways 03 & 06 and Perth STARs Runways 21 & 24.

There were no changes to aircraft operations over High Wycombe that could be attributed to WARRP therefore the reason for the high number of complaints was not able to be determined.

A Google Earth map of Perth Airport and surrounds is shown in Attachment A.

Review of key changes

The four changes identified due to a high level of community concern were considered in detail using NFPMS flight track and movement data as previously discussed. In order to determine numbers of aircraft and their altitudes at specific locations spatial analysis gates were placed at these locations. Figures 13 - 16 show the spatial analysis gates and representative flight tracks associated with the departure and arrival procedures subject to analysis.

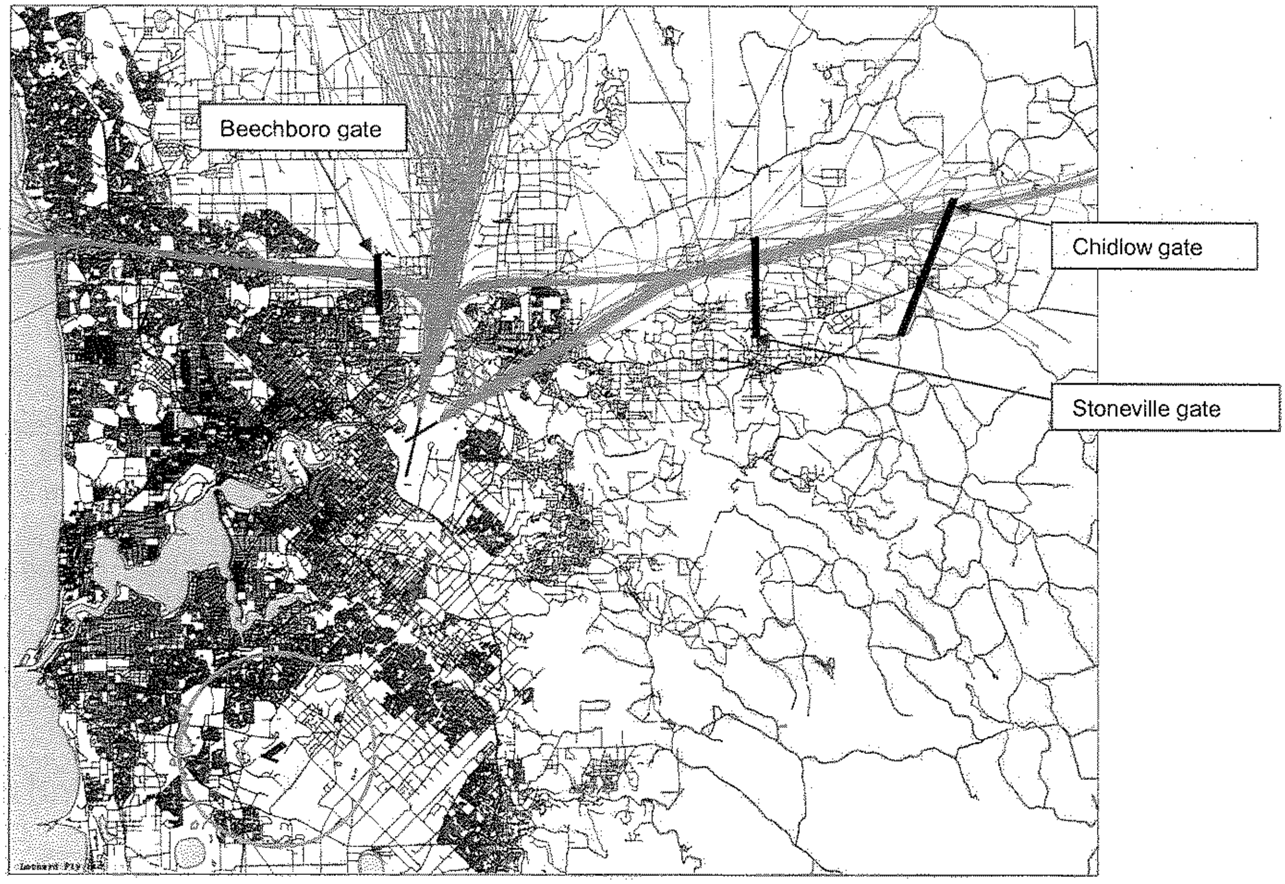

Figure 13 Jet departure tracks from Runways 03 & 06 showing spatial analysis gates

Figure 14 Turboprop departure tracks from Runways 03 & 06 showing spatial analysis gates

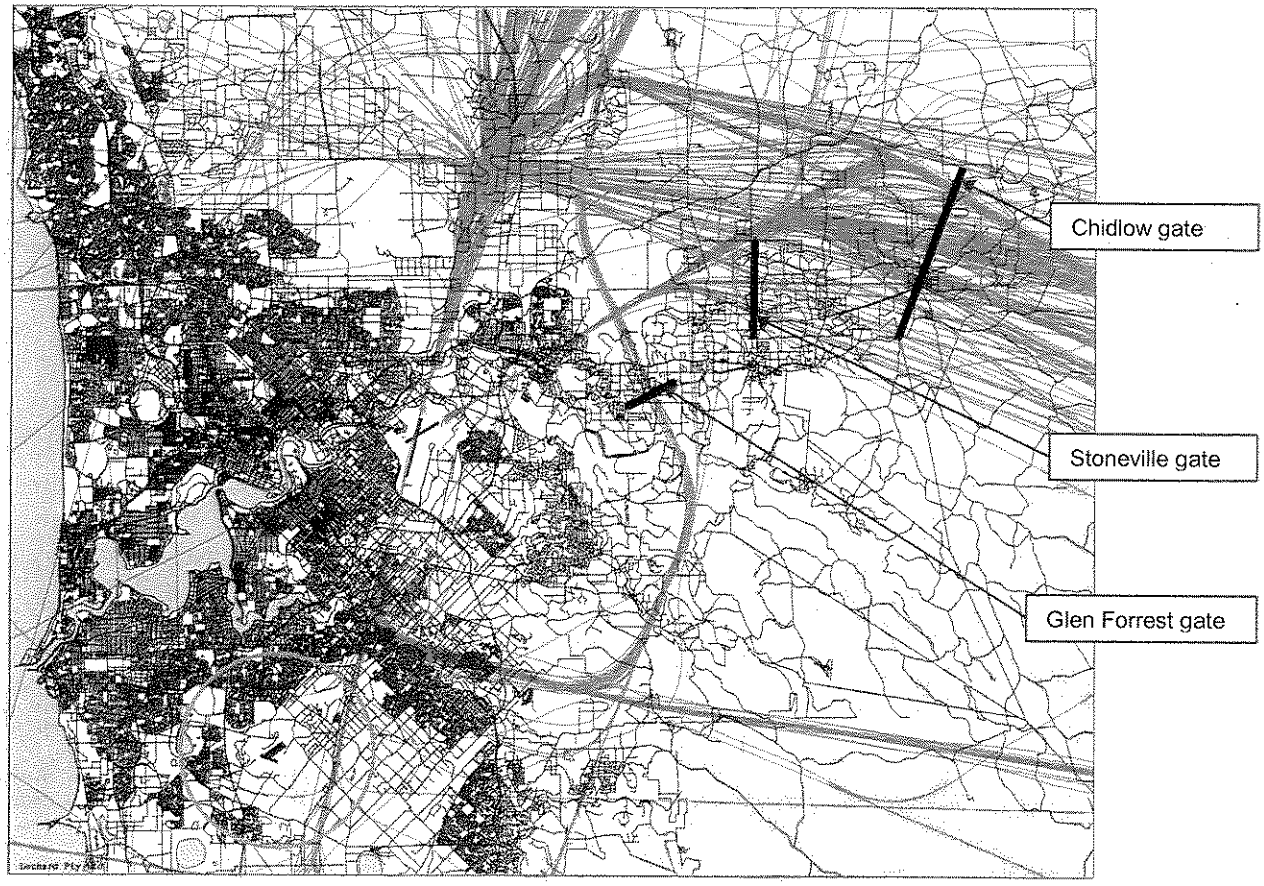

Figure 15 Jet arrival tracks showing spatial analysis gates

Figure 16 Turboprop arrival tracks showing spatial analysis gates

Perth SID West Runway 03 procedure

The original environmental assessment identified potential environmental issues associated with the increased use (estimated to be a tenfold increase to 26 flights/week) of the existing departure track over the suburbs of Beechboro, Malaga and Ballajura. However the assessment, which assumed that the availability of Pearce airspace would not change, found that the noise impact could appropriately be mitigated by formalising the existing practice of tracking departures via R155/156 (Pearce military areas) outside the hours of activation particularly for departures during the noise sensitive night period.

The aircraft flight tracks over the Beechboro, Malaga and Ballajura areas prior to the implementation of the WARRP changes are shown in Figure 1 while those following the WARRP changes are shown in Figure 7. These flight path figures indicate that, while there has been no change in the location of the flight paths, there has been an increase in aircraft numbers as compared to what was anticipated in the environmental assessment. In order to allow a more detailed review of aircraft departures over the Beechboro area, analysis of departures on 5 August 2009, a day with predominant use of Runways 03 and 06 for departures was undertaken. On the 5 August 2009 there were 135 jet departures and 56 turboprop departures from Runways 03 and 06. The flight tracks for these are shown in Figure 17 and 18.

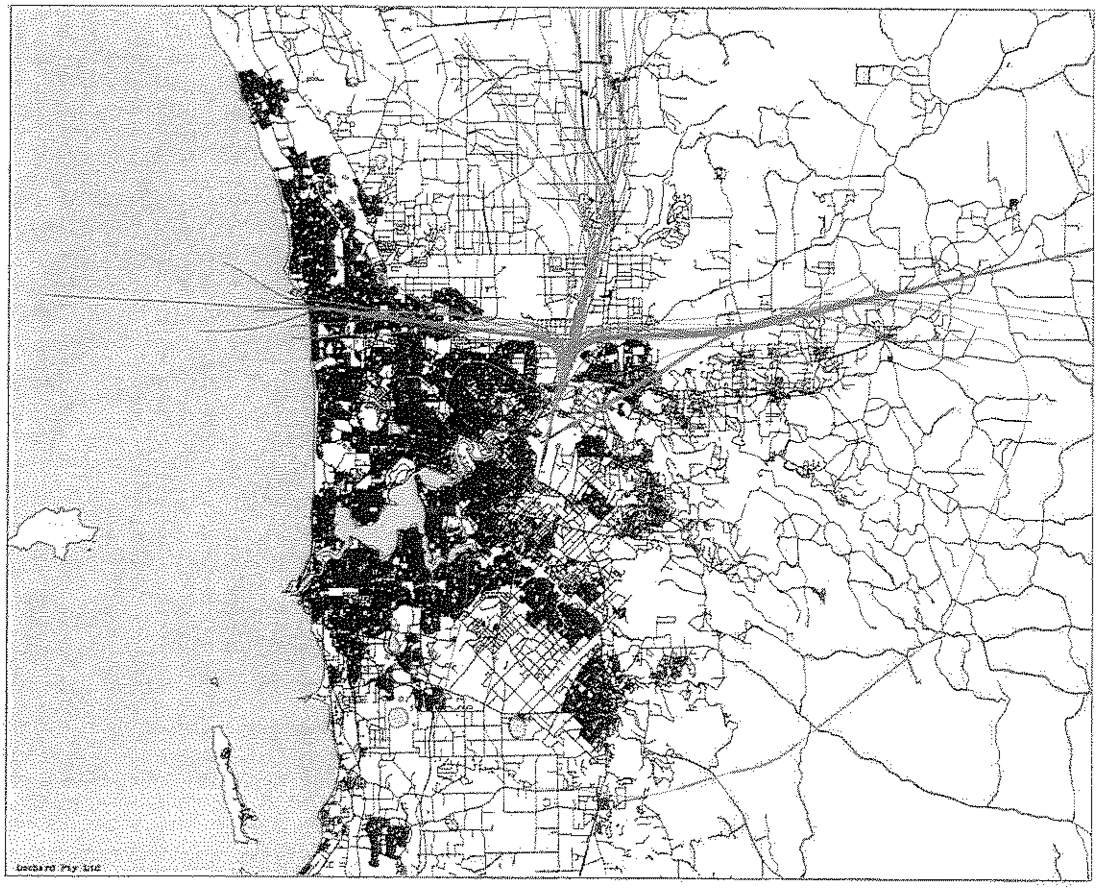

Figure 17 Jet departures from Runways 03 and 06 on 5 August 2009.

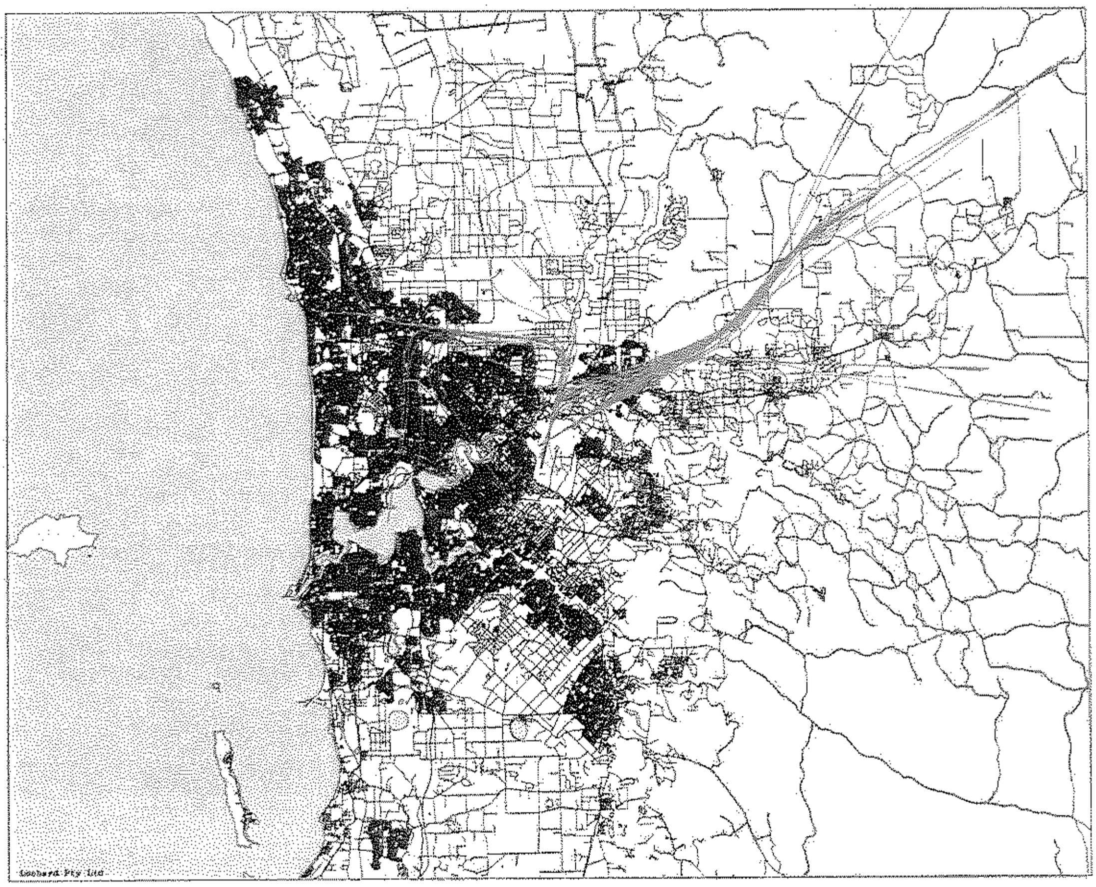

Figure 18 Turboprop departures from Runways 03 and 06 on 5 August 2009.

A spatial analysis gate was created over the departure tracks in the Beechboro area to identify the number of aircraft overflying this area and their altitudes. This determined that on the day there were 29 jet departures on the Perth SID West over or in the vicinity of Beechboro with a range of altitudes of approximately 2,000 (600 metres) – 6,000 feet (1,800 metres) AMSL with most aircraft between 3,000 feet (900 metres) and 5,000 feet (1,500 metres) AMSL as shown in Figure 19. The lateral spread of these flight tracks over the Beechboro area is approximately 1,500m with most within a lateral spread of 500m at the northern half of the analysis gate.

The same spatial analysis gate identified 9 turboprops over or in the vicinity of Beechboro with a range of altitudes of approximately 3,500 (1,050 metres) – 5,000 feet (1,500 metres) AMSL as shown in Figure 20. The lateral spread of these flight tracks is approximately 1,200m.

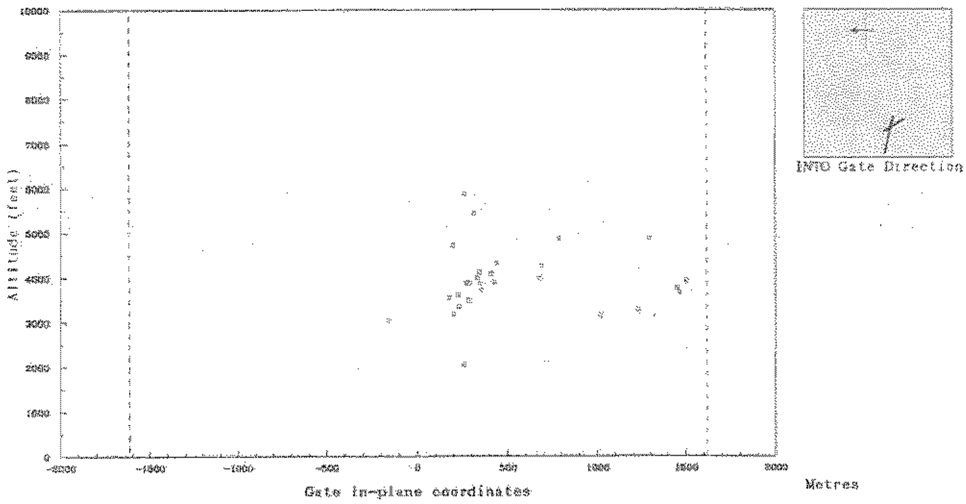

Figure 19 Spatial analysis graph for jet departures over Beechboro area – 5 Aug 2009

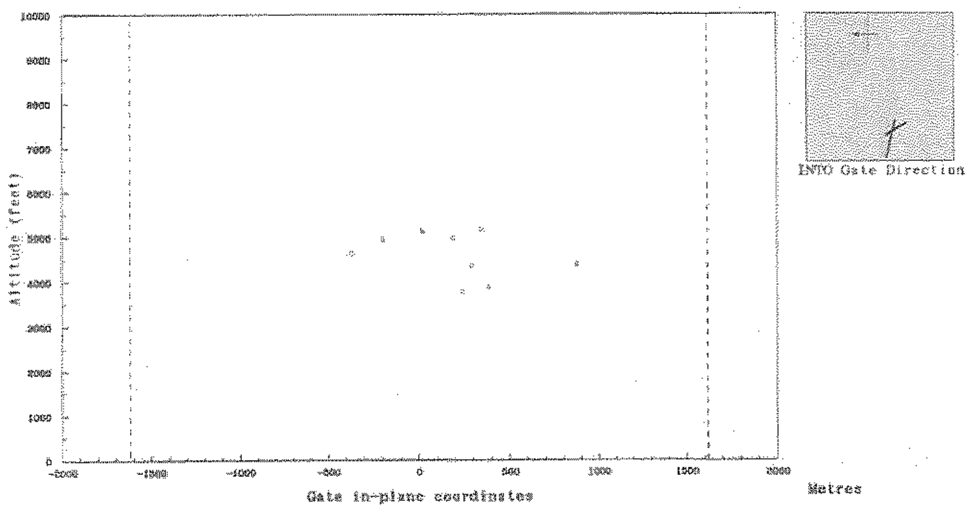

Figure 20 Spatial analysis graph for turboprop departures over Beechboro area – 5 Aug 2009

Further spatial analysis was undertaken to compare January 2008 with January 2009 to determine changes that have may have occurred as a result of the implementation of WARRP. The periods of July 2008 and July 2009 were also compared to take the seasonal nature of runway use at Perth Airport into account that may not have been obvious with the January data. The results of this analysis are shown in Table 4.

Table 4 Comparison of departures over or in the vicinity of Beechboro - January 2008 compared to January 2009

January 2008			January 2009		
Aircraft type	Number over or in the vicinity of Beechboro	Altitude range (AMSL)	Aircraft type	Number over or in the vicinity of Beechboro	Altitude range (AMSL)
Jet	16	2,000 – 4,500 feet (600 – 1,350m)	Jet	80	2,000 – 6,000 feet (600 – 1,800m)
Turboprop	4	3,000 – 4,500 feet (900 – 1,350m)	Turboprop	16	1,500 – 5,500 feet (450 – 1,650m)

The 16 departures over the Beechboro area in January 2008 represented approximately 0.5% of jet departures for the month while the 80 departures over the Beechboro area in January 2009 represented approximately 0.7% of jet departures for that month. (Figures 21 & 22).

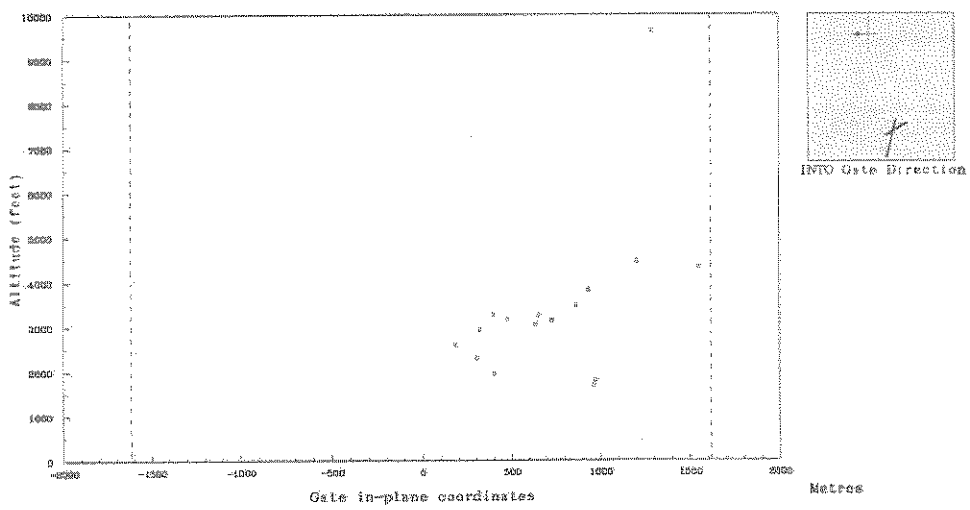

Figure 21 Spatial analysis graph for jet departures over Beechboro area – January 2008

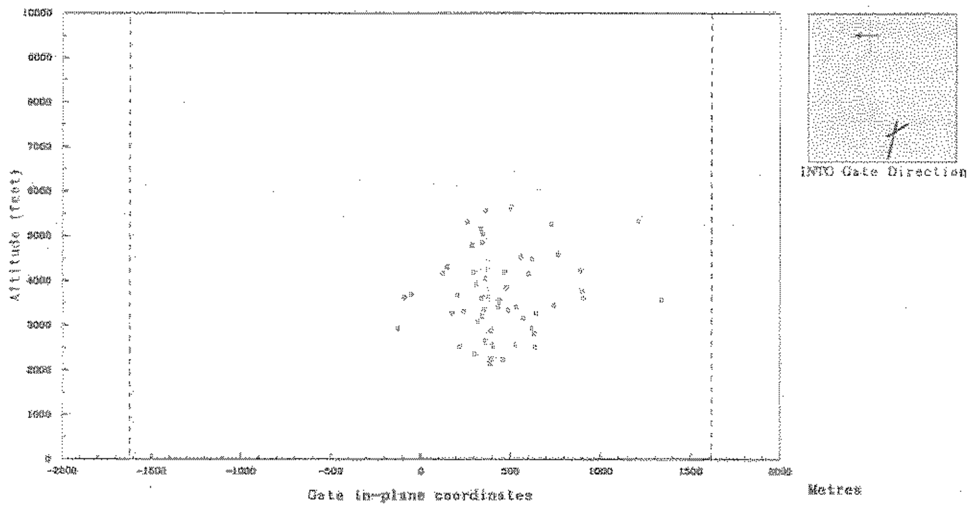

Figure 22 Spatial analysis graph for jet departures over Beechboro area – January 2009

The 4 departures over the Beechboro area in January 2008 represented approximately 0.3% of turboprop departures for the month while the 16 departures over the Beechboro area in January 2009 represented approximately 1.4% of turboprop departures for that month. (Figures 23 & 24).

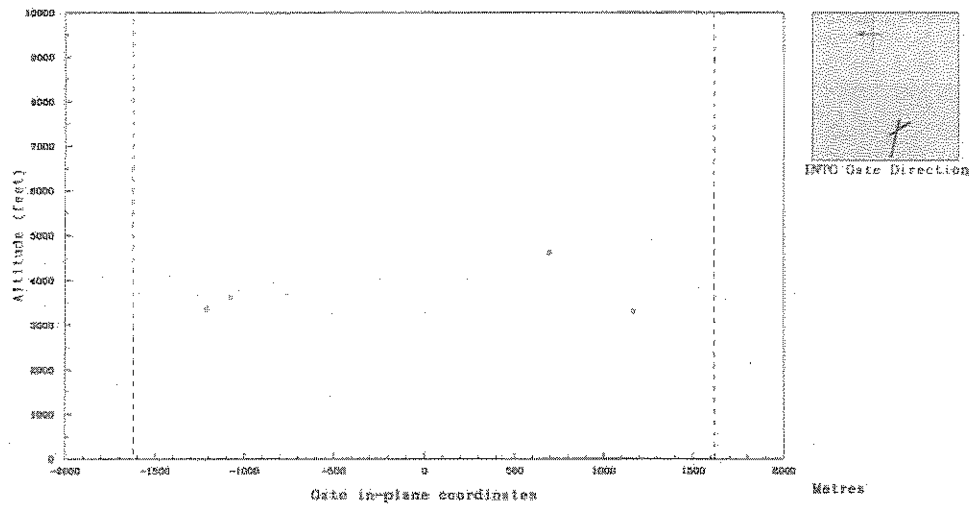

Figure 23 Spatial analysis graph for turboprop departures over Beechboro area January 2008

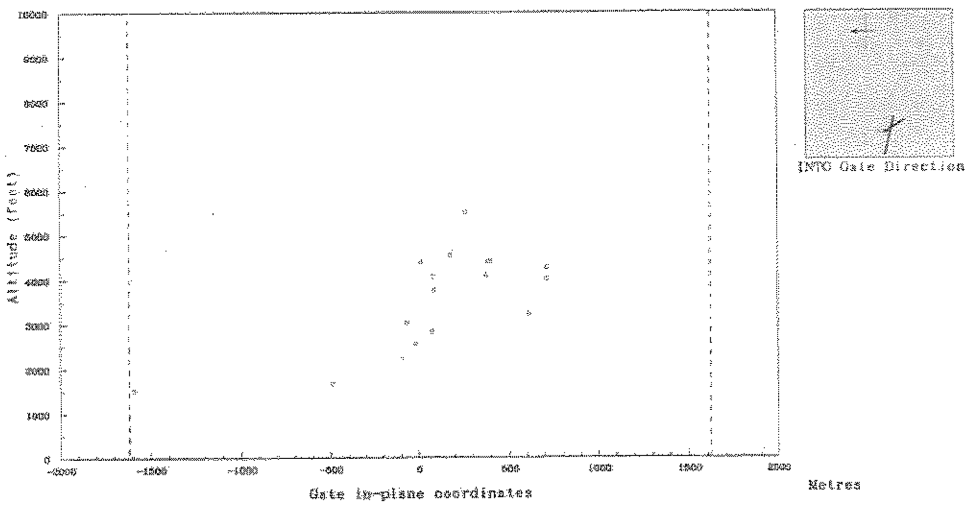

Figure 24 Spatial analysis graph for turboprop departures over Beechboro area January 2009

Similar analysis was undertaken for the periods July 2008 and 2009, the results of which are shown in Table 5.

Table 5 Comparison of departures over or in the vicinity of Beechboro – July 2008 compared to July 2009

July 2008			July 2009		
Aircraft type	Number over or in the vicinity of Beechboro	Altitude range (AMSL)	Aircraft type	Number over or in the vicinity of Beechboro	Altitude range (AMSL)
Jet	14	2,000 – 6,000 feet (600 – 1,800m)	Jet	218	2,000 – 7,000 feet (600 – 2,100m)
Turboprop	10	2,000 – 7,000 feet (600 – 2,100m)	Turboprop	95	3,500 – 7,000 feet (1,050 – 2,100m)

The 14 jet departures over the Beechboro area in July 2008 represented approximately 0.5% of the jet departures for the month while the 218 departures over the same area in July 2009 represented approximately 6.1% of the jet departures for that month (Figures 25 & 26).

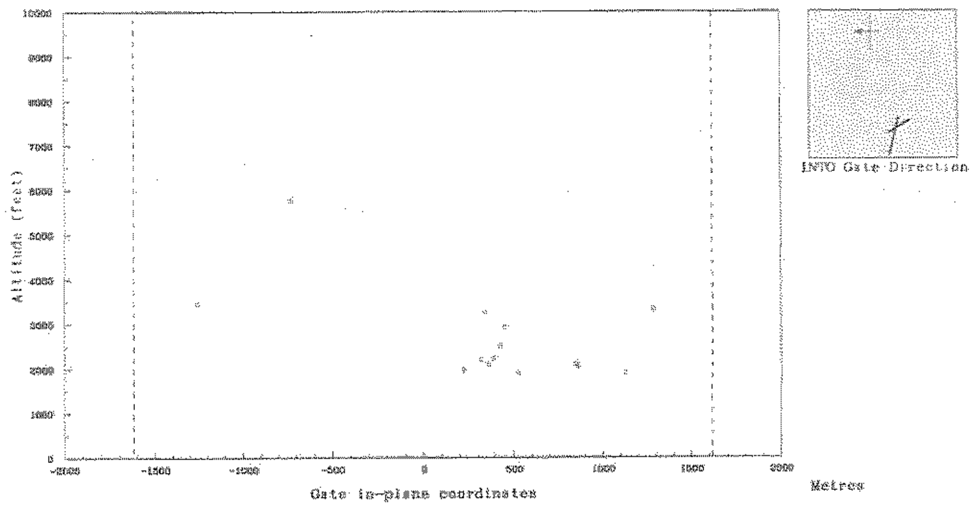

Figure 25 Spatial analysis graph for jet departures over Beechboro area – July 2008

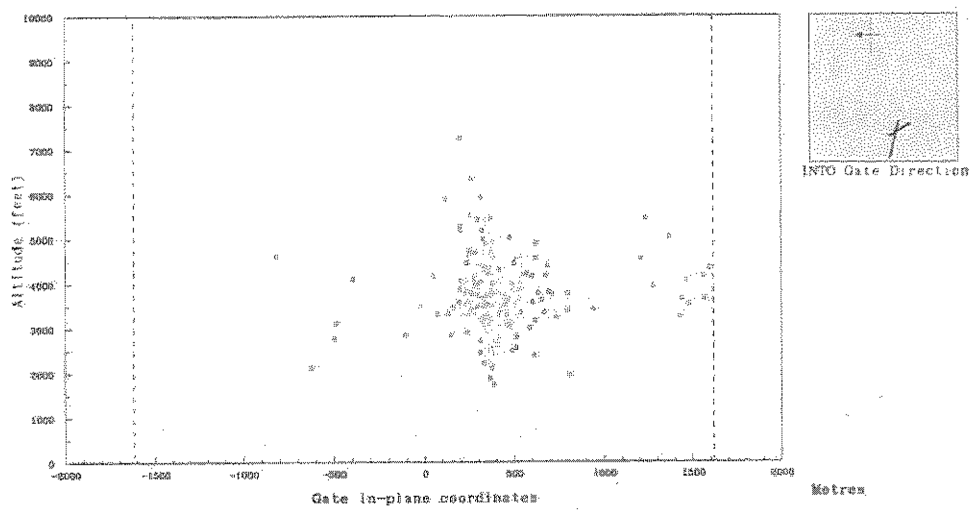

Figure 26 Spatial analysis graph for jet departures over Beechboro area –July 2009

The 10 departures over the Beechboro area in July 2008 represented approximately 1.2% of turboprop departures for the month while the 95 departures over the Beechboro area in July 2009 represented approximately 8% of turboprop departures for that month. (Figures 27 & 28).

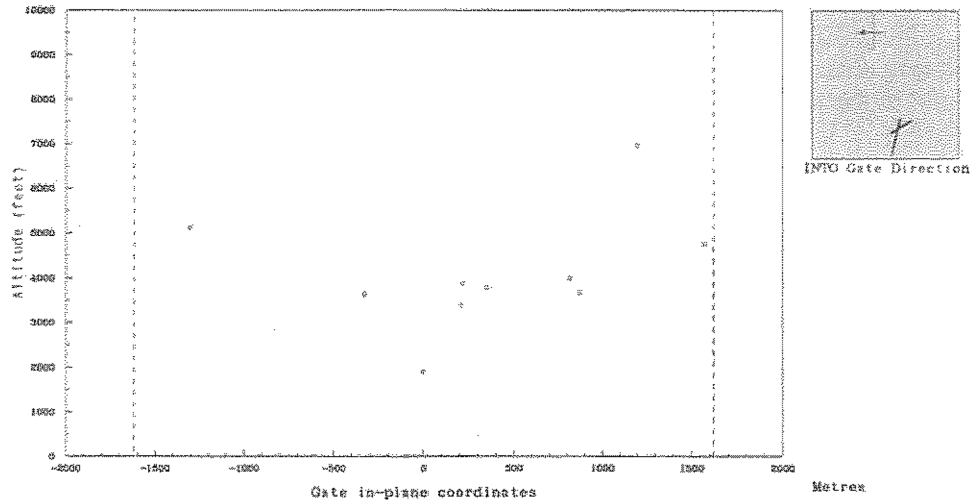

Figure 27 Spatial analysis graph for turboprop departures over Beechboro area July 2008

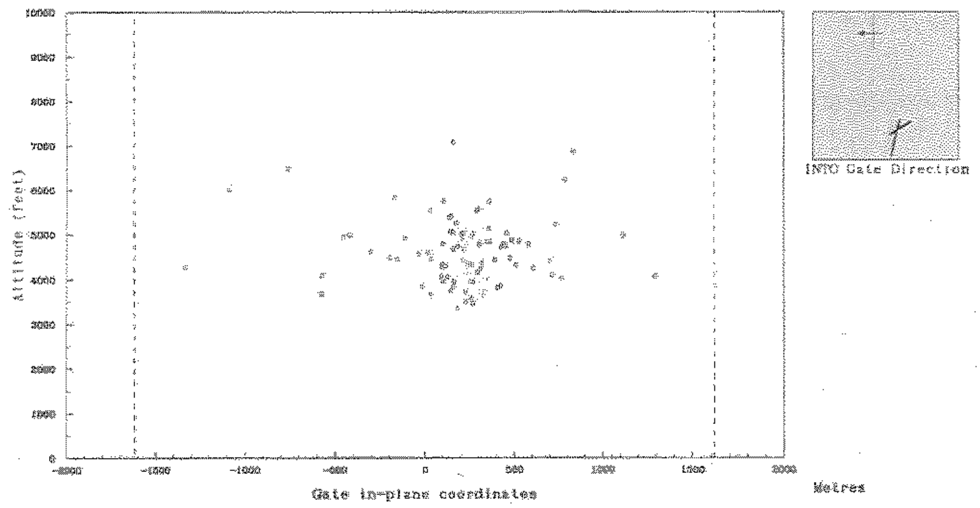

Figure 28 Spatial analysis graph for turboprop departures over Beechboro area July 2009

The departure track over the Beechboro area is used by long haul International flights operated by South African Airways, Air Mauritius and Emirates destined for South Africa, Mauritius and Dubai as identified in the environmental assessment. Additional analysis of these flights, which often take place during the more sensitive late night and early morning periods, show the number of such flights has increased which has resulted in additional noise exposure of the Beechboro area as well as suburbs further west. During the period January to October 2008 (selected to represent the pre WARRP period) there were 374 South African Airways, Air Mauritius and Emirates departures from Runway 03 of which 136 flights (36%) tracked over or in the vicinity of Beechboro. The altitude range of these flights was approximately 2,000 feet (600m) to 4,000 feet (1,200m). (Figure 29). By comparison in the 10 month period from January – October 2009 (selected to represent the post WARRP implementation period) there were 335 South African Airways, Air Mauritius and Emirates departures from Runway 03 of which 240 flights (72%) tracked over or in the vicinity of

Beechboro. The altitude range of these flights was approximately 2,000 feet (600m) to 5,500 feet (1,650m). (Figure 30). This increase is attributable to the overall increase in movements at Perth Airport and less availability of the Pearce military areas as well as the increased use of the SID as part of the WARRP implementation.

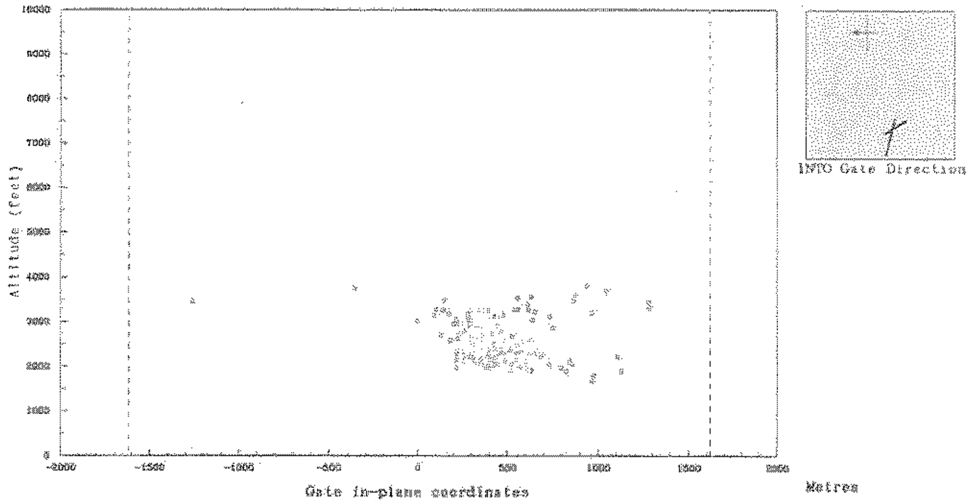

Figure 29 Spatial analysis graph for heavy International departures over Beechboro area Jan – Oct 2008

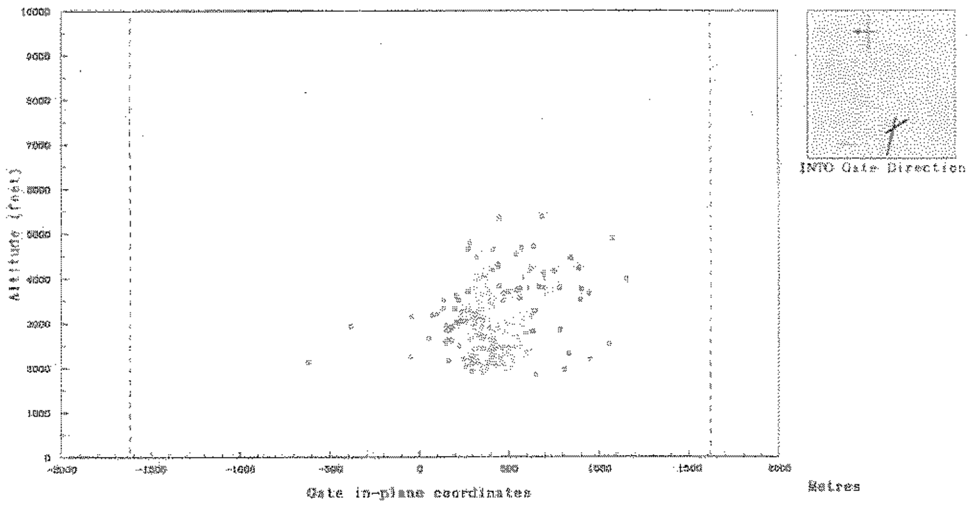

Figure 30 Spatial analysis graph for heavy International departures over Beechboro area Jan – Oct 2009

Perth SID East/AMANA SID Runways 03/06

The proposal replicated the existing routes to the maximum extent practicable, particularly over built up areas to the north-east of the airport. However the environmental assessment did identify that changes were likely to move the track 0.5 nautical miles (925m) to the south over the Stratton area. Aircraft in the vicinity of Stratton would be between 3,000 feet (900m) and 5,000 feet (1,500m) above ground level and climbing thereby minimising noise as far as practicable. Therefore the proposed change was not considered likely to be significant.

The jet aircraft flight tracks for departures to the east prior to the implementation of the WARRP changes are shown in Figure 1 while those following the WARRP changes are shown in Figure 7. Similarly the turboprop aircraft flight tracks for departures to the east prior to the implementation of the WARRP changes are shown in Figure 2, while those following the WARRP changes are shown in Figure 8. These flight path figures indicate that there has been little change to the Runway 06 departure tracks within 16km of the airport however there has been a change to the Runway 03 departure track resulting in a narrower spread of tracks from approximately 8km north of the airport where the aircraft turn right and track to waypoint ALWYN. There has been a similar narrowing of the turboprop departure flight path seen when Figure 2 from January 2008 is compared to Figure 8 from January 2009.

A detailed analysis of departures on 5 August 2009, a day with predominant use of Runways 03 and 06 for departures, was undertaken. On the 5 August 2009 there were 135 jet departures and 56 turboprop departures from Runways 03 and 06. The flight tracks for these are shown in Figures 17 and 18.

A spatial analysis gate was created over the departure tracks in the Stoneville and Chidlow areas to determine the number of aircraft overflying these area and their altitudes.

This determined that on the day there were 81 jet departures on Perth SID East/AMANA SID Runways 03/06 over or in the vicinity of Stoneville with a range of altitudes of approximately 3,500 (1,050m) – 9,000 feet (2,700m) AMSL with most aircraft between 4,500 (1,350metres) and 8,500 feet (2,550m) AMSL as shown in Figure 31. The lateral spread of these flight tracks is less than 1,000m. The same spatial analysis gate identified 4 turboprops over or in the vicinity of Stoneville with a range of altitudes of approximately 6,000 feet (1,800m) – 8,000 feet (2,400m) AMSL as shown in Figure 32. The general elevation of the Stoneville area is approximately 1,000 feet or 300m AMSL, therefore the height of the aircraft above ground is approximately 1,000 feet or 300m less than that determined from the spatial analysis of the NFPMS data.

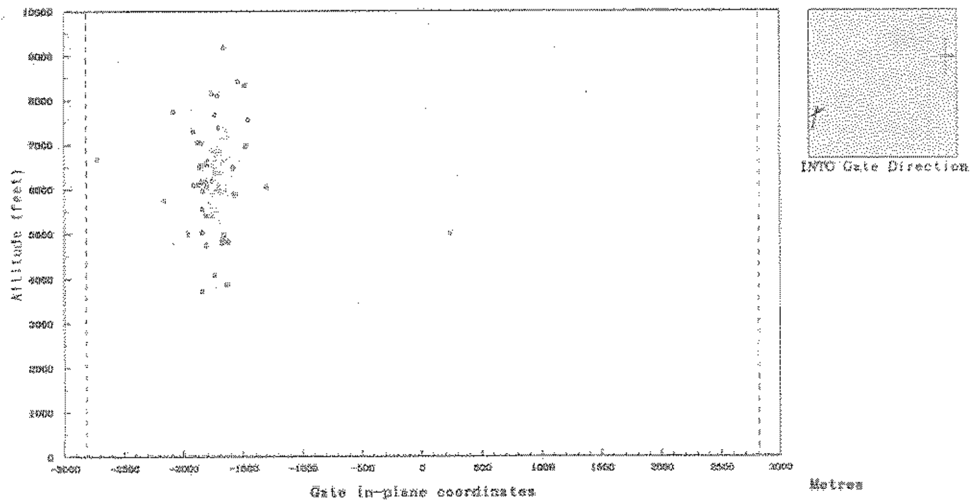

Figure 31 Spatial analysis graph for jet departures over Stoneville area 5 August 2009

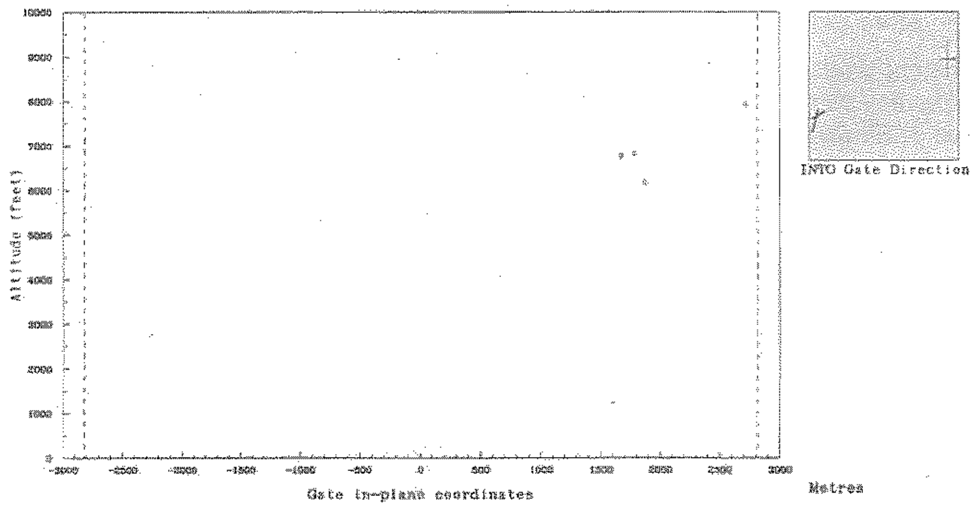

Figure 32 Spatial analysis graph for turboprop departures over Stoneville area 5 August 2009

Further spatial analysis was undertaken to compare January 2008 with January 2009 to determine changes that have may have occurred as a result of the implementation of WARRP. The results of this analysis are shown in Table 6.

Table 6 Comparison of departures over or in the vicinity of Stoneville

January 2008			January 2009		
Aircraft type	Number over or in the vicinity of Stoneville	Altitude range (AMSL)	Aircraft type	Number over or in the vicinity of Stoneville	Altitude range (AMSL)
Jet	66	4,000 – 10,000 feet (1,200 – 3,000m)	Jet	272	4,500 – 9,000 feet (1,350 – 2,700m)
Turboprop	72	4,500 – 9,000 feet (1,350 – 2,700m)	Turboprop	12	6,000 – 8,500 feet (1,800 – 2,550m)

The 66 jet departures over the Stoneville area in January 2008 represented approximately 1.5% of jet departures for the month while the 272 departures over the Stoneville area in January 2009 represented approximately 7.6% of jet departures for that month. The lateral spread of the jet departure tracks has reduced from approximately 4,500m to 1,000m with most within a 500m lateral spread. (Figures 33 & 34).

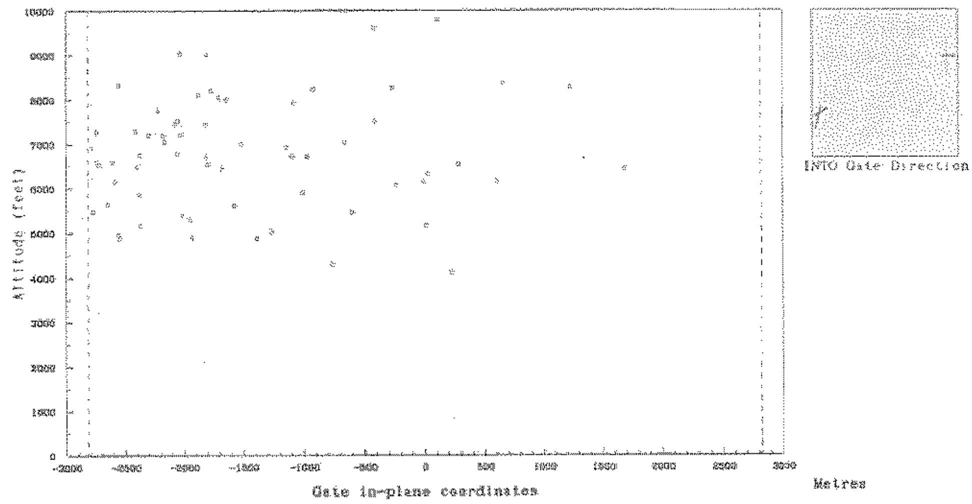

Figure 33 Spatial analysis graph for jet departures over Stoneville area January 2008

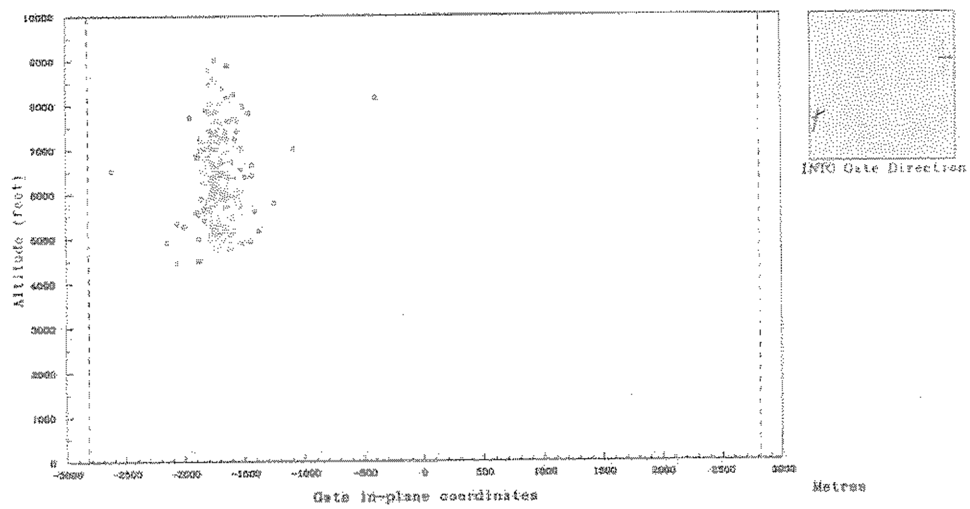

Figure 34 Spatial analysis graph for jet departures over Stoneville area January 2009

The 72 turboprop departures over the Stoneville area in January 2008 represented approximately 5% of turboprop departures for the month while the 12 departures over the Stoneville area in January 2009 represented approximately 1% of turboprop departures for that month. The lateral spread of the turboprop departure tracks has reduced from approximately 5,500m to 2,000m with most within a 300m lateral spread. (Figures 35 & 36).

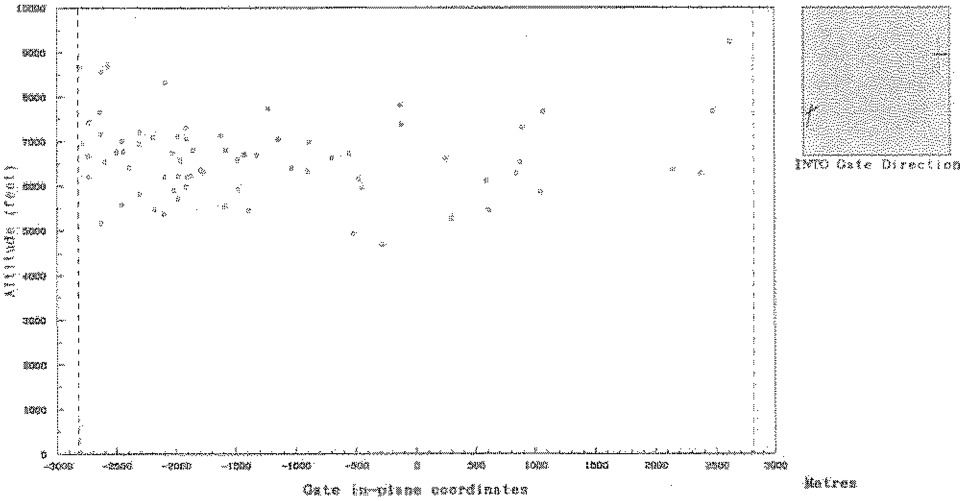

Figure 35 Spatial analysis graph for turboprop departures over Stoneville area January 2008

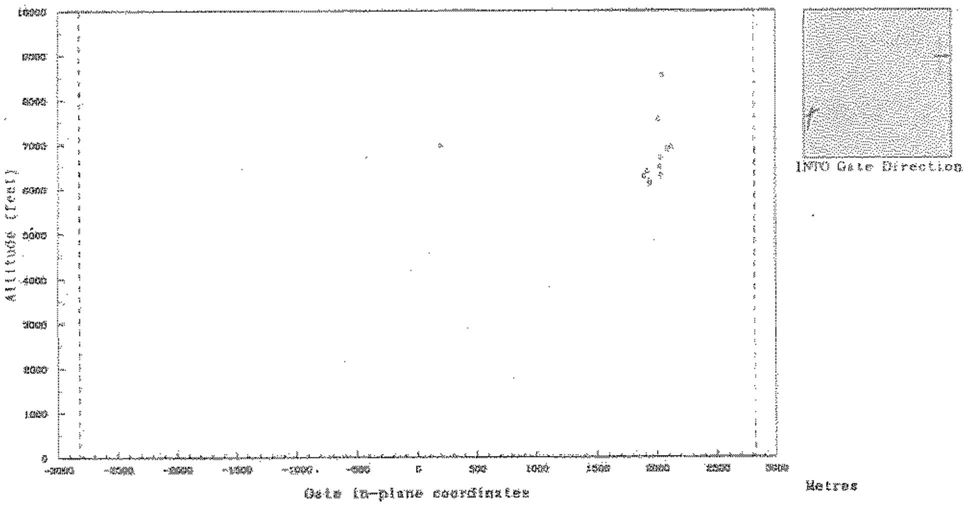

Figure 36 Spatial analysis graph for turboprop departures over Stoneville area January 2009

In order to consider the influence of seasonal weather conditions on runway use at Perth Airport additional analysis of movement data for July 2008 and 2009 over the Stoneville area was also undertaken. The results of this analysis are shown in Table 7.

Table 7 Comparison of departures over or in the vicinity of Stoneville

July 2008			July 2009		
Aircraft type	Number over or in the vicinity of Stoneville	Altitude range (AMSL)	Aircraft type	Number over or in the vicinity of Stoneville	Altitude range (AMSL)
Jet	146	4,000 – 10,000 feet (1,200 – 3,000m)	Jet	877	4,500 – 10,000 feet (1,350 – 3,000m)
Turboprop	91	4,500 – 10,000 feet (1,350 – 3,000m)	Turboprop	49	5,000-8,500 feet (1,500 – 2,550m)

The 146 jet departures over the Stoneville area in July 2008 represented approximately 5.3% of jet departures for the month while the 877 departures over the Stoneville area in July 2009 represented approximately 24.7% of jet departures for that month. The lateral spread of the jet departure tracks remained the same at approximately 5,600m with most flights within a 1,000m lateral spread at the northern end of the Stoneville area for the July 2009 movements. (Figures 37 & 38).

The 91 turboprop departures over the Stoneville area in July 2008 represented approximately 7.5% of turboprop departures for the month while the 49 departures over the Stoneville area in July 2009 represented approximately 4.1% of turboprop departures for that month. The lateral spread of the turboprop departure tracks has remained the same but with most flights within a 2,000m spread at the southern end of the Stoneville area. (Figures 39 & 40).

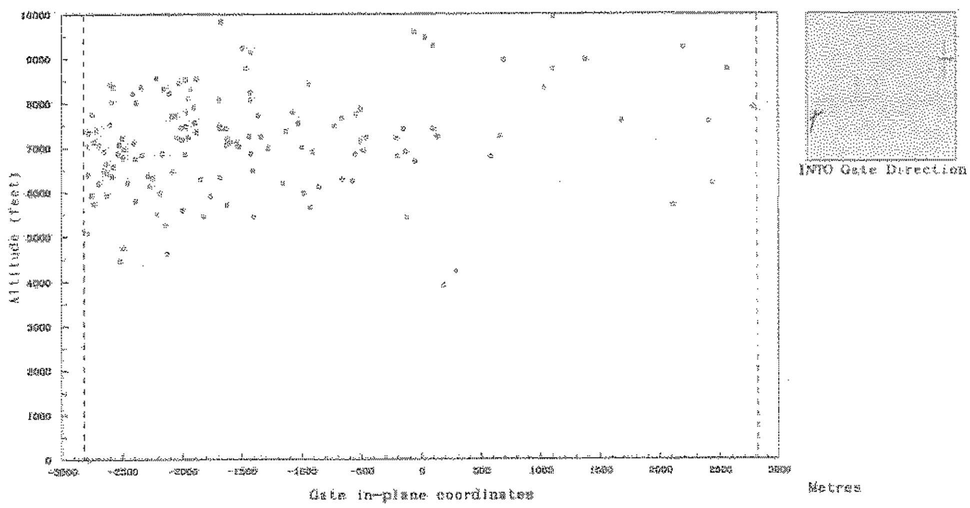

Figure 37 Spatial analysis graph for jet departures over Stoneville area July 2008

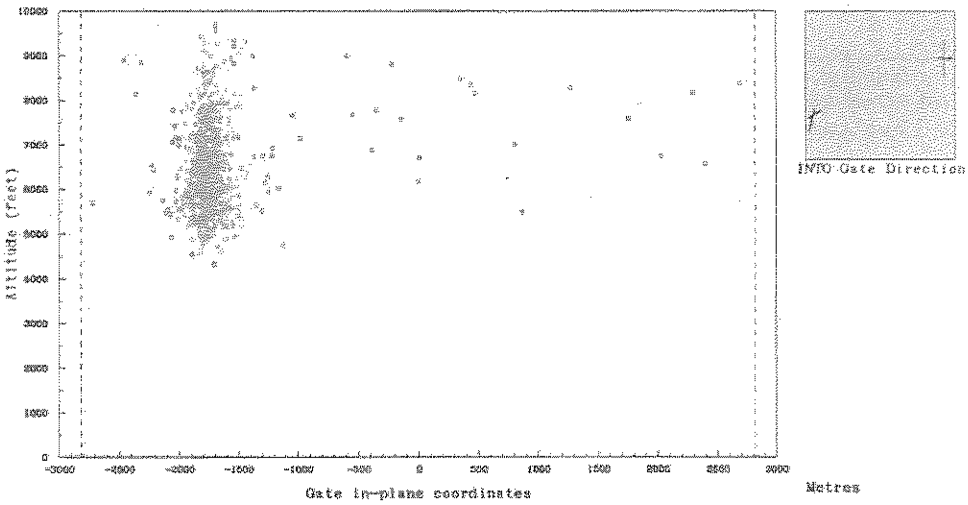

Figure 38 Spatial analysis graph for jet departures over Stoneville area July 2009

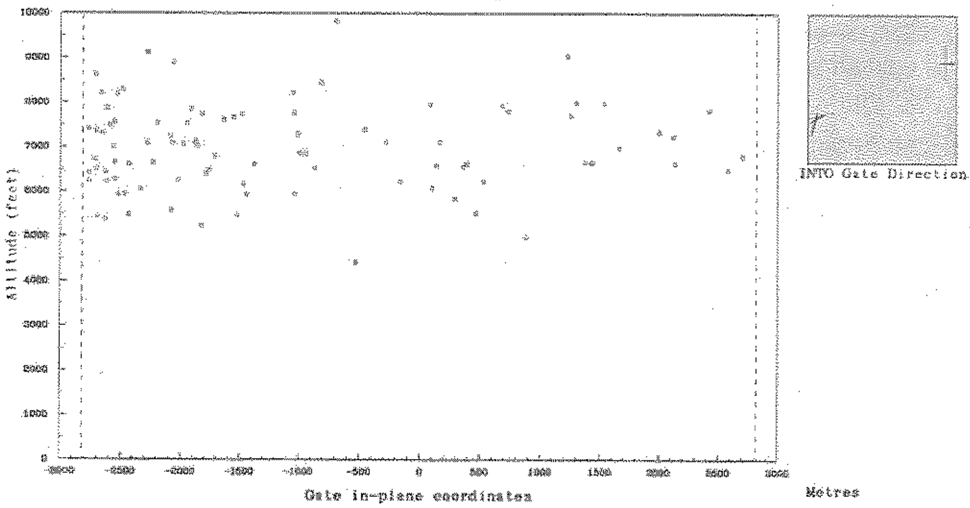

Figure 39 Spatial analysis graph for turboprop departures over Stoneville area July 2008

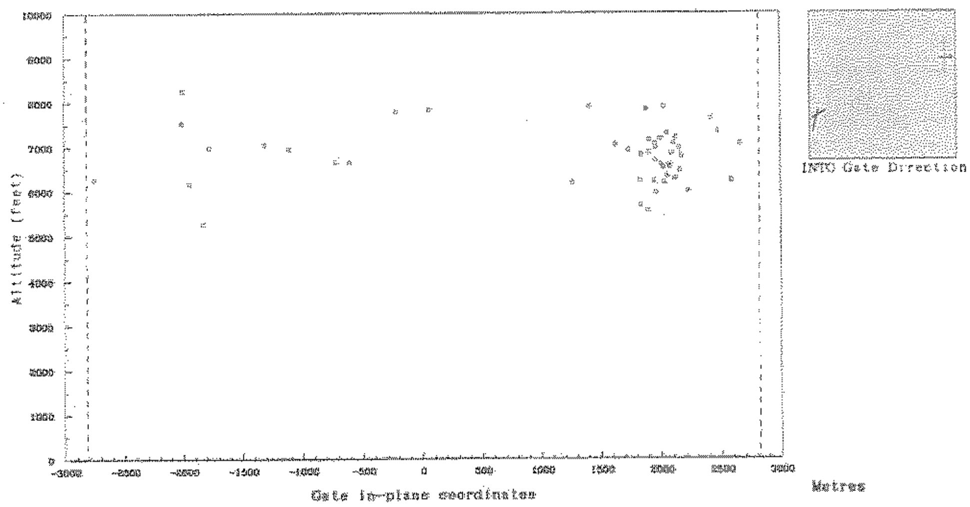

Figure 40 Spatial analysis graph for turboprop departures over Stoneville area July 2098

A spatial analysis gate was also created over the departure tracks in the Chidlow area to determine the number of aircraft overflying this area and their altitudes. As with the Stoneville analysis, movements on the 5 August 2009 were used as this was a day with predominant Runway 03/06 departures. This analysis determined that on the day there were 67 jet departures on Perth SID East/AMANA SID Runways 03/06 over or in the vicinity of Chidlow with a range of altitudes between approximately 5,000 (1,500m) – 10,000 feet (3,000m) AMSL with all but one aircraft at or above 6,000 feet (1,800m) as shown in Figure 41. The lateral spread of these flight tracks is approximately 4,100m. The same spatial analysis gate identified 2 turboprops over or in the vicinity of Chidlow between 8,000 feet (2,400m) – 9,000 feet (2,700m) AMSL as shown in Figure 42. The general elevation of the Chidlow area is approximately 1,000 feet or 300m AMSL, therefore the height of the aircraft above ground is approximately 1,000 feet or 300m less than that determined from the spatial analysis of the NFPMS data.

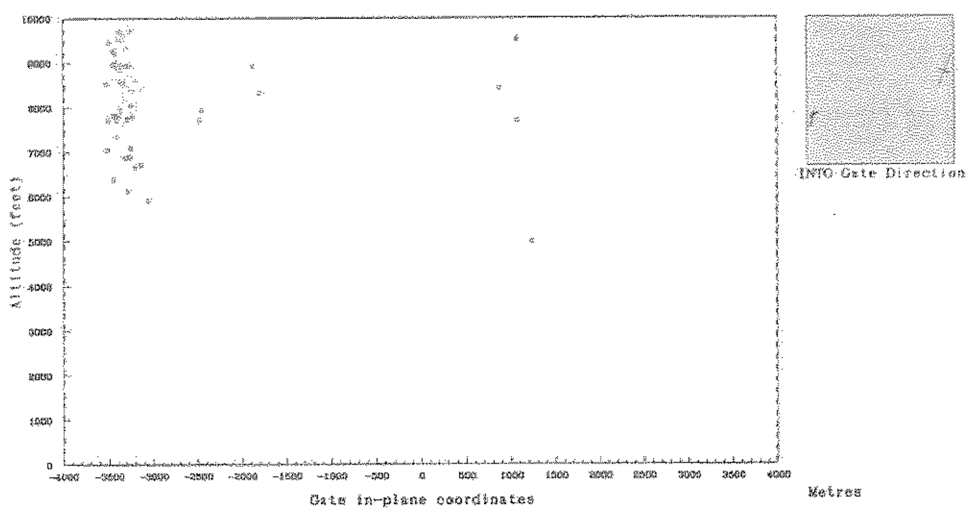

Figure 41 Spatial analysis graph for jet departures over Chidlow area on 5 August 2009

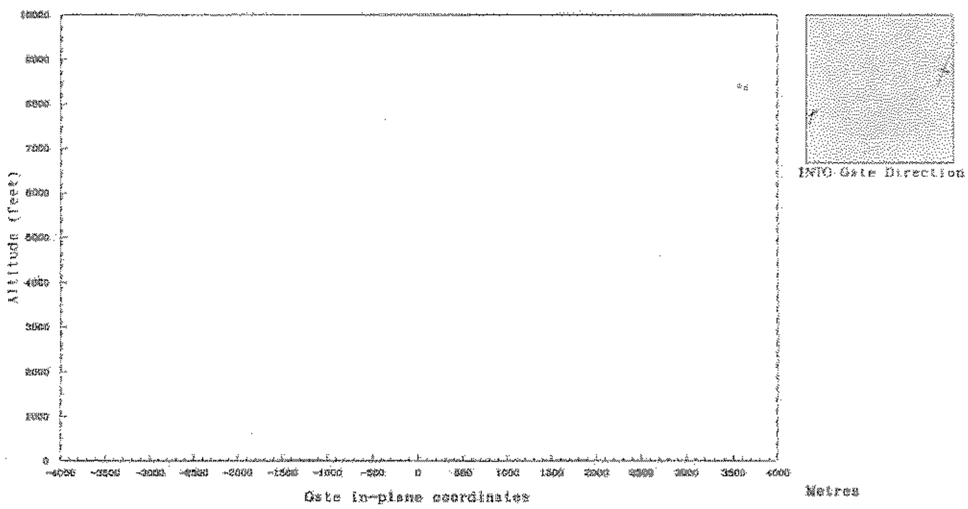

Figure 42 Spatial analysis graph for turboprop departures over Chidlow area on 5 August 2009

Further spatial analysis was undertaken to compare January 2008 with January 2009 to determine changes that have may have occurred as a result of the implementation of WARRP. The results of this analysis are shown in Table 8.

Table 8 Comparison of departures over or in the vicinity of Chidlow – January 2008 compared to January 2009

January 2008			January 2009		
Aircraft type	Number over or in the vicinity of Chidlow	Altitude range (AMSL)	Aircraft type	Number over or in the vicinity of Chidlow	Altitude range (AMSL)
Jet	98	5,000 – 9,500 feet (1,500 – 2,850m)	Jet	187	6,000 – 10,000 feet (1,800 – 3,000m)
Turboprop	23	6,500 – 9,500 feet (1,950 – 2,850m)	Turboprop	161	6,500- 10,000 feet (1,950 – 3,000m)

The 98 jet departures over the Chidlow area in January 2008 represented approximately 3.3% of jet departures for the month while the 187 departures over the Chidlow area in January 2009 represented approximately 5.3% of jet departures for that month. The lateral spread of the jet departure tracks over the Chidlow area has remained at approximately 8,000m however the 2009 data shows that the lateral spread of the majority of flights (93%) has reduced to approximately 500m at the northern extremity of the spread. (Figures 43 & 44)

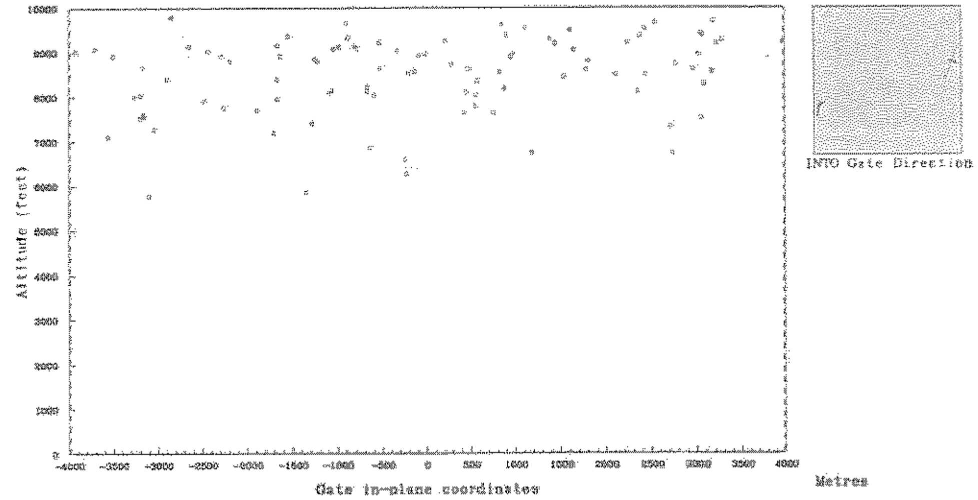

Figure 43 Spatial analysis graph for jet departures over Chidlow area January 2008

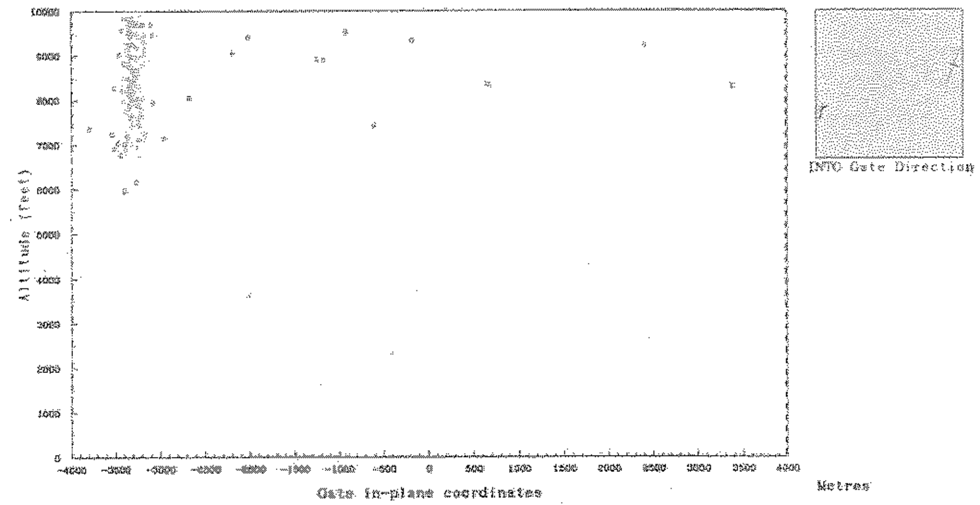

Figure 44 Spatial analysis graph for jet departures over Chidlow area January 2009

The 23 turboprop departures over the Chidlow area in January 2008 represented approximately 1.6% of turboprop departures for the month while the 161 departures over the Chidlow area in January 2009 represented approximately 14.1% of turboprop departures for that month. The lateral spread of the turboprop departure tracks has remained the same at approximately 8,000m over the Chidlow area however the 2009 data shows that the lateral spread of the majority of flights (75%) has reduced to approximately 500m at the southern extremity of the spread. (Figures 45 & 46).

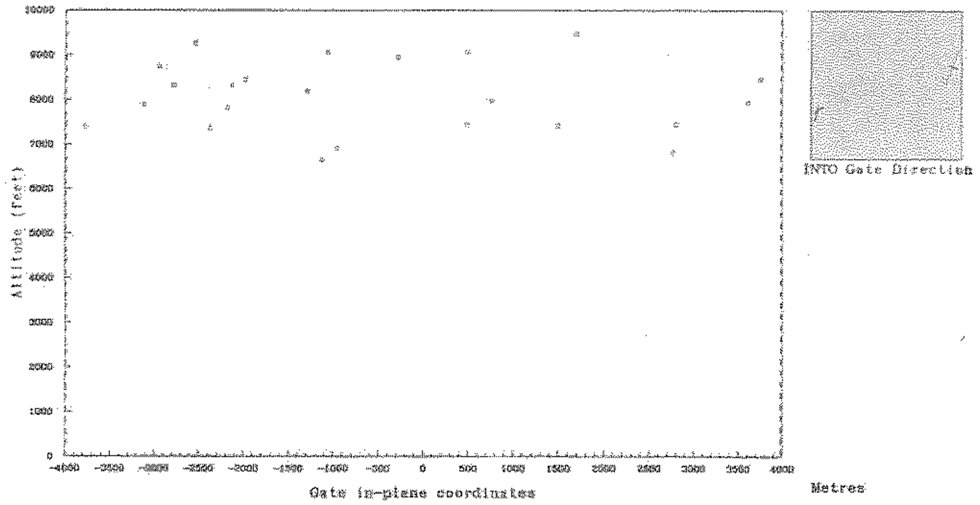

Figure 45 Spatial analysis graph for turboprop departures over Chidlow area January 2008

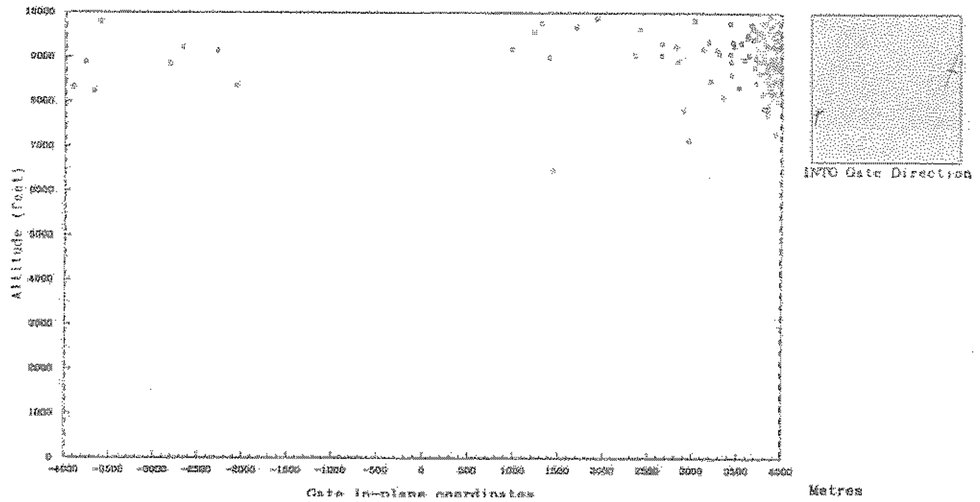

Figure 46 Spatial analysis graph for turboprop departures over Chidlow area January 2009

In order to consider the influence of seasonal weather conditions on runway use at Perth Airport, additional analysis of movement data over the Chidlow area for July 2008 and 2009 was also undertaken. The results of this analysis are shown in Table 9. The lateral spread in the July tracks was similar to that for the January data for 2008 and 2009 respectively.

The 194 jet departures over the Chidlow area in July 2008 represented approximately 7% of jet departures for the month while the 501 departures over the Chidlow area in July 2009 represented approximately 14.1% of jet departures for that month. The lateral spread of the jet departure tracks remained the same at approximately 5,600m with most flights within a 600m lateral spread at the northern end of the Chidlow area for the July 2009 movements. (Figures 47 & 48).

Table 9 Comparison of departures over or in the vicinity of Chidlow – July 2008 compared to July 2009

July 2008			July 2009		
Aircraft type	Number over or in the vicinity of Chidlow	Altitude range (AMSL)	Aircraft type	Number over or in the vicinity of Chidlow	Altitude range (AMSL)
Jet	194	6,000 – 10,000 feet	Jet	501	6,000 – 10,000 feet
Turboprop	21	5,000 – 10,000 feet	Turboprop	31	7,000- 10,000 feet

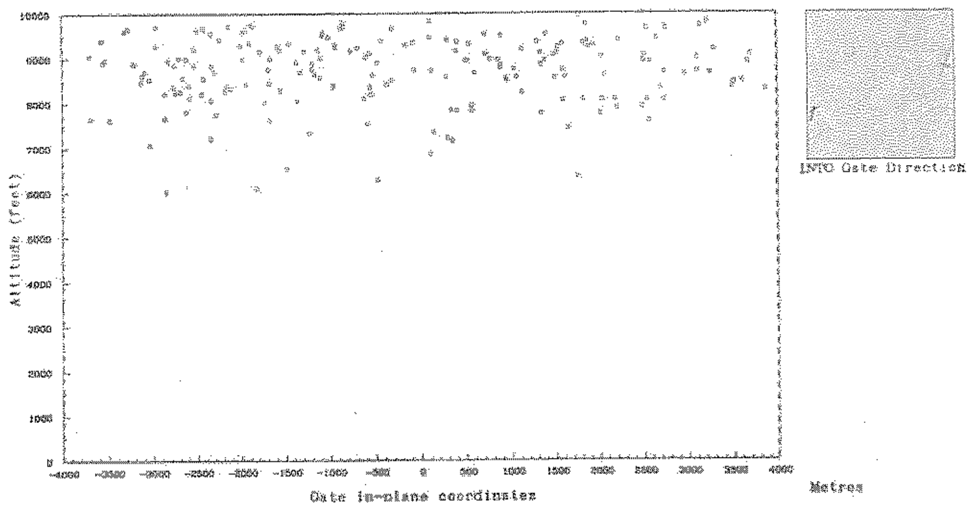

Figure 47 Spatial analysis graph for jet departures over Chidlow area July 2008

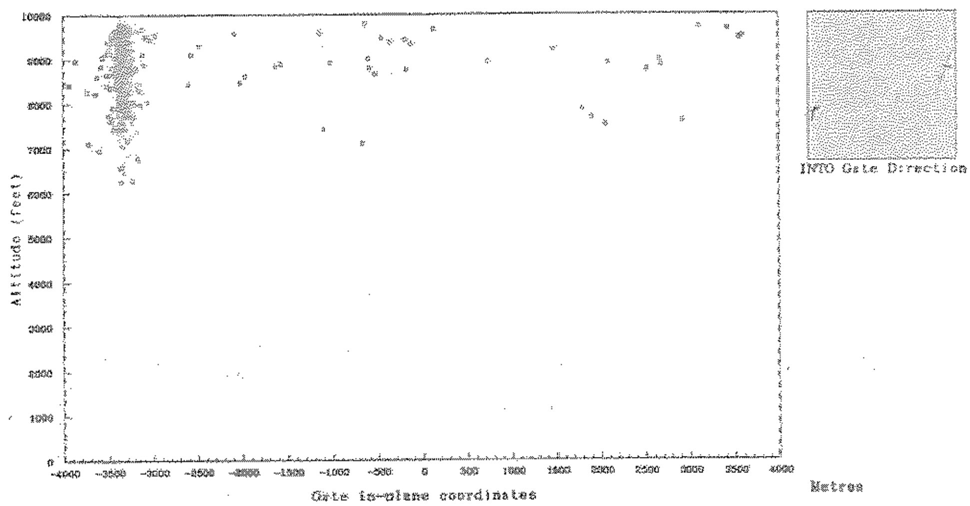

Figure 48 Spatial analysis graph for jet departures over Chidlow area July 2009

The 21 turboprop departures over the Chidlow area in July 2008 represented approximately 1.7% of turboprop departures for the month while the 31 departures over the Chidlow area in July 2009 represented approximately 2.6% of turboprop departures for that month. The lateral spread of the turboprop departure tracks has remained the same but with most flights within a 1,000m spread at the southern end of the Chidlow area

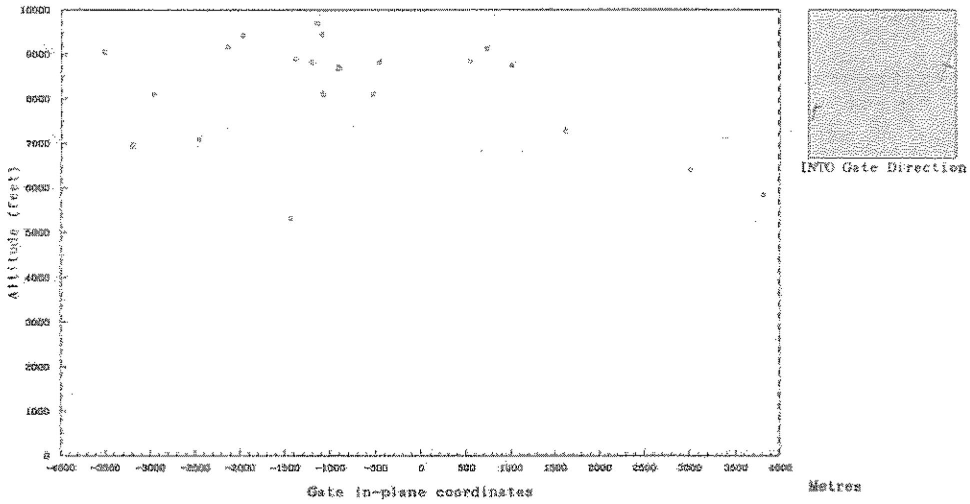

Figure 49 Spatial analysis graph for turboprop departures over Chidlow area July 2008

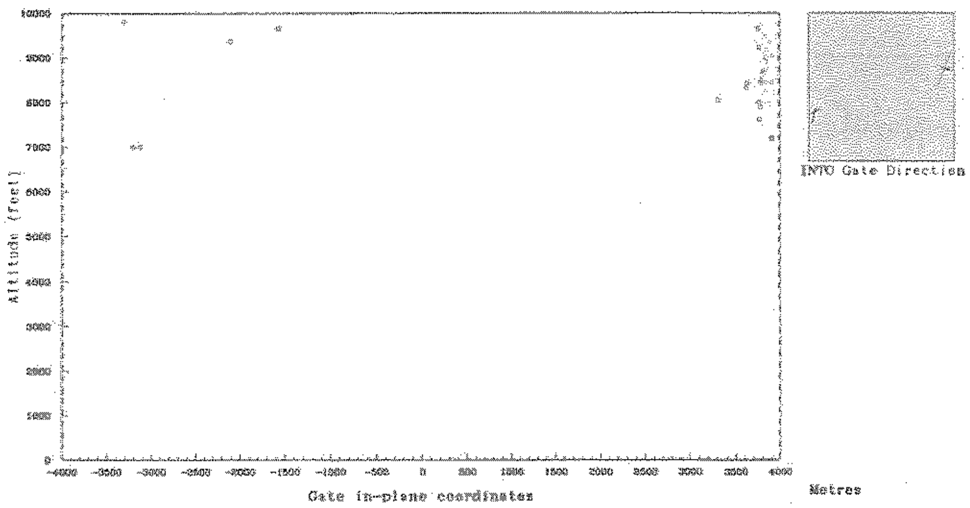

Figure 50 Spatial analysis graph for turboprop departures over Chidlow area July 2009

Perth STARs from the North Runways 03 & 06

The original environmental assessment identified that while the procedure had been designed to avoid residential areas to the maximum extent practicable, there was a potential environmental issue between waypoints GUNGN and GOSNL due to overflight of residential areas previously subject to little if any overflight. Moving the track further east to avoid these areas was considered but not available due to the effect this would have on departing traffic (departures would be required to maintain lower levels below the arrival track potentially increasing noise and emissions). In conclusion the assessment found that there was no practicable alternative to the proposed flight path; the noise impact would be mitigated by the design of the procedure avoiding residential areas as far as practicable; aircraft would be at idle power on descent over much of the track; and aircraft would be above 5000ft AMSL to the maximum extent practicable.

The jet aircraft flight tracks for arrivals from the north prior to the implementation of the WARRP changes are shown in Figure 4, while those following the WARRP changes are shown in Figure 10. Similarly the turboprop aircraft flight tracks for approaches from the north prior to the implementation of the WARRP changes are shown in Figure 5 while those following the WARRP changes are shown in Figure 11. These flight path figures indicate that there have been a number of changes to flight paths as a result of the implementation of this approach procedure.

The most notable change has been the removal of much of the jet and turboprop arrivals from over residential areas of Perth to the west of the airport. This arrival traffic has been relocated to less densely populated areas to the east of the airport.

In order to allow a more detailed review of aircraft flight paths over areas to the east of the airport, a more detailed analysis of arrivals on 5 August 2009, a day with predominant use of Runways 03 and 06 for arrivals, was undertaken. On the 5 August 2009 there were 131 jet departures and 59 turboprop arrivals for Runways 03 and 06. The flight tracks for these are shown in Figures 51 and 52 respectively.

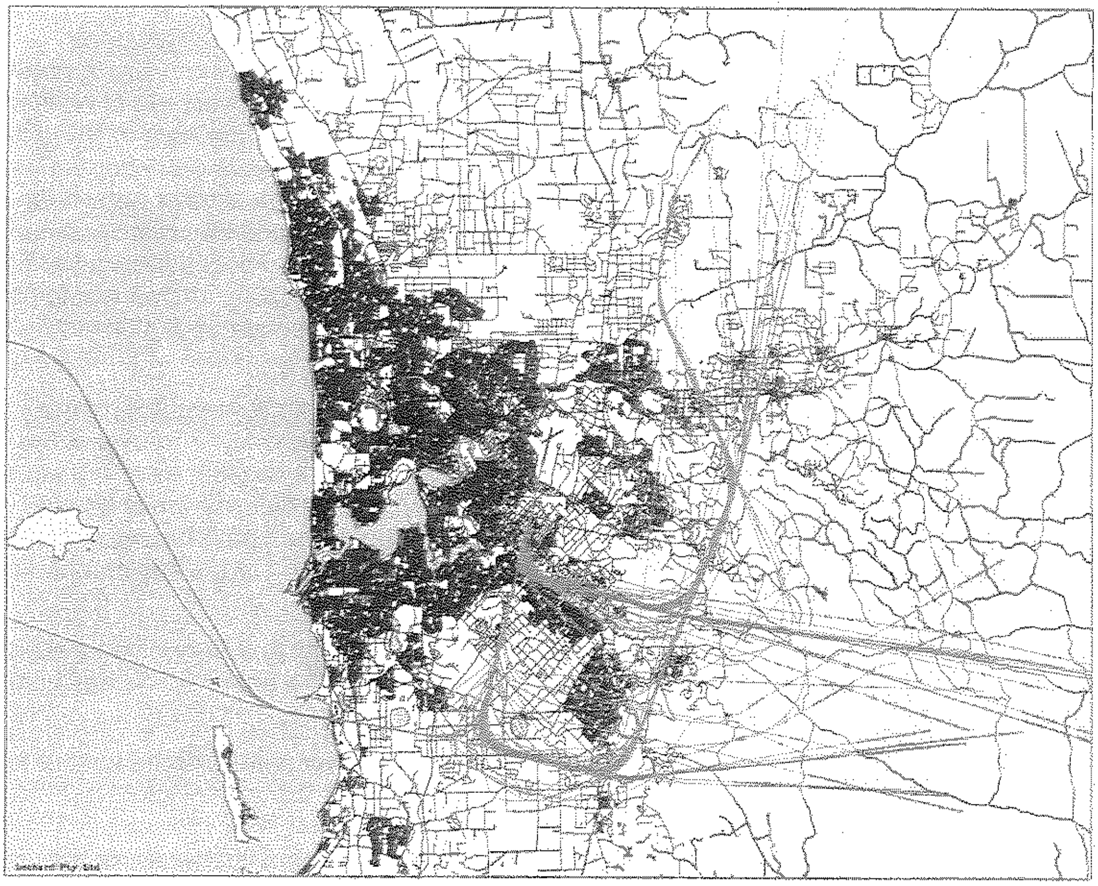

Figure 51 Jet arrivals on Runways 03 and 06 on 5 August 2009

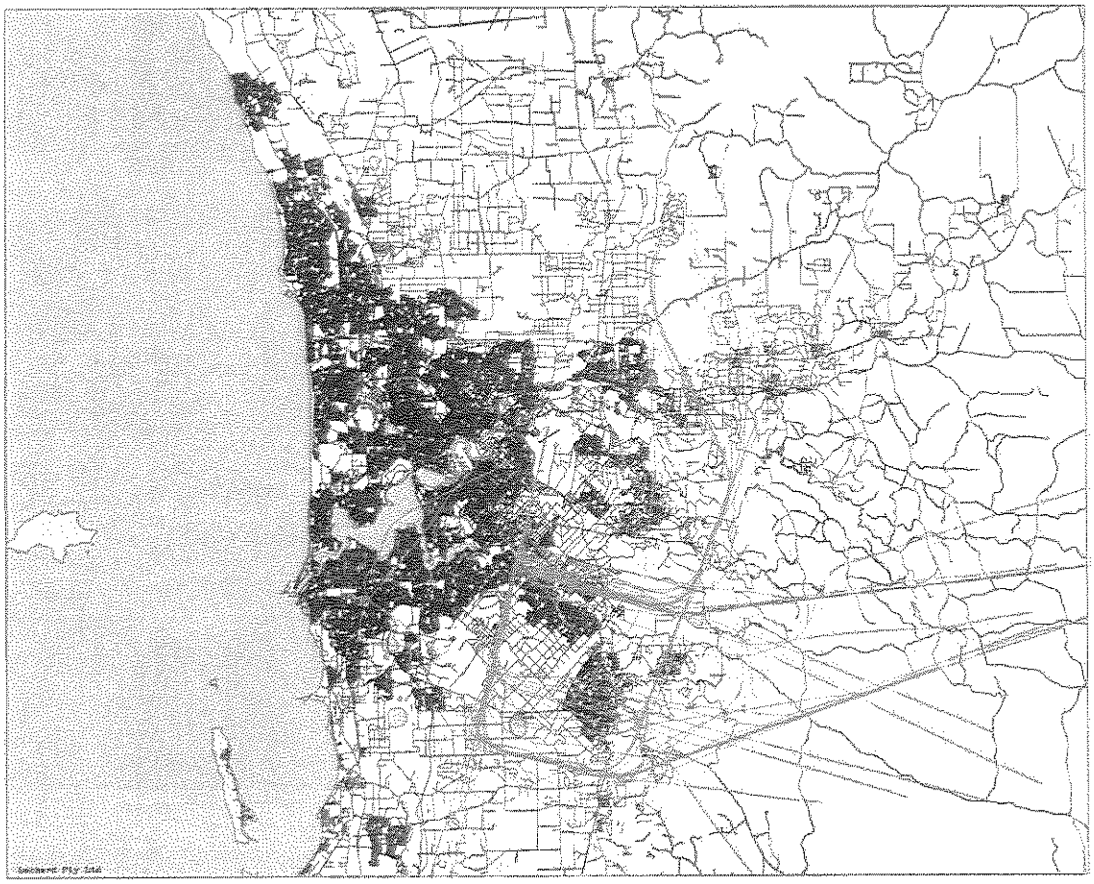

Figure 52 Turboprop arrivals on Runways 03 and 06 on 5 August 2009

A spatial analysis gate was created over the arrival tracks in the Glen Forrest area to determine the number of aircraft overflying this area and their altitudes. This determined that on the day there were 24 jet arrivals on Perth STARs from the North Runways 03 & 06 over or in the vicinity of Glen Forrest with a range of altitudes of approximately 5,000 (1,500m) – 10,000 feet (3,000m) AMSL as shown in Figure 53. Arrivals in the lower part of the altitude range are those tracking for a visual arrival via the GOSNL waypoint for Runway 03 while the higher aircraft are tracking for an Instrument Landing System (ILS) approach to Runway 03 or an approach to Runway 06. The lateral spread of these flight tracks is less than 400m. The same spatial analysis gate identified 6 turboprops over or in the vicinity of Glen Forrest with a range of altitudes of approximately 7,000 feet (2,100m) – 8,500 feet (2,550m) AMSL as shown in Figure 54.

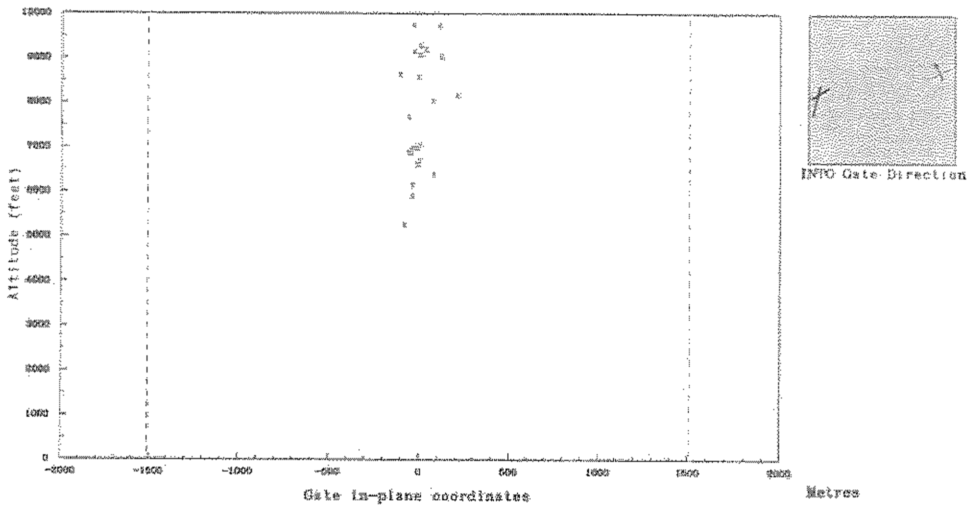

Figure 53 Spatial analysis graph jet arrivals over Glen Forrest area on 5 August 2009

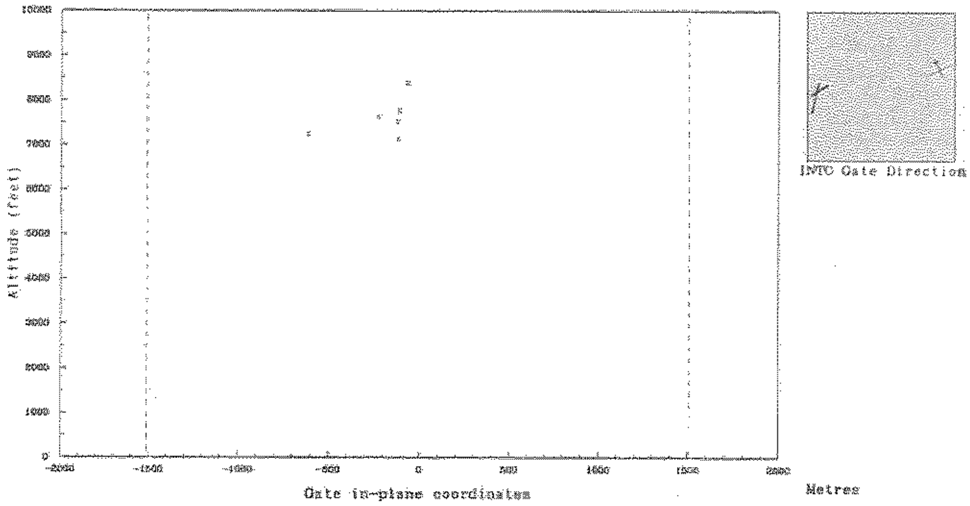

Figure 54 Spatial analysis graph turboprop arrivals over Glen Forrest area on 5 August 2009

Spatial analysis was undertaken for January 2009 for the Glen Forrest area to determine changes that have occurred as a result of the implementation of WARRP. As this arrival track did not exist over Glen Forrest before the implementation of the WARRP changes no comparison with January 2008 was made. The results of this analysis are shown in Table 10.

Table10 Arrivals over or in the vicinity of Glen Forrest – January 2009

January 2009			
Aircraft type	Number over or in the vicinity of Glen Forrest	Altitude range (AMSL)	Lateral Spread
Jet	131	4,000 – 10,000 feet (1,200 – 3,000m)	2,400m
Turboprop	42	4,500 – 10,000 feet (1,350 – 3,000m)	2,200m

The 131 jet arrivals over the Glen Forrest area in January 2009 represented approximately 3.7% of jet arrivals for the month. The altitudes of the aircraft ranged from 4,000 feet (1,200m) to 10,000 feet (3,000m) with a lateral spread of 2,400m with most arrivals confined to a spread of less than 500m. As with the single day analysis, arrivals in the lower part of the attitude range are those tracking for a visual arrival via the GOSNL waypoint for Runway 03, while the higher aircraft are tracking for an Instrument Landing System (ILS approach) on Runway 03 or an approach to runway 06. (Figure 55).

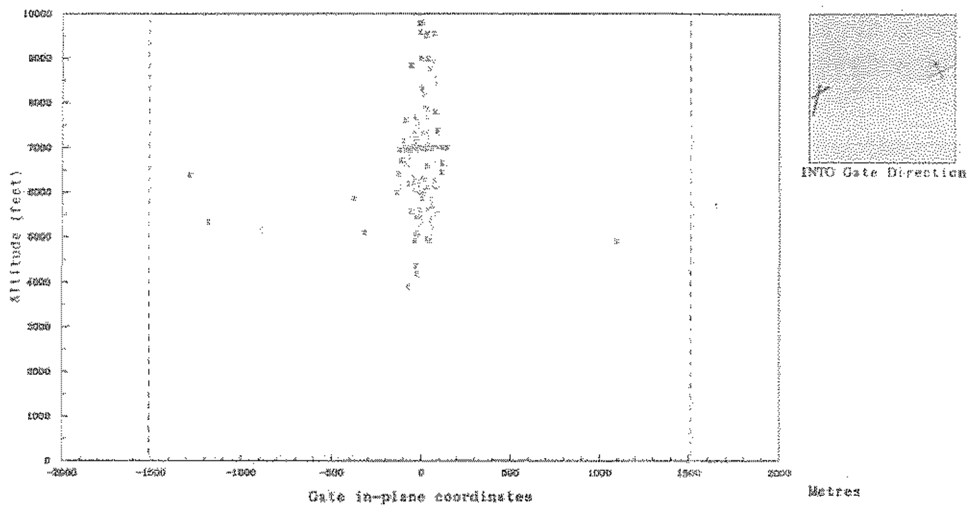

Figure 55 Spatial analysis graph jet arrivals over Glen Forrest area January 2008

The 42 turboprop arrivals over the Glen Forrest area in January 2009 represented approximately 3.5% of turboprop arrivals for the month. The altitudes of the aircraft ranged from 4,500 feet (1,350m) to 10,000 feet (2,550m) with a lateral spread of approximately 2,200m. (Figure 56).

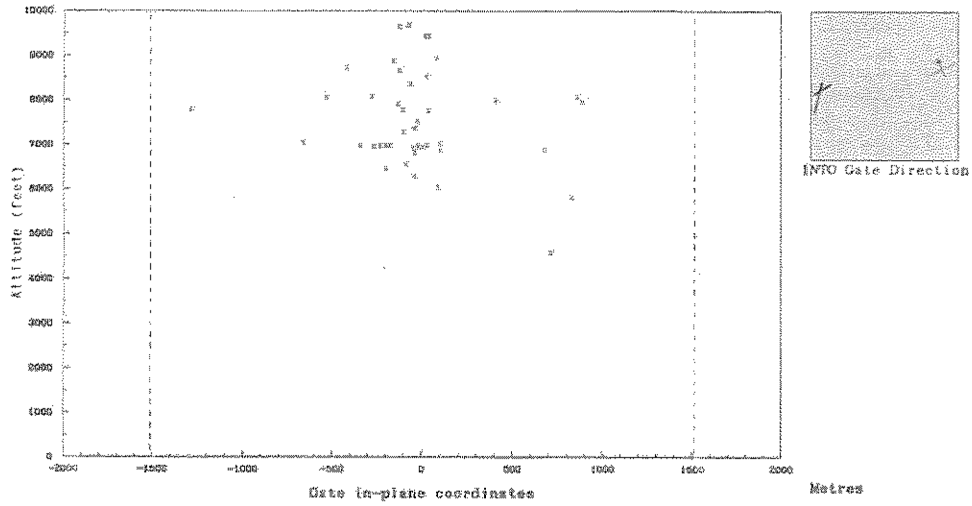

Figure 56 Spatial analysis graph turboprop arrivals over Glen Forrest area January 2008

The general elevation of the Glen Forrest area is approximately 800 feet or 250m AMSL, therefore the height of the aircraft above ground is approximately 800 feet or 250m less than that determined from the spatial analysis of the NFPMS data.

In order to consider the influence of seasonal weather conditions on runway use at Perth Airport additional analysis of movement data over the Glen Forrest area for July 2009 was also undertaken. The results of this analysis are shown in Table 11.

Table 11 Arrivals over or in the vicinity of Glen Forrest- July 2009

July 2009			
Aircraft type	Number over or in the vicinity of Glen Forrest	Altitude range (AMSL)	Lateral spread
Jet	356	4,500 – 10,000 feet (1,200 – 3,000m)	2,500m
Turboprop	94	6,000-10,000 feet (1,800 – 3,000m)	2,800m

The 356 jet arrivals over the Glen Forrest area in July 2009 represented approximately 12.9% of jet arrivals at Perth Airport for the month. The altitudes of the aircraft ranged from 5,000 feet (1,500m) to 10,000 feet (3,000m) with a lateral spread of less than 2,500m, although most arrivals were concentrated in a 500m spread in the centre of the analysis gate. As with the single day analysis, arrivals in the lower part of the altitude range are those tracking for a visual arrival via GOSNL waypoint for Runway 03 while the higher aircraft are tracking for an Instrument Landing System (ILS approach) on Runway 03 or an approach to runway 06. (Figure 57).

The 94 turboprop arrivals over the Glen Forrest area in July 2009 represented approximately 7.3% of turboprop arrivals at Perth Airport for the month. The altitudes of the aircraft ranged from 6,000 feet (1,800m) to 10,000 feet (3,000m) with a lateral spread of approximately 2,800m with most concentrated in a 500m spread in the centre of the analysis gate. (Figure 58).

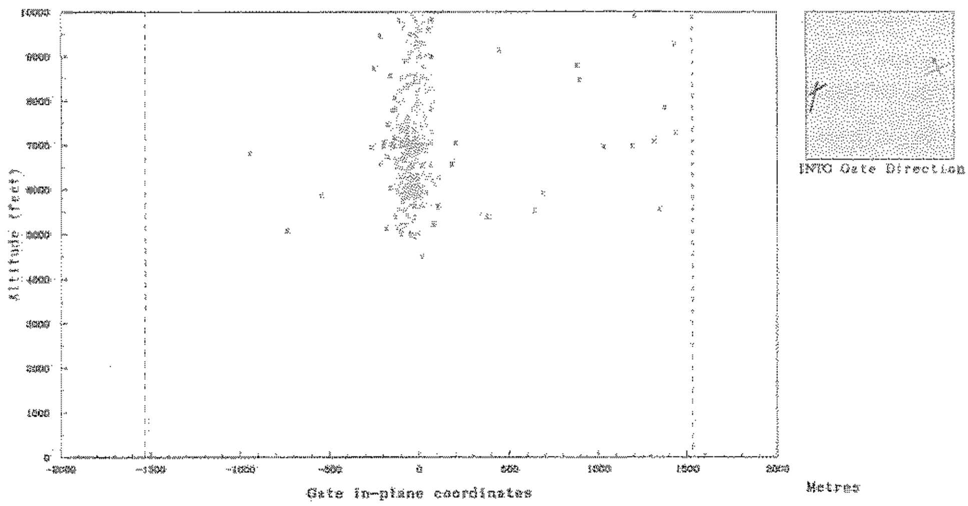

Figure 57 Spatial analysis graph for jet arrivals over Glen Forrest area July 2009

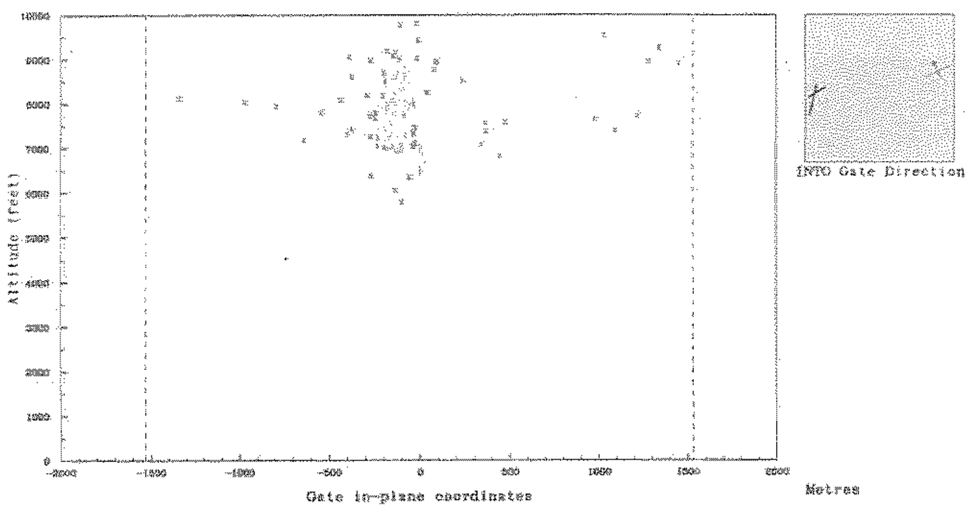

Figure 58 Spatial analysis graph for turboprop arrivals over Glen Forrest area July 2009

Perth STARs Runways 21 & 24

The environmental assessment identified that arriving aircraft already overflew the area affected by the change, which was already exposed to noise from arrivals and departures at Perth Airport, as well as other overflights. Some areas were expected to receive less overflights while others would experience an increase. Areas exposed to an increase would however experience a reduction in departure flights due to other WARRP related changes. Therefore the impact was not expected to be significant.

The jet aircraft flight tracks for arrivals from the east prior to the implementation of the WARRP changes are shown in Figure 4 while those following the WARRP changes are shown in Figure 10. Similarly the turboprop aircraft flight tracks for arrivals from the east prior to the implementation of the WARRP changes are shown in Figure 5 while those following the WARRP changes are shown in Figure 11. These flight path figures indicate that there have been a number of changes to flight paths as a result of the implementation of this approach procedure.

In order to allow a more detailed review of aircraft flight paths over areas to the east of the airport, a more detailed analysis of arrivals on 21 January 2009, a day with predominant use of Runways 21 and 24 for arrivals, was undertaken. On the 21 January 2009 there were 143 jet arrivals and 60 turboprop arrivals on Runways 21 and 24. The flight tracks for these are shown in Figures 59 and 60.

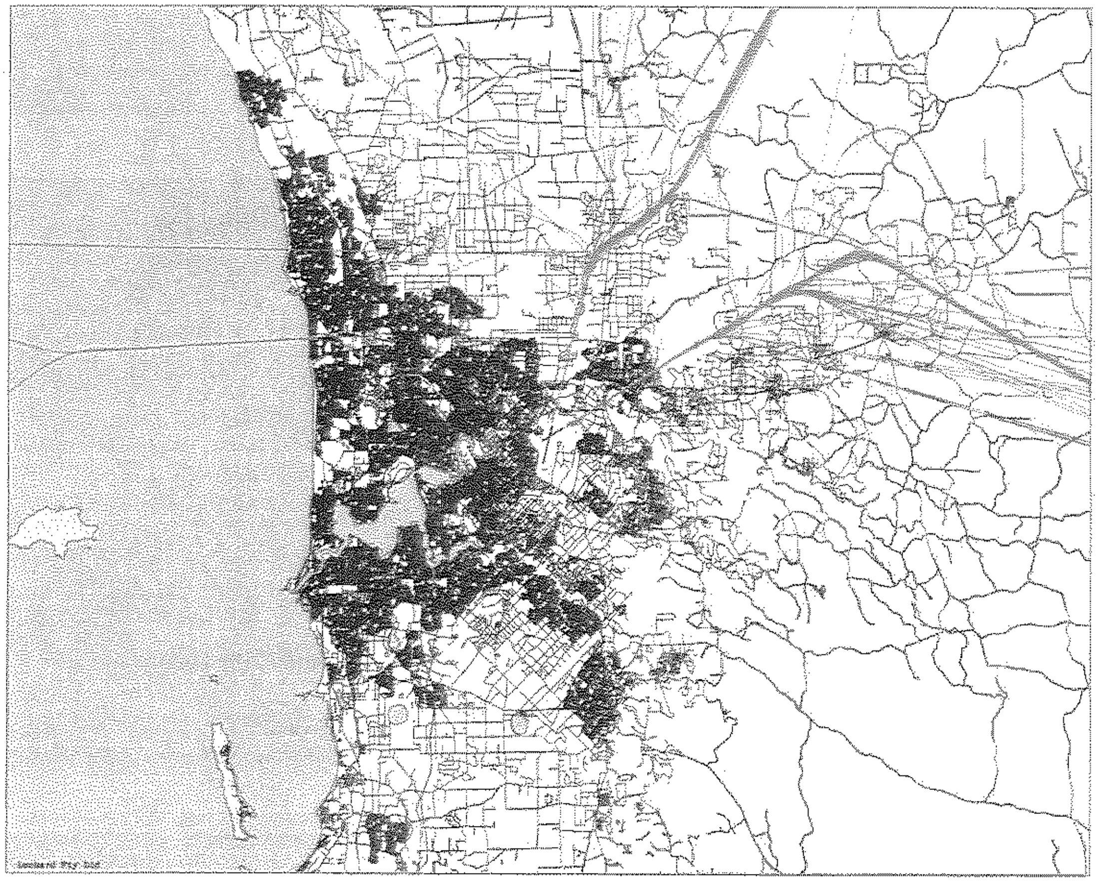

Figure 59 Jet arrivals for Runways 21 & 24 on 21 January 2009

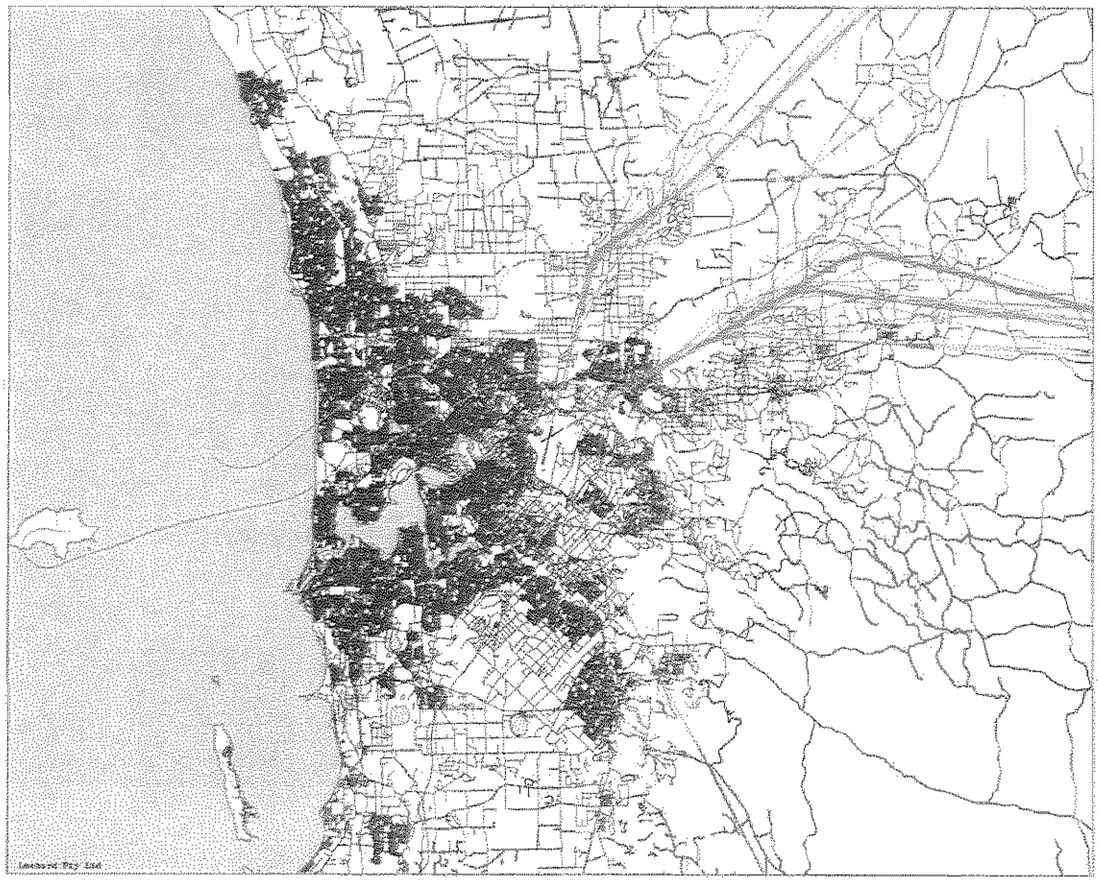

Figure 60 Turboprop arrivals for Runways 21 & 24 on 21 January 2009

A spatial analysis gate was created over the arrival tracks in the Stoneville area to determine the number of aircraft overflying this area and their altitudes. This determined that on the day there were 8 jet arrivals on Perth STARs from the East Runways 21 & 24 over or in the vicinity of Stoneville with a range of altitudes of approximately 2,500 (750m) – 3,500 feet (1,050) AMSL as shown in Figure 61. The lateral spread of these flight tracks is approximately 2,500m. The same spatial analysis gate identified 10 turboprops over or in the vicinity of Stoneville with a range of altitudes of approximately 2,500 feet (750m) – 4,000 feet (1,200m) AMSL as shown in Figure 62.

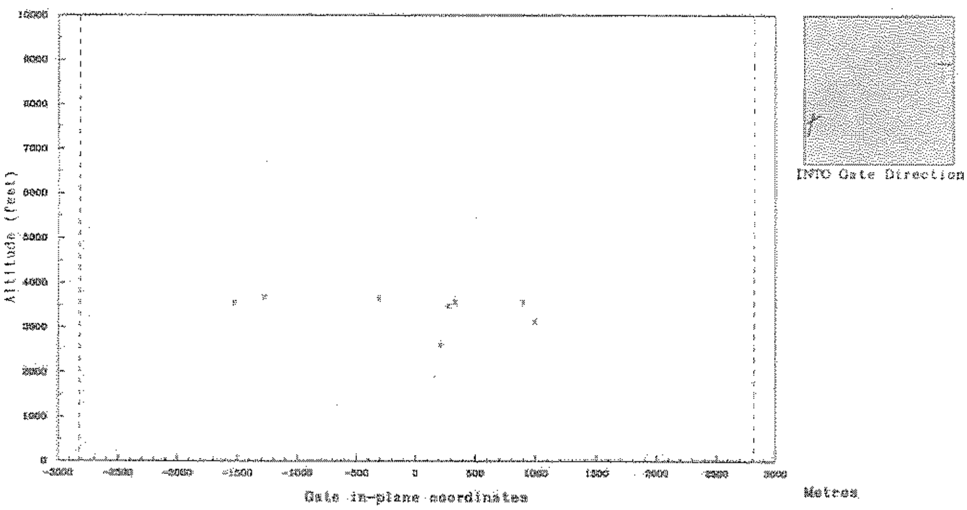

Figure 61 Spatial analysis graph for jet arrivals over Stoneville on 21 January 2009

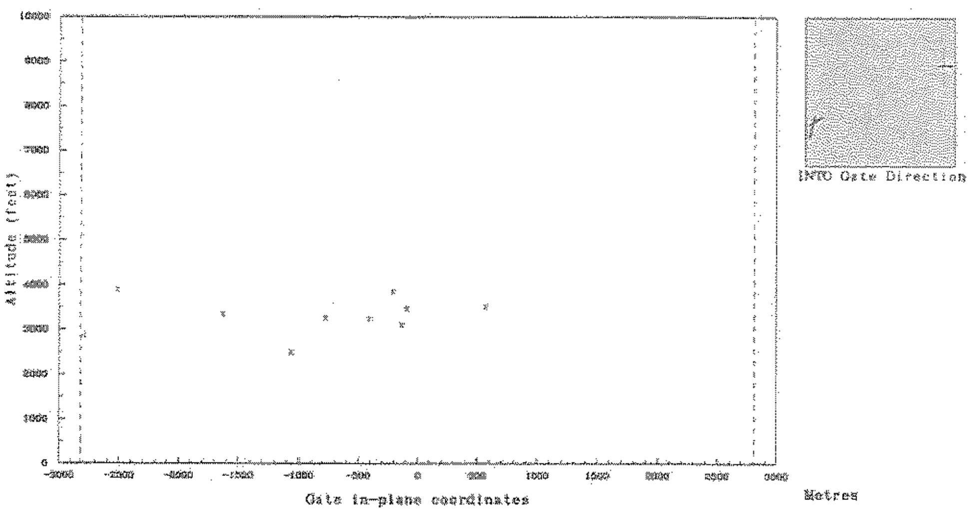

Figure 62 Spatial analysis graph for turboprop arrivals over Stoneville on 21 January 2009

Further spatial analysis was undertaken to compare January 2008 with January 2009 to determine changes that have may have occurred as a result of the implementation of WARRP. The results of this analysis are shown in Table 12.

Table 12 Comparison of arrivals over or in the vicinity of Stoneville – January 2008 compared to January 2009

January 2008			January 2009		
Aircraft type	Number over or in the vicinity of Stoneville	Altitude range (AMSL)	Aircraft type	Number over or in the vicinity of Stoneville	Altitude range (AMSL)
Jet	15	2,500 – 5,000 feet (750 – 1,500m)	Jet	229	2,500 – 6,000 feet (750 – 1,800m)
Turboprop	35	1,200* - 6,500 feet (360 – 1,950m)	Turboprop	102	2,500 – 5,000 feet 750 – 1,500m)

*Note: Aircraft at 1,200feet was a firefighting aircraft and not included in noise analysis.

The 15 jet arrivals over the Stoneville area in January 2008 represented approximately 0.5% of jet arrivals for the month while the 229 arrivals over the Stoneville area in January 2009 represented approximately 6.5% of jet arrivals for that month. The lateral spread of the jet departure tracks has increased from approximately 4,200m to 4,800m). (Figures 63 & 64)

The 35 turboprop arrivals over the Stoneville area in January 2008 represented approximately 2.3% of turboprop departures for the month while the 102 arrivals over the Stoneville area in January 2009 represented approximately 8.5% of turboprop arrivals for that month. The lateral spread of the turboprop departure tracks has reduced from approximately 5,600m to 4,800m.

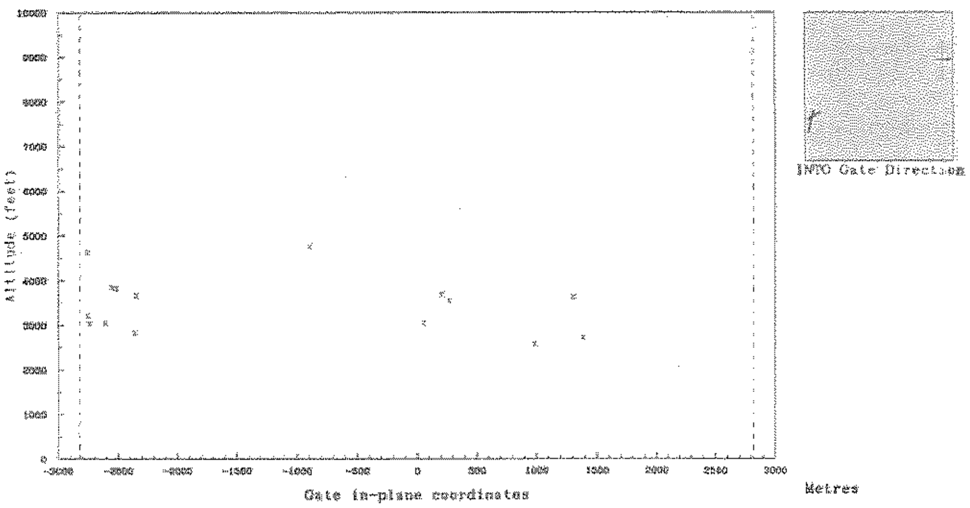

Figure 63 Spatial analysis graph for jet arrivals over Stoneville January 2008

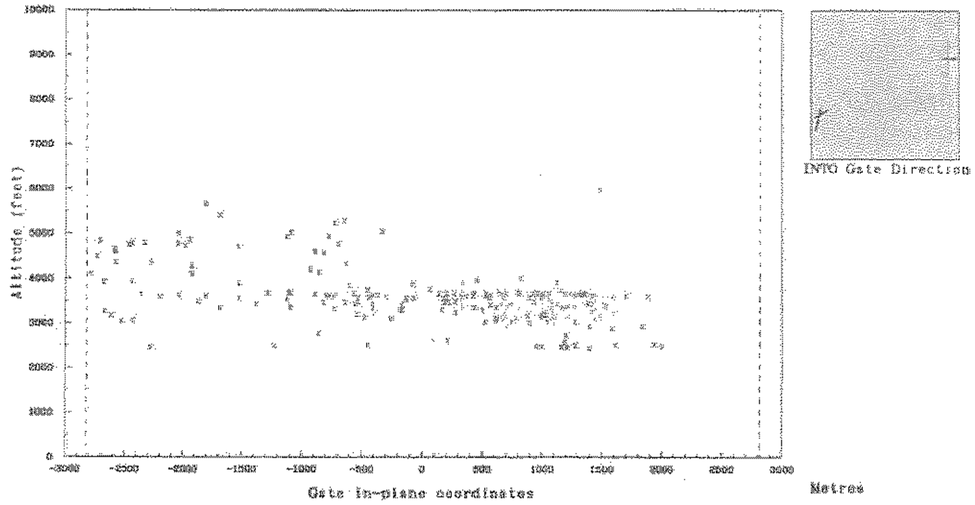

Figure 64 Spatial analysis graph for jet arrivals over Stoneville on January 2009

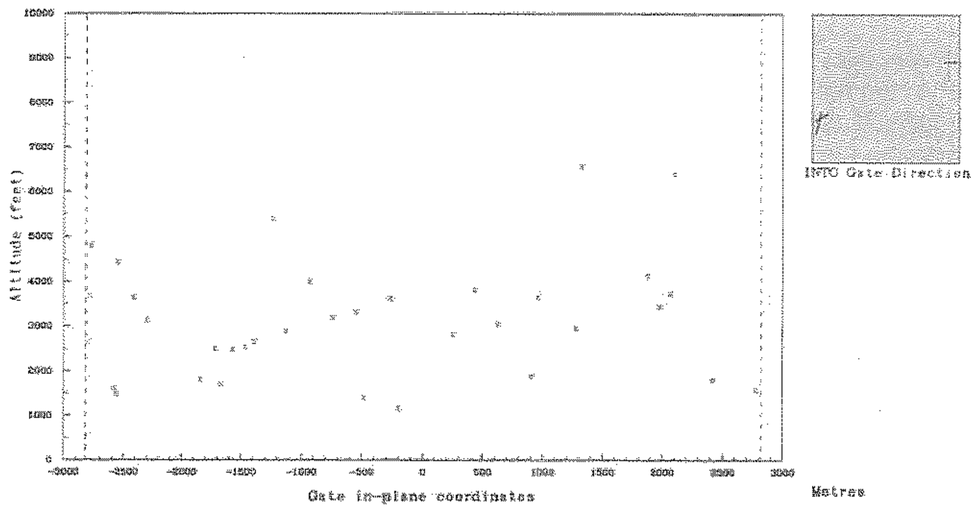

Figure 65 Spatial analysis graph for turboprop arrivals over Stoneville January 2008

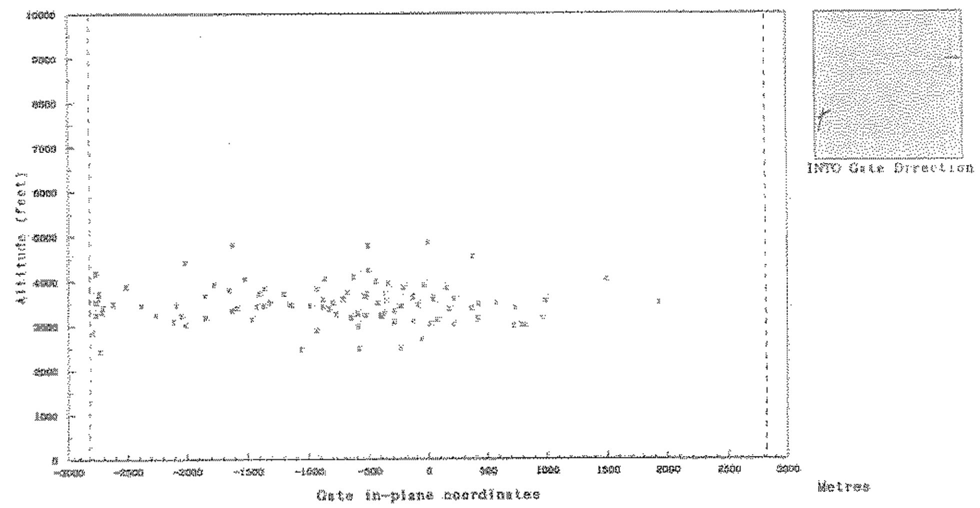

Figure 66 Spatial analysis graph for turboprop arrivals over Stoneville January 2009

Further spatial analysis was undertaken for the arrival tracks in the Chidlow area on 21 January 2009 to determine the number of aircraft overflying this area and their altitudes. This identified that on the day there were 58 jet arrivals on Perth STARs from the East Runways 21 & 24 over or in the vicinity of Chidlow with a range of altitudes of approximately 3,000 (1,500m) – 6,500 feet (1,950) AMSL as shown in Figure 67. The lateral spread of these flight tracks is approximately 8,500m with most aircraft concentrated at the northern end of the Chidlow area. The same spatial analysis gate identified 27 turboprops over or in the vicinity of Chidlow with a range of altitudes of approximately 3,500 feet (1,050m) – 6,000 feet (1,800m) AMSL as shown in Figure 68. The lateral spread of these flight tracks is approximately 7,500m, again with most aircraft concentrated at the northern end of the Chidlow area.

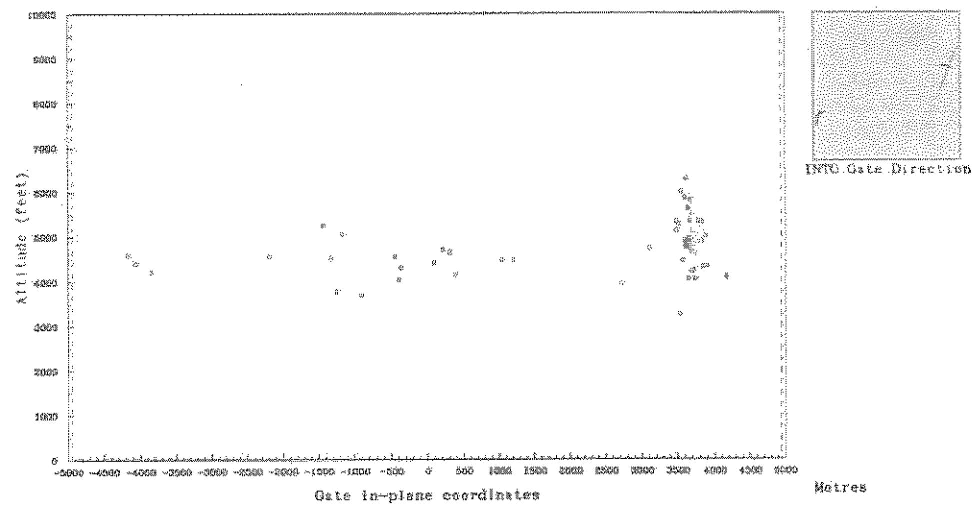

Figure 67 Spatial analysis graph for jet arrivals over Chidlow area on 21 January 2009

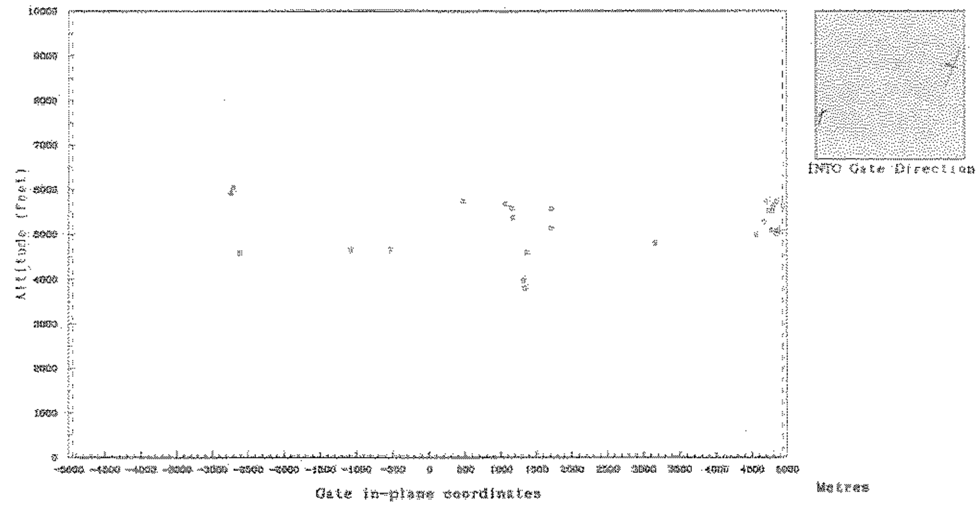

Figure 68 Spatial analysis graph for turboprop arrivals over Chidlow area on 21 January 2009

Further spatial analysis was undertaken to compare January 2008 with January 2009 to determine changes that have may have occurred as a result of the implementation of WARRP. The results of this analysis are shown in Table 13.

Table 13 Comparison of arrivals over or in the vicinity of Chidlow - January 2008 compared to January 2009

January 2008			January 2009		
Aircraft type	Number over or in the vicinity of Chidlow	Altitude range (AMSL)	Aircraft type	Number over or in the vicinity of Chidlow	Altitude range (AMSL)
Jet	631	3,000 – 8,500 feet (1,500 – 2,550m)	Jet	1259	3,000 – 8,500 feet (1,500 – 2,550m)
Turboprop	66	3,500 - 7,500 feet (1,050 – 2,250m)	Turboprop	356	3,000 - 8,500 feet (1,500 – 2,550m)

The 631 jet arrivals over the Chidlow area in January 2008 represented approximately 21.2% of jet arrivals for the month while the 1259 arrivals over the Chidlow area in January 2009 represented approximately 35.5% of jet arrivals for that month. The lateral spread of the jet arrival tracks has remained constant at approximately 10,000m over and in the vicinity of Chidlow. However there has been a slight shift in a concentration of traffic on the northern extremity of the lateral spread. This concentration representing the BEVLY STAR implemented with WARRP has moved approximately 500m south compared to the pre WARRP flight tracks. (Figures 69 & 70).

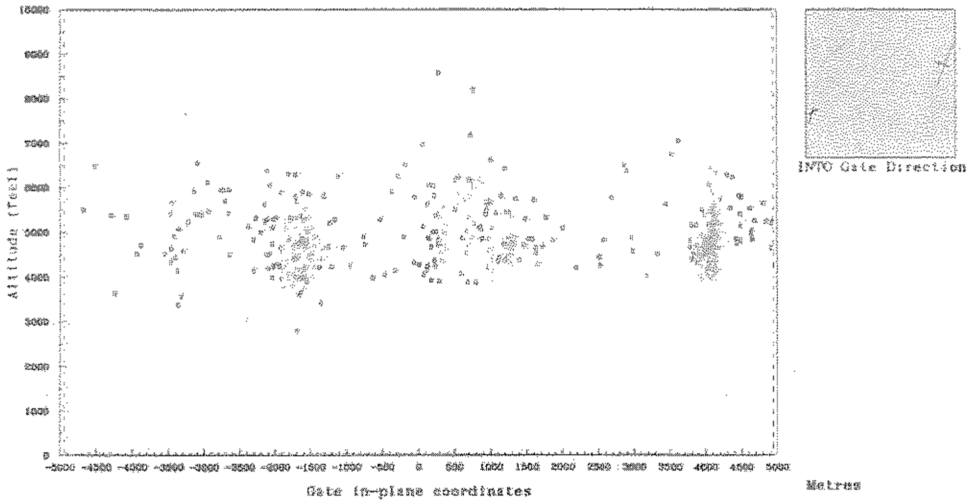

Figure 69 Spatial analysis graph for jet arrivals over Chidlow area January 2008

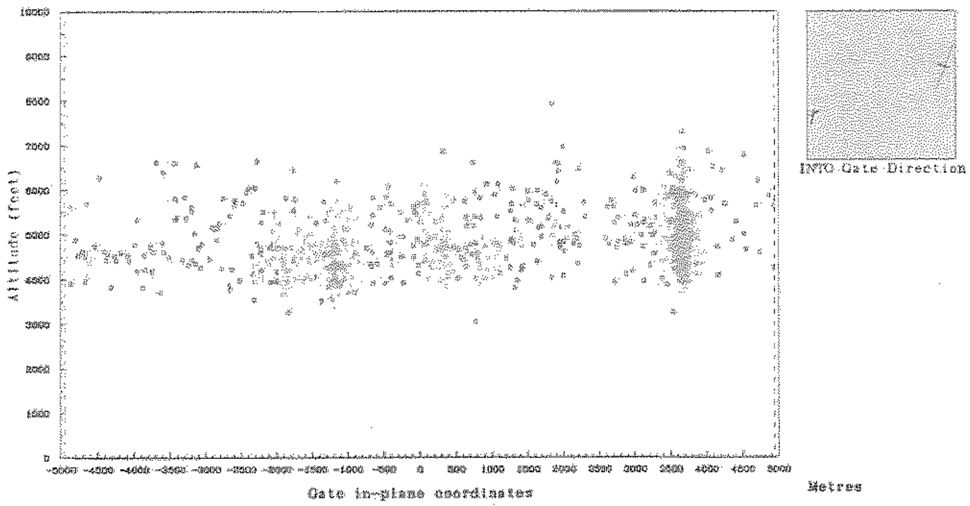

Figure 70 Spatial analysis graph for jet arrivals over Chidlow area January 2009

The 66 turboprop arrivals over the Chidlow area in January 2008 represented approximately 4.4% of turboprop departures for the month while the 356 arrivals over the Chidlow area in January 2009 represented approximately 29.6% of turboprop arrivals for that month. The lateral spread of the jet arrival tracks has also remained constant at approximately 10,000m over and in the vicinity of Chidlow, however the majority of the tracks are concentrated at the northern extremity of the spread. (Figures 71 & 72).

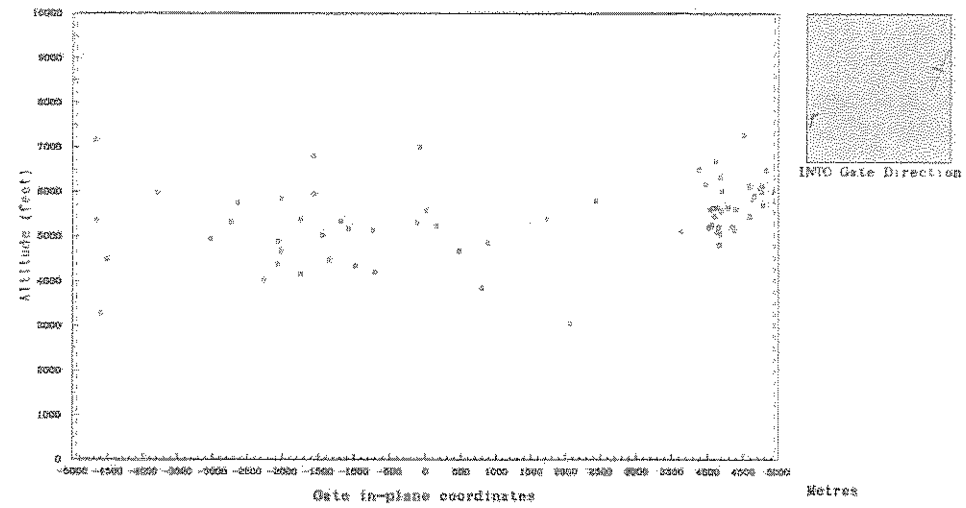

Figure 71 Spatial analysis graph for turboprop arrivals over Chidlow area January 2008

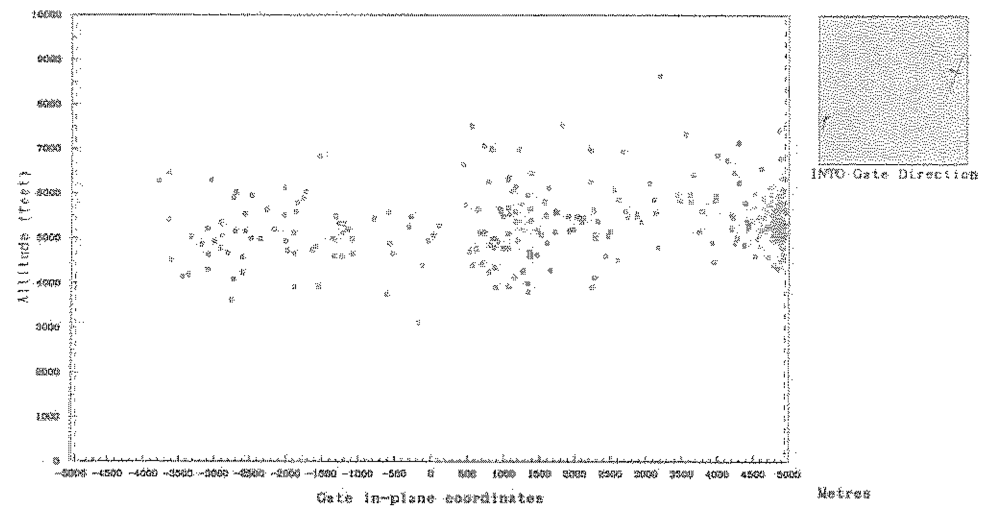

Figure 72 Spatial analysis graph for turboprop arrivals over Chidlow area January 2009

Aircraft noise levels

Airservices' assessment process, based on the organisation's *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise*, uses, among other criteria a single event maximum noise level of 70 dB(A) as a measure of determining the likely impact from aircraft over flights. 70 dB(A) is generally considered to be the external sound level below which no difficulty with reliable communication from radio, television or conversational speech in a typical room with windows open is expected. (Reference - Department of Transport and Regional Services, 2000, *Expanding Ways to Describe and Assess Aircraft Noise,* pp23-35).

The environmental assessments for the WARRP changes around Perth Airport considered that, in most cases, changes in flight paths would not be likely to expose communities to significant noise levels. This was because:

- the numbers of aircraft involved were expected to be unchanged and less than 50 overflights per day, which is the number regarded as having a significant noise impact;
- the altitude at which aircraft would overfly the new communities (generally above 5000ft above mean sea level (AMSL), was an altitude above which noise from jet aircraft should pose minimal disturbance to underlying communities; and
- in the case of arrivals, the new procedures would facilitate continuous descent operations which result in less noise through the increased ability of aircraft to descend using lower engine thrust settings.

It was also determined that some areas of Perth such as those more densely populated areas to the west of the airport would also experience a decrease in noise exposure. This is due to a reduction in the number of aircraft overflights as a result of the implementation of WARRP, thereby decreasing the overall environmental impact of aircraft noise.

Perth Airport is covered by Airservices Australia's NFPMS which includes five noise monitoring terminals (NMT). The location of NMTs is determined by factors including the proximity to flight paths and ambient noise levels. All Perth Airport NMTs are located on or close to the extended runway centrelines within 7.3km of the runway ends in order to meet siting criteria and ensure robust aircraft noise data is obtained. There are no NMTs located in any of the areas of substantial noise complaints as the distance from flight paths, altitudes of aircraft and low ambient noise levels make obtaining reliable aircraft noise data very difficult.

As there are no noise monitors at locations at a distance from the airport, aircraft noise levels at these locations has been estimated using the Integrated Noise Model (INM) developed by the US Federal Aviation Administration (FAA). While the INM is a sophisticated modelling tool which uses noise and performance data from aircraft manufacturers, it is important to note that, because the INM is designed to estimate long-term average effects using average annual input conditions and is not a detailed acoustics model, differences between predicted and measured values can and do occur because important local acoustical variables are not averaged, or because complicated physical phenomena are not explicitly modelled. Day to day variations in aircraft performance, aircraft weights and weather conditions may also result in differences between predicted and measured aircraft noise values. However, in the absence of measured noise data, this was considered to be the only means of obtaining some useful noise information.

Noise modeling has been undertaken for representative aircraft types and the indicative single event maximum noise level determined for the lowest and highest using altitudes determined from the NFPMS data. The results are shown in Tables 14-19.

Table 14 Calculated noise levels for selected aircraft types associated with departures from Runways 03/06 over the Beechboro area

Aircraft Type	Calculated single event maximum noise level (dB(A)) at 2000 feet (600m) AGL	Calculated single event maximum noise level (dB(A)) at 7,000 feet (2,100m) AGL	Number of each type in January 2009	Number of each type in July 2009
B777-300	72	44	3	3
B767-300	77	53	0	3
B747-400	85	69	0	0
B737-700/800	79	65	9	47
B737-400	79	65	0	2
Airbus A340	78	62	11	12
Airbus A330	77	65	7	30
Dash 8	60	46	0	6

Note the Dash 8 is a turboprop while the other aircraft types are jets. Height above sea level is approximately the same as height above ground level for Beechboro.

Table 15 Calculated noise levels for selected aircraft types associated with departures from Runway 03/06 over the Stoneville area

Aircraft Type	Calculated single event maximum noise level (dB(A)) at 3,000 feet (1,500m) AGL	Calculated single event maximum noise level (dB(A)) at 9,000 feet (2,700m) AGL	Number of each type in January 2009	Number of each type in July 2009
B777-300	67	25	0	0
B767-300	76	50	0	107
B747-400	81	60	0	0
B737-700/800	75	62	82	273
B737-400	75	61	13	19
Airbus A340	79	59	0	0
Airbus A330	76	63	10	56
Dash 8	53 (Based on 3,500 feet AGL)	42	3	1

Note the Dash 8 is a turboprop while the other aircraft types are jets. Stoneville has been taken as being approximately 1,000feet (300m) above mean sea level.

Table 16 Calculated noise levels for selected aircraft types associated with departures from Runways 03/06 over the Chidlow area

Aircraft Type	Calculated single event maximum noise level (dB(A)) at 5,000 feet (1,500m) AGL	Calculated single event maximum noise level (dB(A)) at 9,000 feet (2,700m) AGL	Number of each type in January 2009	Number of each type in July 2009
B777-300	61	25	22	38
B767-300	66	50	0	0
B747-400	70	60	0	0
B737-700/800	69	62	51	151
B737-400	68	61	4	9
Airbus A340	68	59	0	0
Airbus A330	69	62	7	8
Dash 8-300	50 (Based on 4,000 feet AGL	42	3	0

Note the Dash 8-300 is a turboprop while the other aircraft types are jets. Chidlow has been taken as being approximately 1,000feet (300m) above mean sea level

Table 17 Calculated noise levels for selected aircraft types associated with arrivals for Runways 21/21 over the Chidlow area

Aircraft Type	Calculated single event maximum noise level (dB(A)) at 2,000 feet (600m) AGL	Calculated single event maximum noise level (dB(A)) at 7,500 feet (2,250m) AGL	Number of each type in January 2009	Number of each type in July 2009
B777-300	74	53	0	0
B767-300	73	56	312	166
B747-400	78	63	0	1
B737-700/800	71	52	481	288
B737-400	70	53	40	23
Airbus A340	70	56	0	2
Airbus A330	71	53	80	92
Dash 8-300	61 (Based on 2,000 feet AGL)	44	96	57

Note the Dash 8-300 is a turboprop while the other aircraft types are jets. Chidlow has been taken as being approximately 1,000feet (300m) above mean sea level.

Table 18 Calculated noise levels for selected aircraft types associated with arrivals for Runways 21/24 over the Stoneville area

Aircraft Type	Calculated single event maximum noise level (dB(A)) at 1,500 feet (450m) AGL	Calculated single event maximum noise level (dB(A)) at 5,000 feet (1,500m) AGL	Number of each type in January 2009	Number of each type in July 2009
B777-300	72	57	0	0
B767-300	74	60	50	14
B747-400	79	67	0	0
B737-700/800	73	55	112	41
B737-400	71	57	12	0
Airbus A340	71	60	0	0
Airbus A330	74	57	6	3
Dash 8-300	59 (Based on 1,500 feet AGL)	48	20	17

Note the Dash 8-300 is a turboprop while the other aircraft types are jets. Chidlow has been taken as being approximately 1,000feet (300m) above mean sea level

Table 19 Calculated noise levels for selected aircraft types associated with arrivals over the Glen Forrest area

Aircraft Type	Calculated single event maximum noise level (dB(A)) at 3,200 feet (960m) AGL	Calculated single event maximum noise level (dB(A)) at 9,200 feet (2,760) AGL	Number of each type in January 2009	Number of each type in July 2009
B777-300	62	50	7	7
B767-300	66	51	3	1
B747-400	72	61	0	0
B737-700/800	61	50	16	29
B737-400	63	51	1	0
Airbus A340	65	54	0	2
Airbus A330	61	51	13	42
Dash 8-300	53 (Based on 3,700 feet AGL)	42	10	25

While the noise from aircraft operations may generally be below the level of 70 dB(A), generally accepted as a threshold level for annoyance, it is noted that most of the communities expressing concern about the WARRP changes have low ambient noise levels, particularly at night. Therefore while the single event maximum noise levels from aircraft overflights may generally not be considered significant, in some situations it will still be noticeable to the residents being overflown.

Mitigation measures since the implementation of WARRP

In response to public concern about aircraft noise at Perth following the implementation of WARRP changes, Airservices has been reviewing a number of the procedures to identify potential opportunities for improvement.

One area of concern was aircraft arrivals tracking directly to the Parkerville navigation aid from a distant waypoint to the east of Perth. This resulted in jet aircraft tracking over locations such as Stoneville that had not previously been regularly exposed to aircraft noise from these arrivals. In early 2010 Perth Air Traffic Control (ATC) changed their procedures to ensure that aircraft would only use this track when absolutely necessary i.e. due to weather or safety requirements. Aircraft previously using the track would now normally arrive via the BEVLY STAR and remain to the north of the Chidlow area or track directly to SPUDO waypoint for traffic sequencing. In both cases overflight of the Stoneville area by these arrivals would be avoided.

Perth ATC staff are also developing options to reduce the overflight of the Beechboro and other residential areas to the west by aircraft departing from Runway 03 and turning west to avoid the Pearce military airspace to the north. The options involve tracking north and west bound jet aircraft straight ahead on runway heading before turning west and avoiding residential areas when the Pearce military airspace is deactivated and available to Perth ATC. This will particularly apply to heavy International flights departing for destinations in the Middle East, South Africa and Mauritius, thereby minimising overflight of residential areas such as Beechboro by these flights in the more noise sensitive night and early morning periods.

In mid April 2010 Airservices installed temporary portable aircraft noise monitors at two locations in the Chidlow area. These will remain in place for 6 – 12 months. The locations are at some distance from the airport however it is expected that they will provide useful aircraft noise data to further review the noise exposure on communities in this area. Noise data from these two temporary portable monitors will be available to members of the community online via WebTrak and through the regular quarterly Perth NFPMS reports on Airservices website.

Conclusions

The Post Implementation Review of WARRP reviewed the changes implemented in the Perth Terminal Airspace in November 2008 to assess if the changes and mitigations had been implemented as planned and to see if the expected environmental outcome was realised.

The review has found that the proposed changes have generally been implemented as proposed and the environmental outcomes have been as expected. However, there have been some unexpected environmental outcomes, such as the greater than expected increase in departures over Beechboro, which have resulted in an increase in the number of noise complaints from residents around Perth airport and beyond.

The noise complaint data for the calendar year 2009 were used to identify key areas of concern and the associated air traffic procedures for detailed review. The outcomes of the detailed review are:

- **Perth SID West Runway 03 procedure**

The environmental assessment identified potential environmental issues associated with the increased use (estimated to be a tenfold increase to 26 flights/week) of the existing departure track over the suburbs of Beechboro, Malaga and Ballajura. However the assessment, which assumed that the availability of Pearce airspace would not change, found that the noise impact could appropriately be mitigated by formalising the existing practice of tracking departures via R155/156 (Pearce military areas) outside the hours of activation, particularly for departures during the noise sensitive night period.

While the noise from individual aircraft overflights has not changed due to any changes in aircraft types or differences in altitudes, particularly jets, the PIR has shown that there has been an increase in the number of flights on this departure track. The comparison of January 2009 with January 2008 showed a 5 fold increase in traffic while the comparison of July 2009 with July 2008 showed a 13 fold increase which exceeded the increase anticipated in the environmental assessment of the proposal. The greater than expected increase is likely to be due to the continued growth in air traffic at Perth Airport and a decrease in the availability of access to the Pearce military areas due to increased military flying, particularly at night, as well as increased use of this departure procedure as a result of the WARRP changes. Further work is being undertaken to formalise the existing practice of tracking departures via the Pearce military areas outside the hours of activation, particularly for heavy International departures during the noise sensitive night period. This is expected to mitigate the noise impact and provide respite to residents in areas such as Beechboro, Malaga and Ballajura.

- **Perth SID East/AMANA SID Runways 03/06**

The proposal replicated the existing routes to the maximum extent practicable particularly over built up areas to the north-east of the airport. However the environmental assessment did identify that changes were likely to move the track 0.5 nautical miles (925m) to the south over the Stratton area. Aircraft in the vicinity of Stratton would be between 3000 feet (900m) and 5000 feet (1,500m) above ground level and climbing, thereby minimising noise as far as practicable. Therefore the proposed change was not considered likely to be significant.

The PIR has determined that there has been an increase in jet traffic over the Stoneville area and jet and turboprop traffic over the Chidlow area following the implementation of this departure procedure.

The comparison of January 2009 with January 2008 showed a 4 fold increase in jet departures while the comparison of July 2009 with July 2008 showed a 6 fold increase over the Stoneville area. While the location of the new departure track replicates the previous track as far as practicable, the new departure procedure has resulted in a concentrated flight path that is further south than the previous track and overflies areas including the northern area of Stoneville.

An examination of a busy day for Runway 03 and Runway 06 departures showed that Stoneville could be overflown by 81 jet departures with a range of altitudes from 3,500 feet (1,050m) – 9,000 feet (2,700) AMSL. The lateral spread of these flights was less than 1,000m. The elevation at Stoneville is approximately 1,000feet (300m) meaning some of these jet departures are 2,500 feet (750m) AGL and therefore exposing the community to noise levels above 70 dB(A). While most of these departures were at or above 4,500 feet, (1,350m) the elevation at Stoneville meant they were still below 5,000 feet (1,500m) AGL above which jet aircraft noise is generally below the accepted 70 dB(A). Jet aircraft in the lower range of altitudes could therefore result in a noise levels above 70 dB(A) at ground level. The comparison of January 2009 with January 2008 also showed a 2-3 fold increase in jet departures.

Analysis of jet departures in the vicinity of Chidlow for the same day showed there were 67 flights with all but one flight within an altitude range of 6,000 feet (1,800m) – 10,000 feet

(3,000m). The lateral spread of these aircraft was 4,000m. Allowing for the 1,000 feet (300m) elevation of the Chidlow area, the jet departures are achieving the minimum 5,000 feet (1,500m) AGL generally required to reduce jet aircraft noise levels to below 70 dB(A).

There has also been an increase in turboprop departures over the Chidlow area. The comparison of January 2009 with January 2008 showed a 7 fold increase in jet departures while the comparison of July 2009 with July 2008 showed a small increase from 21 to 31 departures. However the altitude range of turboprop departures was 6,500 feet (1,950m) – 10,000 feet (3,000m) which, allowing for the elevation of Childlow, means they were all above the 3,000 feet AGL above which turboprop aircraft noise is less than 70 dB(A).

This analysis indicates that aircraft noise levels from jet departures over the Stoneville area is likely to exceed 70 dB(A) and a relatively large number of aircraft are contained within a narrow flight paths. The same analysis has indicated that the departure traffic, while still a relatively large number, over the Chidlow area is at an altitude such that noise from aircraft would be expected to be less than 70 dB(A) and the wide lateral spread indicates that the tracks are not particularly concentrated over this area.

- **Perth STARs from the North Runways 03 & 06**

The environmental assessment identified that while the procedure had been designed to avoid residential areas to the maximum extent practicable, there was a potential environmental issue between waypoints GUNGN and GOSNL due to overflight of residential areas previously subject to little if any overflight. Moving the track further east to avoid these areas was considered but not available due to the effect this would have on departing traffic (departures would be required to maintain lower levels below the arrival track potentially increasing noise and emissions). In conclusion the assessment found that there was no practicable alternative to the proposed flight path, the noise impact would be mitigated by the design of the procedure avoiding residential areas as far as practicable; aircraft would be at idle power on descent over much of the track; and aircraft would be above 5000ft AMSL to the maximum extent practicable.

The PIR has determined that there has been an increase in jet traffic over Glen Forrest and other areas on this arrival route, much of which did not have arrival traffic before the implementation of the WARRP changes. As Glen Forrest was not overflown by arrivals from the north prior to November 2008 due to these arrivals coming from the west of the airport, no analysis of the pre WARRP situation was possible.

An examination of a busy day for Runway 03 and Runway 06 arrivals determined that on the day there were 24 jet arrivals on Perth STARs from the North Runways 03 & 06 over or in the vicinity of Glen Forrest, with a range of altitudes of approximately 4,500 feet (1,350m) – 10,000 feet (3,000m) AMSL. Arrivals in the lower part of the altitude range are those tracking for a visual arrival via the GOSNL waypoint for Runway 03, while the higher aircraft are tracking for an ILS approach to Runway 03 or an approach to Runway 06. The lateral spread of these flight tracks is less than 400m. The spatial analysis identified 6 turboprops over or in the vicinity of Glen Forrest with a range of altitudes of approximately 7,000 feet (2,100m) – 8,500 feet (2,550m) AMSL.

Spatial analysis was also undertaken for January and July 2009 for Glen Forrest overflights. There were 131 jet arrivals over the Glen Forrest area in January 2009 and 356 jet arrivals in July 2009. The altitudes of the aircraft ranged from 4,500 feet (1,350m) to 10,000 feet (3,000m) with most arrivals within a lateral spread of 400m. As with the single day analysis, arrivals in the lower part of the latitude range are those tracking for a visual arrival via the

GOSNL waypoint for Runway 03 while the higher aircraft are tracking for an Instrument Landing System (ILS approach) on Runway 03 or an approach to runway 06

There were 42 turboprop arrivals over the Glen Forrest area in January 2009 and 94 turboprop arrivals in July 2009. The altitudes of the aircraft ranged from 4,500 feet (1,350m) to 10,000 feet (2,550m) with a lateral spread of up to 2,800m.

The elevation at Glen Forrest is approximately 800 feet (250m) meaning some of these jet arrivals are below 5,000 feet (1,500m) AGL and therefore may expose the community to noise levels above 70 dB(A). However the altitude range of turboprops was such that even allowing for the elevation of Glen Forrest means they were all above the 3,000 feet AGL above which turboprop aircraft noise is less than 70 dB(A).

This analysis indicates that while there is a relatively large number of aircraft contained within a narrow flight path over the Glen Forrest area, the calculated aircraft noise levels indicate that noise from aircraft are generally not likely to exceed 70 dB(A).

- **Perth STARs Runways 21 & 24**

The environmental assessment identified that arriving aircraft already overflew the areas affected by the change which was also exposed to noise departures at Perth Airport as well as other overflights. Some areas were expected to receive less overflights while others would experience an increase. However the areas exposed to an increase in arrival traffic were expected to experience a reduction in departure flights due to other WARRP related changes. Therefore no significant impact was expected.

The PIR has determined that there has been an increase in jet and turboprop traffic over the Stoneville and Chidlow areas following the implementation of this arrival procedure.

The comparison of January 2009 with January 2008 showed a 15 fold increase in jet arrivals over the Stoneville area while the same comparison for the Chidlow area showed a 2 fold increase over the Chidlow area. Turboprop arrivals also showed an increase for the same period of comparison with a 3 fold increase for the Stoneville area and a 5 fold increase for the Chidlow area.

An examination of a busy day for Runway 21 and Runway 24 arrivals showed that Stoneville could be overflown by 8 jet arrivals with a range of altitudes from 2,500 feet (750m) – 3,500 feet (1,050m) AMSL. The lateral spread of these flights was less than 1,000m. The elevation at Stoneville is approximately 1,000 feet (300m) meaning these jet arrivals are 1,500 feet (450m) AGL and therefore exposing the community to noise levels above 70 dB(A). The lateral spread of tracks was approximately 2,500m. On the same day there were 10 turboprops over the Stoneville area with a range of altitudes between 2,500 feet (750m) – 4,000 feet (1,200m) AMSL. Although these turboprops can be below 3,000 feet (1,500m) AGL the calculated noise aircraft noise levels indicate that noise from these aircraft are generally not likely to exceed 70 dB(A).

A similar analysis for the same day over the Chidlow area showed that area could be overflown by 58 jet arrivals with a range of altitudes from 3,000 feet (1,500m) – 8,500 feet (2,550m) AMSL. The lateral spread of these flights was 8,500m with most aircraft concentrated on the BEVLY STAR to the north of the Chidlow area. The elevation at Chidlow is approximately 1,000 feet (300m) meaning these some of these jet arrivals may be exposing the community to noise levels above 70 dB(A). On the same day there were 27 turboprops over the Chidlow area with a range of altitudes between 3,500 feet (1,050m) – 6,000 feet (1,800m) AMSL. The lateral spread of these flight tracks is 7,500m again with most concentrated at the northern end of the Chidlow area.

This analysis indicates that aircraft noise levels from some jet arrivals over the Stoneville area is likely to exceed 70 dB(A), however the numbers analysed for the busy day are not likely to result in a significant impact. While some of the arrivals over Chidlow will also exceed this noise level, most of the arrival traffic on the BEVLY STAR is to the north of most of the residential areas of Chidlow and likely to have less impact.

There are a number of flights over the main part of Childow as aircraft fly from a distant waypoint direct to SPUDO waypoint for traffic sequencing. However this is not new and existed prior to the implementation of the WARRP changes. The increase in traffic on this arrival route has also been influenced by the growth in traffic at Perth Airport and is not totally attributable to the changes implemented in November 2008.

Recommendations

As a result of this PIR, the following recommendations are made to further mitigate the environmental outcomes, particularly in terms of aircraft noise, for communities around Perth Airport are made as a result of this PIR:

- Perth ATC should:
  - continue the work to implement departure tracks though the Pearce military areas as much as possible when they are deactivated and available for civil aircraft operations. The use of such departure tracks, particularly for heavy International aircraft departing for destinations to the Middle East, South Africa and Mauritius during the more noise sensitive night and early morning periods should provide respite to areas west of the airport such as Beechboro, Malaga and Ballajura.
  - investigate practicable options to track aircraft further north of areas such as such as Beechboro, Malaga and Ballajura to further mitigate the effects of aircraft noise on these communities at other times of the day.
  - investigate available options to keep arriving aircraft as high as possible over areas such as Chidlow, Stoneville and Glen Forrest, with the aim of keeping jet aircraft above 5,000 feet (1,500m) AGL and turboprop aircraft above 3,000 feet (750) AGL for as long as practicable. This would ensure maximum noise levels do not exceed 70 dB(A), particularly during the more noise sensitive night period. (Night should be considered to be from 7pm to 7am which is consistent Australian Standard AS2021 and used in the development of Australian Noise Exposure Forecasts (ANEF).
  - investigate the formal adoption of Continuous Descent Operations for arriving jet aircraft, particularly during the more sensitive night period, to further mitigate the noise exposure on communities underlying the arrival routes.
  - investigate practicable options to reduce the concentration and raise the altitude of jet departures on the Perth SID East/AMANA SID Runways 03/06 to mitigate the noise exposure to the underlying community.
  - revise DAP NAP 2 Preferred Flight Paths to remove reference to the use of a track from 30NM east direct to Parkerville in order to be consistent with the change implemented in early 2010 to mitigate noise on communities in the Stoneville area and to the south of the Chidlow area.

- Environment & Climate Change:
  - should consider additional temporary noise monitoring in the Glen Forrest and Stoneville areas to quantify the noise exposure experienced by these communities in order to guide the development of further potential mitigation measures.

Attachment A

Google Earth Map of Perth Airport and Surrounds

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Ballajura
Malaga
Beechboro
Stratton
Stoneville
Chidlow
Glen Forrest
High Wycombe
Perth Airport
Perth WA, Australia
Bickley
Great Southern Hwy
D
D
D
D
©2007 Google™

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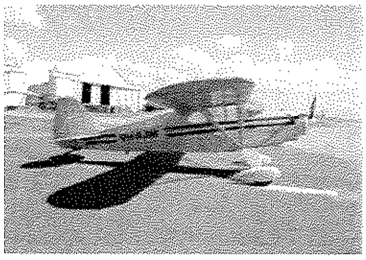
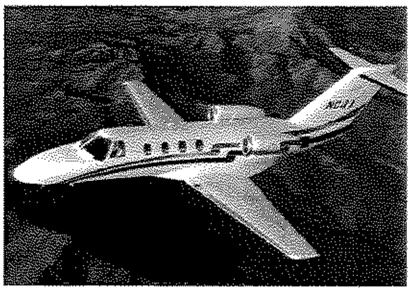
Attachment B

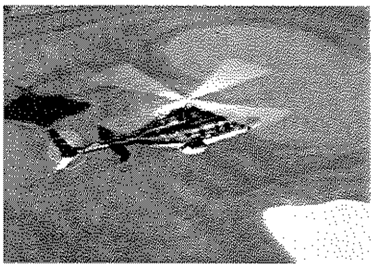
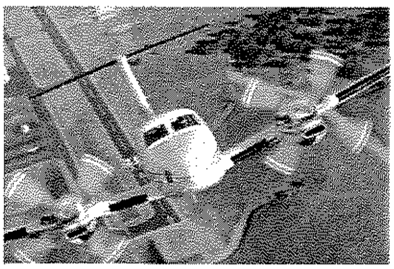
Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise

AIRSERVICES AUSTRALIA

ENVIRONMENTAL PRINCIPLES AND PROCEDURES FOR MINIMISING THE IMPACT OF AIRCRAFT NOISE





Environment Branch
19 August 1997
(Revised 21 November 2002)

ENVIRONMENTAL PRINCIPLES AND PROCEDURES FOR MINIMISING THE IMPACT OF AIRCRAFT NOISE

PART A

FUNDAMENTAL PRINCIPLES

The following fundamental principles are to be used in environmental assessments (of proposals for new air routes and for changes to existing arrangements) and as the basis for selecting preferred noise abatement procedures.

Total Noise Dose

Principle 1: Noise abatement procedures should be optimized to achieve the lowest possible overall impact on the community.

Spatial Distribution of the Noise Dose

Principle 2: Noise should be concentrated as much as possible over non-residential areas.

Principle 3: Noise exposure should be fairly shared whenever possible.

Principle 4: No suburb, group or individual can demand or expect to be exempt from aircraft noise exposure.

Upper and Lower Limits of Noise Exposure

Principle 5: Noise is not considered significant when selecting noise preferred options if exposure amounts to less than 40 Leq_{24} and there are less than 50 overflights per day.

Principle 6: No residential area should receive more than 60 Leq_{24}, i.e., no residential area should receive more noise exposure than that which is considered "unacceptable" for residential housing under Australian Standard AS2021.

Principle 7: There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dB(A).

Timing / Historical issues

Principle 8: When comparing options, operations that are conducted at night or on weekends should be treated as being more sensitive than those which occur during the daytime or on weekdays.

Principle 9: Both short-term and long-term noise exposure should be taken into account in deciding between options.

Principle 10: Options which allow for a gradual change from the current to planned procedures should be given preference.

Principle 11: In deciding between mutually exclusive, but otherwise equivalent options, involving

(i) the overflight of an area which has previously been exposed to aircraft noise for a considerable period of time (and which a large proportion of residents would therefore have been aware of the noise before moving in); or

(ii) a newly exposed area,

option (i) should be chosen.

Reciprocal Flight paths

Principle 12: To the extent practicable, residential areas overflown by aircraft arriving on a particular runway should not also be overflown by aircraft departing from the runway in the reciprocal direction.

PART B

STRATEGY FOR WORKING THROUGH A HIERARCHICAL SET OF ENVIRONMENTAL STANDARDS

The following strategy for working through a hierarchical set of environmental standards shall be followed so that the highest order standard is met 'as far as is practicable'.

To the extent that higher order principles have been satisfied and there remains a need to decide on operational arrangements, the following operational standards and procedures are to be considered. These are presented as a hierarchical set, the most preferred environmental condition being presented first. **In all cases, aviation safety, including system safety through simplified operating arrangements, will be given priority over noise abatement considerations.** However, assuming safety conditions have been satisfied, the sole test for moving to a lower level standard is that the higher standard is "not operationally practicable". If lower rather than higher standards are chosen, then well documented reasons for the decision are required. The noise standard chosen should be achievable for at least 90% of movements.

Assessment Process

Standards have been developed for five operational categories:

A. Jet aircraft operations
B. Propeller aircraft entering/departing terminal area
C. Helicopter operations
D. Flights within terminal area
E. Airwork activities

For each category, the highest practicable standard is to be selected.

A. JET AIRCRAFT

1. No overflight of residential areas

Standard departure and arrival procedures should be designed so that jet aircraft do not overfly residential areas. Radar headings and procedural tracks (in any form) should be assigned to ensure jets do not overfly residential areas.

If this cannot be achieved, then;

2. No overflight of residential areas below 5,000 ft AGL.

A height of 5,000 ft AGL is considered to be the minimum acceptable altitude for the avoidance of significant noise impact on residential populations by jet aircraft. (For reference, the noise at ground level from a climbing B747 at 5,000 ft is about 75 dB(A)s maximum).

In all instances standard departure and arrival procedures should be designed to ensure that jet aircraft do not overfly residential areas at altitudes below 5,000 ft AGL. Radar headings and procedural tracks (in any form) that are assigned to jet aircraft should whenever possible ensure the aircraft do not overfly residential areas at altitudes below 5,000 ft AGL.

If this cannot be achieved, then;

3. Minimisation of incidence of jet aircraft flying below 5,000 ft AGL.

Where jet aircraft flight below 5,000 ft AGL is unavoidable, procedures are to be designed with due consideration for the preferences of the affected community, as determined through a process of consultation with community representatives, in determining which areas will receive greater noise exposure where there are mutually exclusive options for the flight tracks.

The occurrences where departing or arriving aircraft are required to maintain level flight, when below 5,000 ft AGL, are to be kept to a minimum.

If this cannot be achieved, then;

4. Minimisation of noise impact on residential areas by Jet Aircraft below 5,000 ft AGL.

In choosing climb and descent procedures into and out of airports, options that produce the minimum impact on the community which is overflown are to be selected (within the operational capabilities of the aircraft in terms of performance and safety).

B. NON-JET AIRCRAFT ENTERING/DEPARTING TERMINAL AREA

1. No overflight of residential areas

Standard departure and arrival procedures should be designed so that these aircraft do not overfly residential areas. Radar headings and procedural tracks (in any form) should be assigned to ensure they do not overfly residential areas.

If this cannot be achieved, then;

2. No overflight of residential areas below 3,000 ft AGL.

A height of 3,000 ft AGL is considered to be the minimum acceptable altitude for the avoidance of significant noise impact on residential populations by non-jet aircraft with a maximum take-off weight greater than 5700kg. (For reference, the noise at ground level from a climbing SAAB-340 at 3,000 ft AGL is about 70 dB(A)s maximum). In the case of multi-engine piston aircraft with a maximum take-off weight equal to or less than 5700kg a height of 1,500 ft AGL is to be considered the minimum acceptable altitude.

In all instances, standard departure and arrival procedures should be designed to ensure that non-jet aircraft do not overfly residential areas at altitudes below 3,000 ft AGL (or 1,500 ft AGL for multi-engine piston aircraft equal to or less than 5700kg). Radar headings and procedural tracks (in any form) that are assigned to non-jet aircraft should whenever possible ensure the aircraft do not overfly built up areas at altitudes below 3,000 ft AGL (or 1,500 ft AGL for multi-engine piston aircraft equal to or less than 5700kg).

If this cannot be achieved, then;

3. Minimisation of Incidence of Non-jet Aircraft flying below 3,000ft AGL.

Where aircraft flight below 3,000 ft AGL (or 1,500 ft AGL for multi-engine piston aircraft equal to or less than 5700kg) is unavoidable, procedures are to be designed with due consideration for the preferences of the affected community, as determined through a process of consultation with community representatives, in determining which areas will receive greater noise exposure where there are mutually exclusive options for the flight tracks.

The occurrences where departing or arriving aircraft are required to maintain level flight, when below 3,000 ft AGL (or 1,500 ft AGL for multi-engine piston aircraft equal to or less than 5700kg), are to be kept to a minimum.

If this cannot be achieved, then;

4. Minimisation of Noise Impact on residential areas by Non-jet Aircraft below 3,000 ft AGL.

In choosing climb and descent procedures into and out of airports, those options that produce the minimal impact on the community which is overflown are to be selected (within the operational capabilities of the aircraft in terms of performance and safety).

C. HELICOPTER OPERATIONS

1. No overflight of residential areas

Standard departure and arrival procedures should be designed so that helicopters do not overfly residential areas. Radar headings and procedural tracks should be assigned to ensure helicopters do not overfly residential areas.

If this cannot be achieved, then;

2. No overflight of residential areas below 1,500 ft AGL.

A height of 1,500 ft AGL is considered to be the minimum acceptable altitude for the avoidance of significant noise impact on residential populations by twin-engine helicopters (For reference the noise at ground level from an overflying Bell 412 at 1,500 ft is about 70 dB(A) maximum). In the case of a single-engine helicopter a height of 1,000 ft is to be considered the minimum acceptable altitude. (For reference the noise at ground level from an overflying Bell 206L at 1,000 ft is about 70 dB(A) maximum).

In all instances, standard departure and arrival procedures should be designed to ensure that helicopters do not overfly residential areas at altitudes below 1,500 ft for twin-engine helicopters (or 1,000 ft AGL for single-engine helicopter). Radar headings and procedural tracks that are assigned to helicopters should whenever possible ensure that the aircraft do not overfly built up areas at altitudes below 1,500 ft AGL for twin-engine helicopters (or 1,000 ft AGL for single-engine helicopters).

If this cannot be achieved, then;

3. Minimisation of Incidence of Helicopters flying below 1,500ft AGL

Where twin-engine helicopter flight below 1,500 ft AGL (or 1,000 ft for single-engine helicopters) is unavoidable, procedures are to be designed with due consideration for the preferences of the affected community, as determined through a process of consultation with community representatives, in determining which areas will receive noise exposure where there are mutually exclusive options for the flight tracks.

The occurrences where departing or arriving helicopters are required to maintain level flight, when below 1,500 ft AGL for twin-engine helicopters or below 1,000 ft for single-engine helicopters, are to be kept to a minimum.

4. Minimisation of Noise Impact on residential areas by Helicopters below 1,500 ft AGL

In choosing climb and descent procedures into and out of airports, those options that produce the minimal impact on the community which is overflown are to be selected (within the operational capabilities of the aircraft in terms of performance and safety).

In order to reduce the noise impact on residential areas climb and descent procedures should be developed such that twin-engine helicopters maintain a Closest Point of Approach (CPA) distance of at least 1,000 ft (305 m) on take-off and at least 2,500 ft (760 m) on approach from residential or other noise sensitive locations. In the case of single-engine helicopters the recommended CPA is 1,000 ft (305 m) for both take-off and approach.

Where helicopters are flying at a designated altitude within a helicopter access lane then CPA distance to residential areas should be 1,500 ft (460 m) for twin-engine helicopters. In the case of single-engine helicopters the recommended CPA is 1,000 ft (305 m).

The speed at which a helicopter is flown should be such that these CPA distances can be maintained (within the operational capabilities of the aircraft in terms of performance and safety). It is recommended that speed be kept to 100 knots or less.

Where overflight of residential areas cannot be avoided, and the overflight altitudes and CPA distances are less than that considered to be the minimum required to minimise the noise impact on the residential areas, consideration should be given to constraining helicopter operations (with the exception of emergency operations) to between 7am and 10pm on weekdays and between 8am and 10pm on weekends and public holidays.

5. Minimisation of Noise Impact on residential areas by Hovering/Circling Helicopters

Residential and other noise sensitive areas should be avoided by helicopters involved in hovering or circling operations. A minimum CPA of 2,000 ft (610m) to the nearest residential or noise sensitive area should be maintained

Where overflight of these areas cannot be avoided, a minimum altitude of 2,000 ft AGL should be maintained. Helicopter hover/circling operations in these locations should have for maximum duration of 1 minute. ***(As a guide, a helicopter hovering with a LAmax noise level of 70dB(A) would exceed the 40 Leq_{24} principle after approximately 80 seconds!).***

The noise exposure is generally higher on the tail rotor side of the helicopter, therefore the tail rotor side should be kept away from the residential and other noise sensitive areas during hover/circling. Hovering turns should be made with the tail of the helicopter away from the noise sensitive area if practical.

The hover/circling operation should be conducted downwind of any residential or noise sensitive areas if practical.

6. Implement Fly Neighbourly Procedures.

It is recommended that helicopter operators adopt "Fly Neighbourly" piloting techniques such as those set out in the Helicopter Association International (HAI) "Fly Neighborly Guide". In the Australian context these techniques would include:

- Avoid noise sensitive areas
  - Follow high ambient noise routes (Highways, etc)
  - Follow unpopulated routes (Waterways, etc)
- Near Noise sensitive areas:
  - Maintain a flyover altitude of 1,500ft for twin engine helicopters (1,000ft for single engine helicopters) where possible.
  - Maintain a hover/circling altitude of 2,000ft where possible
  - Reduce speed
  - Observe low noise speed/descent settings
  - Avoid sharp manoeuvres
  - Vary your route - Repetition is annoying
  - Use high take-off/descent profiles.

D. FLIGHTS WITHIN TERMINAL AREA

Circuit Training

1. Minimum height for level flight over residential areas.

A minimum circuit height of 1,000ft AGL is to apply for fixed wing aircraft involved in circuit training. In the case of circuit training for helicopters, a minimum height of 800ft AGL is to apply.

2. Limit the number of circuits and the number of aircraft permitted to overfly identified areas.

In conjunction with operators, operations are to be designed to spread noise over different areas where practical options are available.

3. Limit the hours that circuit training is permitted.

At locations where a noise problem exists circuit training may be limited. During week days, it is proposed that circuit training be limited to 7:00 am - 8:00 pm except for 1 night per week where circuits to may be conducted to 10:00 pm. At weekends and on declared public holidays these operations would be contained within the period 9:00 am - 8:00 pm. Consideration may need to be given to extending the times beyond those proposed to account for daylight saving periods.

The actual times for circuit operations should be determined through consultation with community representatives, industry representatives and airport operators.

E. AIRWORK AIRCRAFT

1. Built-up Areas

Operators are to avoid residential areas.

If this cannot be achieved, then;

2. Sensitive Areas

Operators are to avoid areas identified as particularly sensitive (with advice from representative community groups).

3. Minimum Limits

If it is not practicable to avoid operations over residential areas, operators are to conduct their operations above 3,000ft AGL for propeller driven aircraft or helicopters and above 5,000ft AGL for jet aircraft.

4. Practice Instrument Approaches

Aircraft engaged in practice instrument approach training are permitted, irrespective of the runway, provided there are no more than 4 approaches per hour between 7:00 am - 8:00 pm on weekdays and between 9:00am - 8:00pm on weekends and on declared public holidays. The actual number of approaches per hour should be determined through consultation with community representatives, industry representatives and airport operators.

5. Community Input

If heights below 3,000 ft AGL (propeller aircraft and helicopters) and 5,000 ft AGL (jet aircraft) are required for airwork on a continuing basis, the number of operations per week permitted is to be the subject of agreement with community representatives.

PART C

A SCREENING PROCESS USING QUANTIFICATION OF IMPACTS TO DETERMINE WHETHER PROPOSED NEW ARRANGEMENTS REQUIRE DETAILED ENVIRONMENTAL ASSESSMENT.

This noise assessment procedure has been adapted from the Noise Screening Procedure for Certain Air Traffic Actions Above 3,000 Feet AGL developed by the US Federal Aviation Administration and modified to reflect Australian requirements. The basis for the screening process is to identify whether a proposed air traffic action will result in a 3 decibel increase in aircraft noise exposure to underlying residential areas. It is proposed that the use of a 3 decibel change criterion is acceptable as long as the noise level averaged over 24 hours (Leq_{24}) of aircraft does not exceed 45 dB(A) for urban residential areas and 40 dB(A) for rural residential areas.

The use of the Noise Screening Procedure proposed below can be linked with the hierarchy of principles mentioned above to provide an adequate, and defensible, initial assessment process for changes to aircraft flight paths in Australia.

Environmental Assessment of Changes to Flight Tracks

The issues that must be considered with regard to proposed changes to flight tracks are:

- The number and type of aircraft,
- Time of operations (day or night),
- Proximity to existing flight tracks, and height of the track over a residential area.

The attached flow chart outlines the process to be undertaken to determine whether any change is likely to be environmentally significant and therefore require a more formal environmental assessment.

Assessment of Impact of New/Modified Flight Tracks

This refers to any new or modified arrival/departure procedures and any new or modified airways (See Figure 1).

A. If the change is not over a residential area (e.g. over water or uninhabited areas, although wilderness areas will be given special consideration) then the change conforms with the highest environmental principle and no further assessment is required.

B. If the track is over a residential area then the next principle applies (i.e. Jet tracks to be 5000 feet AGL or above over residential areas). If the track is below 5000 feet AGL then a more formal environmental assessment is required. The procedure for this assessment is considered later.

C. If the track is above 5000 feet AGL then it must be considered in terms of whether or not the proposed change will produce noise over a new residential area and whether there will be a 3 decibel Leq change in the aircraft noise exposure of the underlying residential area.

Procedure

The following steps are to be used to determine whether a 3 decibel Leq increase in noise exposure will occur:

Step 1: *Does the proposed action introduce noise exposure from large jets (>34,000kg) which may require further assessment of noise impacts?*

Use Table 1 data to identify the conditions required for the possible exceedance of a 40 dB(A) Leq_{24} level of aircraft noise (see Note). If the conditions in Table 1 are met then the assessment proceeds to Step 2. While the conditions set out in Table 1 may indicate further assessment is not necessary, there may be situations involving noise sensitive areas that will require a full assessment.

Step 2: *Does the proposed action introduce large jets over residential areas which are not routinely exposed to jet aircraft noise?*

Use Table 2 to check the lateral position of the proposed new or moved track in relation to an existing track and determine whether the noise exposure should be regarded as new, or as an increase to existing noise exposure.

The lateral spread of noise from aircraft on a track is represented by a band located symmetrically on the ground below the nominal track. This is a consequence of both the propagation of sound from the aircraft, and the normal lateral dispersion of aircraft which are following a nominally identical flight path. The width of the band either side of the track depends on the height above ground of the aircraft: the higher the aircraft, the wider the spread of its noise. Outside the band, the aircraft noise exposure is not significant. The width of the band is referred to as the "lateral minimum".

If a proposed new or moved track lies beyond the lateral minimum of an existing track as given in Table 2, the community underlying the new or moved track is considered to be exposed to aircraft noise for the first time. Regardless of altitude, any new track lying at least 3 nautical miles from an existing track is considered to expose the underlying community to new aircraft noise. In these cases the assessment proceeds to Step 4.

If Table 2 shows that the new or moved track lies within the lateral minimum of an existing track, the residential area underlying the new or moved track is not considered to be newly exposed to jet aircraft noise, but the proposed action may increase the existing aircraft noise exposure. Proceed to Step 3 to determine whether a 3 decibel change will result.

Step 3: *Will a change to altitude or numbers of jet aircraft on an existing track increase the aircraft noise exposure by 3 decibels?*

Use Table 3 to determine if the change in aircraft noise exposure is at least 3 decibels. If it does, the assessment proceeds to Step 4.

Note that if a new track and an existing track are to co-exist, and the lateral minima of the two tracks overlap, then for the purpose of use of Table 3, the numbers of aircraft on the two tracks are cumulative.

Step 4: *Will the proposed action bring the aircraft noise exposure to 40 dB(A) Leq_{24} in rural residential areas, or 45 Leq_{24} in other areas?*

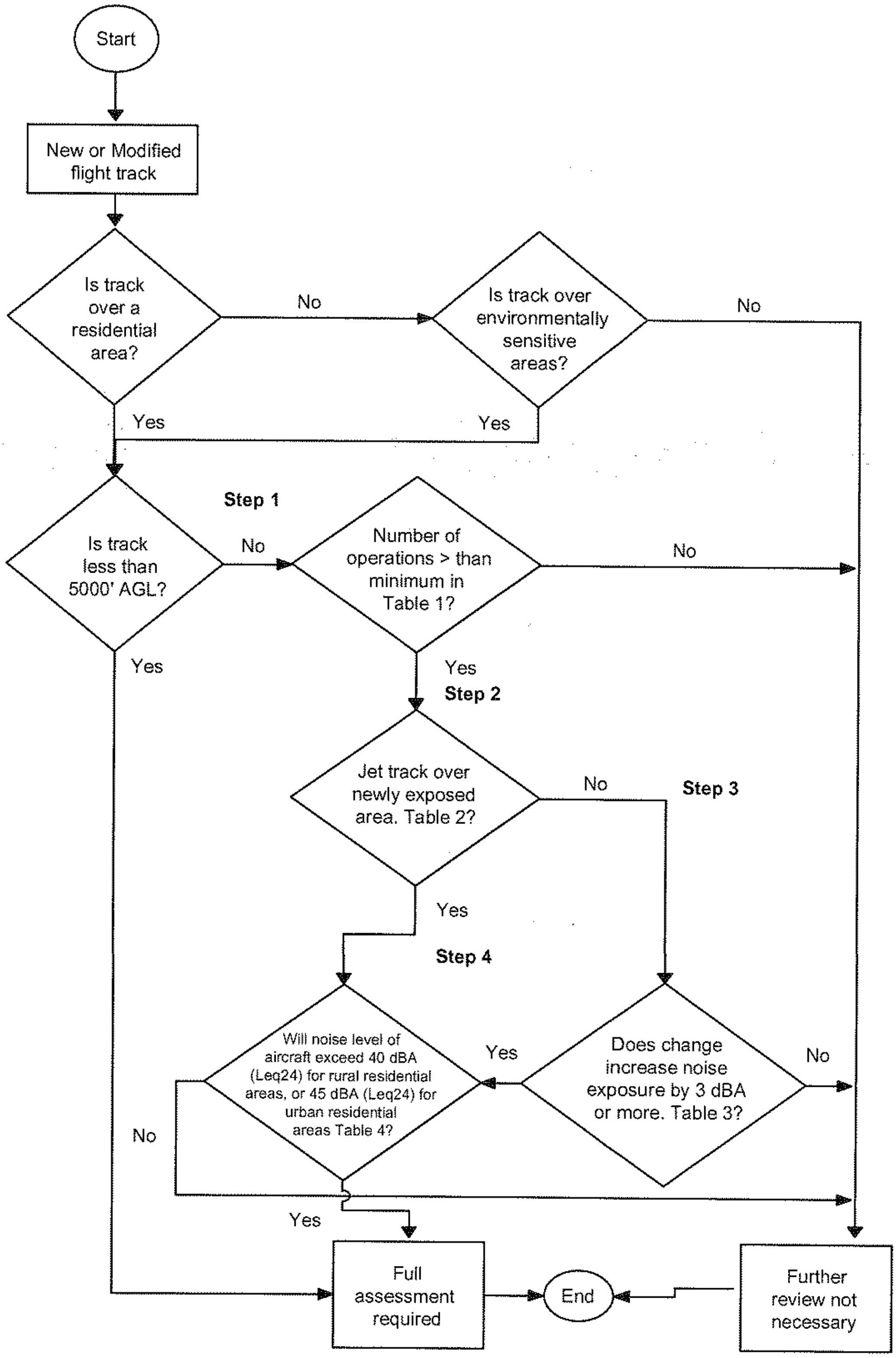
Use Table 4 to decide whether the numbers of jet aircraft will cause these noise criteria to be exceeded.

If the screening procedure (Steps 1 to 4) leads to "Full Assessment Required" on the flow chart, the change requires a more detailed evaluation of the environmental impact to be made.

If the screening procedure leads to the "Further Review Not Necessary" box on the flow chart, the change is deemed not significant, i.e. there is less than a 3 decibel change and/or the aircraft noise exposure will not exceed the criteria (40 and 45 dB(A) Leq_{24} for rural residential and urban residential areas, respectively).

Note: The datum level for the calculation of aircraft noise exposure is the Boeing 747. The use of the B747 reflects the aircraft type producing the greatest noise impact and ensures that the noise exposure is not undervalued.

Figure 1 Flow Chart for Noise Impact Assessment for New or Modified Jet Aircraft Tracks



APPENDIX 1

STEP 1

Does the proposed action introduce noise exposure from large jet aircraft (>34,000Kg) which may require further review of noise impacts?

Application

The procedure applies to new or modified aircraft flight tracks which meet the following conditions:

* involves airports with more than 1,500 large jet aircraft (>34,000kg) operations per year; and
* represents a permanent change or planned test; and
* concerns changes to departure/arrival routes or tracks, used by large jet aircraft, between 5,000 and 18,000 feet AGL

Process

(a) Refer to Table 1.

(b) If the estimated number of daily operations on the affected track are greater than the minimum, the answer is **YES** and proceed to **STEP 2.**

(c) If the estimated number of daily operations on the affected track are less than the tabulated values, the answer is **NO** and further review is not necessary except in special situations.

Table 1:

Aircraft Altitude (feet AGL)	*Number of Daily Operations*	
	by large Jet aircraft (>34,000kg) on the Affected Route See Notes (1) and (2) below	
	Departures	*Arrivals*
5000	2	20
6000	3	30
7000	5	40
8000	6	50
9000	8	65
10000	12	80
11000	15	100
12000	20	120
13000	25	140
14000	30	160
15000	35	180
16000	45	200
17000	55	230
18000	65	260

(1) Chapter 2 jet aircraft (e.g. B727, FK28) and large International jet aircraft (Chapter 2 and Chapter 3) shall be counted in full. Count 50% of all other Chapter 3 jet aircraft.

(2) Each nighttime (1900 - 0700) flight counts as four operations.

STEP 2

Does this action introduce large jet aircraft over residential areas which are not routinely exposed to jet aircraft noise?

Process

(a) Refer to Table 2.

(b) If the location of the new track is greater than 3 nautical miles from the nearest existing track, the answer is **YES** and proceed to **STEP 4.**

(c) If the new or moved track is within 3 nautical miles of the existing track minimum but at a distance such that the noise could be regarded as new, as determined by reference to Table 2, the answer is **YES.** Proceed to **STEP 4** to determine whether the action will cause aircraft noise exposure to exceed 40 dB(A) Leq_{24} in rural residential areas or 45 dB(A) Leq_{24} in urban residential areas.

(d) If the new or moved track lies within the lateral minimum distance from the existing route, as determined by reference to Table 2, the answer is **NO** and proceed to **STEP 3** to determine whether the action will cause a 3 decibel increase in existing aircraft noise exposure.

Table 2:

Aircraft Altitude (feet AGL)	*No Change Lateral Minimum (nautical miles))*
5000 — 6000	1
6000 — 12000	2
above 12000	3

STEP 3

Will a change to altitude or numbers of jet aircraft on an existing track increase the aircraft noise exposure by 3 decibels?

Process

(a) Refer to Table 3.

(b) If Table 3 indicates the change in aircraft noise exposure is 3 or more decibels, the assessment then proceeds to **Step 4.**

(c) If Table 3 indicates that the change in aircraft noise exposure is less than 3 decibels, no further assessment is necessary.

Table 3: Change in Aircraft Noise Exposure (decibels)

Change in Altitude of Jet Aircraft (%)	Change in Number of daily Operations of Jet Aircraft (%)																				
	-90	-70	-50	-30	-10	0	10	30	50	70	90	100	110	130	150	170	190	210	230	250	260
10	-11	-6	-4	-3	-1	-1	-1	0	1	1	2	2	2	3	3	3	4	4	4	4	5
5	-11	-6	-4	-2	-1	-1	0	1	1	2	2	2	3	3	3	4	4	4	5	5	5
0	-10	-5	-3	-2	0	0	0	1	2	2	3	3	3	4	4	4	5	5	5	5	6
-5	-9	-5	-3	-1	0	1	1	2	2	3	3	4	4	4	5	5	5	6	6	6	6
-10	-9	-4	-2	0	1	1	2	2	3	3	4	4	4	5	5	5	6	6	6	7	7
-15	-8	-3	-1	0	1	2	2	3	4	4	5	5	5	5	6	6	6	7	7	7	7
-20	-8	-3	-1	1	2	2	3	4	4	5	5	5	6	6	7	7	7	7	8	8	8
-25	-7	-2	0	2	3	3	4	4	5	6	6	6	6	7	7	7	8	8	8	9	9
-30	-6	-1	1	2	3	4	4	5	6	6	7	7	7	7	8	8	8	9	9	9	9
-35	-5	-1	2	3	4	5	5	6	6	7	7	8	8	8	9	9	9	10	10	10	10
-40	-4	0	3	4	5	6	6	7	7	8	8	9	9	9	10	10	10	10	11	11	11
-45	-4	1	3	5	6	6	7	8	8	9	9	9	10	10	10	11	11	11	12	12	12
-50	-3	2	4	6	7	8	8	9	9	10	10	11	11	11	11	12	12	12	13	13	13
-55	-1	3	6	7	8	9	9	10	10	11	11	12	12	12	13	13	13	14	14	14	14
-60	0	5	7	8	9	10	10	11	12	12	13	13	13	14	14	14	15	15	15	15	25
-65	1	6	8	10	11	11	12	12	13	14	14	14	16	15	15	16	18	16	17	17	27
-70	3	8	10	11	13	13	13	14	15	15	16	16	16	17	17	17	18	18	18	18	29
-75	5	10	12	13	15	15	15	16	17	17	17	18	18	19	19	19	20	20	20	20	21
-80	7	12	14	16	17	17	18	19	19	20	20	20	21	21	22	22	22	22	23	23	23

Note that if a new track and an existing track are to co-exist, and the lateral minima of the two tracks overlap, then for the purpose of use of Table 3, the numbers of aircraft on the two tracks are cumulative.

STEP 4

Considering the type of residential community, will the noise (Leq_{24}) from large jet aircraft reach 40 dB(A) in rural residential areas, or 45 dB(A) in other areas?

Process

(a) Refer to Table 4.

(b) If the estimated number of daily operations on the affected track is greater than the minimum then the answer is **YES** and a detailed environmental assessment is required.

(c) If the estimated number of daily operations on the affected track is less than the minimum then the answer is **NO** and further noise assessment is not necessary except in special situations.

Table 4: Minimum Number of Daily Operations by Large Jet Aircraft (34,000Kg) on the Affected Route.

Aircraft Altitude (feet AGL)	Departures Residential Community (see below)		Arrivals Residential Community (see below)	
	Rural	*Urban*	*Rural*	*Urban*
5000	2	6	20	60
6000	3	10	30	90
7000	5	15	40	120
8000	6	20	50	150
9000	8	25	65	200
10000	12	35	80	240
11000	15	45	100	300
12000	20	60	120	360
13000	25	75	140	420
14000	30	90	160	480
15000	35	110	180	>500
16000	45	130	200	>500
17000	55	160	230	>500
18000	65	200	260	>500

(1) Chapter 2 jet aircraft (e.g. B727, FK28) and large International jet aircraft (Chapter 2 and Chapter 3) shall be counted in full. Count 50% of all other Chapter 3 jet aircraft.

(2) Each nighttime (1900 — 0700) flight counts as four operations.

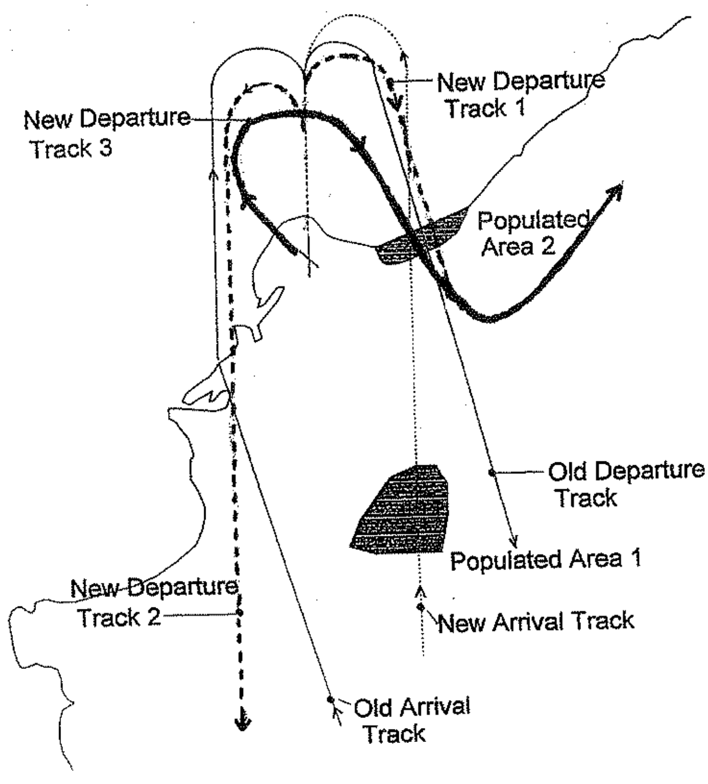
(3) If the composition of an area is not known, classify the area as rural residential.

Examples of new tracks subjected to proposed assessment procedure

Scenario

The airport proposing the changes has more than 1,500 large jet aircraft (>34,000kg) operations a year. The proposed changes are to be permanent and the changes involve tracks used by large jet aircraft between 5,000 and 18,000 feet AGL (See Figure 2).

Figure 2. Diagram representing existing and proposed tracks.



Departure Tracks

Proposed New Track 1.

This track is a new track over a residential area at 5000 feet AGL. Therefore it requires assessment using the noise screening process to determine whether the change is likely to produce a 3 decibel increase in aircraft noise exposure on the underlying community.

Step 1. The number of jet aircraft movements on this track is estimated to be 27 per day. As the number of jet aircraft exceeds the number of operations in Table 1 at 5000 feet AGL, the assessment proceeds to Step 2.

Step 2. The proposed new track lies outside the No Change lateral minimum at 5000 feet AGL, i.e. beyond 1 nautical mile of a pre-existing departure track, therefore the assessment proceeds to Step 4.

Step 4. The estimated number of jet aircraft departures exceeds the number set out in Table 4. As the proposed change is assessed as being likely to result in a 3 decibel increase in exposure from aircraft noise on the underlying community, further assessment to determine the environmental significance of the proposed change is required.

Proposed New Track 2.

This is a new departure track , however, it will not be over a residential area or a wilderness area, therefore no further assessment is required.

Proposed New Track 3.

This track is a new track that passes over a residential area at 6000 feet AGL. Therefore it requires assessment using the noise screening process to determine whether the change is likely to produce a 3 decibel increase in aircraft noise exposure on the underlying community.

Step 1. The number of jet aircraft movements on this track is estimated to be 5 per day. As the number of jet aircraft exceeds the number of operations in Table 1 at 5000 feet AGL, the assessment proceeds to Step 2.

Step 2. The new track lies within the No Change lateral minimum of the existing route closest to the community therefore the assessment proceeds to Step 3.

Step 3. The existing track has 29 jet movements. The new track will have 5 jet movements i.e. an 83% decrease, therefore Table 3 indicates that the change in aircraft noise exposure is less than a 3 decibel increase. This indicates that no further assessment is required.

Arrival Tracks

Proposed New Track 1.

The track will pass over two residential areas, one approximately 25 nautical miles from the airport and another approximately 10 nautical miles from the airport. The number of jet aircraft using the track daily is 46.

Residential area 1.

Step 1. The aircraft will be at approximately 7500 feet AGL over the first populated area. Table 1 indicates that the acceptable number of aircraft at this level is approximately 45. Therefore proceed to Step 2.

Step 2. The new track is outside the no change lateral minimum therefore proceed to Step 4.

Step 4. As the area is urban, Table 4 indicates 130 jet arrivals would be required to increase aircraft noise exposure by 3 decibels. This track has 46 arrivals, therefore no further assessment is required.

Residential area 2.

Step 1 The aircraft will be at approximately 5000 feet AGL over the second populated area. Table 1 indicates that the required number of arrivals to increase noise exposure by 3 decibels is 20, therefore proceed to Step 2.

Step 2. Table 2 indicates that, as the new track is within 1 nautical mile of a pre-existing track, it is within the no change lateral minimum, therefore proceed to Step 3.

Step 3. Table three is used to assess the impact of the increase or decrease in traffic. The new track will introduce 46 arrivals, and, as there will be a coexisting departure track with 5 departures, the total number of jet aircraft overflights will be 51. Table 3 indicates that this increase will produce an increase in noise exposure greater than 3 decibels, therefore further assessment to determine the environmental significance of the proposed change will be required.

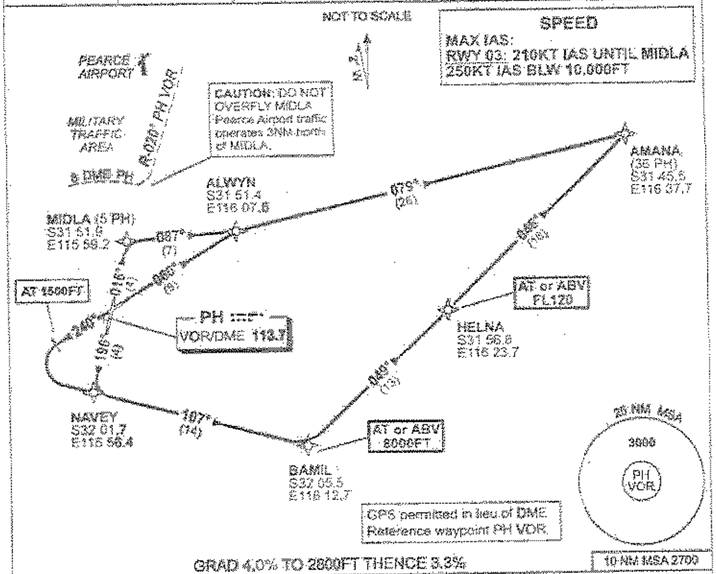
Attachment C

Perth Departure and Approach Procedure Plates

STANDARD INSTRUMENT DEPARTURES (SID)
AMANA TWO (JET) (RNAV)
PERTH, WA (YPPH)

27 AUG 2009

ATIS	ACD	SMC	TWR	DEP	
113.7 123.8	118.55	121.7	120.5	118.7	Bearings are Magnetic Elevations in FEET AMSL



AMANA TWO DEPARTURE (JET)

RWY 03
- Track 016° to MIDLA,
- Turn RIGHT, track 087° to ALWYN,
- Turn LEFT, track 079° to AMANA, thence as cleared

RWY 06
- Track 060° to ALWYN,
- Turn RIGHT, track 079° to AMANA, thence as cleared

RWY 21
- Track 196° to NAVEY

RWY 24
- Track 240°
- At 1500FT turn LEFT,
- Track DCT to NAVEY

From NAVEY
- Track 107° to BAMIL
  Cross BAMIL AT or ABV 8000FT
- Turn LEFT, track 049° to HELNA,
  Cross HELNA AT or ABV FL120,
- Track 048° to AMANA, thence as cleared

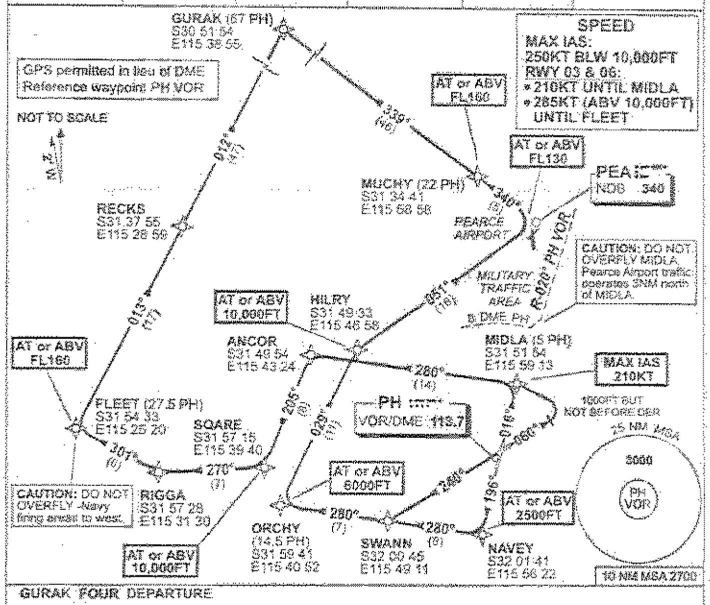
Changes: PH NDB DCMSD, RWY 06/24 TRACKS, BAMIL TO HELNA TRACK. PPHDP03-120

AIRSERVICES AUSTRALIA

STANDARD INSTRUMENT DEPARTURES (SID)
GURAK FOUR (RNAV)
PERTH, WA (YPPH)

11 MAR 2010

ATIS	ACD	SMC	TWR	DEP	
113.7 123.8	118.55	121.7	120.5	118.7	Bearings are Magnetic Elevations in FEET AMSL



GURAK FOUR DEPARTURE

RWY 03
MAX IAS 210KT UNTIL MIDLA
GRAD 3.3% (7% to FL160)
- Track 016° to MIDLA

RWY 06
GRAD 3.3% (7% to FL160)
MAX IAS 210KT UNTIL MIDLA
- Track 060°
- At 1000FT but not before DER (1.3 DME), turn LEFT
- Track DCT to MIDLA

From MIDLA
MAX IAS 285KT ABV 10,000FT UNTIL FLEET
- Turn LEFT, track 280° to ANCOR,
- Turn LEFT, track 205° to SQARE,
  Cross SQARE AT or ABV 10,000FT
- Turn RIGHT, track 270° to RIGGA,
- Turn RIGHT, track 301° to FLEET,
  Cross FLEET AT or ABV FL160,
- Turn RIGHT, track 013° to RECKS,
- Track 012° to GURAK, thence as cleared

RWY 21
GRAD 3.3% (6% to FL160)
- Track 196° to NAVEY
  Cross NAVEY AT or ABV 2500FT
- Turn RIGHT, track 280° to SWANN

RWY 24
GRAD 3.3% (7% to 6000FT then 6% to FL160)
- Track 240° to SWANN

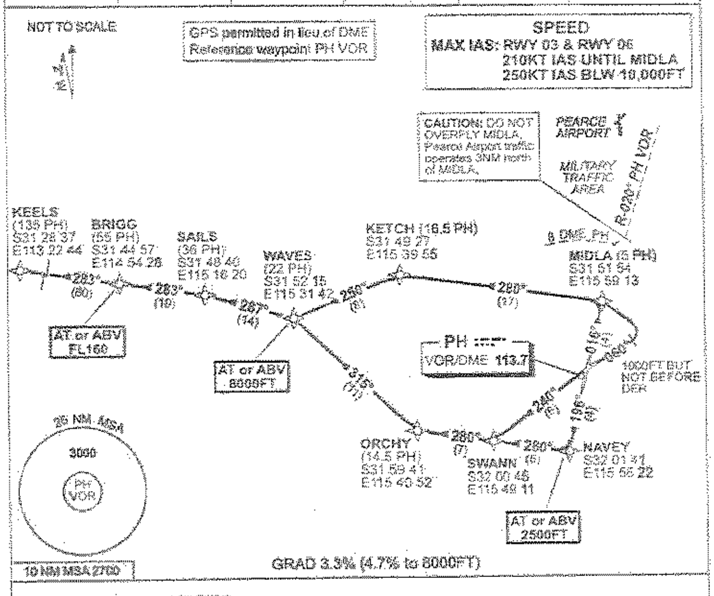
From SWANN
- Track 280° to ORCHY
  Cross ORCHY AT or ABV 6000FT,
- Turn RIGHT, track 029° to HILRY,
  Cross HILRY AT or ABV 10,000FT,
- Turn RIGHT, track 051° to PEA NDB,
  Cross PEA NDB AT or ABV FL130,
- Turn LEFT, track 340° to MUCHY,
  Cross MUCHY AT or ABV FL160;
- Track 339° to GURAK, thence as cleared

Changes: SWANN TO ORCHY TRACK, RWY24 TEXT. CD-ORD FORMAT. PPHDP02-122

STANDARD INSTRUMENT DEPARTURES (SID)
KEELS FOUR (RNAV)
PERTH, WA (YPPH)

11 MAR 2010

ATIS	ACD	SMC	TWR	DEP	
113.7 123.8	118.55	121.7	120.5	118.7	Bearings are Magnetic Elevations in FEET AMSL



KEELS FOUR DEPARTURE

RWY 03
- Track 016° to MIDLA

RWY 06
- Track 060°
- At 1000FT but not before DER (1.3 DME) turn LEFT
- Track DCT to MIDLA

From MIDLA
- Turn LEFT, track 280° to KETCH
- Turn LEFT, track 250° to WAVES
  Cross WAVES AT or ABV 8000FT
- Turn RIGHT, track 287° to SAILS
- Turn LEFT, track 283° to BRIGG
  Cross BRIGG AT or ABV FL160
- Track 283° to KEELS, thence as cleared

RWY 21
- Track 196° to NAVEY
  Cross NAVEY AT or ABV 2500FT
- Turn RIGHT, track 280° to SWANN

RWY 24
- Track 240° to SWANN

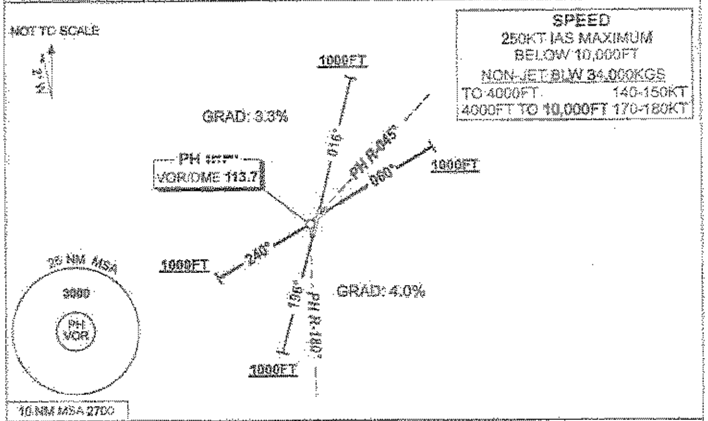
From SWANN
- Track 280° to ORCHY
- Turn RIGHT, track 315° to WAVES
  Cross WAVES AT or ABV 8000FT
- Turn LEFT, track 287° to SAILS
- Turn LEFT, track 283° to BRIGG
  Cross BRIGG AT or ABV FL160
- Track 283° to KEELS, thence as cleared

Changes: RWY 06 SPEED RESTR, CO-ORD FORMAT. PPHDP08-122

STANDARD INSTRUMENT DEPARTURES (SID)
PERTH THREE DEPARTURE (RADAR) - ALL RUNWAYS
PERTH, WA (YPPH)

27 AUG 2009

ATIS	ACD	SMC	TWR	DEP	
113.7 123.8	118.55	121.7	120.5	118.7	



PERTH THREE DEPARTURE (RADAR)

RWY 03
- Track 016°
- At 1000FT but not before DER turn to Assigned Heading
- Contact Departures for Radar Vectors

RWY 06
- Track 060°
- At 1000FT but not before DER turn to Assigned Heading
- Contact Departures for Radar Vectors

RWY 21
- Track 196°
- At 1000FT but not before DER turn to Assigned Heading
- Contact Departures for Radar Vectors

RWY 24
- Track 240°
- At 1000FT but not before DER turn to Assigned Heading
- Contact Departures for Radar Vectors

COMMUNICATIONS FAILURE : PROCEDURE IN IMC

On recognition of communication failure.
- Squawk 7600,
- Maintain last assigned vector for 2 minutes, and
- CLIMB IF NECESSARY TO MINIMUM SAFE ALTITUDE, to maintain terrain clearance, then
- Proceed in accordance with the latest ATC route clearance acknowledged.

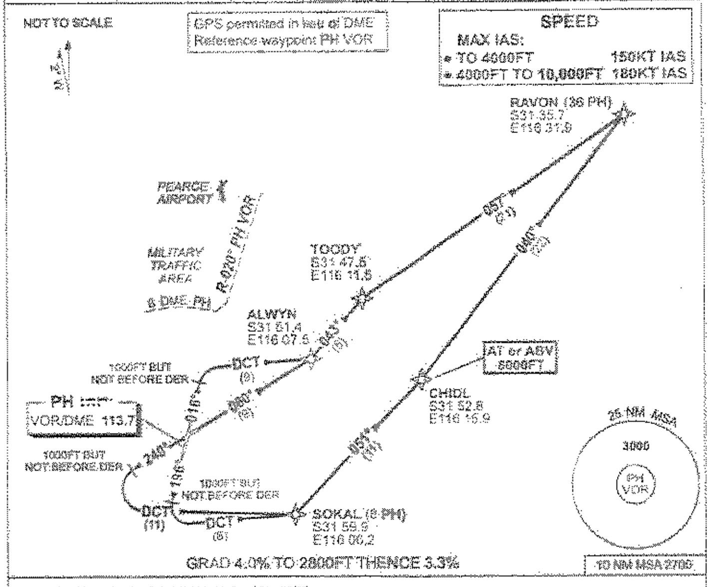
Changes: RWY 06/24 TRACKS. PPHDP01-120

AIRSERVICES AUSTRALIA

STANDARD INSTRUMENT DEPARTURES (SID)
RAVON TWO (NON-JET) (RNAV)
PERTH, WA (YPPH)

27 AUG 2009

ATIS	ACD	SMC	TWR	DEP	
113.7 123.8	118.55	121.7	120.5	118.7	Bearings are Magnetic Elevations in FEET AMSL



GRAD 4.0% TO 2800FT THENCE 3.3%

RAVON TWO DEPARTURE (NON-JET)

RWY 03
- Track 016°
- At 1000FT but not before DER (1.1 DME)
- Turn RIGHT, track DCT to ALWYN
- Turn LEFT, track 043° to TOODY
- Turn RIGHT, track 057° to RAVON, thence as cleared

RWY 06
- Track 060° to ALWYN
- Turn LEFT, track 043° to TOODY
- Turn RIGHT, track 057° to RAVON, thence as cleared

RWY 21
- Track 196°
- AT 1000FT but not before DER (0.8 DME)
- Turn LEFT, track DCT to SOKAL

RWY 24
- Track 240°
- AT 1000FT but not before DER (Abeam PH VOR)
- Turn LEFT, track DCT to SOKAL

From SOKAL
- Turn LEFT, track 051° to CHIDL
  Cross CHIDL AT or ABV 8000FT
- Turn LEFT, track 040° to RAVON, thence as cleared

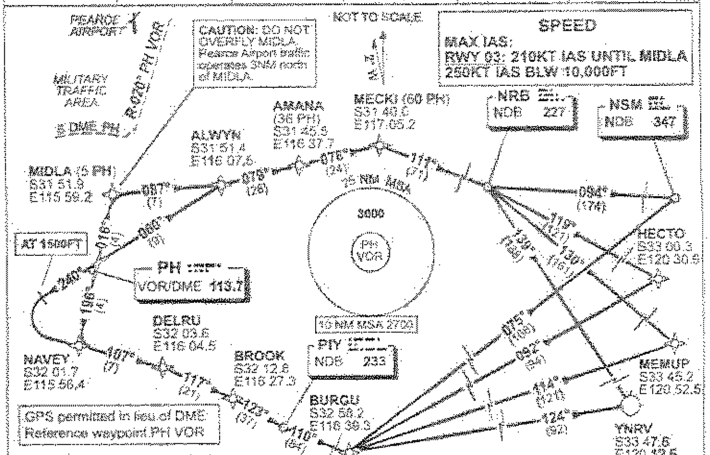
Changes: PH NDB DCMSD, RWY 06/24 TRACKS. PPHDP12-120

AIRSERVICES AUSTRALIA

STANDARD INSTRUMENT DEPARTURES (SID)
RWYS EAST (JET) (RNAV)
PERTH, WA (YPPH)

27 AUG 2009

ATIS	ACD	SMC	TWR	DEP	
113.7 123.8	118.55	121.7	120.5	118.7	Bearings are Magnetic Elevations in FEET AMSL



GRAD 4.0% TO 2800FT THENCE 3.3%

NORSEMAN (NSM) ONE DEPARTURE
HECTO ONE DEPARTURE
MEMUP ONE DEPARTURE
RAVENSTHORPE (YNRV) ONE DEPARTURE

RWY 03
- Track 016° to MIDLA
- Turn RIGHT, track 087° to ALWYN

RWY 06
- Track 060° to ALWYN

From ALWYN
- Track 079° to AMANA
- Track 078° to MECKI
- Turn RIGHT, track 111° to NRB NDB

From NRB
For NSM
- Turn LEFT, track 094° to NSM NDB, thence as cleared

For HECTO
- Turn RIGHT, track 119° to HECTO, thence as cleared

For MEMUP
- Turn RIGHT, track 130° to MEMUP, thence as cleared

For YNRV
- Turn RIGHT, track 139° to YNRV

RWY 21
- Track 196° to NAVEY
- Turn LEFT, track 107° to DELRU

RWY 24
- Track 240°
- At 1500FT turn LEFT
- Track DCT to NAVEY
- Track 107° to DELRU

From DELRU
- Turn RIGHT, track 117° to BROOK
- Turn RIGHT, track 123° to PIY NDB
- Turn LEFT, track 110° to BURGU

From BURGU
For NSM
- Turn LEFT, track 075° to NSM NDB, thence as cleared

For HECTO
- Turn LEFT, track 092° to HECTO, thence as cleared

For MEMUP
- Turn RIGHT, track 114° to MEMUP, thence as cleared

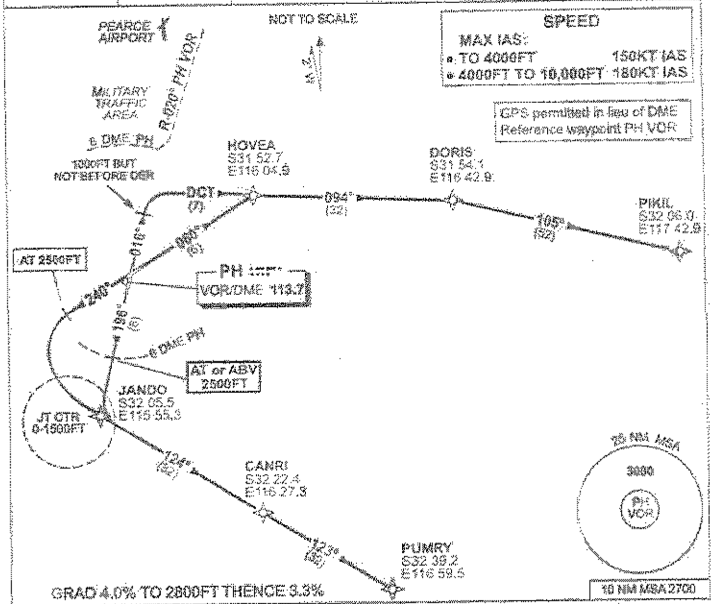
For YNRV
Turn RIGHT, track 124° to YNRV

Changes: PH NDB DCMSD. PPHDP04-120

STANDARD INSTRUMENT DEPARTURES (SID)
RWYS EAST (NON-JET) (RNAV)
PERTH, WA (YPPH)

27 AUG 2009

ATIS	ACD	SMC	TWR	DEP	Bearings are Magnetic
113.7 123.8	118.55	121.7	120.5	118.7	Elevations in FEET AMSL



PIKIL ONE DEPARTURE (NON-JET)

RWY 03
- Track 016°
- AT 1000FT but not before DER (1.1 DME) Turn RIGHT, track DCT to HOVEA
- Track 094° to DORIS
- Turn RIGHT, track 105° to PIKIL, thence as cleared

RWY 06
- Track 060° to HOVEA
- Turn RIGHT, track 094° to DORIS
- Turn RIGHT, track 105° to PIKIL, thence as cleared

PUMRY ONE DEPARTURE (NON-JET)

RWY 21
- Track 196° to JANDO
  Cross 6 DME PH AT or ABV 2500FT
- Turn LEFT, track 124° to CANRI
- Track 123° to PUMRY, thence as cleared

RWY 24
- Track 240°
- At 2500FT turn LEFT
- Track DCT to JANDO
- Track 124° to CANRI
- Track 123° to PUMRY, thence as cleared

Changes: PH NDB DCMSD.

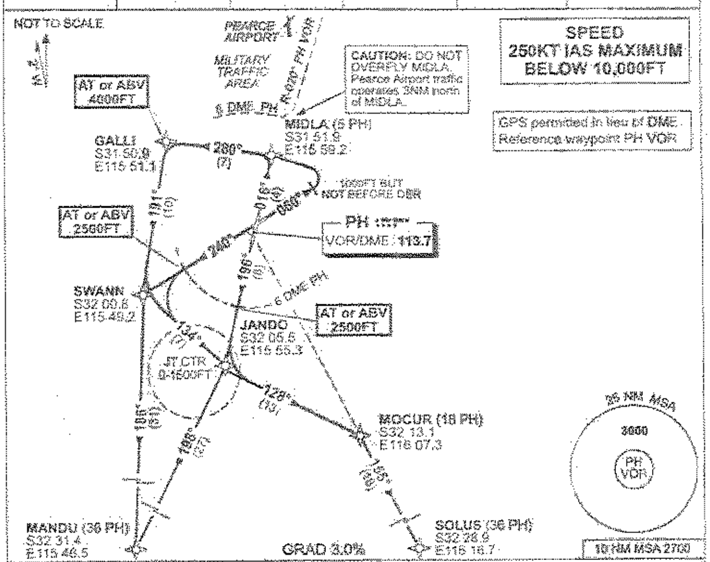
PPHDP07-120

AIRSERVICES AUSTRALIA

STANDARD INSTRUMENT DEPARTURES (SID)
RWYS SOUTH (RNAV)
PERTH, WA (YPPH)

27 AUG 2009

ATIS	ACD	SMC	TWR	DEP	
113.7 123.6	118.55	121.7	120.5	118.7	Bearings are Magnetic Elevations in FEET AMSL



MANDU ONE DEPARTURE

RWY 03

- Track 016° to MIDLA
- Turn LEFT, track 280° to GALLI
  Cross GALLI AT or ABV 4000FT
- Turn LEFT, track 191° to SWANN
- Turn LEFT, track 186° to MANDU

RWY 06

- Track 060°
- AT 1000FT but not before DER (1.3 DME)
- Turn LEFT, track DCT to MIDLA
- Turn LEFT, track 280° to GALLI
  Cross GALLI AT or ABV 4000FT
- Turn LEFT, track 191° to SWANN
- Turn LEFT, track 186° to MANDU

RWY 21

- Track 196° to JANDO
  Cross 6 DME PH AT or ABV 2500FT
- Track 196° to MANDU

RWY 24

- Track 240° to SWANN
  Cross 6 DME PH AT or ABV 2500FT
- Turn LEFT, track 186° to MANDU

SOLUS ONE DEPARTURE

RWY 03

- Track 016° to MIDLA
- Turn LEFT, track 280° to GALLI
  Cross GALLI AT or ABV 4000FT
- Turn LEFT, track 191° to SWANN
- Turn LEFT, track 134° to JANDO

RWY 06

- Track 060°
- AT 1000FT but not before DER (1.3 DME)
- Turn LEFT, track DCT to MIDLA
- Turn LEFT, track 280° to GALLI
  Cross GALLI AT or ABV 4000FT
- Turn LEFT, track 191° to SWANN
- Turn LEFT, track 134° to JANDO

RWY 21

- Track 196° to JANDO
  Cross 6 DME PH AT or ABV 2500FT

RWY 24

- Track 240° to SWANN
  Cross 6 DME PH AT or ABV 2500FT
- Turn LEFT, track 134° to JANDO

From JANDO

- Track 128° to MOCUR
- Turn RIGHT, track 155° to SOLUS

Changes: PH NDB DCMSD.

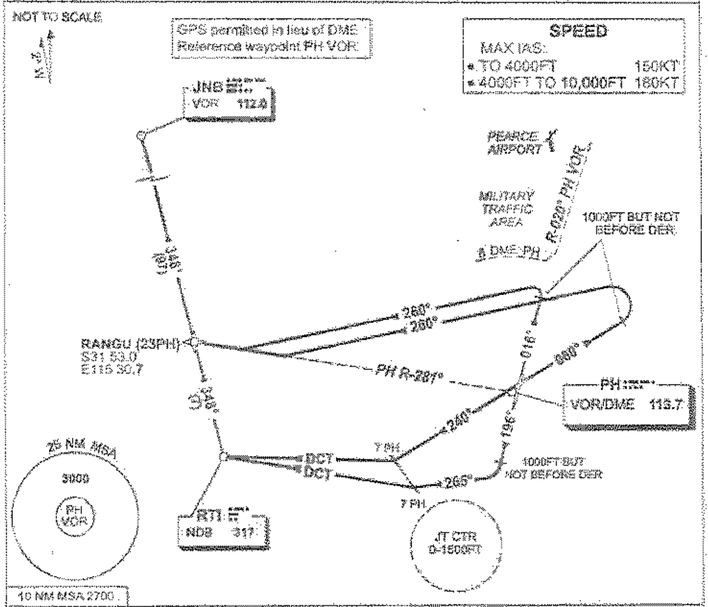
PPHDP09-120

AIRSERVICES AUSTRALIA

STANDARD INSTRUMENT DEPARTURES (SID)
RWYS WEST (NON-JET)

27 AUG 2009 **PERTH, WA (YPPH)**

ATIS	ACD	SMC	TWR	DEP	
113.7 123.8	118.55	121.7	120.5	118.7	Bearings are Magnetic Elevations in FEET AMSL



RANGU FIVE DEPARTURE

RWY 03

- Track 016°
- At 1000FT BUT not before DER (1.1 DME)
- Turn LEFT, track 260°
- Intercept and track PH R-281° to RANGU.

RWY 06

- Track 060°
- At 1000FT BUT not before DER (1.3DME)
- Turn LEFT, track 260°
- Intercept and track PH R-281° to RANGU.

AT RANGU

- Turn RIGHT, track 348° to JNB VOR, thence as cleared

ROTTNEST (RTI) SEVEN DEPARTURE

RWY 21

- Track 196°
- At 1000FT BUT not before DER (0.8 DME)
- Turn RIGHT, track 265°
- At 7 DME track DCT to RTI

RWY 24

- Track 240°
- At 7 DME turn RIGHT
- Track DCT to RTI

From RTI

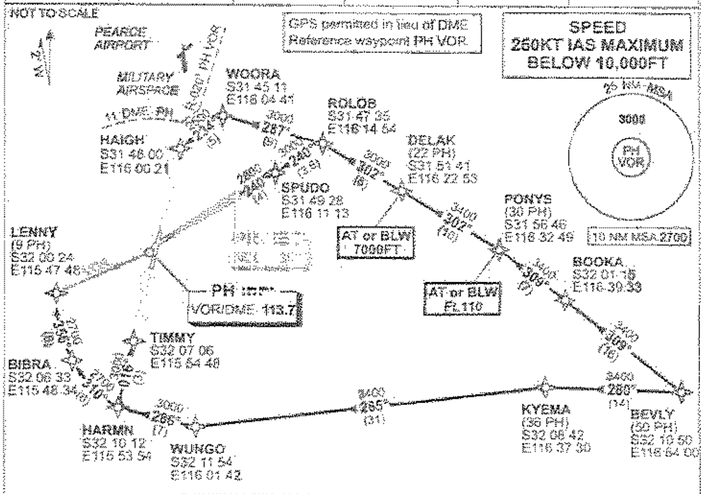
- Turn RIGHT, track 348° to JNB VOR, thence as cleared

Changes: PH NDB DCMSD, RWY 06/24 TRACKS. PPHDP13-120

STANDARD ARRIVAL ROUTE (STAR)
BEVLY FOUR ARRIVAL (JET) (RNAV)
PERTH, WA (YPPH)

11 MAR 2010

ATIS	PEA CEN	APP	TWR	SMC	
113.7 123.8	123.3	123.6	120.5	121.7	Bearings are Magnetic Elevations in FEET AMSL



ARRIVAL: BEVLY FOUR

RWY 03: From BEVLY, track 280° to KYEMA,
- Turn LEFT, track 265° to WUNGO,
- Turn RIGHT, track 286° to HARMN,
- Turn RIGHT, track 016° to TIMMY,
- Intercept LOC RWY 03.

RWY 06: From BEVLY, track 280° to KYEMA,
- Turn LEFT, track 265° to WUNGO,
- Turn RIGHT, track 286° to HARMN,
- Turn RIGHT, track 310° to BIBRA,
- Turn RIGHT, track 356° to LENNY for VOR RWY 06.

NOTE: If listed APP is not AVBL, ACFT can expect alternative instructions from PH APP within 36NM PH.

RWY 21: From BEVLY, track 309° to BOOKA,
- Track 309° to PONYS,
  Cross PONYS AT or BLW FL110,
- Turn LEFT, track 302° to DELAK,
  Cross DELAK AT or BLW 7000FT,
- Track 302° to ROLOB,
- Turn LEFT, track 287° to WOORA,
- Turn LEFT, track 234° to HAIGH,
- Intercept LOC or RNAV(GNSS)RWY 21.

RWY 24: From BEVLY, track 309° to BOOKA,
- Track 309° to PONYS,
  Cross PONYS AT or BLW FL110,
- Turn LEFT, track 302° to DELAK,
  Cross DELAK AT or BLW 7000FT,
- Track 302° to ROLOB,
- Turn LEFT, track 240° to SPUDO,
- Track 240° to PRL NDB,
- Intercept LOC RWY 24.

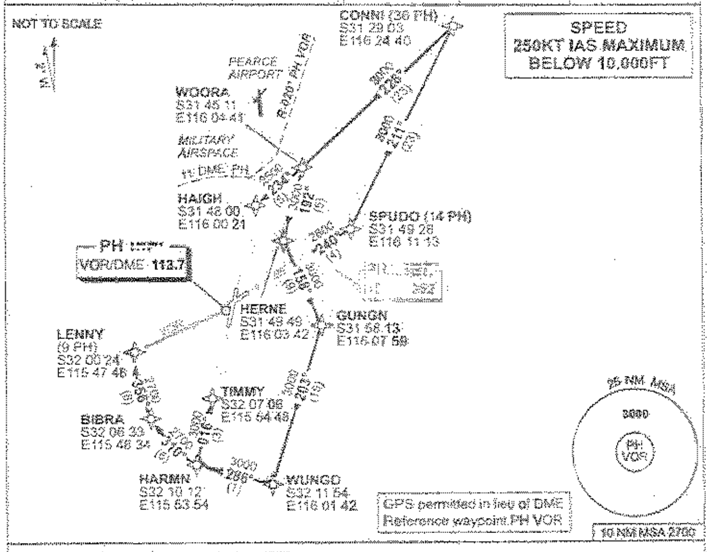
COMMUNICATIONS FAILURE: PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

Changes: SPUDO-PRL, CO-ORD FORMAT, Editorial. PPHSR09-122

STANDARD ARRIVAL ROUTE (STAR)
CONNI THREE ARRIVAL (NON-JET) (RNAV)
11 MAR 2010 **PERTH, WA (YPPH)**

ATIS	PEA CEN	APP	TWR	SMC	
113.7 123.8	123.3	123.6	120.5	121.7	Bearings are Magnetic Elevations in FEET AMSL



ARRIVAL: CONNI THREE (NON-JET)

RWY 03: From CONNI, track 228° to WOORA,
- Turn LEFT, track 192° to HERNE,
- Turn LEFT, track 156° to GUNGN,
- Turn RIGHT, track 203° to WUNGO,
- Turn RIGHT, track 286° to HARMN,
- Turn RIGHT, track 016° to TIMMY,
- Intercept LOC RWY 03.

RWY 06: From CONNI, track 228° to WOORA,
- Turn LEFT, track 192° to HERNE,
- Turn LEFT, track 158° to GUNGN,
- Turn RIGHT, track 203° to WUNGO,
- Turn RIGHT, track 286° to HARMN,
- Turn RIGHT, track 310° to BIBRA,
- Turn RIGHT, track 356° to LENNY for VOR RWY 06.

RWY 21: From CONNI, track 228° to WOORA,
- Turn RIGHT, track 234° to HAIGH,
- Intercept LOC or RNAV (GNSS) RWY 21.

RWY 24: From CONNI, track 211° to SPUDO,
- Turn RIGHT, track 240° to PRL NDB,
- Intercept LOC RWY 24.

NOTE: If listed APP is not AVBL, ACFT can expect alternative instructions from PH APP within 36NM PH.

COMMUNICATIONS FAILURE: PROCEDURE IN IMC

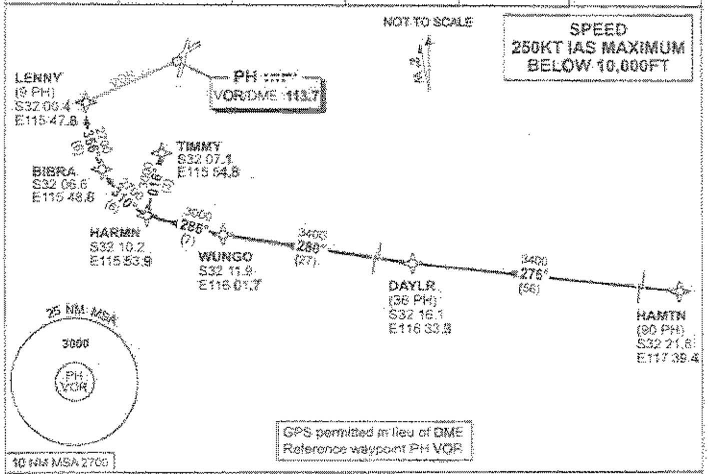
- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

Changes: SPUDO-PRL, CO-ORD FORMAT, Editorial. PPHSR11-122

27 AUG 2009

STANDARD ARRIVAL ROUTE (STAR)
DAYLR THREE ARRIVAL (NON-JET) (RNAV)
PERTH, WA (YPPH)

ATIS	PEA CEN	APP	TWR	SMC	
113.7 123.8	123.3	123.6	120.5	121.7	Bearings are Magnetic Elevations in FEET AMSL



TRANSITIONS:

HAMTN: From HAMTN to DAYLR,
Track 276° to DAYLR,
Then follow ARRIVAL instructions.

ARRIVAL: **DAYLR THREE**

RWY 03: From DAYLR, track 280° to WUNGO,
- Turn RIGHT, track 286° to HARMN,
- Turn RIGHT, track 016° to TIMMY,
- Intercept LOC RWY 03,

RWY 06: From DAYLR, track 280° to WUNGO,
- Turn RIGHT, track 286° to HARMN,
- Turn RIGHT, TRACK 310° to BIBRA,
- Turn RIGHT, track 356° to LENNY for VOR RWY 06.

NOTE: If listed APP is not AVBL, ACFT can expect alternative instructions from PH APP within 38NM PH.

COMMUNICATIONS FAILURE: PROCEDURE IN IMC

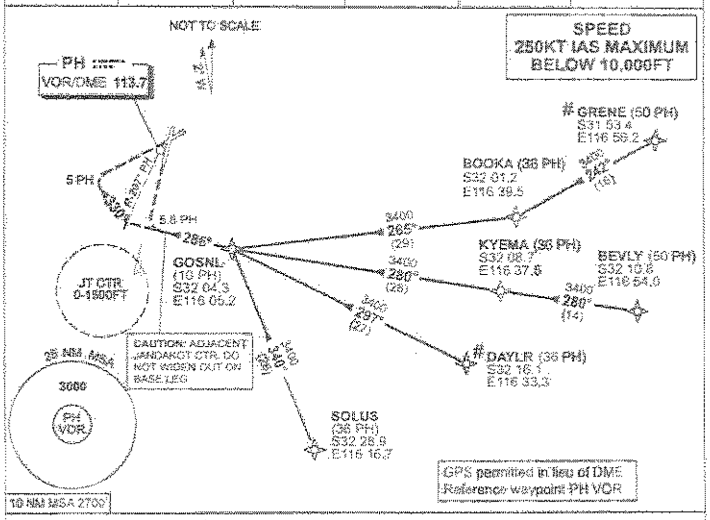
- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

Changes: REVISED PROCEDURE, PH NDB DCMSD. PPHSR02-120

STANDARD ARRIVAL ROUTE (STAR)
GOSNL TWO ARRIVAL (RNAV)
PERTH, WA (YPPH)

27 AUG 2009

ATIS	PEA CEN	APP	TWR	SMC	
113.7 123.8	123.3	123.6	120.5	121.7	Bearings are Magnetic Elevations in FEET AMSL



TRANSITIONS: (# NON-JET ONLY)

 # GRENE: From GRENE to GOSNL
- Track 242° to BOOKA.
- Turn RIGHT, track 265° to GOSNL,
  Then follow ARRIVAL instructions

 # DAYLR: From DAYLR to GOSNL
- Track 297° to GOSNL,
  Then follow ARRIVAL instructions

BEVLY: From BEVLY to GOSNL
- Track 280° to KYEMA,
- Track 280° to GOSNL,
  Then follow ARRIVAL instructions

SOLUS: From SOLUS to GOSNL
- Track 340° to GOSNL,
  Then follow ARRIVAL instructions

ARRIVAL: GOSNL TWO

RWY 03 VISUAL: From GOSNL track 286° to 5NM final (5.8DME)

RWY 06 VISUAL: From GOSNL track 286° to PH R-207°
- Turn RIGHT, track 330° to 5NM final

COMMUNICATIONS FAILURE: PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

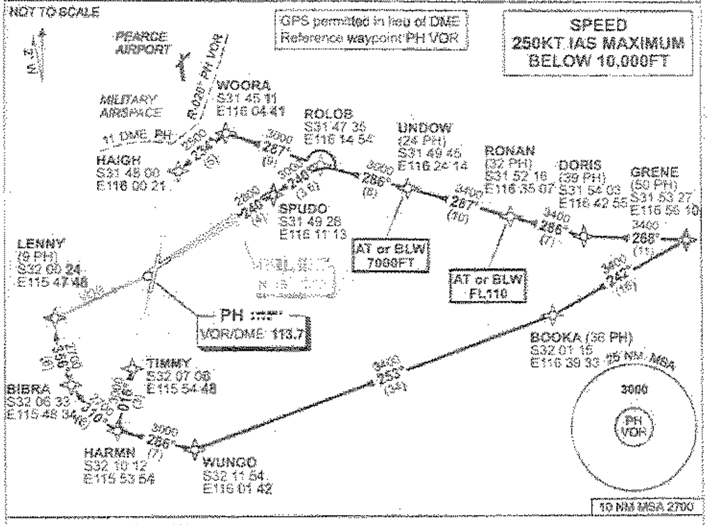
Changes: PH NDB DCMSD.

PPHSR05-120

11 MAR 2010

STANDARD ARRIVAL ROUTE (STAR)
GRENE FOUR ARRIVAL (NON-JET) (RNAV)
PERTH, WA (YPPH)

ATIS	PEA CEN	APP	TWR	SMC	Bearings are Magnetic Elevations in FEET AMSL
113.7, 123.8	123.3	123.6	120.5	121.7	



ARRIVAL GRENE FOUR:

RWY 03: From GRENE, track 242° to BOOKA,
- Turn RIGHT, track 253° to WUNGO,
- Turn RIGHT, track 286° to HARMN,
- Turn RIGHT, track 016° to TIMMY,
- Intercept LOC RWY 03.

RWY 06: From GRENE, track 242° to BOOKA,
- Turn RIGHT, track 253° to WUNGO,
- Turn RIGHT, track 286° to HARMN,
- Turn RIGHT, track 310° to BIBRA,
- Turn RIGHT, track 356° to LENNY for VOR RWY 06.

NOTE: If listed APP is not AVBL, ACFT can expect alternative instructions from PH APP within 36NM PH.

RWY 21: From GRENE, track 268° to DORIS,
- Turn RIGHT, track 286° to RONAN,
  Cross RONAN AT or BLW FL110,
- Track 287° to UNDOW,
  Cross UNDOW AT or BLW 7000FT,
- Track 287° to WOORA,
- Turn LEFT, track 234° to HAIGH,
- Intercept LOC or RNAV(GNSS) RWY 21.

RWY 24: From GRENE, track 268° to DORIS,
- Turn RIGHT, track 286° to RONAN,
  Cross RONAN AT or BLW FL110,
- Track 287° to UNDOW,
  Cross UNDOW AT or BLW 7000FT,
- Track 286° to ROLOB,
- Turn LEFT, track 240° to SPUDO,
- Track 240° to PRL NDB,
- Intercept LOC RWY 24.

COMMUNICATIONS FAILURE: PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

Changes: SPUDO-PRL, CO-ORD FORMAT Editorial.

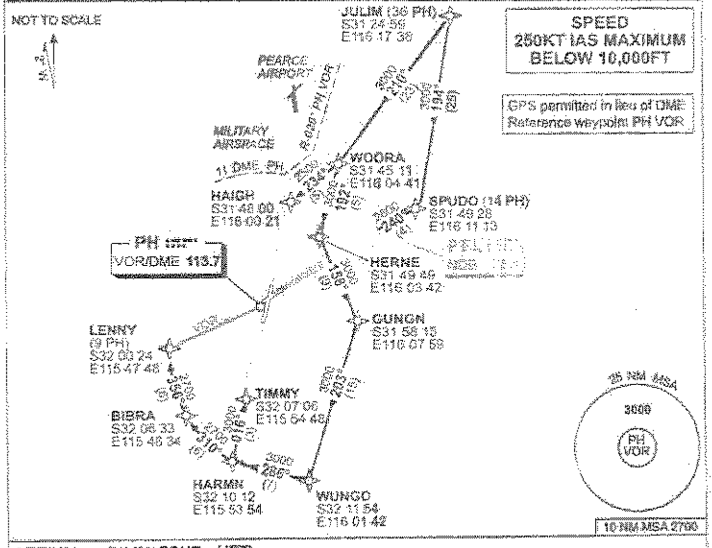
PPHSR01-122

AIRSERVICES AUSTRALIA

STANDARD ARRIVAL ROUTE (STAR)
JULIM FOUR ARRIVAL (JET) (RNAV)
PERTH, WA (YPPH)

11 MAR 2010

ATIS	PEA CEN	APP	TWR	SMC	Bearings are Magnetic Elevations in FEET AMSL
113.7 123.8	123.3	123.6	120.5	121.7	



ARRIVAL: JULIM FOUR (JET)

RWY 03: From JULIM, track 210° to WOORA,
- Turn LEFT, track 192° to HERNE.
- Turn LEFT, track 158° to GUNGN.
- Turn RIGHT, track 203° to WUNGO.
- Turn RIGHT, track 286° to HARMN.
- Turn RIGHT, track 016° to TIMMY.
- Intercept LOC RWY 03.

RWY 06: From JULIM, track 210° to WOORA,
- Turn LEFT, track 192° to HERNE.
- Turn LEFT, track 158° to GUNGN.
- Turn RIGHT, track 203° to WUNGO,
- Turn RIGHT, track 286° to HARMN.
- Turn RIGHT, track 310° to BIBRA.
- Turn RIGHT, track 356° to LENNY for VOR RWY 06.

RWY 21: From JULIM, track 210° to WOORA,
- Turn RIGHT, track 234° to HAIGH,
- Intercept LOC or RNAV (GNSS) RWY 21.

RWY 24: From JULIM, track 194° to SPUDO,
- Turn RIGHT, track 240° to PRL NDB,
- Intercept LOC RWY 24.

NOTE: If listed APP is not AVBL, ACFT can expect alternative instructions from PH APP within 36NM PH.

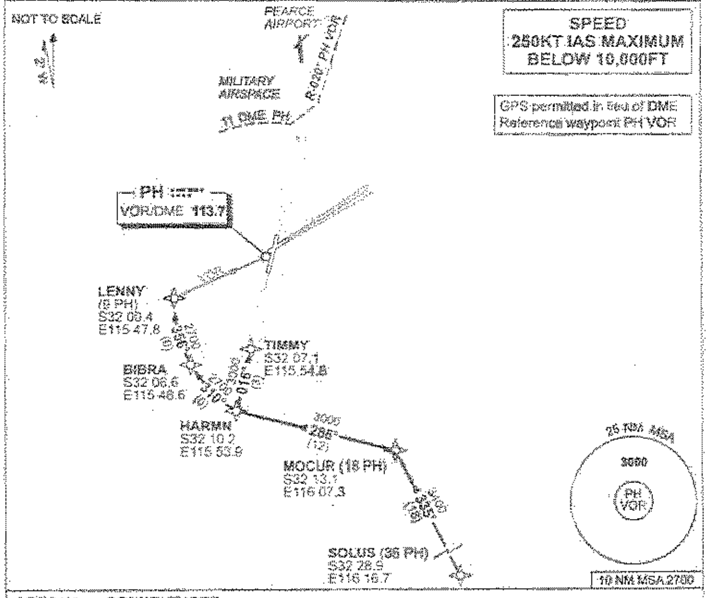
COMMUNICATIONS FAILURE: PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.6.

Changes: SPUDO-PRL, CO-ORD FORMAT, Editorial. PPHSR04-122

STANDARD ARRIVAL ROUTE (STAR)
SOLUS THREE ARRIVAL (RNAV)
27 AUG 2009 PERTH, WA (YPPH)

ATIS	PEA CEN	APP	TWR	SMC	
113.7 123.8	125.3	121.6	120.5	121.7	Bearings are Magnetic Elevations in FEET AMSL



ARRIVAL: SOLUS THREE

RWY 03: From SOLUS, track 335° to MOCUR,
- Turn LEFT, track 286° to HARMN,
- Turn RIGHT, track 016° to TIMMY, intercept LOC RWY 03.

RWY 06: From SOLUS, track 335° to MOCUR,
- Turn LEFT, track 286° to HARMN,
- Turn RIGHT, TRACK 310° to BIBRA,
- Turn RIGHT, track 356° to LENNY for VOR RWY 06.

RWY 21/24: From SOLUS, track 335° to MOCUR. Expect radar vectors for LOC or RNAV (GNSS) RWY 21, or LOC RWY 24.

NOTE: If listed APP is not AVBL, ACFT can expect alternative instructions from PH APP within 36NM PH.

COMMUNICATIONS FAILURE: PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

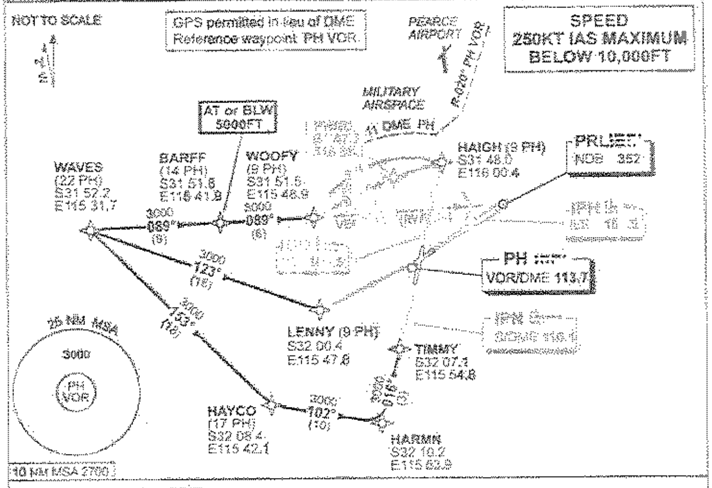
Changes: REVISED PROCEDURE. PH NDB DCMSD. PPHSR10-120

AIRSERVICES AUSTRALIA

STANDARD ARRIVAL ROUTE (STAR)
WAVES FIVE ARRIVAL (RNAV)
PERTH, WA (YPPH)

19 NOV 2009

ATIS	PEA CEN	APP	TWR	SMC	Bearings are Magnetic
113.7 123.8	123.3	123.6	120.5	121.7	Elevations in FEET AMSL



ARRIVAL: **WAVES FIVE**

RWY 03: From WAVES, track 153° to HAYCO
- Turn LEFT, track 102° to HARMN
- Turn LEFT, track 016° to TIMMY

Intercept LOC or RNAV (GNSS) RWY 03

RWY 06: From WAVES, track 123° to LENNY for VOR RWY 06

RWY 21: From WAVES, track 089° to BARFF,
Cross BARFF AT or BLW 5000FT
Track 089° to WOOFY
Track via 9 DME arc to intercept LOC RWY 21
or on request: Track 058° to PPHND for RNAV (GNSS) RWY 21

RWY 24:
From WAVES, track 089° to BARFF,
Cross BARFF AT or BLW 5000FT
Track 089° to WOOFY
Expect radar vectors to intercept LOC RWY 24

NOTE: If listed APP is not AVBL, ACFT can expect instructions from PH APP within 36NM PH.

COMMUNICATIONS FAILURE: PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

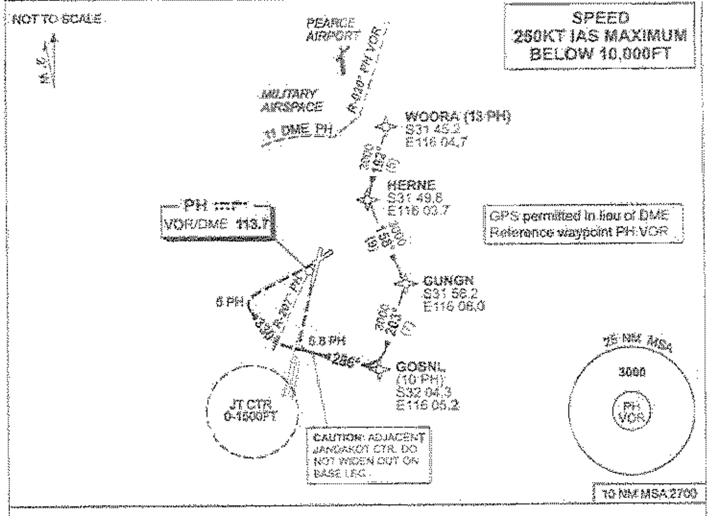
Changes: RWY 24 PROC, Editorial. PPHSR06-121

AIRSERVICES AUSTRALIA

STANDARD ARRIVAL ROUTE (STAR)
WOORA ONE ARRIVAL (RNAV)
PERTH, WA (YPPH)

27 AUG 2009

ATIS	PEA CEN	APP	TWR	SMC	Bearings are Magnetic Elevations in FEET AMSL
113.7 123.8	123.3	123.6	120.5	121.7	



ARRIVAL: WOORA ONE

From WOORA track 192° to HERNE,
- Turn LEFT, track 158° to GUNGN,
- Turn RIGHT, track 203° to GOSNL

RWY 03 VISUAL: From GOSNL turn RIGHT,
- Track 286° to 5NM final (5.8DME)

RWY 06 VISUAL: From GOSNL turn RIGHT,
- Track 286° to PH R-207°
- Turn RIGHT, track 330° to 5NM final

COMMUNICATIONS FAILURE: PROCEDURE IN IMC

- Squawk 7600, comply with vertical navigation requirements, but not below MSA.
- Track via the latest STAR clearance to the nominated runway, then fly the most suitable approach in accordance with ERSA EMERG Section 1.5.

Changes: PH NDB DCMSD.

PPHSR12-120

AIRSERVICES AUSTRALIA

AECOM

AECOM Australia Pty Ltd
3 Forrest Place
Perth WA 6000
GPO Box B59
Perth WA 6849
Australia
www.aecom.com

+61 8 6430 2000 tel
+61 8 6430 2999 fax

17 May 2010

Ken Owen
Airservices Australia
25 Constitution Ave
CANBERRA ACT 2600

Dear Ken

Aircraft Noise Measurement - Perth Airport

Please find attached AECOM's technical report on aircraft noise monitoring around Perth as per Airservices request. Noise monitoring was conducted at five locations (Bickley, Glen Forrest, Chidlow, Stoneville and Beechboro) over a two week period to inform Airservices about the impact of aircraft noise on the community. The study relied on noise data obtained from unattended equipment strategically sited at these locations under flight paths, supplemented by attended noise monitoring, as well as flight track data from Airservices noise and flight path monitoring system. Key findings were:

- Background noise levels vary considerably from location to location. Chidlow and Stoneville had substantial periods of time during the day with very low background noise levels. Bickley, Glen Forrest and Beechboro have relatively higher levels of background noise than Chidlow and Stoneville, but were still at the lower end of the spectrum. The background noise levels measured are consistent with rural residential land use.
- Noise events at each location that exceeded 70dB(A) were mostly attributable to non-aircraft noise sources, with the exception of Beechboro. Analysis of the 60dB(A) and 65dB(A) noise events produced similar results, i.e. most were attributable to non-aircraft noise sources.
- Attended monitoring demonstrated that, unless the aircraft flight-path was almost directly above the measuring location, the aircraft noise level did not reach 60dB(A). These noises were still audible, even though the noise level was approximately 50dB(A), due to a large extent to the relative low noise level of the surrounding environment. Analysis of results in Chidlow and Glen Forrest revealed that a large proportion of noise events over 60dB(A) were due to traffic, wind or animal/bird noises.
- There is considerable variability in the number of events per day at each location exceeding 70dBA, some days having few or none, others with eight or more.

In summary, aircraft noise at these locations is noticeable due to low levels of background noise. During the day and evening, due to the number of non-aircraft noise sources exceeding 70dB(A) at these locations (wildlife, traffic, wind), aircraft noise is not regarded as making a strong contribution to the overall noise experience of the community. The few 70 dB(A) events (less than one per day), during morning and night, would be more obvious in the absence of the masking from local noise.

Yours faithfully

Hugh Richardson

Hugh Richardson
Manager Acoustics
h.richardson@bassett.com.au

Mobile: +61 438 933 381
Direct Dial: +61 8 6430 2700
Direct Fax: +61 8 6430 2997

Aircraft Noise Monitoring - April 2010

Perth Airport Flight Paths

Aircraft Noise Monitoring - April 2010

Perth Airport Flight Paths

Prepared for
Airservices Australia

Prepared by

AECOM Australia Pty Ltd
3 Forrest Place, Perth WA 6000, GPO Box B59, Perth WA 6849, Australia
T +61 8 6430 2000 F +61 8 6430 2999 www.aecom.com
ABN 20 093 846 925

21 April 2010

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Quality Information

Document Aircraft Noise Monitoring - April 2010

Ref 60146949

Date 21 April 2010

Prepared by Hugh Richardson

Reviewed by Martti Warpenius

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
0	21 April-2010	Draft Issue containing logged data results for April 2 to April 9	H Richardson Princ Eng, Acoustics	Hugh Richardson
1	22-Apr-2010	Including Client comments on Draft	H Richardson Princ Eng, Acoustics	Hugh Richardson
2	23-Apr-2010	Including Client amendments	H Richardson Princ Eng, Acoustics	Hugh Richardson
3	13-May-2010	Add arrival/departure information to appendix	H Richardson Princ Eng, Acoustics	Hugh Richardson
4	17-May-2010	Amendments for clarity	H Richardson Princ Eng, Acoustics	Hugh Richardson

Table of Contents

Executive Summary

AECOM was appointed by Airservices Australia (ASA) to conduct aircraft noise monitoring over two weeks at five locations under flight paths into and out of Perth Airport. The locations are Chidlow, Stoneville, Beechboro, Glen Forrest and Bickley.

The purpose was to provide quantitative data as to noise levels in support of the potential impact on residents near to the flight paths.

Impact analysis has previously used the N70 parameter for impact assessment. It is defined as the number of aircraft events exceeding 70 dB(A) measured in 'slow'mode. It has been used effectively at Sydney and Coolangatta Airports and has been used here in preference to the Australian Noise Exposure Forecast (ANEF) contours .

The summary of noise observations at each of the measurement locations is as follows:

Location	*Background Noise Level L_{90} dB(A)*	*Aircraft N70 (over 14 days)*	*Overflights in 14 days Within 2.5 km of each site*
Chidlow	25.3	14	725
Stoneville	30.7	15	1082
Beechboro*	40.9	53	192
Glen Forrest	35.3	1	168
Bickley	27.6	15	330

The duration of N70 events, ie the duration of aircraft noise levels exceeding 70 dB(A) varied from 3 to 16 seconds, with an average duration of 6 seconds.

1.0 Introduction

1.1 Concerns of the Community

The following items were identified by ASA to be addressed in the study of aircraft noise:

1. How loud aircraft are (with respect to background and non-aircraft noise sources).
2. How often aircraft noise occurs (eg. number of noise events per hour/day).
3. Duration of each aircraft noise event.
4. What part of the day is affected; morning (6:00-7:00), day (7:00-20:00), evening (20:00-23:00) and night (23:00-6:00).
5. The different nature of aircraft noise (jet and non-jet to be considered separately) compared to other (non-aircraft) noise sources.
6. How aircraft are operating (height of aircraft, arrival/departure).

2.0 Criteria

The conventional approach for providing information on aircraft noise impacts to community has been to publish Australian Noise Exposure Forecast (ANEF) contours or Australian Noise Exposure Index contours (ANEI). The contours process together information about magnitude, frequency and duration of aircraft noise events to provide a single number indicator of average daily noise exposure (i.e. a measure related to the total energy received over one day) on a scale starting at 20 and moving up in increments of 5.

The ANEF contour system is frequently misunderstood by residents because of it's lack of information regarding the magnitude, frequency or duration of the aircraft noise events.

The contours are used by Australian Standard AS2021- 2000 "Aircraft noise intrusion - building siting and construction" for land-use planning and development assessment. In accordance with the standard, areas with an aircraft noise exposure level of less than ANEF 20 are defined as "acceptable" for residential development without special conditions that stipulate noise treatment. This has been commonly misunderstood by both potential residents and local authorities to mean noise outside the ANEF 20 contour will be insignificant and will not be a cause of annoyance.

AS2021 indicates that although areas outside the ANEF 20 contour are "acceptable" for residential development, up to 45% of residents living outside but near this contour would express dissatisfaction and 10% of residents would express extreme dissatisfaction.

AS2021 identifies construction noise limits within a sleeping area to be 50 dB(A). (Acoustic terminology is set out in Appendix A.) On the assumption that an open-window residential building provides 10 dB attenuation to outside noise levels, the aircraft noise impact would need to be limited to 60 dB(A). In a low-noise environment, aircraft events of N60 would seem to be the guideline for limitation. At night and early morning, operations should minimise N60s during the summer. During winter, when a house is more likely to be closed up, the attenuation of 15 dB would allow N65s as the limiting measure.

A study undertaken by the Dept of Infrastructure, Transport, Regional Development and Local Government ("Discussion Paper on Expanding Ways to Describe and Assess Aircraft Noise") recommends the use of the N70 measure, the number of events which exceeded an aircraft noise level of 70 dB(A) over the period of one day. The measure has been used around Sydney Airport and Coolangatta and was determined to be a better indication of aircraft noise impact on the community than the ANEF contours.

In agreement with ASA, AECOM decided that N70 is an appropriate measure to use in assessment of aircraft noise exposure for this project. This parameter also provides the ability to compare impacts with other communities in Australia also affected by aircraft noise. N60 and N65 measures (the number of events which exceeded an aircraft noise level of 60 dB(A) and 65dB(A) respectively, over the period of one day) provide additional qualitative parameters in recognition of aircraft noise impact sensitivity being different across the different times of the day.

We noted that several of the monitoring sites have low noise background noise levels for the greater part of the day with few man-made noise sources. Consequently, a comparison of aircraft noise in relation to background noise level (L_{90}) was also undertaken.

3.0 Methodology

3.1 Data collection

Larsen Davis Sound Level Meter Type 1 (SLM) noise loggers were deployed late on the 1st April 2010.

The loggers were deployed with the following settings:

Frequency-weight	A
Time-weight	Slow
Time setting	15min
Start Time	1/04/2010 14:00
Stop Time	1/05/2010 00:00
	L01
Lx	L05
	L10
	L50
	L90
	L95

Each was calibrated before commencement of measurements, and at collection, and found to be within acceptable limits. Each unit has been calibrated within the past two years, and certificates are available for the units with the serial numbers at Appendix B.

Threshold levels of the units were set to 58 dB(A) $L_{eq,\ slow}$ with a time duration of 3 seconds. The trigger commenced an audio recording of the event after the sound level exceeded 58dB(A) for 3 seconds so that the recording could be assessed later to determine the source of the noise (ie. whether it was an aircraft or not). This level was found to record all relevant aircraft noise without excessive recording of non-aircraft noises that typically have shorter durations (traffic, insects etc.).

Attended monitoring was also conducted at each site during a 6 hour site attendance on a separate day. Each site was visited to monitor data collection integrity on five occasions in addition to the attended monitoring. Observation of aircraft position at nearest proximity, maximum noise levels and time of passover were recorded and aircraft noise events were 'marked' on the logger record. This information was used to correlate sound events with the aircraft movements into and out of Perth Airport and to provide confidence in the logged data.

The loggers were recovered 15th and 19th April, 2010. Short periods of data were lost at Chidlow and Glen Forrest due to data overload of the memory during a rain period; those loggers were left out from the 15th to 19th April to make up the total time.

3.2 Locations

General logger locations under flight paths were specified by ASA to best reflect the aircraft noise exposure in the areas with the highest level of complaint. Specific locations within these areas were selected by AECOM to be, where possible, away from frequent non-aircraft noise sources such as roads or residences. However, due to legal considerations, logger placement was limited to public land and so most loggers were placed in publically owned bushlands, generally out of sight of obviously trafficked ways. Consequently fauna noise (bird chorus) was a significant element to the dawn and dusk data logging.

The sites selected are marked on the aerial photography and local photos with their GPS coordinates in Appendix C.

3.3 Data analysis

3.3.1 Time of day

As recommended by the study undertaken by the Dept of Infrastructure, Transport, Regional Development and Local Government ("Discussion Paper on Expanding Ways to Describe and Assess Aircraft Noise") the monitoring periods are divided into morning (6:00-7:00), day (7:00-20:00), evening (20:00-23:00) and night (23:00-6:00).

3.3.2 Background noise levels

L_{90} measurements are analysed as the basis for background noise levels during the daily periods of morning, day, evening and night. These measurements were conducted on slow-weighting and consequently the true background noise level may be lower than that reported in this study. The 'averaging' of L_{90} data is taking L_{90} of the 15 minute L_{90}s for each period during the day and over the fourteen days of logging.

3.3.3 Correlation with overflights – Airservices flight data

ASA provided flight information of all flights into and out of Perth Airport for the duration of the logging period. This data displayed all flight information for flyovers passing within 1.5 km and also within 2.5 km of each logging site. (An example of overflight paths is shown in Appendix D.) These data correlated to the 'events' logged on the measuring equipment. Attended monitoring of noise from flights further than 1.5 km was also assessed, and observed generally to be attenuated sufficiently to not exceed 60 dB(A) at the microphone. The overflight data was checked against the ASA 1.5 km data to confirm proximity, and to be used as a guide in identifying a noise 'event'. Several aircraft events could not be correlated with the overflight data as they may have been further than 2.5 km from the measuring sites, but were included as events. Examples of this are jets taking off upwind of Beechboro; they are audible but do not fly within 2.5 km of that site.

3.3.4 Analysis

The loggers were set to record an event that exceeded the $L_{eq,\ slow}$ 58 dB(A) for more than three seconds at the microphone. The source of noise (ie aircraft, fauna, traffic etc.) was reviewed from the recorded audio (WAV) files. Each event was subjectively identified and sorted as either 'aircraft' or 'other'. The 'aircraft' events were further divided into 'jet', 'non-jet',

These events were correlated with filtered noise data from the Larson Davis loggers to establish which aircraft overflights exceeded 60 dB(A), which also displayed the typical transient decay of aircraft flyovers.

Where aircraft may have been audible below the notional level for intrusion of 70 dB(A) these were categorised into N65 events and N60 events. These were then reported in Section 3 below to assist with evaluation of the primary N70 results.

4. Results

3.4 Background environmental conditions

Attended monitoring at each location determined that the loggers' L_{90} slow-weighted levels are representative of background noise levels at various times in the day (morning (6:00-7:00), day (7:00-20:00), evening (20:00-23:00) and night (23:00-6:00)). The L_{90} background noise levels at Chidlow, and Bickley were as low as 20 to 25 dB(A) at various times during a 24 hour period, consistent with outer suburbia or semi-rural conditions. The very low L_{90} levels observed were infrequent; however, at Chidlow L_{90} was below 40 dB(A) for extended periods of the day.

Higher L_{90} data at Bickley and Beechboro, and observed during attended monitoring at Glen Forrest, reflect the higher residential density. Attended monitoring and review of the .WAV files noted bird noise as being variable during the day. Traffic noise was generally higher during the day.

The slow-weighted energy averaged $L_{eq,\ 15\ min}$ levels, however, were consistently between 40 and 50 dB(A). The plots of L_{Max} and L_{A90} are presented in Appendix F indicating typical differences of 30 to 35 dB between the two at each site. As indicated in the separation of aircraft from other sources within the N70 events summaries below, aircraft contributed only peripherally to those L_{AMax} statistics. Observed background levels at Glen Forrest could be expected to be between those at Beechboro and Bickley. At Bickley, the 15 minute L_{AMax} was consistently between 75 and 85 dB(A). The L_{AMax} at Beechboro was a broader spread, consistently between 70 and 85 dB(A). At Chidlow, the spread was even broader between 65 and 85 dB(A).

Aircraft noise levels, where they exceed 70 dB(A) during 'Night' and 'Morning' periods, would be readily noticeable by a resident accustomed to the background conditions. In summer, with windows open for natural ventilation, the residential buildings would provide approximately 10 dB attenuation to the N70 events leaving a noticeable difference between background noise level and event noise.

Table 3.4-1 (below) reports the background noise levels by period. Appendix F includes tables of all N70, N65 and N60 events including fauna and other than aircraft man-made noise.

Table 3.4-1 - Background noise levels (L90 dB) at each location by period of the day as measured over a 14 day period

Location	*Morning*	*Day*	*Evening*	*Night*	*24 hour Average*
Chidlow	25.7	29.2	23.3	23.3	26.6
Stoneville	33.8	33.7	25.9	26.6	30.7
Beechboro	43.9	43.5	39.7	36.2	40.9
Glen Forrest	39.3	39.7	30.9	28.3	35.3
Bickley	30.0	28.9	25.9	25.4	27.6

The data given above for each time period is calculated by using the bottom 10% rule to find an L_{90} per day and taking the median of these values over the days measured. The 24 hour average is calculated by using the 10% method to find the L90 over the entire period.

Meteorological conditions during the monitoring period were typical Perth summer with clear sunny days, morning breeze from the east or south east, and afternoon sea breezes from the south west or south south west. Rain occurred to a minor extent on 13th April, with heavier rain (over 25 mm) on 14th April, the latter would have been heavy enough to affect background noise levels. During some part of each day the 'worst case' wind would have occurred, that being 3 m/s. We did not analyse the conditions for wind from source to receiver at the time of each event.

3.5 N70

Table 3.5-1 summarises the aircraft N70 events at each location for each daily period. This data may be assessed against similar data at other monitored locations around Australia. This data indicates a number of events that would be clearly distinguishable by an outdoor observer near the nominated locations. Note that there were instances where the aircraft noise coincided with local noise events such as car pass-bys or noisy fauna. In these instance the true aircraft noise level, and hence the N70 would have been marginally lower than that reported in this study.

Table 3.5-1 - N70 Aircraft events by location and time of day for a 14 day period. Results are averaged per day.

Location	Morning	Day	Evening	Night
Chidlow	<1	<1	0	0
Stoneville	<1	<1	0	<1
Beechboro	<1	2.9	<1	<1
Glen Forrest	0	<1	0	0
Bickley	0	1.0	0	<1

Some of these records are contaminated by local noise sources and the number is therefore conservative.

Appendix G tabulates all events by time of day, by location and separated into jet, non-jet, and non-aircraft events.

Although not core to this assessment, we include N65 and N60 events as an indicator of noise that might be considered to impact residents near the logging sites. They should be considered as being relevant to evening and night-time periods of the day. Note that they are averaged as per day.

3.6 N65

Table 3.6-1 summarises the aircraft N65 events at each location for each daily period. This data may be assessed against similar data at other monitored locations around Australia. This data indicates a large number of events that would be clearly distinguishable by a resident, outside, near the nominated locations.

Table 3.6-1 - N65 Aircraft events, by location and time of day (averaged per day over 14 days)

Location	Morning	Day	Evening	Night
Chidlow	<1	4.0	0	<1
Stoneville	1.9	9.8	<1	1.8
Beechboro	<1	8.1	<1	<1
Glen Forrest	<1	1.0	0	0
Bickley	<1	2.2	<1	<1

3.7 N60

Table 3.7-1 summarises the aircraft N60 events at each location by time period, indicating a large number of events that would be clearly distinguishable by a resident, outside, near the nominated locations.

Table 3.7-1 - N60 Aircraft events, by location and time of day for a 14 day period (averaged per day)

Location	Morning	Day	Evening	Night
Chidlow	2.3	13.1	<1	2.1
Stoneville	3.4	28.9	2.6	4.4
Beechboro	<1	11.5	<1	<1
Glen Forrest	<1	3.1	0	<1
Bickley	<1	5.4	<1	<1

3.8 Attended monitoring

Attended monitoring demonstrated that, unless the aircraft flight-path was almost directly above the measuring location, the aircraft noise level did not reach 60dB(A). These noises were still audible even though the noise level was approximately 50dB(A). Occasional up-wind aircraft noise could be detected beyond the 2.5 km radius. At Beechboro, several logged aircraft events were not overflights, but departures at the airport, away from the monitoring site, to the south . These noise emissions were sufficient to trigger the logger and record a N60 event, despite there being no overflight.

It was observed that some aircraft noise events, contaminated by extraneous noise such as traffic noise or fauna noise, just exceeded 70 dB(A). It was not possible to separate the non-aircraft noise from the measurement so they were included with N70 results.

Attended monitoring in Chidlow and Glen Forrest revealed that a large proportion of noise events over 60dB(A) were due to traffic, wind or animal/bird noises.

3.9 Aircraft type

Segregation of the aircraft N70 events by aircraft type, distinguished as 'jet' or 'non-jet' (turbo-prop, light aircraft and helicopter) is set out in Table 3.9-1. Jets comprise the majority of all recorded events. Helicopters were categorised as non-jet. The audio (.WAV) recordings used to identify the logged overpasses and these were also correlated with the ASA overflight data.

A small number of aircraft noise events were audible at the noise measurement locations but were not identified on the ASA data as passing within 1.5 km or 2.5 km of the sites. They have nevertheless been included in this report and mainly affect the N60 data. They were distantly heard aircraft, such as jet take-offs upwind, to the south away from Beechboro. Some aircraft climbing out of Perth Airport upwind of Bickley would be similarly audible with the wind blowing from the west or south-west. Aircraft events detectable as such, not identified on the ASA overflight data, and which could not be distinguished as a jet, were arbitrarily allocated into the non-jet category.

Table 3.9-1 - Number of N60 aircraft events by location and aircraft category, averaged per day

Location	*Jet*	*Non Jet*
Chidlow	11.6	5.9
Stoneville	34.0	5.4
Beechboro	7.7	5.1
Glen Forrest	0.8	2.6
Bickley	2.8	3.6

The totals of aircraft type for the monitoring period are set out at Appendix E.
Aircraft models plus arrivals and departure classification are in data spreadsheets provided separately.

3.10 Number of overflights

Attended monitoring established that noise levels from aircraft more than approx 1 km rarely exceeded 60 dB(A). Data from Airservices Aust provided the number of overflights within 2.5 km of monitoring locations. These are set out in Table 3.10-1 for comparison with logged N70, N65 and N60 events; refer Tables 3.5.1, 3.6.1 and 3.7.1.

Table 3.10-1 – 14 day total number of aircraft overpasses by location and aircraft category

Location	*TOTAL*
Chidlow	725
Stoneville	1082
Beechboro	192
Glen Forrest	168
Bickley	330

The number of aircraft overpassing the logging sites, within 2.5 km is (generally an order of magnitude larger than the N70s recorded and) similar in magnitude to number of total events (Table 3.11.1 below) exceeding 60 dB(A) L_{max}. Review of the recorded events shows aircraft noise is a small proportion of these events. Further analysis by time-of-day may better demonstrate the differences, for instance, a large proportion of the Glen Forrrest events were ravens, kookaburras and galahs. At Beechboro, the most frequent non-aircraft events were wind and traffic.

3.11 Number of events

The total number of measured noise events exceeding 60, 65 and 70 dB(A) respectively is shown in Table 3.11-1. The number in parenthesis indicates the total weekly number of events attributed to aircraft.

Table 3.11-1 - All events recorded over 14 days by location with aircraft events in parenthesis

Location	*Events 60 - 65 dB(A)*	*Events 65 - 70 dB(A)*	*Events > 70 dB(A)*
Chidlow	235(180)	396(52)	577(14)
Stoneville	423(359)	223(177)	39(15)
Beechboro	190(45)	128(68)	68(53)
Glen Forrest	338(32)	381(15)	178(1)
Bickley	484(55)	134(20)	53(15)

For the Chidlow location, the logger was set up close to a road so that the expected number of events exceeding 70 dB(A) at the houses set well back from the road in this area would be less than presented in Table 3.11-1.

The data for all events has not been separated into daily periods, however, the overall figures indicate that the number of local events exceeding 60 dB(A) $L_{slow,max}$ is substantially greater than aircraft events, especially in relatively high activity areas like Chidlow and Beechboro which were both near local roads. The local road at Chidlow was a dead-end and traffic was considered to be minmal; the primary source of noise at this location was considered to be birds. The local road at Beechboro was near a bend and traffic slowed down on approach and accelerated out of the bend. Traffic noise was primarily the latter.

These data are shown in greater detail at Appendix G, separating events by location, time of day, type of aircraft (Jet, non-Jet) and arrival or departure.

4.0 Discussion

Background noise levels vary considerably from location to location; Chidlow and Stoneville have substantial periods during the day with very low background levels, associated with their semi-rural nature and limited residential presence. Bickley, Glen Forrest and Beechboro have higher levels of background noise, also associated with residential presence.

The noise level at each measurement location exceeded 70 dB(A) mostly due to extraneous noise events which include man-made noise (motor bikes, cars, trucks etc.) and natural noises (bird,insect, animal and wind noise). Analysis of the 60 dB(A) and 65 dB(A) exceedances also showed the same trend.

In general the number of events from aircraft is small compared to the flights within 2.5 km of the monitoring sites. During the day when local noise provides some masking, noise intrusion would be slight. The few night time and morning events would be noticeable against the low background levels.

The number of 70 dB(A) exceedances is called N70 and those due to aircraft noise were on average less than 1 per day compared with generally larger numbers of non-aircraft events. The exceptions were Beechboro, where the majority of N70 events are attributable to aircraft. There is considerable variability in the number of events per day, some days having few or none, others with eight or more.

These aircraft noise events had an average duration of approximately 6 seconds, the longest measured result being 16 seconds.

The number (both relatively and absolutely) of events diverges greatly between monitored locations.

Appendix A: Acoustic Terminology

The following is a brief description of the acoustic terminology used in this brief.

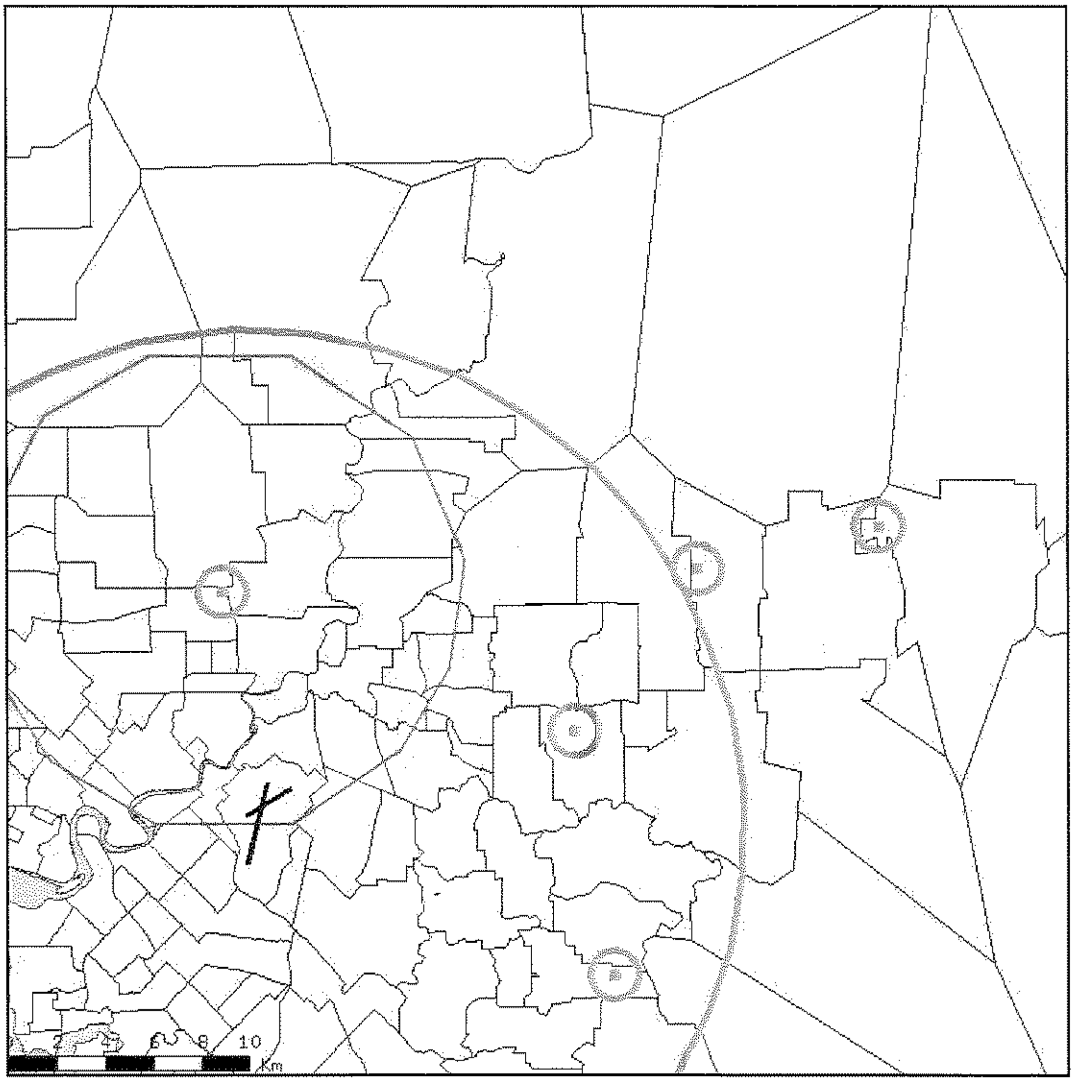
Ambient Sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.
Character, acoustic	The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency content (spectrum) dictate a sound's character.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel readings of every day sounds; 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB Martin Place at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	*A-weighted decibels* The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
Slow	Slow weighting of the sound level meter
Frequency	Frequency is synonymous to *pitch.* Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on
L_{max}	The maximum sound pressure level measured over a given period.
L_{min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The sound pressure level that is exceeded for 90% of the time for which the given sound is measured.
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
N70 N65 N60	The number of events where noise from the target source exceeds 70 dB(A). The number of events where noise from the target source exceeds 65 dB(A). The number of events where noise from the target source exceeds 60 dB(A).

Appendix B: Logger serial numbers for each location

Serial Numbers	Bickley	Chidlow	Beechboro	Glenn Forrest	Stoneville
Larson-davies	01640	01620	01621	01619	01639

Calibration certificates are separately provided as a .pdf.

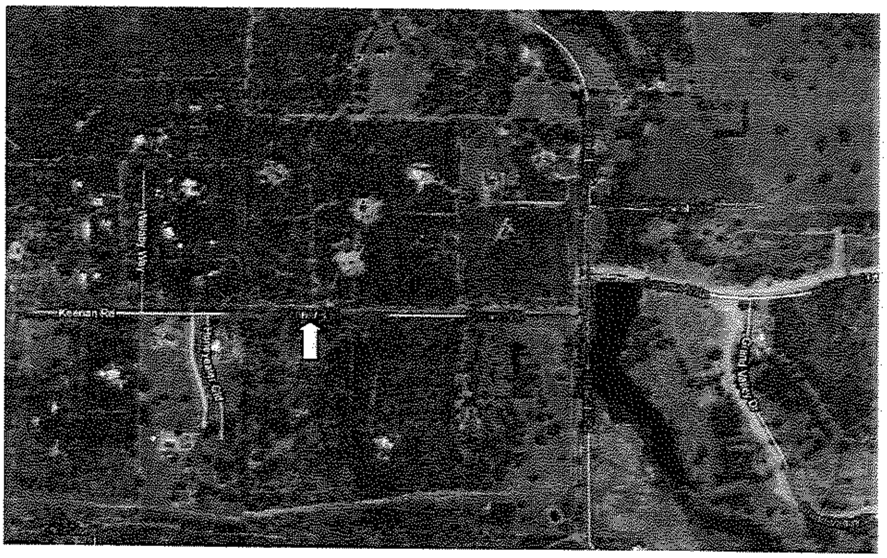
Appendix C: Logger locations

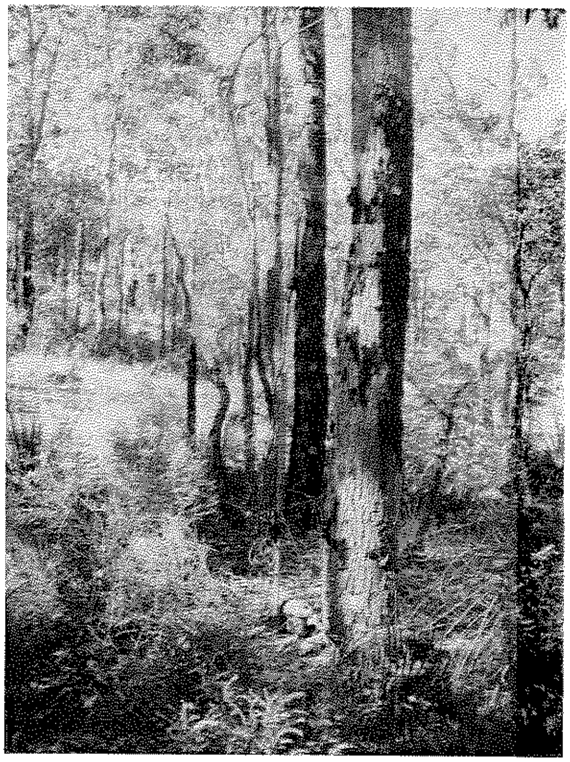


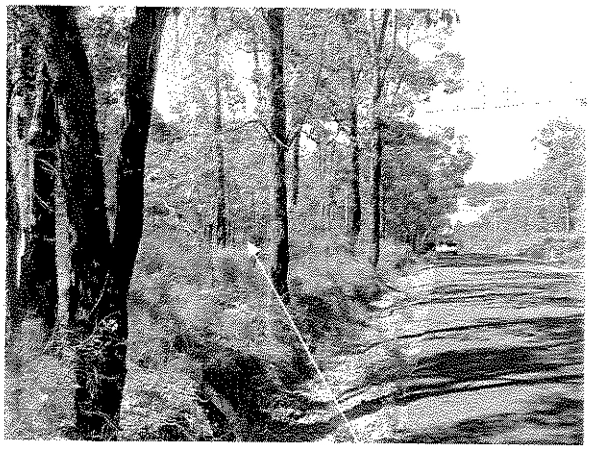
Coordinates of 5 loggers from ground level GPS after logger positioning;

Zone Name	Lat_Centre	Long_Centre	X_Centre	Y_Centre
Beechboro	31.85742S	115.94979E	400646.264	6474887.475
Bickley	32.00126S	116.11918E	416801.587	6459085.603
Chidlow	31.83504S	116.23586E	427693.114	6477594.422
Glen Forrest	31.91035S	116.10265E	415156.586	6469150.050
Stoneville	31.85041S	116.15732E	420274.078	6475835.512

Chidlow



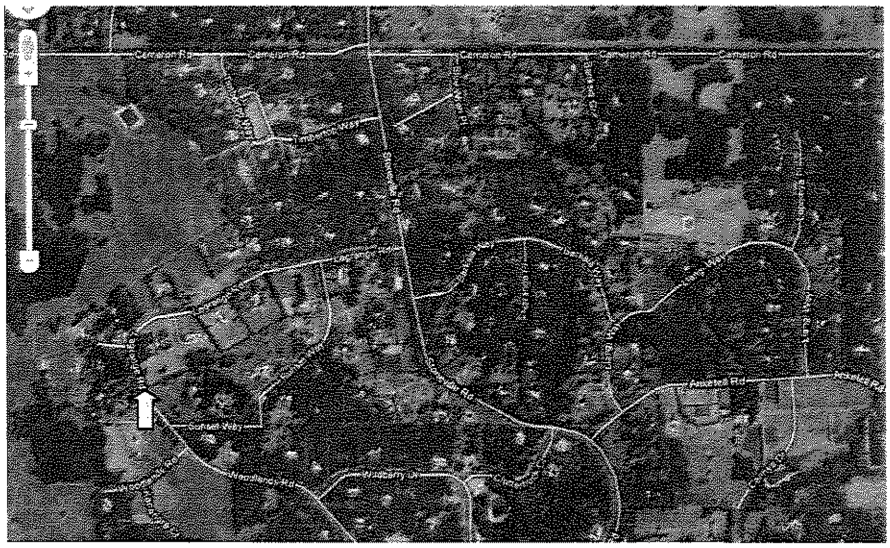


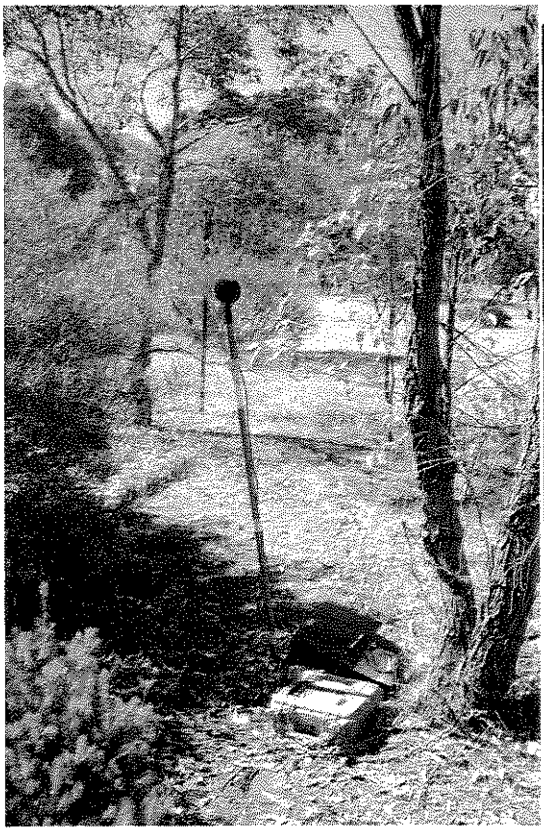


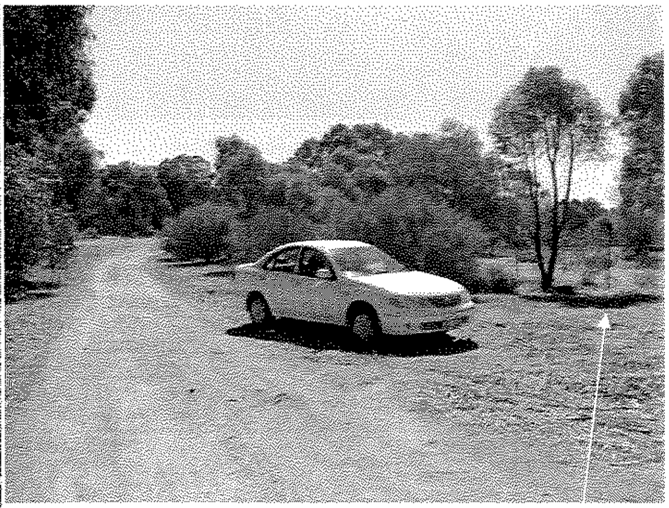
View of Keenan Rd looking east, logger on verge

Stoneville

Stoneville



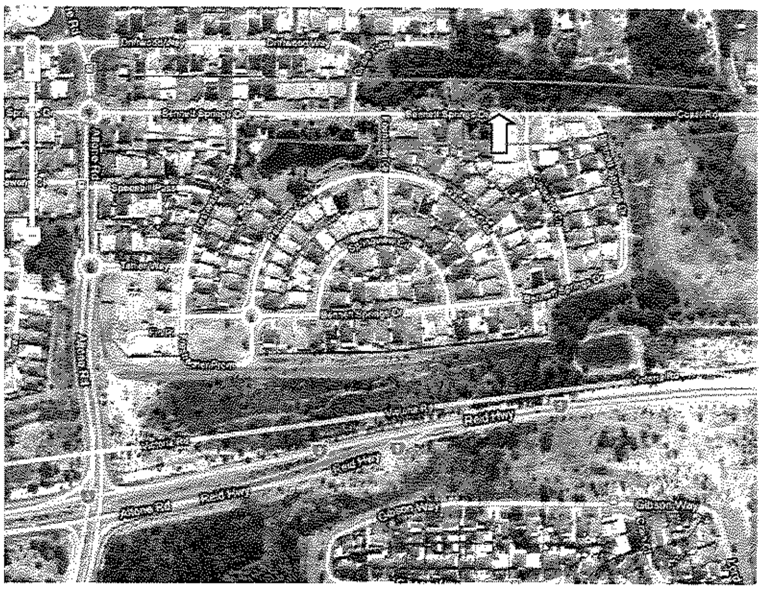


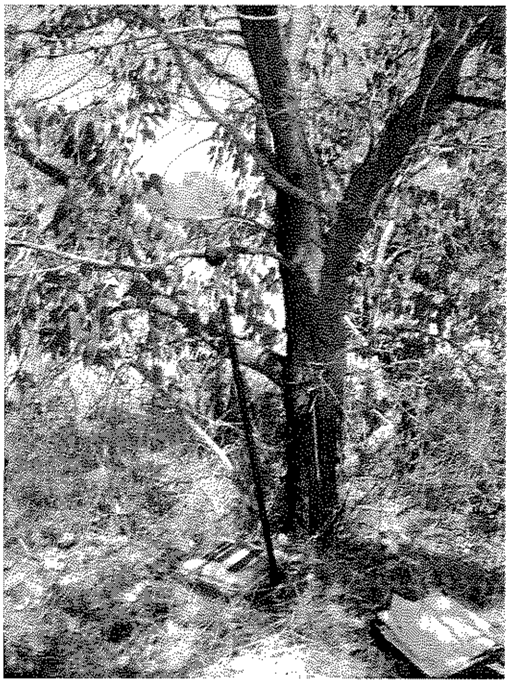


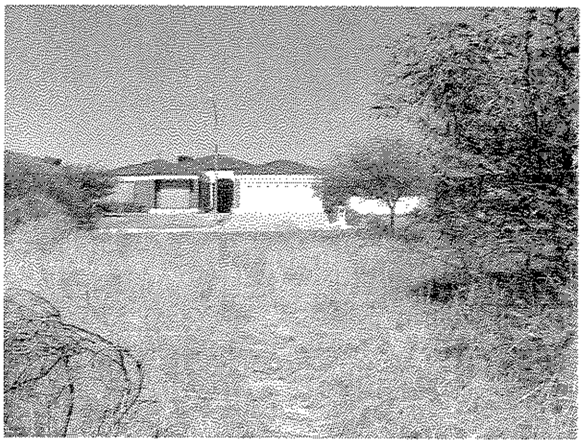
View of site looking north with logger to right

Beechboro

Beechboro

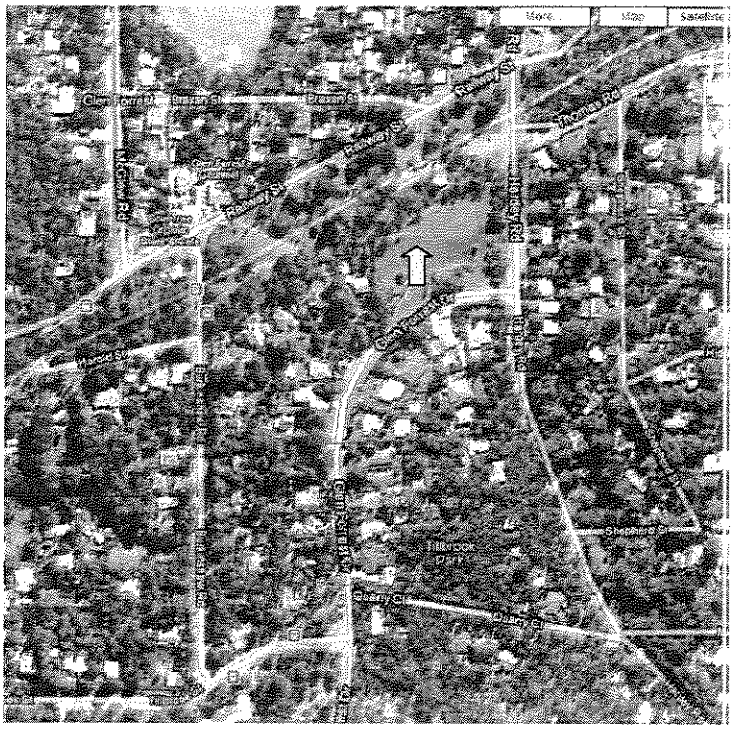


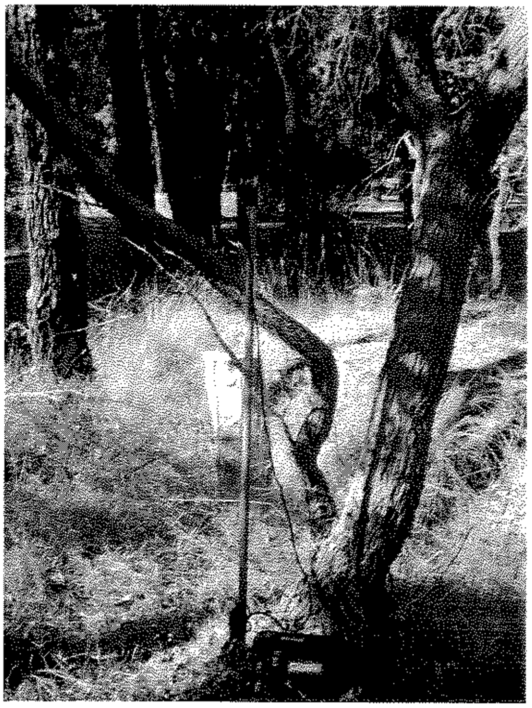




Glen Forrest

Glen Forrest





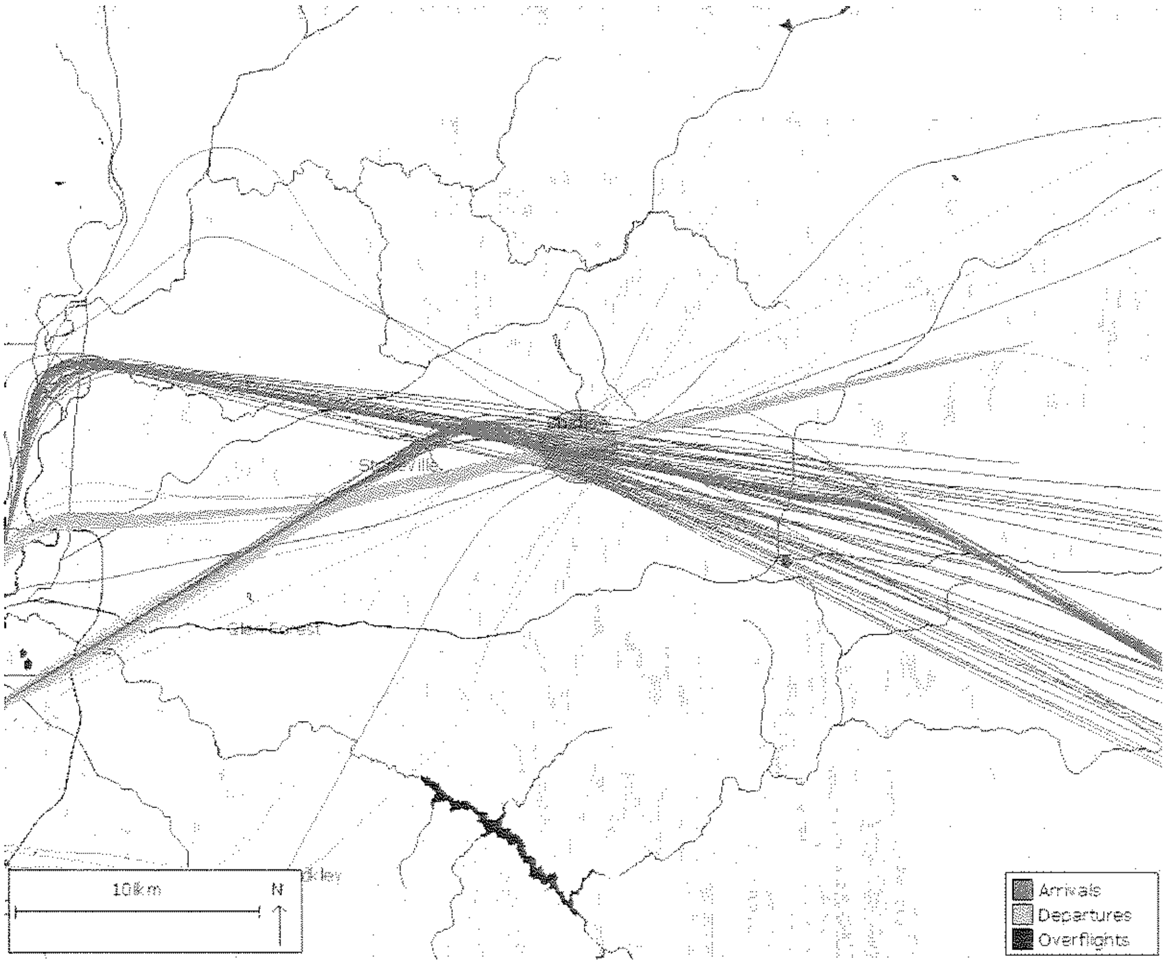
Site showing walk-trail left, playground right

Bickley

Bickley

View of site from road, opposite dam. Location is about 50 m from road.

Appendix D: Example of overflights for one site



Data extracted from ASA records included data and time, aircraft type and whether it was arriving or departing Perth.

Appendix E: Aircraft type

Summary of categorisation of aircraft events for the logging period of fourteen days:

Flights Summary		
	Totals for 14 days	
	Jet	**Non-Jet**
Chidlow	163	83
Stoneville	476	75
Beechboro	100	66
Glen Forrest	11	37
Bickley	39	51

Appendix F: Background noise summary

The average back ground noise levels are linear averages of 15 min L_{90} dB(A) and are for the period of January 24 to 31, 2010. For the final report, L_{90} data is to be extracted and averaged for each day by location.

Chidlow	Average L_{90} dB(A)
Night	23.3
Morning	25.7
Day	29.2
Evening	23.3

Stoneville	Average L_{90} dB(A)
Night	26.6
Morning	33.8
Day	33.7
Evening	25.9

Glen Forrest	Average L_{90} dB(A)
Night	28.3
Morning	39.3
Day	39.7
Evening	30.9

Bickley	Average L_{90} dB(A)
Night	25.4
Morning	30.0
Day	28.9
Evening	25.9

Beechboro	Average L_{90} dB(A)
Night	36.2
Morning	43.9
Day	43.5
Evening	39.7

Appendix G: All events summary table

Total Aircraft Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	2	1	6	0
Day	1	12	12	38	14
Evening	0	0	0	4	0
Night	0	0	2	5	1

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	2	5	27	6	1
Day	14	56	137	105	31
Evening	0	0	3	5	1
Night	0	5	25	5	2

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	4	32	48	6	6
Day	43	183	405	149	76
Evening	0	1	37	5	2
Night	1	30	61	6	6

Jet Aircraft Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	2	1	5	0
Day	0	4	7	31	1
Evening	0	0	0	4	0
Night	0	0	2	4	0

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	2	5	27	5	1
Day	1	39	118	75	10
Evening	0	0	3	4	0
Night	0	2	24	4	0

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	2	25	43	5	1
Day	9	122	339	87	37
Evening	0	0	35	4	1
Night	0	16	59	4	0

Non-Jet Aircraft Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	1	0
Day	1	8	5	7	13
Evening	0	0	0	0	0
Night	0	0	0	1	1

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	1	0
Day	13	17	19	30	21
Evening	0	0	0	1	1
Night	0	3	1	1	2

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	2	7	5	1	5
Day	34	61	66	62	39
Evening	0	1	2	1	1
Night	1	14	2	2	6

Non-Aircraft Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	53	25	0	1	0
Day	121	477	24	11	38
Evening	2	26	0	3	0
Night	1	35	0	0	0

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	151	30	3	6	5
Day	381	797	66	66	140
Evening	8	40	1	3	5
Night	3	40	0	0	2

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	211	31	7	16	27
Day	608	850	126	194	514
Evening	19	41	1	4	33
Night	11	40	0	6	7

Total Departure Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	2	1	5	0
Day	1	4	5	31	6
Evening	0	0	0	4	0
Night	0	0	1	4	1

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	1	4	23	5	1
Day	4	39	81	75	9
Evening	0	0	0	4	0
Night	0	3	17	4	2

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	2	26	40	5	6
Day	7	118	174	98	20
Evening	0	0	1	4	0
Night	1	21	31	4	3

Jet Departure Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	2	1	5	0
Day	0	4	5	31	0
Evening	0	0	0	4	0
Night	0	0	1	4	0

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	1	4	23	5	1
Day	0	39	77	75	0
Evening	0	0	0	4	0
Night	0	2	17	4	0

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	1	24	36	5	1
Day	0	116	165	85	2
Evening	0	0	1	4	0
Night	0	16	31	4	0

Non-Jet Departure Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	1	0	0	0	6
Evening	0	0	0	0	0
Night	0	0	0	0	1

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	4	0	4	0	9
Evening	0	0	0	0	0
Night	0	1	0	0	2

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	1	2	4	0	5
Day	7	2	9	13	18
Evening	0	0	0	0	0
Night	1	5	0	0	3

Total Arrival Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	0	1	5	0	2
Evening	0	0	0	0	0
Night	0	0	0	0	0

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	2	2	33	2	13
Evening	0	0	3	0	0
Night	0	0	2	0	0

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	10	6	165	6	41
Evening	0	0	35	0	1
Night	0	0	18	1	0

Jet Arrival Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	0	0	1	0	1
Evening	0	0	0	0	0
Night	0	0	0	0	0

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	1	0	22	0	10
Evening	0	0	3	0	0
Night	0	0	2	0	0

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	8	3	126	1	35
Evening	0	0	33	0	1
Night	0	0	18	0	0

Non-Jet Arrival Events

N70	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	0	1	4	0	1
Evening	0	0	0	0	0
Night	0	0	0	0	0

N65	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	1	2	11	2	3
Evening	0	0	0	0	0
Night	0	0	0	0	0

N60	Glen Forrest	Chidlow	Stoneville	Beechboro	Bickley
Morning	0	0	0	0	0
Day	2	3	39	5	6
Evening	0	0	2	0	0
Night	0	0	0	1	0

CIVIL AVIATION SAFETY AUTHORITY AUSTRALIA

Audit Report

Airservices Australia: Perth TCU

AUDIT DETAILS:

Auditee Name:	RUSSELL GREEN
Auditee Position	A/Executive Team Leader
Functional Area:	PERTH TCU
Audit Location(s):	PERTH
Audit Number:	03-01
Audit Start Date:	17 June 2003
Audit End Date:	27 June 2003
Audit Scope:	CASRs 172, 65

CASA Office:
Aviation Infrastructure & Sport Aviation Branch
GPO Box 2005
CANBERRA ACT 2601

AUDIT TEAM MEMBERS:

Lead Auditor:	Greg Diprose
Auditors:	Kel Morton & Paul Taylor

Lead Auditor:	**Signature:**	**Date:**
Greg Diprose	....	8 July 2003

ABOUT AN AUDIT REPORT

Authority for the conduct of the audit

The audit identified in this report was carried out by CASA in pursuance of its functions under section 9 of the Civil Aviation Act 1988.

Confidentiality

This audit report is a confidential document between the CASA and the operator/certificate holder. CASA will not disclose this report or any part of it to any third person except, in pursuance of its functions, with the express permission of the operator/certificate holder, or as required by law.

Audit Methodology

The audit is a sampling exercise and does not purport to be a total systems review. The sampling provides a snapshot of the system and any deficiencies detected could point to a systemic problem, requiring a total systems review by the operator. Deficiencies and problems identified in the audit findings must be addressed by the operator/certificate holder as outlined below.

Audit Findings

Audit findings may be in the form of RCAs (Requests for Corrective Action) (both Standard and Safety Alerts) or Observations.

RCA (REQUEST FOR CORRECTIVE ACTION)

RCAs detail deficiencies that involve non-compliance with legislation and must be addressed. The deficiency is described in the 'details of deficiency' and the regulatory basis for the assessment is stated in the 'criteria' section. For standard RCAs, the following actions must be taken to address the deficiency/deficiencies:

1. Remedial action(s) to remedy the immediate situation so that operations are brought within safe parameters;
2. Investigative action to investigate the deficiency/problem and determine the root cause;
3. Corrective action(s) to address the root cause of the problem

The certificate holder must record both the remedial and corrective action taken on the 'recipient's response' page of the RCA and return it to the address shown, by the due date. Where the corrective action is not able to be completed by the due date, the certificate holder must indicate the date by which the corrective action will be completed.

(As an example: the REMEDIAL ACTION to address an identified deficiency of "cabin crew not currently trained in emergency procedures" would be to conduct training for all affected staff. The CORRECTIVE ACTION would be to document and implement a system for training, recording, reporting and warning of pending expiry dates for all initial and recurrent training).

SAFETY ALERTS

A SAFETY ALERT is a particular type of REQUEST FOR CORRECTIVE ACTION that must be addressed IMMEDIATELY. As the holder of the certificate, licence, CASA approval or authority, the certificate holder must take action to ensure that the deficiency is rectified carrying out RCA steps 2) and 3) above:
a) before the continued operation of the aircraft concerned; or

b) before continuing any activity carried out under the certificate or licence or approval or authority held by you that is the subject of the deficiency;

AUDIT OBSERVATIONS

An AUDIT OBSERVATION is raised by an auditor to draw attention to latent conditions or minor deficiencies in a system that cannot be attributed to a current legislative requirement. The intention is to raise awareness with a view to avoiding problems in the future.
Response to OBSERVATIONS is not required. However, auditees would be well advised to take appropriate action as part of their continuous improvement processes. Actions taken may be covered in future surveillance.

INDEX OF FINDINGS

Audit Element:	Audit Findings:

DELETION

CASR 172.065 MOS Chapter 10	**RCA 0301-02** Airspace limitations preclude pilot navigation or radar vectoring onto final approach for runway 03 ILS in accordance with any recognised standards.

DELETION

CASR 172 MOS Chapter 11	**RCA 0301-04** Pilots are issued confusing information in relation to arrivals for runway 03 at Perth.

DELETION

DELETION

DELETION

DELETION

DELETION

DELETION

Audit Element Summaries

Audit Element: Audit sub-element:	Analysis:

DELETION DELETION

Standards for the provision of Air Traffic Services (MOS CH 10)	Included in sampling were workplace observations of delivery of service from the four TCU ATS work positions including various traffic scenarios, staffing procedures and handover takeover processes. Sampling indicated compliance with the MOS with the following exception: **RCA 0301-02 CASR 172.065 MOS Chapter 10** Airspace limitations preclude pilot navigation or radar vectoring onto final approach for runway 03 ILS in accordance with any recognised standards. The following Observation made in CASA Audit 01-32, final report dated 20 September 2001 page 7 re airspace for Runway 03 is also pertinent. Observation: The recently introduced revised procedures for arriving international regarding visual approaches is impacting on operations at PH particularly due to the control zone size and lack of airspace to the south of the airport for Rwy 03 approaches to descend to comply with the 8nm final.

DELETION DELETION

DELETION DELETION

Enroute/Terminal Clearances	Included in sampling were comparisons of MOS, MATS and AIP versus local procedures in use. Sampling indicated compliance with the applicable CASRs with the following exception: **RCA 0301-04 CASR 172 MOS Chapter 11** Pilots are issued confusing information in relation to arrivals for runway 03 at Perth. Pilots are advised to "expect instrument procedure" for all STARs that terminate with both visual and instrument procedures at Perth. The only published instrument approach available from the STAR clearance is the RWY 03 VOR/DME approach. On transfer to Perth TCU the pilot is then instructed to expect radar vectors for the 03 ILS, or when in VMC, a visual approach.

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DELETION

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DELETION

CASR 65	Pre-audit sampling included CATSOAM, national procedures and processes in relation to ATC Licensing. Sampling of 7 licences from Perth TCU was carried out in order to test compliance with CASR 65 on site. The following elements were tested:
Recency (65.025)	Local system and records found to be satisfactory.
Currency (65.030)	Local system found to be unsatisfactory. Remedial action had been taken immediately. RCA raised against CASR 172.120.
Authority to carry out air traffic control function (65.035)	Sampling indicated compliance with the CASR.
Ratings (65.075)	Sampling indicated compliance with the CASR.
Endorsements (65.085)	Sampling indicated compliance with the CASR.
Qualifications (65.095)	Sampling indicated compliance with the CASR.
Practical training (65.100)	Sampling indicated compliance with the CASR.
Examinations (65.105)	Sampling indicated compliance with the CASR.

NOTE: Copies of the Requests for Corrective Action were attached to the short report (Surveillance Results Report) provided at the Exit Meeting in Perth on 27 June 2003. A corrected copy of RCA 0301-01 is provided with this report. (Please destroy previous copy)

Written communication to Perth Airport Aircraft Noise Management Consultative Committee during the Western Australia Route Review Project (WARRP)

26 July 2006	Letter from Ken Hodge, WARRP Project Manager
27 July 2006	Email from Geoff Atkinson, Planning Coordinator Perth Airport (Ken Hodge letter attached)

Emails from WARRP Project Coordinator:

11 August 2006

8 September 2006

15 September 2006

13 October 2006

10 November 2006

27 November 2006

21 December 2006 – re-sent 8 January 2007

8 May 2007 (unable to provide copy)

9 September 2008

AIRSERVICES AUSTRALIA

Business Centre: Air Traffic Control

Address: PO Box 1093, Tullamarine Vic 3043
Business Centre Phone: 03 9339 2455
Business Centre Fax: 03 9339 2450
ABN 59 698 720 886

File No: 2004/7144

To: Perth Airport Noise Management Strategy Committee

Subject: Western Australia Route Review Project (WARRP)

Airservices Australia has established the Western Australia Route Review Project to implement safety and systemic improvements to the entire West Australian air route structure.

Stage 1 of the project deals with the high priority systemic safety issues identified in the route structure and Standard Instrument Departure (SID) / Standard Terminal Arrival Route (STAR) package for operations in the Perth Terminal area. Once this component is completed Stage 2 will address route structure issues to more remote destinations in Western Australia.

Scope of Stage 1

To design and implement a route structure & integrated SID/STAR package for Western Australia that:

- provides for increasing traffic in the Perth terminal area by significantly improving systemic safety and reducing complexity.
- complies with:
  - Air Traffic Management Design Manual standards
  - Environmental requirements and
  - Industry preferred options where possible

As part of the consultation that will be undertaken during the project a website has been developed to encourage awareness and understanding of proposed changes and also provide opportunity for feedback and suggestion. The site is accessed from the RAPAC page on Airservices Australia website and may be accessed directly via the URL below.

http://www.airservicesaustralia.com/waroutereview/default.asp

The proposed timeline for stage 1 aims for implementation of designs in June 2007. In order to achieve this goal, designs will need to be developed, assessed for safety/environmental issues, validated and finalised by the start of January 2007. Work on the project will advance independent of the NMSC meeting schedule therefore please take the opportunity to visit the site regularly, review items as they are posted and provide any feedback or questions you feel may be appropriate.

Yours Sincerely,

Ken Hodge

Project Manager
Melbourne Centre
E-mail: ken.hodge@airservicesaustralia.com

26th July 2006

-----Original Message-----
From: Dunne, Kathleen
Sent: **Wednesday, 5 July 2006 3:05 PM - Email to RAPAC Members only**
To: AFAP; AIPA; Alwyn Adkins NAT JET; Andrew Forte AAA; Angela Picton AIPA; Barry Hallett AFAP; Bruce Glover AFAP; Denis Macneall PVT; Doug Green AAA; Flight Procedures QANTAS; GAPAN; Gavin Healy PVT; ghiggins@chcaustralia.com NO ID; Graeme Lauder WA Convenor; Graham Rennie QANTAS; Greg Doherty AAA; HGFA; Ian Johnson PVT; James Toye PVT; Jenny Pickford PVT; Joe Luxford MAAA WA; John Chesbrough SAAA; John Douglas RFACA; John Seman PVT; Kerry Lovegrove PVT; Kevin Saunders WAGA; Laurie Garcia PVT; Lewis Tucker PVT; Lloyd Mais PVT; Mark Jones AAA; Michael Corbett PVT; Haines, Michael; Mike Alves ASAC; Nigel Sparg HGFA/HGAWA; Peter Bruce PVT; Peter Goodhew PVT; Peter Griffin PVT; Peter Hales PVT; Peter Heath NAPAC; Peter Nadilo and Philip Clements PVT; Peter Smith RFDS; RAAA CEO; Robert Anderson VIRGIN; Rod Sear PVT; Ron Magrath PATOG; Sean Collier PVT; Shayne Graham PVT; Stephen Lansell RFDS; Steve Young PVT; Stuart Airey RFDS; Trevor Aitken QANTAS; Ben Firkins CASA; Bob Armstrong ATSB; Bryan Boase BOM; Dilip Mathew DOTARS; Drew Gaynor DPI; Ian Mallett CASA; John Dolby CASA; Lisa Duncan DOTARS; Marlene Alden CASA; Tony Williams CASA; Hodder, John (RAAF); Mort White RAAF HQ; NAVY; Peter Reynolds NASIG; Phil Coughlan ARMY; Scott Lowe NAVY; Stephen Bonney RAAF; Wayne Prosser ARMY; Wayne Snell ARMY; Angus, Stephen; Ayliffe, Wayne; Bennett, Gavan; Bilton, Bruce; Bridges, Alan; Briggs, Harry; Canham, Max; Charker, Craig; Dale, Lance; DeSair, Chris; Dixon, Andrew; Duczek, Alf; Dudley, Richard; Evans, Peter; Farmer, Ray; Fon-Lowe, David; Gunton, Anthony; Hanley, Brad; Harding, Ian; Harfield, Jason; Helman, Justin; Hickey, Ken; Hoare, Michael; Hobson, Peter; Hodge, Ken; Hood, Greg; Hossack, Alan; Huggins, Vicki; Kennedy, Christopher; Kern, Pam; Lee, Rod; McLean, Ken; Meagher, Peter; Miller, Iain; Morris, Glenn; OPSMGRS, Melbourne; Reidy-crofts, Paul; Rogers, Graeme; SS, Melbourne; Steffen, Paul; Vale, Damien; Weller, Jim; Whitely, Geoffrey
Cc: Bob Welch; Brenton Hollitt; David Swiggs; Grahame Hill; John Hogan; Peter Stephenson; Peter Ware; Ron Lawford
Subject: Western Australia Route Review - Web Link

All,

Please find attached correspondence from Ken Hodge, Airservices, re advice on the Western Australia Route review web page.

Regards,

Kathleen Dunne
RAPAC Secretariat

From: Geoff Atkinson [mailto:Geoff.Atkinson@wac.com.au]
Sent: Thursday, 27 July 2006 2:09 PM
To: Cr Barry McKenna; Cr Phil Marks; Dr. Michael Lekias JP; Geoff Atkinson; Hon Judi Moylan MP; Jennifer Stritzke; Mr Andrew Sellick; Mr David White; Mr Dominic Carbone; Mr Drew Gaynor; Bennett, Gavan; Mr Iain Miller; Mr John Collins; Mr John Macpherson; Mr Jonathan Throssell; Mr Kim Wilkie MP; Mr Lance Dale; Mr Michael Foley; Mr Nick Heidl; Mr Phil Lipple; Mr Raymond Leclezio; Mr Ross Wells; Mr Shayne Silcox; Mr Stuart Henry MP; Ms Cristina Mojica; Ms Sue Burrows; Richard Gates; Torb Petersen
Cc: Hodge, Ken
Subject: Noise Management Strategy Committee - WA Route Review Project

Dear all,

Attached is a letter from Ken Hodge, Airservices Australia, informing us of the WA Route Review Structure (WARRP).

Ken will deliver a presentation at the next meeting of the Noise Management Strategy Committee to be held on Wednesday 27 September 2006 in the River Room East, Ascot Quays Apartment Hotel, 150 Great Eastern Highway, Ascot, commencing at 10.00am.

I encourage you to visit the project web site as indicated in Ken's letter. Please revisit the site regularly to see the updates as developments to designs progress. The web site allows for feedback or questions and I suggest you don't wait until our next meeting for this, but to bring them forward early through the web site.

Cheers,
Geoff

Geoff Atkinson
Planning Coordinator
Perth Airport - Its Happening
Baker Road
P O Box 6
CLOVERDALE WA 6985
Tel: +61 8 9478 8478
Fax: +61 8 9277 7537
Email: geoff.atkinson@wac.com.au
www.perthairport.com

From: Kern, Pam
Sent: Friday, 11 August 2006 7:19 PM
To: 'AFAP'; 'AIPA'; 'Alwyn Adkins NAT JET'; 'Andrew Forte AAA'; 'Andrew Glover VIRGIN'; 'Andrew Sellick - Environment MGR - ACFT OPS -QANTAS'; 'Angela Picton AIPA'; 'Barry Hallett AFAP'; 'Cr Barry McKenna - Councillor - City of Bayswater'; 'Cr Phil Marks - City of Belmont'; 'Cristina Mojica - Director Airport Planning - DOTARS'; 'David White - Environmental Advisor - Virgin Blue'; 'Denis Macneall PVT'; 'Doug Green AAA'; 'Drew Gaynor - DPI'; 'Flight Procedures QANTAS'; 'Frank Smith PVT'; 'GAPAN'; 'Gavan Bennet - Environment Services - ASA'; 'Gavin Healy PVT'; 'Geoff Atkinson - Planning Coordinator'; 'ghiggins@chcaustralia.com NO ID'; 'Graeme Lauder WA Convenor'; 'Graham Rennie QANTAS'; 'Greg Doherty AAA'; 'HGFA'; 'Hon Judi Moylan MP - Federal Member for Pearce'; 'Ian Johnson PVT'; 'James Toye PVT'; 'Jennifer Stritzke - Secretary - Environmental Scientist - Perth Airport'; 'Jenny Pickford PVT'; 'Joe Luxford MAAA WA'; 'John Chesbrough SAAA'; 'John Colins - Mayor - City of South Perth'; 'John Douglas RFACA'; 'John Macpherson - Principle Environment Officer (Noise)'; 'John Seman PVT'; 'Jonathan Throssell - CEO Shire of Mundaring'; 'Kerry Lovegrove PVT'; 'Kevin Saunders WAGA'; 'Kim Wilkie MP - Federal Member for Swan'; 'Laurie Garcia PVT'; 'Lewis Tucker PVT'; 'Lloyd Mais PVT'; 'Mark Jones AAA'; 'Mayor - City of Canning'; 'Michael Corbett PVT'; 'Michael Foley - Acting CEO - City of Swan'; 'Michael Haines CIVIL AIR'; 'Michael Wiggins VIRGIN'; 'Mike Alves ASAC'; 'Mr Nick Heidl - Bellevue Action Group'; 'Nigel Sparg HGFA/HGAWA'; 'Peter Bruce PVT'; 'Peter Griffin PVT'; 'Peter Hales PVT'; 'Peter Heath NAPAC'; 'Peter Nadilo and Philip Clements PVT'; 'Peter Smith RFDS'; 'Phil Lipple - Cannington Community Representative'; 'RAAA CEO'; 'Raymond LecLezio - The Guildford Association'; 'Rick Gates - Chairman - General Manager Airport'; 'Rick Williams HGFA/HGAWA'; 'Rod Sear PVT'; 'Ron Magrath PATOG'; 'Ross Wells - MGR Health and Ranger SVCS - City of Gosnells'; 'Sean Collier PVT'; 'Shayne Graham PVT'; 'Stephen Knudsen VIRGIN'; 'Stephen Lansell RFDS'; 'Steve Young PVT'; 'Stuart Airey RFDS'; 'Stuart Henry MP - Federal Mmember for Hasluck'; 'Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda'; 'Torb Petersen - Aeronautical Planning Manager - Perth Airport'; 'Trevor Aitken QANTAS'; 'Walter Dollman QANTAS'
Subject: Western Australia Route Review Project (WARRP) - Website updated

All,

The WARRP website has been updated, direct link below.

http://www.airservicesaustralia.com/warouterreview/default.asp

Please advise if you wish to be removed from the email distribution list.

Regards

Pam Kern
Project Coordinator
Western Australia Route Review
warrp@airservicesaustralia.com
Telephone 03 9339 2512

From: Hodge, Ken [mailto:Ken.Hodge@AirservicesAustralia.com]
Sent: Friday, 8 September 2006 15:31
To: AFAP; AIPA; Alwyn Adkins NAT JET; Andrew Forte AAA; Andrew Glover VIRGIN; Andrew Sellick - Environment MGR - ACFT OPS -QANTAS; Angela Picton AIPA; Barry Hallett AFAP; Clarke, Steven; Cr Barry McKenna - Councillor - City of Bayswater; Cr Phil Marks - City of Belmont; Cristina Mojica - Director Airport Planning - DOTARS; Dale, Lance; David White - Environmental Advisor - Virgin Blue; Dawson, Paul; Denis Macneall PVT; Doug Green AAA; Drew Gaynor - DPI; Flight Procedures QANTAS; Frank Smith PVT; GAPAN; Gavan Bennet -

Environment Services - ASA; Gavin Healy PVT; Geoff Atkinson; ghiggins@chcaustralia.com; Graeme Lauder WA Convenor; Graham Rennie QANTAS; Greg Doherty; HGFA; Hon Judi Moylan MP - Federal Member for Pearce; Hood, Greg; Ian Johnson PVT; James Toye PVT; Jennifer Stritzke; Jenny Pickford PVT; Joe Luxford MAAA WA; John Chesbrough SAAA; John Colins - Mayor - City of South Perth; John Douglas RFACA; John Macpherson - Principle Environment Officer (Noise); John Seman PVT; Jonathan Throssell - CEO Shire of Mundaring; Kerry Lovegrove PVT; Kevin Saunders WAGA; Kim Wilkie MP - Federal Member for Swan; King, Marianne; Laurie Garcia PVT; Lewis Tucker PVT; Lloyd Mais PVT; Mark Jones AAA; Mayor - City of Canning; michael.chapman@virginblue.com.au; Michael Corbett PVT; Michael Foley - Acting CEO - City of Swan; Michael Haines CIVIL AIR; Michael Wiggins VIRGIN; Mike Alves ASAC; Mr Nick Heidl - Bellevue Action Group; Nigel Sparg HGFA/HGAWA; Peter Bruce PVT; Peter Griffin PVT; Peter Hales PVT; Peter Heath NAPAC; Peter Nadilo and Philip Clements PVT; Peter Smith RFDS; Phil Lipple - Cannington Community Representative; RAAA CEO; Raymond LecLezio - The Guildford Association; Reidy-crofts, Paul; Richard Gates; Rick Williams HGFA/HGAWA; Rigney, Ron; Rod Sear PVT; Ron Magrath PATOG; Ross Wells - MGR Health and Ranger SVCS - City of Gosnells; Sean Collier PVT; Shayne Graham PVT; Spinks, Denise; Stephen Knudsen VIRGIN; Stephen Lansell RFDS; Steve Young PVT; Stuart Airey RFDS; Stuart Henry MP - Federal Mmember for Hasluck; Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda; Torb Petersen; Trevor Aitken QANTAS; Walter Dollman QANTAS
Subject: Western Australia Route Review - Website Update

http://www.airservicesaustralia.com/waroutereview/default.asp

From: Kern, Pam
Sent: Friday, 15 September 2006 3:51 PM
To: 'AFAP'; 'AIPA'; 'Alwyn Adkins NAT JET'; 'Andrew Forte AAA'; 'Andrew Glover VIRGIN'; 'Andrew Sellick - Environment MGR - ACFT OPS -QANTAS'; 'Angela Picton AIPA'; 'Barry Hallett AFAP'; 'Cr Barry McKenna - Councillor - City of Bayswater'; 'Cr Phil Marks - City of Belmont'; 'Cristina Mojica - Director Airport Planning - DOTARS'; 'David White - Environmental Advisor - Virgin Blue'; 'Denis Macneall PVT'; 'Doug Green AAA'; 'Drew Gaynor - DPI'; 'Flight Procedures QANTAS'; 'Frank Smith PVT'; 'GAPAN'; 'Gavan Bennet - Environment Services - ASA'; 'Gavin Healy PVT'; 'Geoff Atkinson - Planning Coordinator'; 'ghiggins@chcaustralia.com NO ID'; 'Graeme Lauder WA Convenor'; 'Graham Rennie QANTAS'; 'Greg Doherty AAA'; 'HGFA'; 'Hon Judi Moylan MP - Federal Member for Pearce'; 'Ian Johnson PVT'; 'James Toye PVT'; 'Jennifer Stritzke - Secretary - Environmental Scientist - Perth Airport'; 'Jenny Pickford PVT'; 'Joe Luxford MAAA WA'; 'John Chesbrough SAAA'; 'John Colins - Mayor - City of South Perth'; 'John Douglas RFACA'; 'John Macpherson - Principle Environment Officer (Noise)'; 'John Seman PVT'; 'Kerry Lovegrove PVT'; 'Kevin Saunders WAGA'; 'Kim Wilkie MP - Federal Member for Swan'; 'Laurie Garcia PVT'; 'Lewis Tucker PVT'; 'Lloyd Mais PVT'; 'Mark Jones AAA'; 'Mayor - City of Canning'; 'Michael Corbett PVT'; 'Michael Foley - Acting CEO - City of Swan'; 'Michael Haines CIVIL AIR'; 'Michael Wiggins VIRGIN'; 'Mr Nick Heidl - Bellevue Action Group'; 'Nigel Sparg HGFA/HGAWA'; 'Peter Bruce PVT'; 'Peter Griffin PVT'; 'Peter Hales PVT'; 'Peter Heath NAPAC'; 'Peter Nadilo and Philip Clements PVT'; 'Peter Smith RFDS'; 'Phil Lipple - Cannington Community Representative'; 'RAAA CEO'; 'Raymond LecLezio - The Guildford Association'; 'Rick Gates - Chairman - General Manager Airport'; 'Rick Williams HGFA/HGAWA'; 'Rod Sear PVT'; 'Ron Magrath PATOG'; 'Ross Wells - MGR Health and Ranger SVCS - City of Gosnells'; 'Sean Collier PVT'; 'Shayne Graham PVT'; 'Stephen Knudsen VIRGIN'; 'Stephen Lansell RFDS'; 'Steve Young PVT'; 'Stuart Airey RFDS'; 'Stuart Henry MP - Federal Mmember for Hasluck'; 'Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda'; 'Tony Cuccaro'; 'Torb Petersen - Aeronautical Planning Manager - Perth Airport'; 'Trevor Aitken QANTAS'; 'Walter Dollman QANTAS'
Subject: WARRP Website - Update

All,

The WARRP website has been updated, direct link below.

http://www.airservicesaustralia.com/waroutereview/default.asp

Please advise if you wish to be removed from the email distribution list.

Regards

Pam Kern
Project Coordinator
Western Australia Route Review
warrp@airservicesaustralia.com
Telephone 03 9339 2512

From: Kern, Pam
Sent: Friday, 13 October 2006 6:07 PM

To: 'AFAP'; 'Alwyn Adkins NAT JET'; 'Andrew Forte AAA'; 'Andrew Glover VIRGIN'; 'Andrew Sellick - Environment MGR - ACFT OPS -QANTAS'; 'Angela Picton AIPA'; 'Barry Hallett AFAP'; 'Cr Barry McKenna - Councillor - City of Bayswater'; 'Cr Phil Marks - City of Belmont'; 'Cristina Mojica - Director Airport Planning - DOTARS'; Dale, Lance; 'David White - Environmental Advisor - Virgin Blue'; Dawson, Paul; 'Denis Macneall PVT'; 'Doug Green AAA'; 'Drew Gaynor - DPI'; 'Flight Procedures QANTAS'; 'GAPAN'; 'Gavan Bennet - Environment Services - ASA'; 'Gavin Healy PVT'; 'Geoff Atkinson - Planning Coordinator'; 'ghiggins@chcaustralia.com NO ID'; 'Graeme Lauder WA Convenor'; 'Graham Rennie QANTAS'; 'Greg Doherty AAA'; 'HGFA'; Hodge, Ken; 'Hon Judi Moylan MP - Federal Member for Pearce'; Hood, Greg; 'Ian Johnson PVT'; 'James Toye PVT'; 'Jennifer Stritzke - Secretary - Environmental Scientist - Perth Airport'; 'Jenny Pickford PVT'; 'Joe Luxford MAAA WA'; 'John Colins - Mayor - City of South Perth'; 'John Douglas RFACA'; 'John Macpherson - Principle Environment Officer (Noise)'; 'John Seman PVT'; 'Kerry Lovegrove PVT'; 'Kevin Saunders WAGA'; 'Kim Wilkie MP - Federal Member for Swan'; King, Marianne; 'Laurie Garcia PVT'; 'Lewis Tucker PVT'; 'Lloyd Mais PVT'; 'Mark Jones AAA'; 'Mayor - City of Canning'; 'Michael Chapman'; 'Michael Corbett PVT'; 'Michael Haines CIVIL AIR'; 'Michael Wiggins VIRGIN'; 'Mr Nick Heidl - Bellevue Action Group'; 'Murray Warfield'; 'Nigel Sparg HGFA/HGAWA'; 'Peter Bruce PVT'; 'Peter Griffin PVT'; 'Peter Hales PVT'; 'Peter Heath NAPAC'; 'Peter Nadilo and Philip Clements PVT'; 'Peter Smith RFDS'; 'Phil Lipple - Cannington Community Representative'; 'RAAA CEO'; 'Raymond LecLezio - The Guildford Association'; Reidy-crofts, Paul; 'Rick Gates - Chairman - General Manager Airport'; 'Rod Sear PVT'; 'Ron Magrath PATOG'; 'Ron Rigney'; 'Ross Wells - MGR Health and Ranger SVCS - City of Gosnells'; 'Sean Collier PVT'; 'Shayne Graham PVT'; Spinks, Denise; 'Stephen Knudsen VIRGIN'; 'Stephen Lansell RFDS'; 'Steve Young PVT'; 'Steven Tan'; 'Stuart Airey RFDS'; 'Stuart Henry MP - Federal Mmember for Hasluck'; 'Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda'; 'Tony Cuccaro'; 'Torb Petersen - Aeronautical Planning Manager - Perth Airport'; 'Trevor Aitken QANTAS'; 'Walter Dollman QANTAS'; Wells, Mark
Subject: Western Australia Route Review Project - Significant Update

All,

The WARRP website has been updated and the changes are significant, please use the direct link below.

http://www.airservicesaustralia.com/waroutereview/default.asp

Please advise if you wish to be removed from the email distribution list.

Regards

Pam Kern
Project Coordinator
Western Australia Route Review
warrp@airservicesaustralia.com
Telephone 03 9339 2512

From: Kern, Pam [mailto:Pam.Kern@AirservicesAustralia.com]
Sent: Friday, 13 October 2006 3:07 PM
To: AFAP; Alwyn Adkins NAT JET; Andrew Forte AAA; Andrew Glover VIRGIN; Andrew Sellick - Environment MGR - ACFT OPS -QANTAS; Angela Picton AIPA; Barry Hallett AFAP; Cr Barry McKenna - Councillor - City of Bayswater; Cr Phil Marks - City of Belmont; Cristina Mojica - Director Airport Planning - DOTARS; Dale, Lance; David White - Environmental Advisor - Virgin Blue; Dawson, Paul; Denis Macneall PVT; Doug Green AAA; Drew Gaynor - DPI; Flight Procedures QANTAS; GAPAN; Gavan Bennet - Environment Services - ASA; Gavin Healy PVT; Geoff Atkinson - Planning Coordinator; ghiggins@chcaustralia.com; Graeme Lauder WA Convenor; Graham Rennie QANTAS; Greg Doherty AAA; HGFA; Hodge, Ken; Hon Judi Moylan MP - Federal Member for Pearce; Hood, Greg; Ian Johnson PVT; James Toye PVT; Jennifer Stritzke - Secretary - Environmental Scientist - Perth Airport; Jenny Pickford PVT; Joe Luxford MAAA WA; John Colins - Mayor - City of South Perth; John Douglas RFACA; John Macpherson - Principle Environment Officer (Noise); John Seman; Kerry Lovegrove PVT; Kevin Saunders WAGA; Kim Wilkie MP - Federal Member for Swan; King, Marianne; Laurie Garcia PVT; Lewis Tucker PVT; Lloyd Mais PVT; Mark Jones AAA; Mayor - City of Canning; Michael Chapman; Michael Corbett PVT; Michael Haines CIVIL AIR; Michael Wiggins VIRGIN; Mr Nick Heidl - Bellevue Action Group; Murray Warfield; Nigel Sparg HGFA/HGAWA; Peter Bruce PVT; Peter Griffin PVT; Peter Hales PVT; Peter Heath NAPAC; Peter Nadilo and Philip Clements PVT; Peter Smith RFDS; Phil Lipple - Cannington Community Representative; RAAA CEO; Raymond LecLezio - The Guildford Association; Reidy-crofts, Paul; Rick Gates - Chairman - General Manager Airport; Rod Sear PVT; Ron Magrath PATOG; Ron Rigney; Ross Wells - MGR Health and Ranger SVCS - City of Gosnells; Sean Collier PVT; Shayne Graham PVT; Spinks, Denise; Stephen Knudsen VIRGIN; Stephen Lansell RFDS; Steve Young PVT; Steven Tan; Stuart Airey RFDS; Stuart Henry MP - Federal Mmember for Hasluck; Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda; Tony Cuccaro; Torb Petersen - Aeronautical Planning Manager - Perth Airport; Trevor Aitken QANTAS; Walter Dollman QANTAS; Wells, Mark
Subject: Western Australia Route Review Project - Significant Update

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Regards

Pam Kern
Project Coordinator
Western Australia Route Review
warrp@airservicesaustralia.com
Telephone 03 9339 2512

From: Kern, Pam
Sent: Friday, 10 November 2006 10:48 PM
To: 'AFAP'; 'Alwyn Adkins NAT JET'; 'Andrew Forte AAA'; 'Andrew Glover VIRGIN'; 'Andrew Sellick - Environment MGR - ACFT OPS -QANTAS'; 'Angela Picton AIPA'; 'Barry Hallett AFAP'; 'Cr Barry McKenna - Councillor - City of Bayswater'; 'Cr Phil Marks - City of Belmont'; 'Cristina Mojica - Director Airport Planning - DOTARS'; Dale, Lance; 'David White - Environmental Advisor - Virgin Blue'; Dawson, Paul; 'Denis Macneall PVT'; 'Doug Green AAA'; 'Drew Gaynor - DPI'; 'Flight Procedures QANTAS'; 'GAPAN'; 'Gavan Bennet - Environment Services - ASA'; 'Gavin Healy PVT'; 'Geoff Atkinson - Planning Coordinator'; 'ghiggins@chcaustralia.com NO ID'; 'Graeme Lauder WA Convenor'; 'Graham Rennie QANTAS'; 'Greg Doherty AAA'; 'HGFA'; Hodge, Ken; 'Hon Judi Moylan MP - Federal Member for Pearce'; Hood, Greg; 'Ian Johnson PVT'; 'James Toye PVT'; 'Jennifer Stritzke - Secretary - Environmental Scientist - Perth Airport'; 'Jenny Pickford PVT'; 'Joe Luxford MAAA WA'; 'John Colins - Mayor - City of South Perth'; 'John Douglas RFACA'; 'John Macpherson - Principle Environment Officer (Noise)'; 'John Seman PVT'; 'Kerry Lovegrove PVT'; 'Kevin Saunders WAGA'; 'Kim Wilkie MP - Federal Member for Swan'; King, Marianne; 'Laurie Garcia PVT'; 'Lewis Tucker PVT'; 'Lloyd Mais PVT'; 'Mark Jones AAA'; 'Mayor - City of Canning'; 'Michael Chapman'; 'Michael Corbett PVT'; 'Michael Haines CIVIL AIR'; 'Michael Wiggins VIRGIN'; 'Mr Nick Heidl - Bellevue Action Group'; 'Murray Warfield'; 'Nigel Sparg HGFA/HGAWA'; 'Peter Bruce PVT'; 'Peter Griffin PVT'; 'Peter Hales PVT'; 'Peter Heath NAPAC'; 'Peter Nadilo and Philip Clements PVT'; 'Peter Smith RFDS'; 'Phil Lipple - Cannington Community Representative'; 'RAAA CEO'; 'Raymond LecLezio - The Guildford Association'; Reidy-crofts, Paul; 'Rick Gates - Chairman - General Manager Airport'; 'Rod Sear PVT'; 'Ron Magrath PATOG'; 'Ron Rigney'; 'Ross Wells - MGR Health and Ranger SVCS - City of Gosnells'; 'Sean Campbell SKYWEST'; 'Sean Collier PVT'; 'Shayne Graham PVT'; Spinks, Denise; 'Stephen Knudsen VIRGIN'; 'Stephen Lansell RFDS'; 'Steve Young PVT'; 'Steven Tan'; 'Stuart Airey RFDS'; 'Stuart Henry MP - Federal Mmember for Hasluck'; 'Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda'; 'Tony Cuccaro'; 'Torb Petersen - Aeronautical Planning Manager - Perth Airport'; 'Trevor Aitken QANTAS'; 'Walter Dollman QANTAS'; Wells, Mark
Subject: Western Australia Route Review Project (WARRP) - Website updated

All,

The WARRP website has been updated, direct link below.

http://www.airservicesaustralia.com/waroutereview/default.asp

Please advise if you wish to be removed from the email distribution list.

Regards

Pam Kern
Project Coordinator
Western Australia Route Review
warrp@airservicesaustralia.com
Telephone 03 9339 2512

From: Kern, Pam
Sent: Monday, 27 November 2006 9:36 AM
To: AFAP; Alwyn Adkins NAT JET; Andrew Forte AAA; Andrew Glover VIRGIN; Andrew Sellick - Environment MGR - ACFT OPS -QANTAS; Angela Picton AIPA; Barry Hallett AFAP; Cr Barry McKenna - Councillor - City of Bayswater; Cr Phil Marks - City of Belmont; Cristina Mojica - Director Airport Planning - DOTARS; David White - Environmental Advisor - Virgin Blue; Denis Macneall PVT; Denise Spinks; Doug Green AAA; Drew Gaynor - DPI; Flight Procedures QANTAS; GAPAN; Gavan Bennet - Environment Services - ASA; Gavin Healy PVT; Geoff Atkinson - Planning Coordinator; ghiggins@chcaustralia.com NO ID; Graeme Lauder WA Convenor; Graham Rennie QANTAS; Greg Doherty AAA; Greg Hood; HGFA; Hon Judi Moylan MP - Federal Member for Pearce; Ian Johnson PVT; James Toye PVT; Jennifer Stritzke - Secretary - Environmental Scientist - Perth Airport; Jenny Pickford PVT; Joe Luxford MAAA WA; John Colins - Mayor - City of South Perth; John Douglas RFACA; John Macpherson - Principle Environment Officer (Noise); John Seman PVT; Ken Hodge; Kerry Lovegrove PVT; Kevin Saunders WAGA; Kim Wilkie MP - Federal Member for Swan; Lance Dale; Laurie Garcia PVT; Lewis Tucker PVT; Lloyd Mais PVT; Marianne King; Mark Jones AAA; Mayor - City of Canning; Michael Chapman; Michael Corbett PVT; Michael Haines CIVIL AIR; Michael Wiggins VIRGIN; Mr Nick Heidl - Bellevue Action Group; Murray Warfield; Nigel Sparg HGFA/HGAWA; Paul Dawson; Paul Reidy-Crofts; Peter Bruce PVT; Peter Griffin PVT; Peter Hales PVT; Peter Heath NAPAC; Peter Nadilo and Philip Clements PVT; Peter Smith RFDS; Phil Lipple - Cannington Community Representative; RAAA CEO; Raymond LecLezio - The Guildford Association; Rick Gates - Chairman - General Manager Airport; Rod Sear PVT; Ron Magrath PATOG; Ron Rigney; Ross Wells - MGR Health and Ranger SVCS - City of Gosnells; Sean Collier PVT; Shaune Campbell SKYWEST; Shayne Graham PVT; Stephen Knudsen VIRGIN; Stephen Lansell RFDS; Steve Young PVT; Steven Tan; Stuart Airey RFDS; Stuart Henry MP - Federal Mmember for Hasluck; Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda; Tony Cuccaro; Torb Petersen - Aeronautical Planning Manager - Perth Airport; Trevor Aitken QANTAS; Walter Dollman QANTAS; Wells, Mark
Subject: Western Australia Route Review Project - MAJOR Update

All,

The WARRP website has been updated and the changes are significant, please use the direct link below.

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Please advise if you wish to be removed from the email distribution list.

Regards

Pam Kern
Project Coordinator
Western Australia Route Review
warrp@airservicesaustralia.com
Telephone 03 9339 2512

From: Kern, Pam
Sent: Monday, 27 November 2006 9:36 AM
To: AFAP; Alwyn Adkins NAT JET; Andrew Forte AAA; Andrew Glover VIRGIN; Andrew Sellick - Environment MGR - ACFT OPS -QANTAS; Angela Picton AIPA; Barry Hallett AFAP; Cr Barry

McKenna - Councillor - City of Bayswater; Cr Phil Marks - City of Belmont; Cristina Mojica - Director Airport Planning - DOTARS; David White - Environmental Advisor - Virgin Blue; Denis Macneall PVT; Spinks, Denise; Doug Green AAA; Drew Gaynor - DPI; Flight Procedures QANTAS; GAPAN; Bennett, Gavan; Gavin Healy PVT; Geoff Atkinson - Planning Coordinator; ghiggins@chcaustralia.com NO ID; Graeme Lauder WA Convenor; Graham Rennie QANTAS; Greg Doherty AAA; Hood, Greg; HGFA; Hon Judi Moylan MP - Federal Member for Pearce; Ian Johnson PVT; James Toye PVT; Jennifer Stritzke - Secretary - Environmental Scientist - Perth Airport; Jenny Pickford PVT; Joe Luxford MAAA WA; John Colins - Mayor - City of South Perth; John Douglas RFACA; John Macpherson - Principle Environment Officer (Noise); John Seman PVT; Hodge, Ken; Kerry Lovegrove PVT; Kevin Saunders WAGA; Kim Wilkie MP - Federal Member for Swan; Dale, Lance; Laurie Garcia PVT; Lewis Tucker PVT; Lloyd Mais PVT; King, Marianne; Mark Jones AAA; Mayor - City of Canning; Michael Chapman; Michael Corbett PVT; Haines, Michael; Michael Wiggins VIRGIN; Mr Nick Heidl - Bellevue Action Group; Murray Warfield; Nigel Sparg HGFA/HGAWA; Dawson, Paul; Reidy-crofts, Paul; Peter Bruce PVT; Peter Griffin PVT; Peter Hales PVT; Peter Heath NAPAC; Peter Nadilo and Philip Clements PVT; Peter Smith RFDS; Phil Lipple - Cannington Community Representative; RAAA CEO; Raymond LecLezio - The Guildford Association; Rick Gates - Chairman - General Manager Airport; Rod Sear PVT; Ron Magrath PATOG; Ron Rigney; Ross Wells - MGR Health and Ranger SVCS - City of Gosnells; Sean Collier PVT; Shaune Campbell SKYWEST; Shayne Graham PVT; Stephen Knudsen VIRGIN; Stephen Lansell RFDS; Steve Young PVT; Steven Tan; Stuart Airey RFDS; Stuart Henry MP - Federal Mmember for Hasluck; Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda; Tony Cuccaro; Torb Petersen - Aeronautical Planning Manager - Perth Airport; Trevor Aitken QANTAS; Walter Dollman QANTAS; Wells, Mark
Subject: Western Australia Route Review Project - MAJOR Update

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Please advise if you wish to be removed from the email distribution list.

Regards

Pam Kern
Project Coordinator
Western Australia Route Review
warrp@airservicesaustralia.com
Telephone 03 9339 2512

From: Kern, Pam
Sent: **Monday, 8 January 2007 5:32 PM**
To: AFAP; Alwyn Adkins NAT JET; Andrew Forte AAA; Andrew Glover VIRGIN; Andrew Sellick - Environment MGR - ACFT OPS -QANTAS; Angela Picton AIPA; Barry Hallett AFAP; Cr Barry McKenna - Councillor - City of Bayswater; Cr Phil Marks - City of Belmont; Cristina Mojica - Director Airport Planning - DOTARS; David White - Environmental Advisor - Virgin Blue; Denis Macneall PVT; Denise Spinks; Doug Green AAA; Drew Gaynor - DPI; Flight Procedures QANTAS; GAPAN; Gavan Bennet - Environment Services - ASA; Gavin Healy PVT; Geoff Atkinson - Planning Coordinator; ghiggins@chcaustralia.com NO ID; Graeme Lauder WA Convenor; Graham Rennie QANTAS; Greg Doherty AAA; Greg Hood; HGFA; Hon Judi Moylan MP - Federal Member for Pearce; Ian Johnson PVT; James Toye PVT; Jennifer Stritzke - Secretary - Environmental Scientist - Perth Airport; Jenny Pickford PVT; Joe Luxford MAAA WA; John Colins - Mayor - City of South Perth; John Crane - Virgin; John Douglas RFACA; John Macpherson - Principle Environment Officer (Noise); John Seman PVT; Ken Hodge; Kerry Lovegrove PVT; Kevin Saunders WAGA; Kim Wilkie MP - Federal Member for Swan; Lance Dale; Laurie Garcia PVT; Lewis Tucker PVT; Lloyd Mais PVT; Marianne King; Mark Jones AAA; Mayor - City of Canning; Michael Chapman; Michael Corbett PVT; Michael Haines CIVIL AIR; Mr Nick Heidl - Bellevue Action Group; Murray Warfield; Nigel Sparg HGFA/HGAWA; Paul Dawson; Paul Reidy-Crofts; Peter Bruce PVT; Peter Griffin PVT; Peter Hales PVT; Peter Heath NAPAC; Peter Nadilo and Philip Clements PVT; Peter Smith RFDS; Phil Lipple - Cannington Community Representative; RAAA CEO; Raymond LecLezio - The Guildford Association; Rick Gates - Chairman - General Manager Airport; Rod Sear PVT; Ron Magrath PATOG; Ron Rigney; Ross Wells - MGR Health and Ranger SVCS - City of Gosnells; Sean Collier PVT; Shaune Campbell SKYWEST; Shayne Graham PVT; Stephen Lansell RFDS; Steve Young PVT; Steven Tan; Stuart Airey RFDS; Stuart Henry MP - Federal Mmember for Hasluck; Sue Burrows - Executive MGR Planning & Development - Shire of Kalamunda; Tony Cuccaro; Torb Petersen - Aeronautical Planning Manager - Perth Airport; Trevor Aitken QANTAS; Walter Dollman QANTAS; Wells, Mark
Cc: Joiner, Brian
Subject: Western Australian Route Review Project - Delayed until Nov 07

All,

The WARRP website has been updated as stage 1 has been delayed until Nov 07, more information can be obtained using the link below.

http://www.airservicesaustralia.com/waroutereview/default.asp

Please contact the project office if you wish to be removed from the email distribution list or have any questions.

Regards

Pam Kern
Project Coordinator
Western Australia Route Review
warrp@airservicesaustralia.com
Telephone 03 9339 2512

From: Whitely, Geoffrey
Sent: Tuesday, 9 September 2008 11:37 PM
To: alemax@upnaway.com; 'Daryl Evans'; 'Derek Hayden'; dfoster@qantas.com.au; 'Greg Eastaway'; 'Greg Meechan - Skywest Airlines'; grennie@qantas.com.au; 'John Crane'; john@maroomba.com.au; 'Johnm@nationaljet.com.au'; 'Laurie Garcia'; Michael Bleus; mickc@skippers.com.au; mwarfield@qantas.com.au; NOTA, STEPHEN; opssupport@nationaljet.com.au; RICHARDSON, MARK; Rob@ChampagenPCServices.com.au; Russell Bryant; Savvas, Marios; Star Aviation (ops@star-aviation.com.au); Steve Bellamy; 'Steve Young'; 'Walter Dolllman'; 'Walter Estermann'; 'warren.wilkinson@skywest.com.au'
Cc: Rutledge, Simon; Ayliffe, Wayne; Kern, Pam; Mayo, Phil; Parry, Sarah; Olsson, Darren; 'kel.morton@casa.gov.au'
Subject: Update of Western Australia Route Review number 3.doc

Dear all,

sorry about the size of this update, however many having been requesting data and this is the quickest way I can achieve delivery.

I will get this to our "web master" to have it put on the website but there will be a delay so herewith please find attached:

- update number 3
- sid and stars DRAFT
- 2 charts
- route data

We will continue to update the web site (as mentioned above) and I will flag an email to you when this happens.

Regards

Geoff

Pilot Information

- Feedback/Questions
- WA RAPAC Minutes
- Route Structure Issues (updated 19 July 2006)
- Route Structure Strategies (updated 11 August 2006)
- Route Structure Proposal 1 (updated 8 September 2006)
- Route Structure Proposal 2 (updated 15 September 2006)
- Route Structure Proposal 3 (updated 12 October 2006)
- Route Structure Proposal 3 (updated 6 November 2006)
- Perth SID/STAR Simulator Trials (updated 24 November 2006)

Western Australia Route Review Project (WARRP)

Background

During work on the Perth Route Review Project it was identified that, with changes to navigation and separation capabilities, systemic improvements can be extended beyond the Perth terminal area to include the entire Western Australia route structure. The project was therefore re-scoped and renamed accordingly.

Stage 1 of the Western Australia Route Review Project has been initiated to deal with the high priority systemic safety issues identified in the route structure and SID/STAR package for operations in the Perth Terminal area. Once this component is completed Stage 2 will address route structure issues to more remote destinations in Western Australia.

As part of the consultation that will be undertaken during the project this website has been developed to encourage awareness and understanding of proposed changes and also provide opportunity for feedback and suggestion. The site will be updated as developments to designs progress.

The proposed timeline for changes aims for implementation of designs in June 2007. In order to achieve this goal, designs will be developed over the next 6 months and finalised by the start of January 2007. Initial advice on route structure issues and options will be posted for comment by mid July.

Scope of Stage 1

To design and implement a route structure & integrated SID/STAR package that:

- provides for continued traffic growth in the Perth terminal area by
  - significant increasing systemic safety and
  - reducing complexity.

- complies with:
  - Air Traffic Management Design Manual standards
  - Environmental requirements and
  - Industry preferred options where possible.

WARRP – Stage 1 Delay - (updated 21 December 2006)

Recent simulation trials of proposals revealed additional issues to be addressed and highlighted the complexity of factors impacting Perth operations, as mentioned previously. The effect of identifying further changes needed to proposals meant that the project would be unable to complete all environmental and consultation processes in time for the January submission cut-off for June charts. The decision was therefore taken to defer the implementation of changes to November 2007. Whilst the complexity of the task eventually meant the delay was unavoidable it does present further opportunity to refine the proposals and improve outcomes for all at implementation. Additional work on the proposals will now be undertaken and further information on progress posted as it becomes available.

Stages 1 and 2 Combined - Implementation re-scheduled for June 2008 (updated 30 April 2007)

As described above, the complexity of factors impacting on Perth operations required additional work which the WARRP Implementation Team has conducted with all affected units. View full details for Stages 1 and 2 Combined.

June 2008 Implementation deferred until November 2008 (updated March 2008)

Since our last update, significant work has been undertaken to improve the route structure throughout Western Australia. However, after an assessment of the work program, it was concluded that the implementation dateline of June would not be met and as such the date was pushed back to 20 November 2008.

- **Status**

  To date all aspects of route and airspace design have been completed including design safety assessment, industry and military consultation and approval by the Office of Airspace Regulation at CASA. Unfortunately the tasks of procedures validation, implementation planning and group training requirements to meet a 5 June implementation were not completed and or were not at a stage where we were comfortable to proceed. Work on the revised separation minima with CASA is still ongoing.

Industry consultation

At the RAPAC forum conducted on 29th February 2008 industry was presented with the new Route and SID/STAR structure for November 2008 implementation. View full details of the information presented at the meeting.

As an Air Navigation Service Provider it is paramount to maintain safety while continuing to improve our services to you. This Project remains a priority and we are on target for our new implementation date of 20th November 2008.

Airspace and Route Review for Western Australia and surrounds incorporating a Revised GPS Based Navigation Tolerance Minima (updated July 2008)

As advised in our previous updates, the implementation of a revised Traffic Management Program is underway. The change is aimed at increasing safety and efficiency in the vicinity of Perth and surrounding procedural (non radar) areas. This has involved a significant amount of work and the scheduled implementation of 20th November 2008 is on target, with ATC training to commence shortly. The 20th November marks a major change in the way in which air traffic is structured in Western Australia and parts of South Australia and the Northern Territory.

- View full details of the July 2008 update

Comments and or Feedback:

Please take the opportunity to review items as they are posted and provide any feedback or questions you feel may be appropriate.

Last Updated: July 16, 2008

Western Australia Route Review - Stage 1 and 2 Combined - Implementation June 2008

As previously detailed, Stage 1 implementation was scheduled for June 2007. The complexity of factors impacting on Perth operations required additional work and the decision was therefore taken to defer the implementation of changes to November 2007, when stages 1 & 2 could be implemented simultaneousy.

The WARRP implementation team has conducted further design meetings with all affected units, including the Australian Defence Force. These meetings have focussed on the need to gain additional access to some military airspace to facilitate a segregated traffic pattern.

As Airservices Australia is committed to achieving an airspace design that provides the most benefits to all providers and users, additional time has been required to reach an agreed solution that will deal with predicted traffic increases.

Schematic diagrams for the WARRP will be provided with the next update, with an anticipated implementation timeline of simulation in the 3rd quarter of 2007 and final implementation of the WARRP now expected in June 2008.

The Project team are working on interim measures for a Nov 2007 implementation whilst concurrently working on the objectives of the Western Australia Route Review.

The interim measures for Nov 2007 will involve resectorisation of the outer northern sector of the Perth arrivals group, located in Melbourne Centre. The resectorisation will more evenly spread the work load for controllers in an already congested piece of airspace, assisting in reducing frequency congestion.

Last Updated: May 10, 2007

RAPAC Presentation - Perth - 29 February 2008

Primary Aim

1. Reduce exposure between aircraft pairs by implementing a fixed route structure to;
   a. minimise conflicts in climb/descent phase (36-120nm);
   b. place crossovers (conflict points) close to Perth or in the cruise phase of flight
2. Optimise use of modern aircraft capabilities in each of the following system components:
   a. Arrival/Departure procedures
   b. Fixed Segregated Route Structure (RNAV based)
   c. Flow management including "Feeder fix" philosophy
   d. Environment
   e. Sectorisation
3. Implement a revised Traffic Management Program
4. Reduce delays for aircraft climbing into controlled airspace and potential conflicts in Class G airspace.
5. Review sectorisation

Perth Departure & Arrival Procedures

- Clearly defined inbound and outbound traffic streams
- Fixed Route Structure
- Limited rerouting required
- Reduce number of transitions
- Defined inbound and outbound traffic stream illustration
- Overview of Inbound and Outbound Traffic Streams to 160NM Perth chart

Standard Instrument Departure (SID) plates

Direction	SID Plate title	RWY	Aircraft Type	Gate
North	GURAK 1	03/06/21	All	GURAK
North-East	RAVON 1	03/06/21	Prop	RAVON
	AMANA 1	03/06/21	Jet	AMANA
East	BROOK 3	21	Jet	BROOK
	NRB 1	03/06	Jet	NRB
	CANRI 1	21	Prop	CANRI
	PIKIL 1	03/06	Prop	PIKIL
South	JANDO 1	21	Prop*	
	SWANN 1	03/06	Prop	
West	WAVES 1	03/21	All	WAVES

Note: Retained SIDs

- PERTH2
- RANGU3RTI5

Standard Arrival Route (STAR) plates

Direction	Aircraft Type	Gate	Runway	STAR Plate title
North	Jet	JULUM	21/24	JULUM 1
			03/06 – IAL	JULUM 1
			03/06 – VMC	GOSNL 1
	Prop	CONDL	21/24	CONDL1
			03/06 – IAL	CONDL1
			03/06 – VMC	GOSNL 1
East	Jet	BEVLY	21/24	BEVLY 1
			03/06 – IAL	BEVLY 1
			03/06 – VMC	GOSNL 1
	Prop	GRENE	21/24	GRENE 1
			03/06 – IAL	GRENE 1
			03/06 – VMC	GOSNL 1
South	Prop	SOLUS	03/06/21/24	SOLUS 1
West	All	WAVES	03/06/21	WAVES 3
East /Sth East	Prop	DAYLR	03/06 IMC	DAYLR 1

Western Australia - En route

General

- One way routes where practical
- RNAV based
- Separate Jet and Prop routes
- FIA realignment
- Sector grouping redefined
- En route chart

Airspace

1. **FIA (Class G)**
    1. Jurien Bay area 122.4 / 121.2 boundary chart
    2. Kalgoorlie 122.1 changed to 135.7
    3. New FIA in the Billabong area between Kalbarri and Shark Bay
    4. New FIA in the Telfer area -134.5MHz
        a. Complementary changes to surrounding FIA
    5. Realignment of boundaries in the Pilbara
        a. Barrow Island and Onslow now in 125.9 area
        b. remove DME arc based on old CTA steps
2. **Class E**
    a. Aligned with Class G boundaries where possible
        i. minor variations within 200NM of Perth
3. **Sectorisation**
    a. Smaller groupings of frequencies
4. **FIR**
    a. Modification to YMMM/YBBB boundary north of Telfer

a. Modification to YMMM/YBBB boundary north of Telfer

Implementation

1. **Target Date - 20 November 2008**
2. **Transition issues**
    a. Major data change - Airservices Australia and Operators
    b. New Arrival/Departure procedures
    c. Flow management including "Feeder fix" philosophy
    d. Sectorisation
3. **Interim measures**
    a. Consideration of early initiatives being investigated

Last Updated: March 26, 2008

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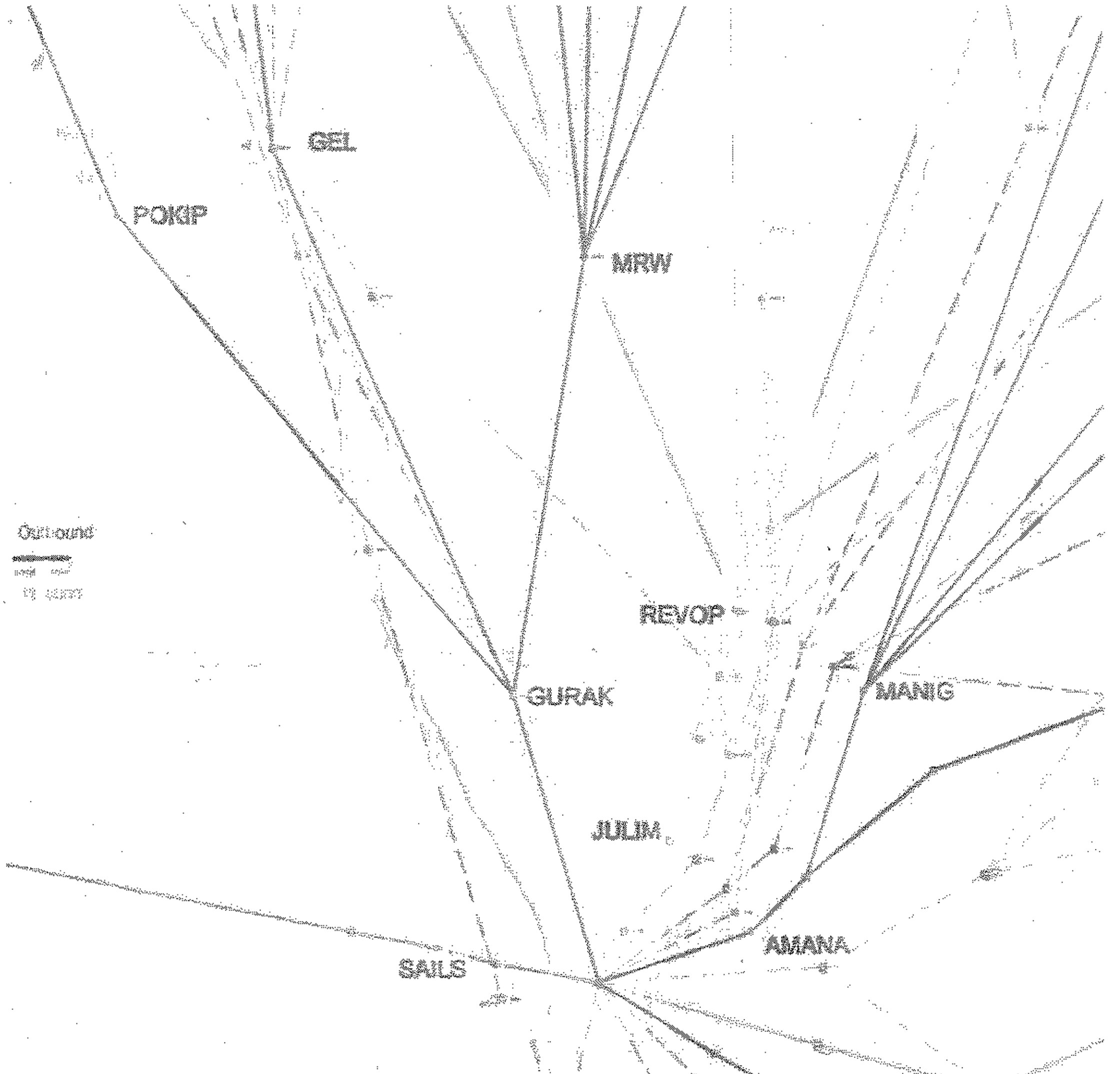

- Overview of Inbound and Outbound Traffic Streams to 160NM Perth chart

Defined inbound and outbound traffic stream illustration

CLOSE X

Standard Instrument Departure (SID) plates

Direction	SID Plate title	RWY	Aircraft Type	Gate
North	GURAK 1	03/06/21	All	GURAK
North-East	RAVON 1	03/06/21	Prop	RAVON
	AMANA 1	03/06/21	Jet	AMANA
East	BROOK 3	21	Jet	BROOK
	NRB 1	03/06	Jet	NRB
	CANRI 1	21	Prop	CANRI
	PIKIL 1	03/06	Prop	PIKIL
South	JANDO 1	21	Prop*	
	SWANN 1	03/06	Prop	
West	WAVES 1	03/21	All	WAVES

Note: Retained SIDs

- PERTH2
- RANGU3RTI5

Standard Arrival Route (STAR) plates

Direction	Aircraft Type	Gate	Runway	STAR Plate title
North	Jet	JULUM	21/24	JULUM 1
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	Prop	CONDL	21/24	CONDL1
			03/06 – IAL	CONDL1
			03/06 – VMC	GOSNL 1
East	Jet	BEVLY	21/24	BEVLY 1
			03/06 – IAL	BEVLY 1
			03/06 – VMC	GOSNL 1
	Prop	GRENE	21/24	GRENE 1
			03/06 – IAL	GRENE 1
			03/06 – VMC	GOSNL 1
South	Prop	SOLUS	03/06/21/24	SOLUS 1
West	All	WAVES	03/06/21	WAVES 3
East /Sth East	Prop	DAYLR	03/06 IMC	DAYLR 1

Western Australia - En route

General

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- En route chart

Airspace

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    1. Jurien Bay area 122.4 / 121.2 boundary chart
    2. Kalgoorlie 122.1 changed to 135.7
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        a. Complementary changes to surrounding FIA
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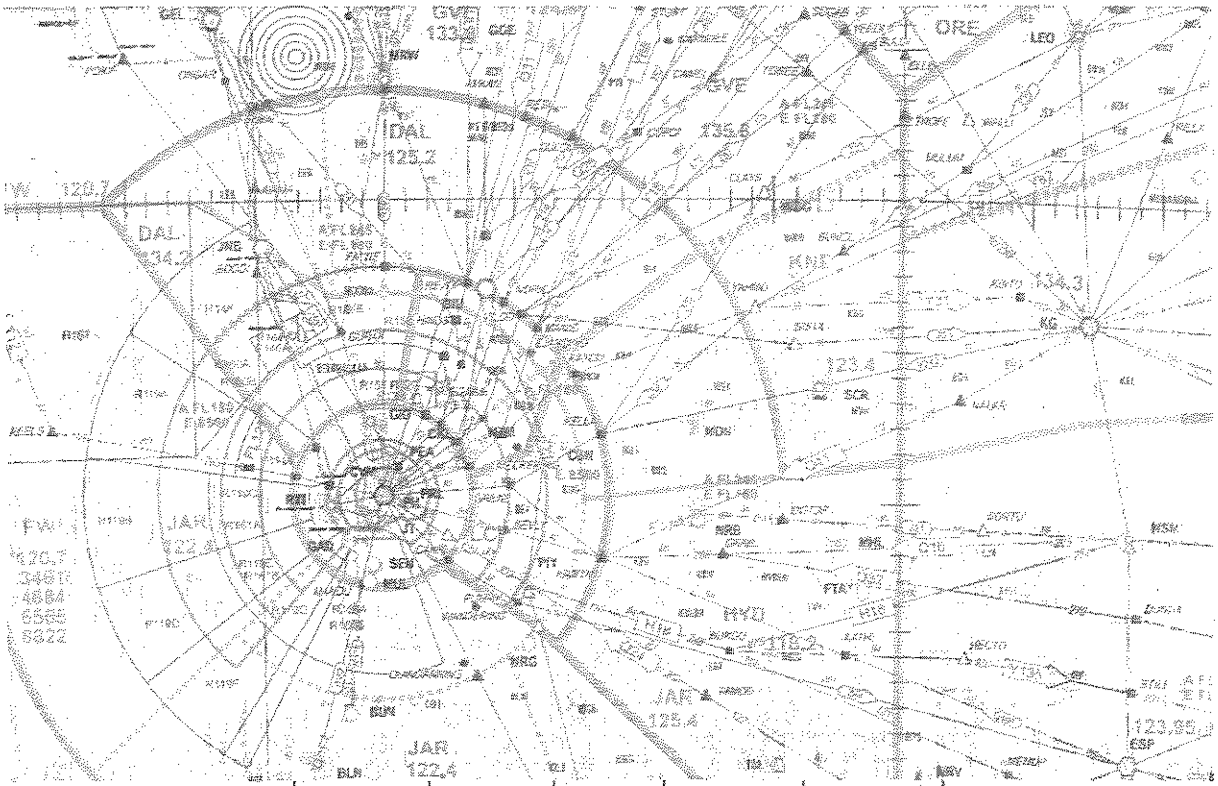
        a. Barrow Island and Onslow now in 125.9 area
        b. remove DME arc based on old CTA steps
2. **Class E**
    a. Aligned with Class G boundaries where possible
        i. minor variations within 200NM of Perth
3. **Sectorisation**
    a. Smaller groupings of frequencies
4. **FIR**
    a. Modification to YMMM/YBBB boundary north of Telfer



Overview of Inbound and Outbound Traffic Streams to 150NM Perth Chart

CLOSE X

North-East	RAVON 1	03/06/21	Prop	RAVON
	AMANA 1	03/06/21	Jet	AMANA
East	BROOK 3	21	Jet	BROOK
	NRB 1	03/06	Jet	NRB
	CANRI 1	21	Prop	CANRI
	PIKIL 1	03/06	Prop	PIKIL
South	JANDO 1	21	Prop	
	SWANN 1	03/06	Prop	
West	WAVES 1	03/21	All	WAVES

Note: Retained SIDs

- PERTH2
- RANGU3RTI5

Standard Arrival Route (STAR) plates

Direction	Aircraft Type	Gate	Runway	STAR Plate title
North	Jet	JULUM	21/24	JULUM 1
			03/06 – IAL	JULUM 1
			03/06 – VMC	GOSNL 1
	Prop	CONDL	21/24	CONDL 1
			03/06 – IAL	CONDL 1
			03/06 – VMC	GOSNL 1
East	Jet	BEVLY	21/24	BEVLY 1
			03/06 – IAL	BEVLY 1
			03/06 – VMC	GOSNL 1
	Prop	GRENE	21/24	GRENE 1
			03/06 – IAL	GRENE 1
			03/06 – VMC	GOSNL 1
South	Prop	SOLUS	03/06/21/24	SOLUS 1
West	All	WAVES	03/06/21	WAVES 3
East /Sth East	Prop	DAYLR	03/06 IMC	DAYLR 1

Western Australia - En route

General

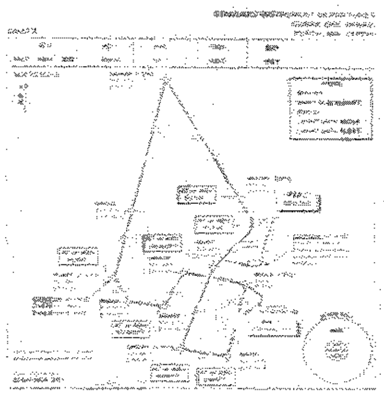
RAPAC Presentation - Perth - 29 February 2008 - GURAK 1

Proposed SIDs
Departures to the North

GURAK 1 - All pressurised aircraft

RWY21
Similar to existing NAMBU departure

RWY03/06
Used when Pearce airspace active



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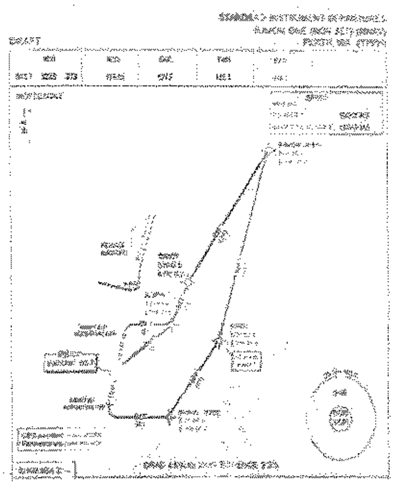
RAPAC Presentation - Perth - 29 February 2008 - RAVON 1

Proposed SIDs

Departures to the North-East

RAVON 1 - Prop only

RWY21
RWY03/06



Last Updated: March 17, 2008

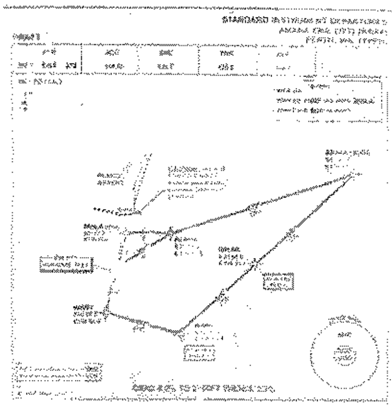
RAPAC Presentation - Perth - 29 February 2008 - AMANA 1

Proposed SIDs
Departures to the North-East

AMANA 1 - Jet only

RWY21
Join outbound route at AMANA

RWY03/06
As above



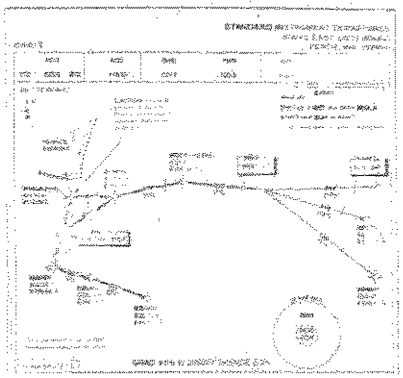
RAPAC Presentation - Perth - 29 February 2008 - BROOK 3 / NBR 1

Proposed SIDs
Departures to the East

BROOK3 / NRB1 - Jet only

RWY21
BROOK3 to join outbound route at BROOK

RWY03/06
NRB1 – transitions to join outbound route at NSM / HECTO / MEMUP



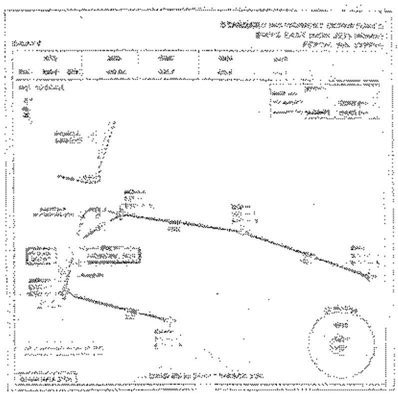
RAPAC Presentation - Perth - 29 February 2008 - CANRI 1 / PIKIL 1

Proposed SIDs
Departures to the South East

CANRI1 / PIKIL1 - Prop only

RWY21
Join outbound route at CANRI

RWY03/06
Cleared from PIKIL direct to destination or appropriate ATS route



Last Updated: March 17, 2008

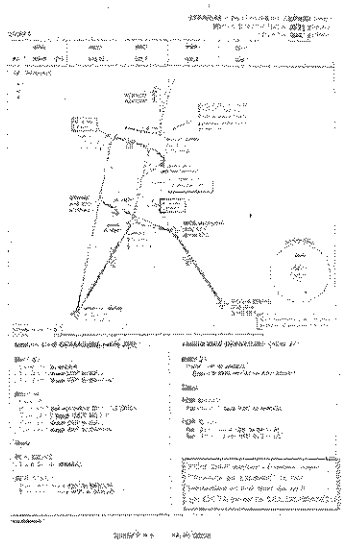
RAPAC Presentation - Perth - 29 February 2008 - JANDO 1 / SWANN 1

Proposed SIDs
Departures to the South

SWANN1 / JANDO1 - Prop only

RWY21
New procedure for departures to YABA / YBLN etc

RWY03/06
as above



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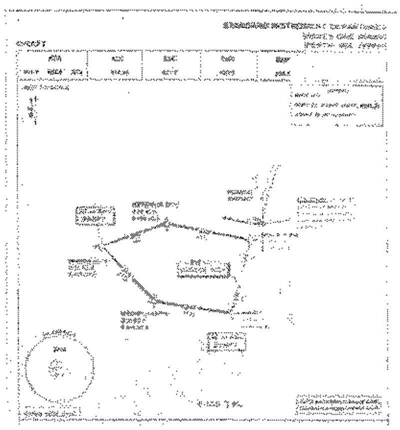
RAPAC Presentation - Perth - 29 February 2008 - WAVES 1

Proposed SIDs
Departures to the West

WAVES 1 - "All" aircraft

RWY21
Same as KEELS3 to join ATS route at WAVES

RWY03
as above

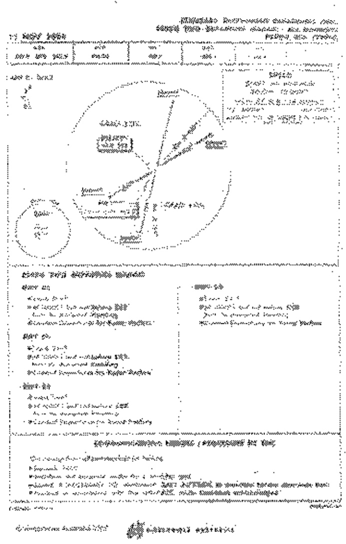


Last Updated: March 17, 2008

RAPAC Presentation - Perth - 29 February 2008 - PERTH 2

Retained SID
Radar Departure

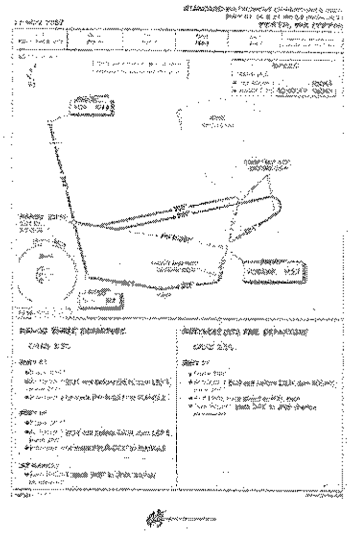
PERTH2 - "All aircraft"



RAPAC Presentation - Perth - 29 February 2008 - RANGU 3/RTI 5

Retained SIDs
Departures to the West

RANGU3 / RTI5 - Prop only



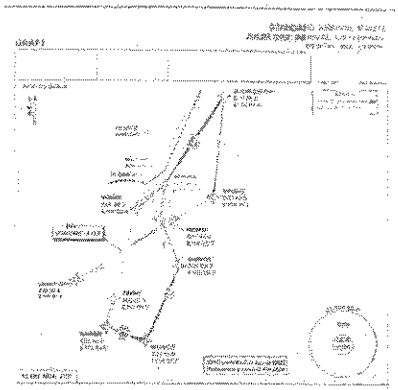
Last Updated: March 17, 2008

RAPAC Presentation - Perth - 29 February 2008 - JULUM 1

Proposed STARs
Arrivals from the North

JULUM1 - Jet only

All Runways



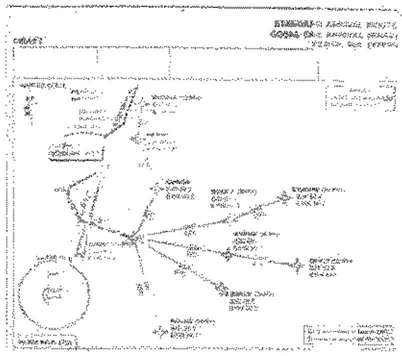
Last Updated: March 17, 2008

RAPAC Presentation - Perth - 29 February 2008 - GOSNL 1

Proposed STARs
Arrival for RWY03/06 only

GOSNL1 - All aircraft

Visual Procedure for RWY03/06



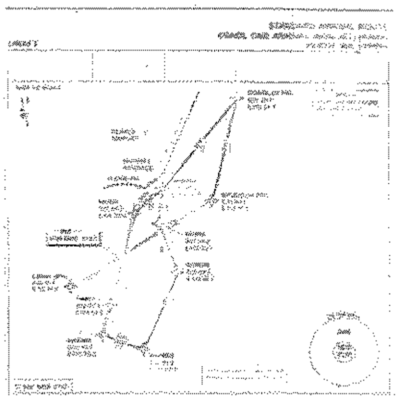
Last Updated: March 17, 2008

RAPAC Presentation - Perth - 29 February 2008 - CONDL 1

Proposed STARs
Arrivals from the North

CONDL1 - Prop only

All Runways



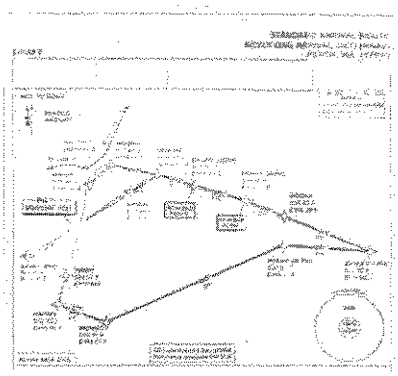
Last Updated: March 17, 2008

RAPAC Presentation - Perth - 29 February 2008 - BEVLY 1

Proposed STARs.
Arrivals from the East

BEVLY1 - Jet only

All Runways



Last Updated: March 17, 2008

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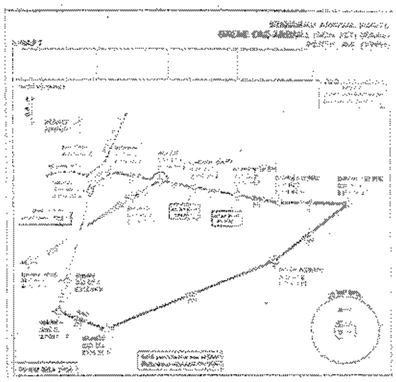
RAPAC Presentation - Perth - 29 February 2008 - GRENE 1

Proposed STARs
Arrivals from the East

GRENE1 - Props only

All Runways



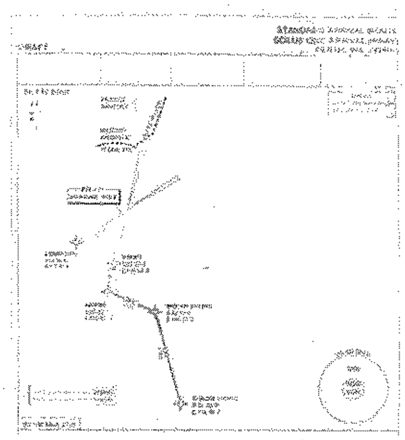
Last Updated: March 17, 2008

RAPAC Presentation - Perth - 29 February 2008 - SOLUS 1

Proposed STARs
Arrivals from Albany

SOLUS1 - "All" aircraft

RWY03
Arrivals from YABA



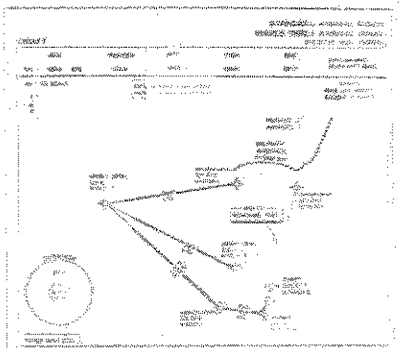
Last Updated: March 17, 2008

RAPAC Presentation - Perth - 29 February 2008 - WAVES 3

Proposed STARs
Arrivals from the West

WAVES 3 - "All" aircraft

RWY 03/06/21
Replaces existing WAVES2 - Transition not required

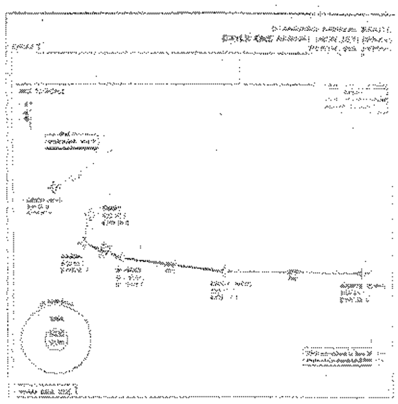


RAPAC Presentation - Perth - 29 February 2008 - DAYLR 1

Proposed STARs
Arrivals from the East/SE

DAYLR1 - Prop only

RWY03/06
IMC



Last Updated: March 17, 2008

RAPAC Presentation - Perth - 29 February 2008

Primary Aim

1. Reduce exposure between aircraft pairs by implementing a fixed route structure to:
   a. minimise conflicts in climb/descent phase (36-120nm);
   b. place crossovers (conflict points) close to Perth or in the cruise phase of flight
2. Optimise use of modern aircraft capabilities in each of the following system components:
   a. Arrival/Departure procedures
   b. Fixed Segregated Route Structure (RNAV based)
   c. Flow management including "Feeder fix" philosophy
   d. Environment
   e. Sectorisation
3. Implement a revised Traffic Management Program
4. Reduce delays for aircraft climbing into controlled airspace and potential conflicts in Class G airspace.
5. Review sectorisation

Perth Departure & Arrival Procedures

- Clearly defined inbound and outbound traffic streams
- Fixed Route Structure
- Limited rerouting required
- Reduce number of transitions
- Defined inbound and outbound traffic stream illustration
- Overview of Inbound and Outbound Traffic Streams to 160NM Perth chart

Standard Instrument Departure (SID) plates

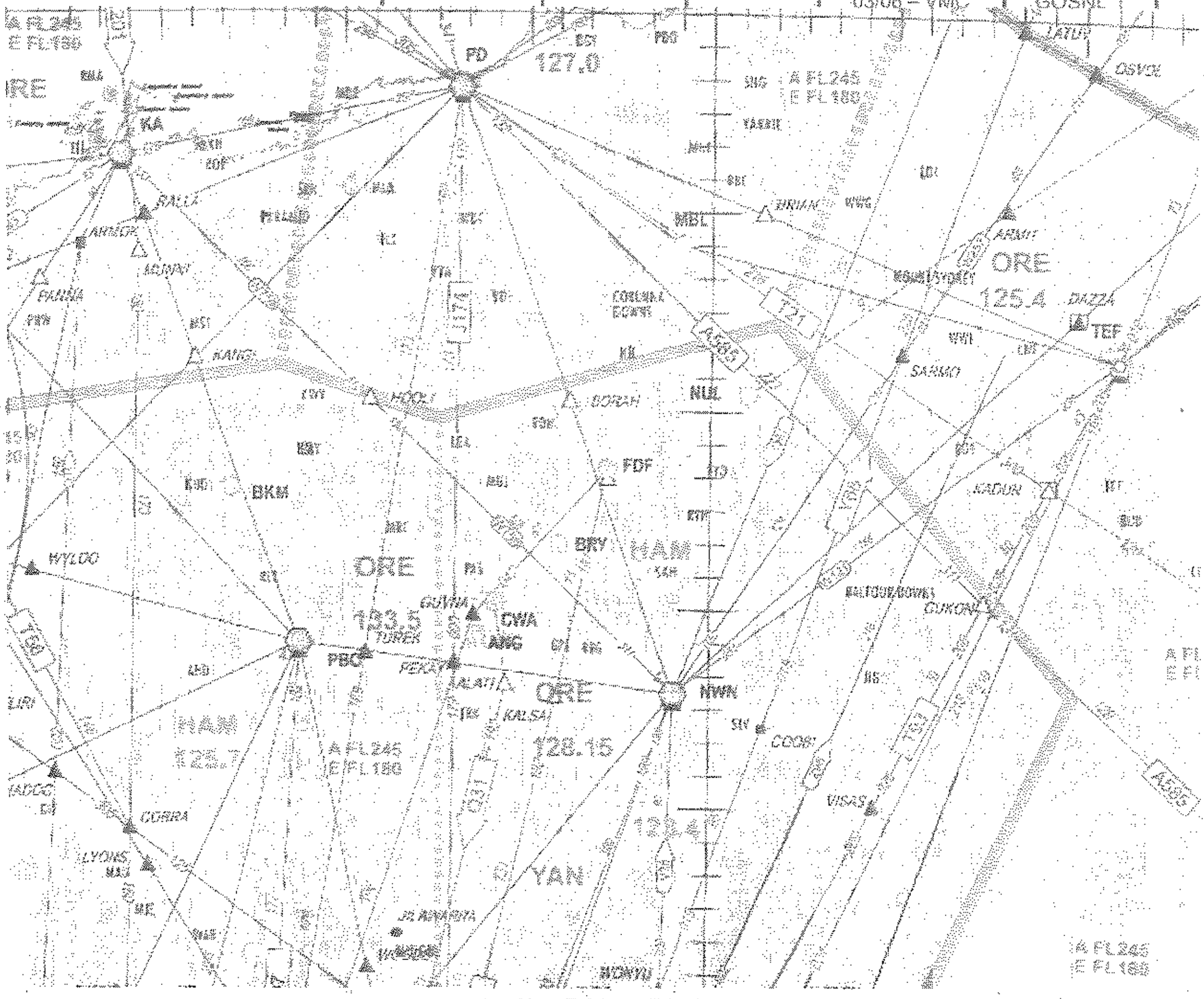
Direction	SID Plate title	RWY	Aircraft Type	Gate
North	GURAK 1	03/06/21	All	GURAK
North-East	RAVON 1	03/06/21	Prop	RAVON
	AMANA 1	03/06/21	Jet	AMANA
East	BROOK 3	21	Jet	BROOK
	NRB 1	03/06	Jet	NRB
	CANRI 1	21	Prop	CANRI
	PIKIL 1	03/06	Prop	PIKIL
South	JANDO 1	21	Prop*	
	SWANN 1	03/06	Prop	
West	WAVES 1	03/21	All	WAVES

Note: Retained SIDs

- PERTH2
- RANGU3RTI5

Standard Arrival Route (STAR) plates

Direction	Aircraft Type	Gate	Runway	STAR Plate title
North	Jet	JULUM	21/24	JULUM 1
			03/06 – IAL	JULUM 1
			03/06 – VMC	GOSNL 1



En route chart

3. New FIA in the Billabong area between Kalbarri and Shark Bay

4. New FIA in the Telfer area - 134.5MHz
    a. Complementary changes to surrounding FIA

CLOSE X

5. Realignment of boundaries in the Pilbara
    a. Barrow Island and Onslow now in 125.9 area
    b. remove DME arc based on old CTA steps

2. **Class E**
    a. Aligned with Class G boundaries where possible
        i. minor variations within 200NM of Perth

3. **Sectorisation**
    a. Smaller groupings of frequencies

4. **FIR**
    a. *Modification to YMMM/YBBB boundary north of Telfer*

Implementation

1. **Target Date - 20 November 2008**

2. **Transition issues**

    a. Major data change - Airservices Australia and Operators
    b. New Arrival/Departure procedures
    c. Flow management including "Feeder fix" philosophy
    d. Sectorisation

RAPAC Presentation - Perth - 29 February 2008

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	NRB 1	03/06	Jet	NRB
	CANRI 1	21	Prop	CANRI
	PIKIL 1	03/06	Prop	PIKIL
South	JANDO 1	21	Prop	
	SWANN 1	03/06	Prop	
West	WAVES 1	03/21	All	WAVES

Note: Retained SIDs

- PERTH2
- RANGU3RTI5

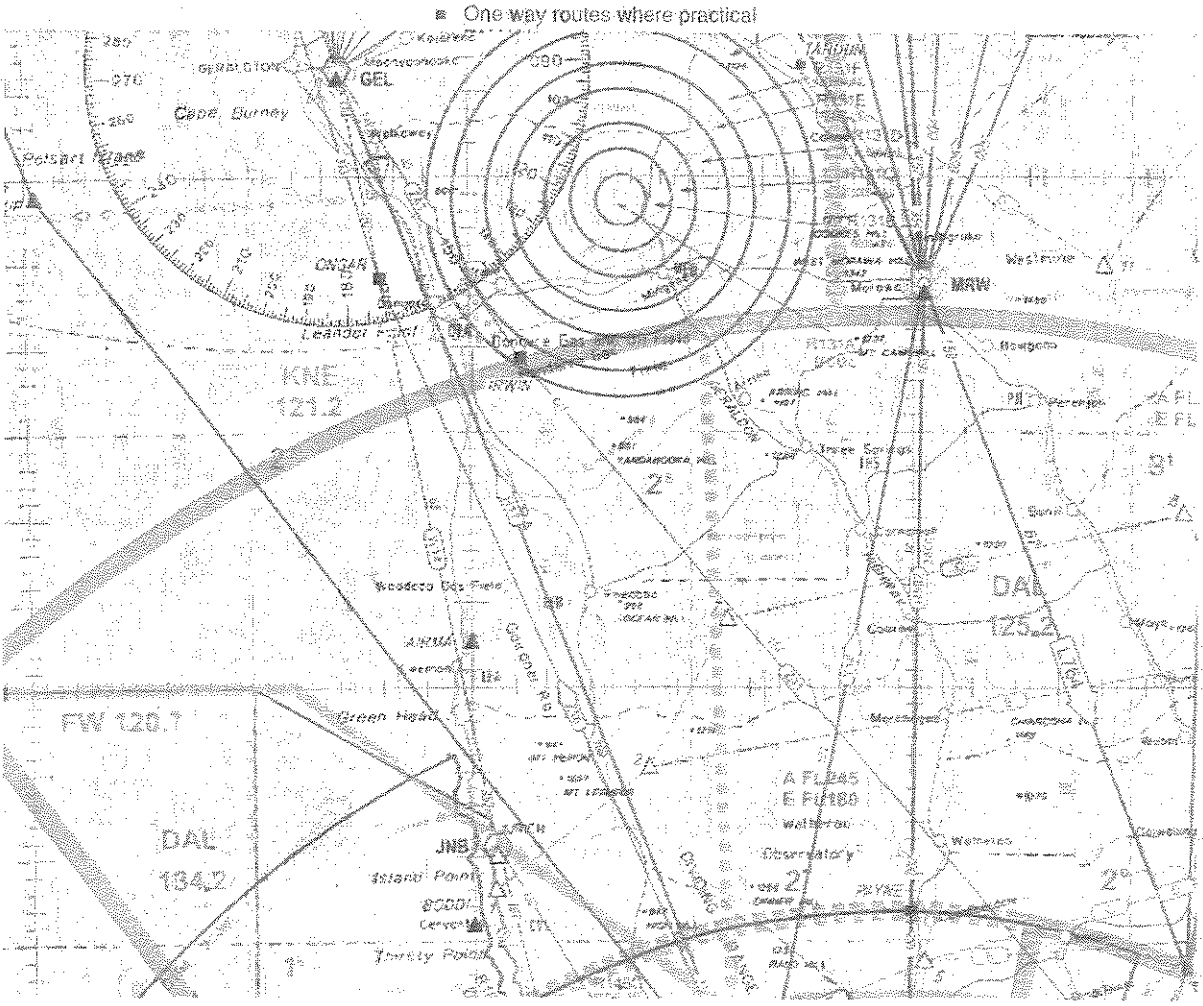
Standard Arrival Route (STAR) plates

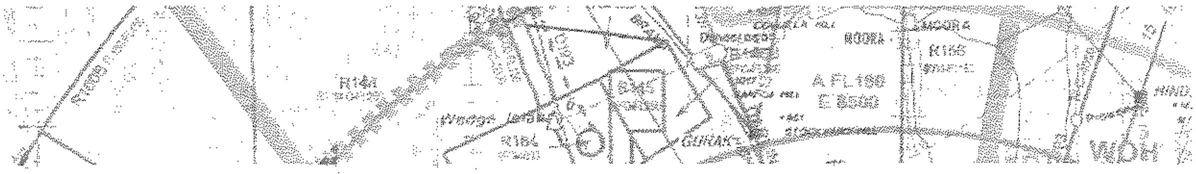
Direction	Aircraft Type	Gate	Runway	STAR Plate title
North	Jet	JULUM	21/24	JULUM 1
			03/06 – IAL	JULUM 1
			03/06 – VMC	GOSNL 1
	Prop	CONDL	21/24	CONDL1
			03/06 – IAL	CONDL1
			03/06 – VMC	GOSNL 1
East	Jet	BEVLY	21/24	BEVLY 1
			03/06 – IAL	BEVLY 1
			03/06 – VMC	GOSNL 1
	Prop	GRENE	21/24	GRENE 1
			03/06 – IAL	GRENE 1
			03/06 – VMC	GOSNL 1
South	Prop	SOLUS	03/06/21/24	SOLUS 1
West	All	WAVES	03/06/21	WAVES 3
East /Sth East	Prop	DAYLR	03/06 IMC	DAYLR 1

Western Australia - En route

General

- One way routes where practical





Jurien Bay area 122.4 / 121.2 boundary chart

CLOSE

AIRSERVICES AUSTRALIA

Western Australia Route Review Project (WARRP)

Airspace and Route Review for Western Australia and surrounds incorporating a Revised GPS Based Navigation Tolerance Minima– July 2008 update

Justification

The affected airspace currently has a number of existing issues with the primary concerns being traffic congestion on nose-to-nose routes and significant delays for aircraft arrivals and departures at Perth. To combat these concerns as well as allow for the ever increasing number and diversity of aircraft in the region, a new system will be introduced that optimises the use of modern aircraft capabilities in each of the following system components:

- Arrival/Departure procedures
- Fixed Segregated Route Structure (RNAV based)
- User Preferred Routes (UPR) / Flex Track operations as appropriate
- Flow management
- Environment
- Sectorisation

An integral part of the project was the review of the existing GPS/RNAV and GPS/OCEANIC navigation tolerance. The original tolerance was a Circular Errors of Position (CEP) of 14NM resulting in a lateral separation standard between aircraft at 29NM. This is calculated by adding 14NM + 14NM (the CEPs of both aircraft) to the required 1NM buffer. It has since been found that this tolerance was too conservative.

A process was then completed involving an in-depth mathematical and safety analysis to determine a more appropriate separation minimum between GPS/RNAV and/or GPS/OCEANIC aircraft operating in Australian Administered Control Area (CTA). It was proven that an amended tolerance of 7NM CEP between aircraft with GPS/RNAV or GPS/OCEANIC approvals could be achieved, resulting in a lateral separation minimum of 15NM (7+7+1) between aircraft with no reduction in safety. The amended tolerance enables the project to create a new route structure that provides a more efficient use of airspace.

Whilst the current focus of the project is on areas considered to be in critical need of change, the overall scope was not limited just to the immediate requirements, but includes an assessment of traffic demands throughout Australia and up to adjacent Flight Information Regions (FIRs)

Operational Benefits

The new Traffic Management Program aims to improve safety and efficiency via:

- A reduction in the exposure between aircraft pairs by;
    - reducing conflicts in climb/descent phase (36-120NM);
    - positioning aircraft crossovers (conflict points) close to Perth or in the cruise phase of flight
- The use of the amended tolerance to construct segregated routes for turbo props and jets in 'racetrack patterns' that remain clear of holding patterns and opposite direction traffic. This enables uninterrupted climb for most outbound traffic.
- A reduction in the length and number of delays for aircraft climbing into controlled airspace with the flow-on effect of a reduction in possible conflicts outside of controlled airspace.
- A change to airspace sectorisation for ATC allowing a more evenly distributed workload among controllers.
- Provision of less restrictive climb/descent profiles.
- The introduction of a 'Feeder fix' philosophy
- A realignment of routes, where practical, to take advantage of the predominate wind

Operational Changes

There will be significant changes to the existing route structure in all phases of flight however there are no changes to other operational requirements such as standard phraseology and position reporting.

The main changes are as follows:

Arrival/Departure Procedures

The new design has fixed inbound tracking with fixed outbound tracking except for runway 03. This eliminates the need for a "flip flop" SID STAR design with each runway requiring unique tracking. The route alignment allows for easy transition to instrument approaches at some remote aerodromes (pseudo STAR).

The changes allow for more predictability as well as flexibility for both controllers and pilots.

Enroute Tracking

The new fixed route structure provides segregation between turbo-prop and jet traffic and where possible, race track routes have been introduced to replace two-way routes.

User Preferred Routes and Flex Track operations

New gates inbound to Perth have been designed to match the expected Flex trial gate requirements between Perth and Brisbane

Flow Management

Earlier flow management will be enabled by streaming inbound traffic in narrow bands. These tracks have been straightened to reduce the impact of wind on aircraft speed. The inbound turbo-prop and jet traffic track on separate routes and will be processed independently.

Holding patterns in the Perth area have been reviewed to assist with flow requirements and a 'feeder fix' philosophy will be introduced shortly after implementation to allow for some absorption during the cruise phase of flight of expected delays.

Flight Planning
Changes to flight planning will be limited to the new tracking details in Field 15. All other flight planning details will remain unchanged.

OCTA
Many of the FIA boundaries will change to provide airspaces with better VHF coverage and to align more appropriately with the traffic disposition.

ATC Changes

Air Traffic Controllers will operate with new airspace volumes that better allow for even distribution of workload with the amended route structure. Controllers will be utilising the amended navigation tolerance for GPS/RNAV approved aircraft to provide better lateral separation solutions. There is no change to any other separation standards or operations outside controlled airspace.

Western Australia Route Review - Route Structure Issues

Below are some of the issues that must be taken into account when considering a terminal area route structure for Perth.

1. Perth geographical position resulting in significant traffic flows from the East and North. (see Figure 1)
2. Impact of restricted airspace in the Perth area. For example operations transiting RAAF Pearce restricted airspace to be FL160 and above.
3. Limited Class C airspace, between RAAF airspace to North and Class G to South (approx 100 degrees BIU - PIY tracks), in which to process the majority of aircraft.
4. Large number of diverse destinations (mine sites etc) with existing routes that need to merge into an orderly and consistent Perth entry/exit structure.
5. Current route structure and radar coverage limitations means many outbound aircraft are often only able to be processed using restrictive time based separation standards with opposite direction inbound traffic. This restricts outbound aircraft climb to preferred levels.
6. Some navaids have been identified by industry as required until alternate navigation capabilities are the norm and therefore should be utilised as part of any route structure. This may also present opportunities to establish some less restrictive lateral separation options for the inbound/outbound issue mentioned in item 5.
7. The need to ensure where possible that route crossovers are achieved either in the cruise phase of flight or within 30nm of Perth using a segregated SID/STAR package.

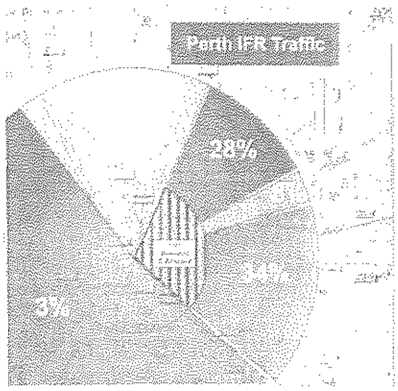


Figure 1

These issues together with external/internal feedback are forming the basis of current background work being undertaken to develop route structure options.

Last Updated: July 19, 2008

Western Australia Route Review - Route Structure Strategies

1. **Static Route Structure**

   Establish inbound and outbound routes that remain fixed regardless of runway in use at Perth. This will enable consistent flight planning and tracking.

2. **Route crossovers**

   Enable route crossovers close to the field or in the cruise phase of flight whilst making maximum use of the limited 100 deg arc of Class C airspace to the east of Perth. Utilise three inbound streams and two outbound corridors with tracks merging/diverging at around 90nm Perth. SID/STAR package to resolve crossovers close to the aerodrome.

3. **Integrated SID/STAR package**

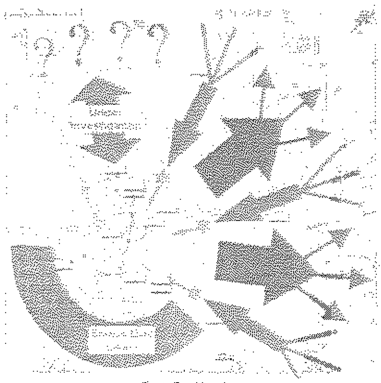
   Develop an integrated SID/STAR package that provides tracking and VNAV requirements between the threshold and the route.

   Inbound streams to track to Gates at around 40nm Perth where STARs commence. VNAV requirements on STARs to provide for constant descent approaches where safety permits.

   Outbound corridors with segregated Prop/Jet SIDs to enhance the safety management of highly varied climb/speed profiles during the departure phase. The need to vector off track in faster following traffic scenarios should be reduced.

4. **Flow to Gate**

   Introduce "Flow to Gate" methodology with ATC and Pilots collaborating to get aircraft to gates at a predetermined time to achieve the sequenced landing time. Enable absorption of delays in cruise phase of flight where possible and safer, more efficient traffic management in the terminal area.



Perth Terminal Area
Current [illegible] under consideration

Figure 1

Inbound sequenced streams

STAR commencement at a FLOW GATE

Outbound corridors

These issues together with external/internal feedback are forming the basis of current background work being undertaken to develop route structure options.

Last Updated: August 11, 2006

Western Australia Route Review - Route Structure Proposal 1

The graphic accessed from the link below displays a proposed static route structure based on the strategies described previously. Please remember that this structure will apply regardless of the runway in use at Perth. This proposal has evolved over a number of iterations that were subjected to internal scrutiny to ensure that the key goals of increased systemic safety and provision for traffic growth are met.

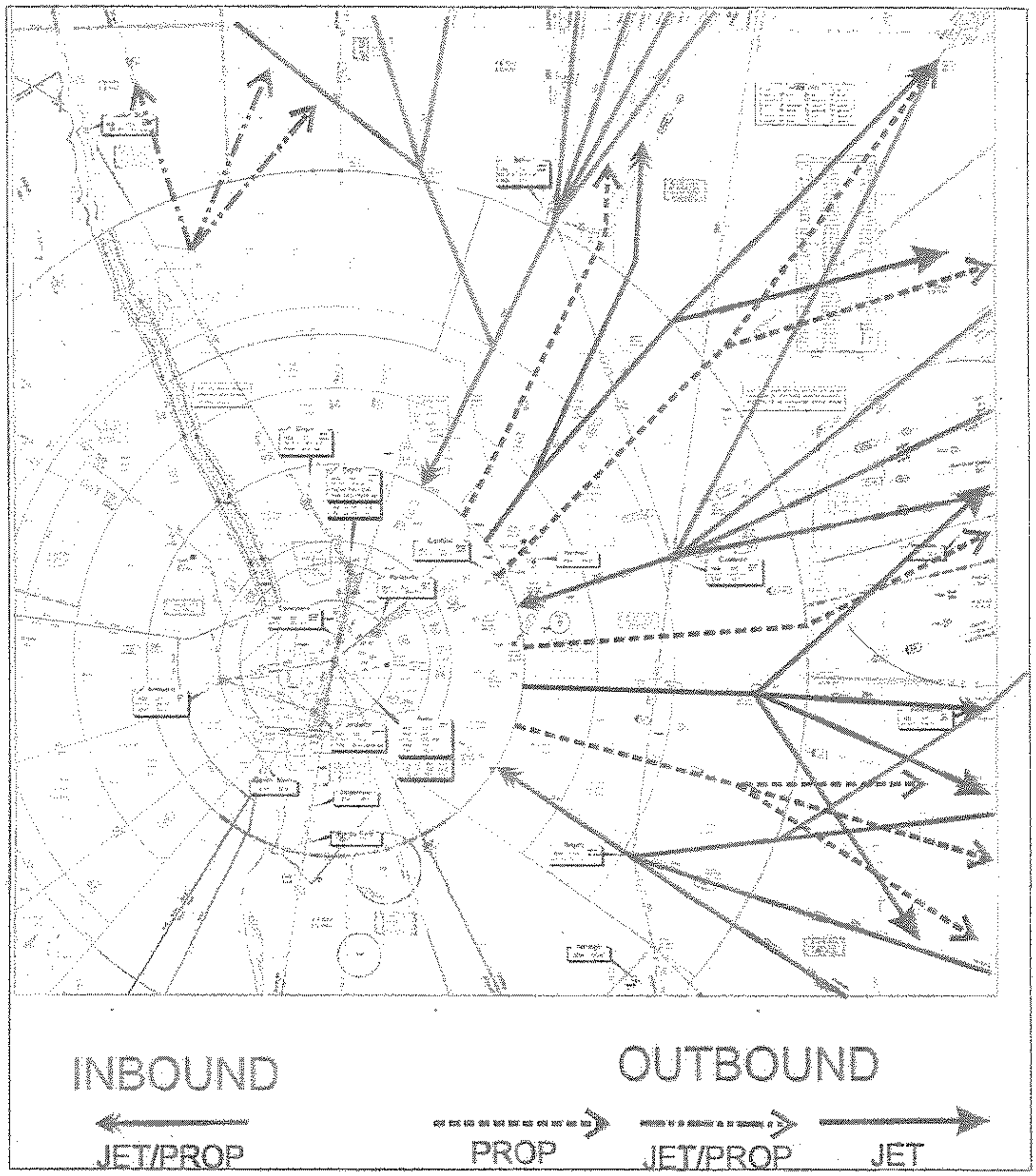
Evaluation in Airservices Australia's ATC simulator has confirmed that systemic safety, traffic separation and management processes in the enroute environment are an improvement on today's situation and provide for future growth. Work is now commencing to determine that a safe and acceptable integrated SID/STAR package can be developed to support the proposal within the important Approach/Departures airspace.

Although still subject to internal discussion, the proposal is presented for external feedback and comment. Further background information on tracking and mileage for various destinations is currently being gathered and will be made available next week.

- Route Structure Proposal graphic

Last Updated: September 8, 2006

Route Structure Proposal 1



Western Australia Route Review - Route Structure Proposal 2

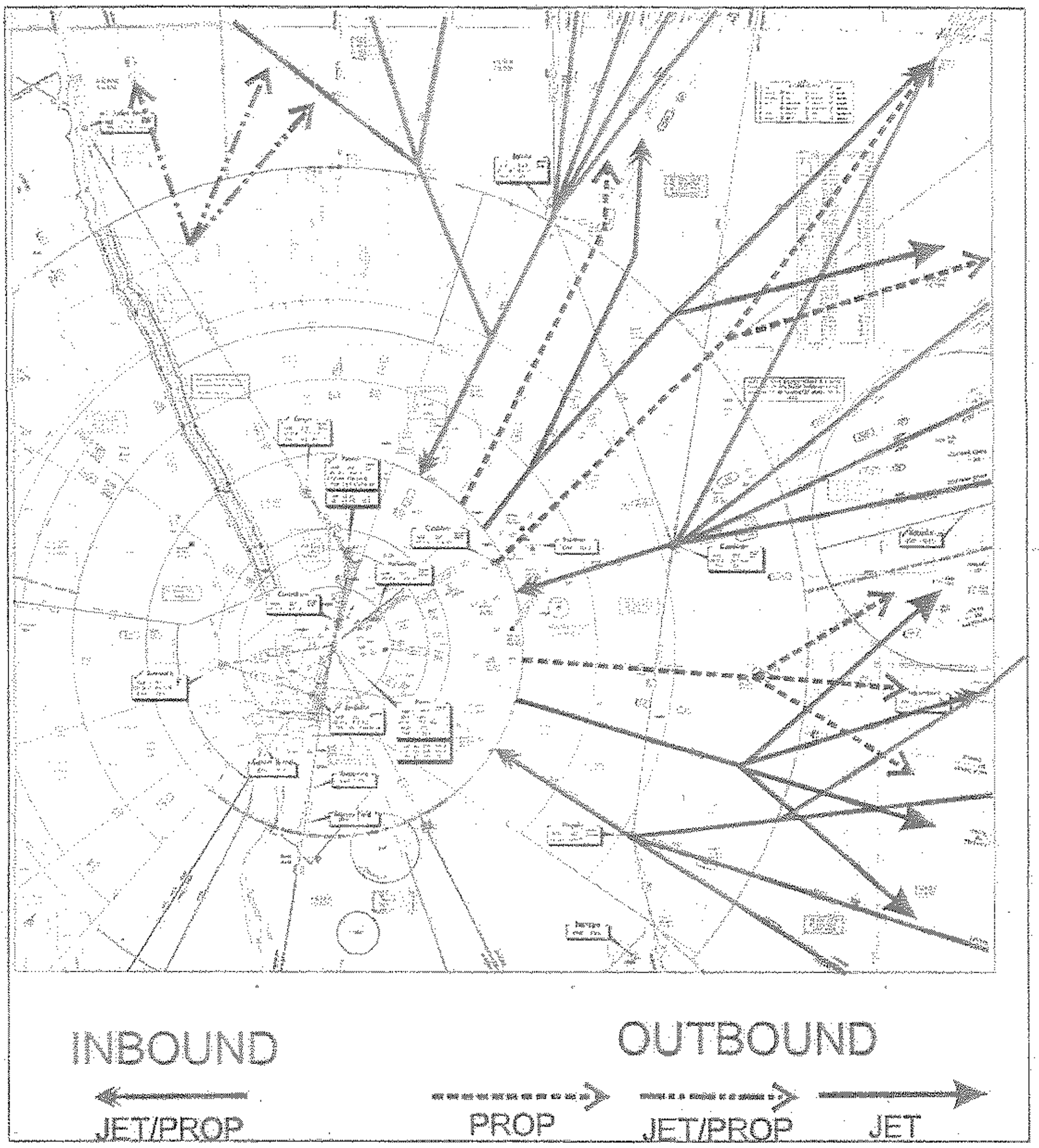
As a result of work undertaken in Perth this week to determine a safe and accep structure it has become clear that a revision to the south west corridor is requirec of factors including runway 21 operations, the impact of restricted airspace to the profile altitude requirements for arrivals. The graphic accessed from the link belo

Graphics of the SID/STAR package for various runway operations will be prepar

- Route Structure Proposal 2 graphic

Last Updated: September 15, 2006

Route Structure Proposal 2



Western Australia Route Review - Route Structure Proposal 3

Following further internal review of the second route structure proposal, and the SID/STAR package required to support it, concerns arose regarding some aspects of the total package and its ability to deliver the sought-after safety and operational benefits for industry. Whilst the proposal showed some genuine improvements compared to current practice, as mentioned earlier, the amount of off-track vectoring required for sequencing on the three inbound routes and the restrictions on climb inside the terminal area, in the busy south east departure corridor, warranted further consideration.

The proposal was reassessed by staff experienced in the traffic segregation techniques used in the busy Sydney basin area. The results identified significant further improvements to the proposal by merging a fully segregated (jet/prop - inbound and outbound) route structure with the general principles of the current runway 21/24 traffic management plan. This provides separate major corridors, rather than combined routes, for inbound aircraft whilst still maintaining separate major corridors for outbound traffic. Segregating jet and prop traffic on separate routes will dramatically reduce the need for vectoring for sequencing, potential climb restrictions and allow full and effective implementation of the flow to gate methodology.

For industry this will translate into an even greater level of standardisation in tracking and procedures for both arriving and departing aircraft, compared to the second proposal. For ATC this revised proposal will further increase safety margins to enable foreseeable traffic growth and significantly assist in improving the level and consistency of service provision, particularly in the arrival and sequencing phase of flight.

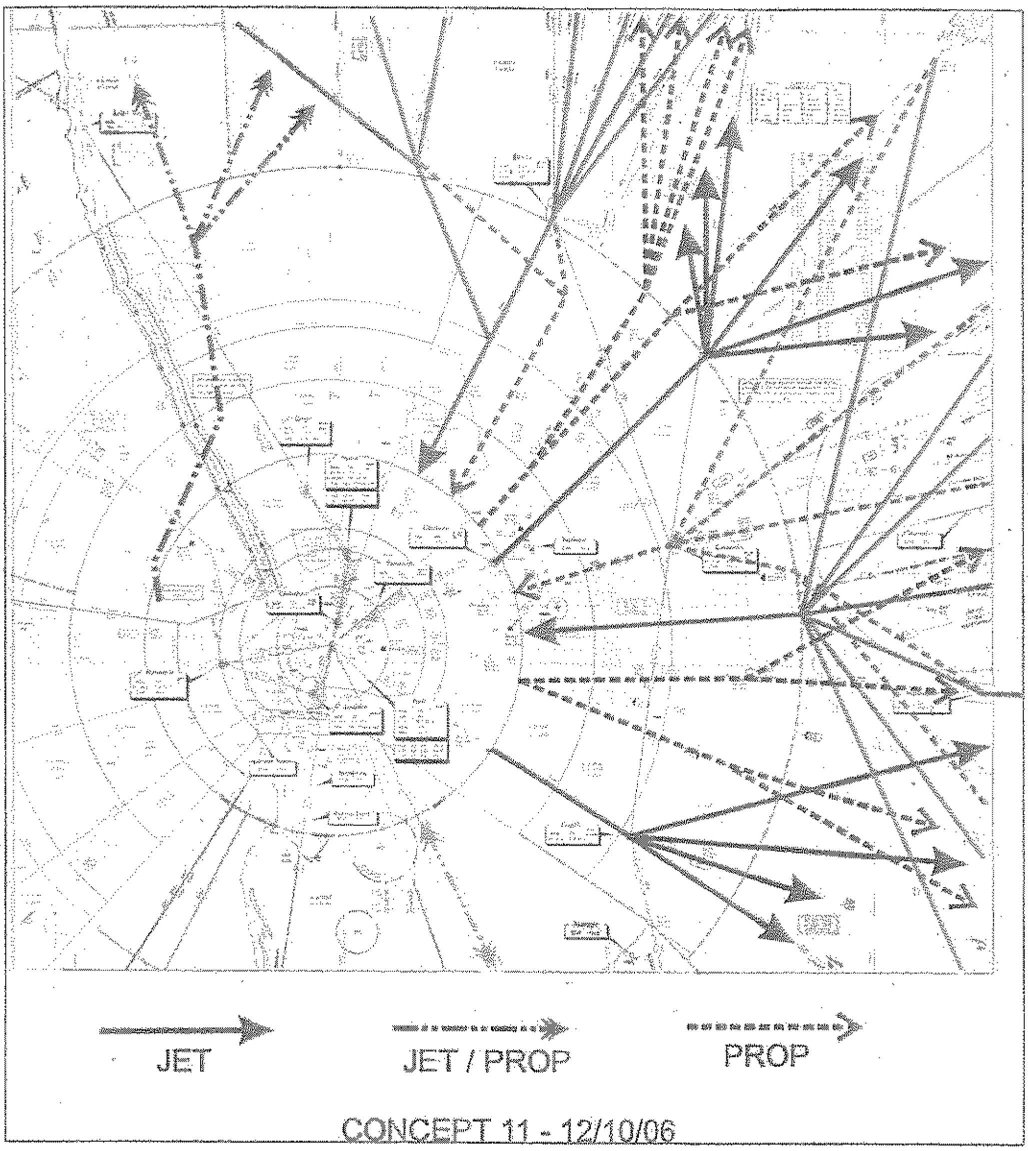
Work will progress quickly to adjust the SID/STAR package to support the revised proposal and present this for industry feedback. Enroute and TCU simulator validation of the revised proposal are scheduled for early November and are expected to confirm the anticipated safety and systemic benefits. Some minor fine tuning may follow industry feedback and ATC trials however given the extensive development and review process undertaken it is not expected to uncover any further need for major change to this third proposal.

The graphic accessed from the link below provides more detail on the structure being used as the basis for simulator validation.

- Route Structure Proposal 3 graphic

Last Updated: October 13, 2006

Route Structure Proposal 3



Western Australia Route Review - ATC SIM Trials - Route Structure Proposal 3A

En route simulator trials of the revised proposal were undertaken in Melbourne last week and co

Some fine tuning of proposal 3 resulted in minor changes to achieve more manageable crossove Perth region.

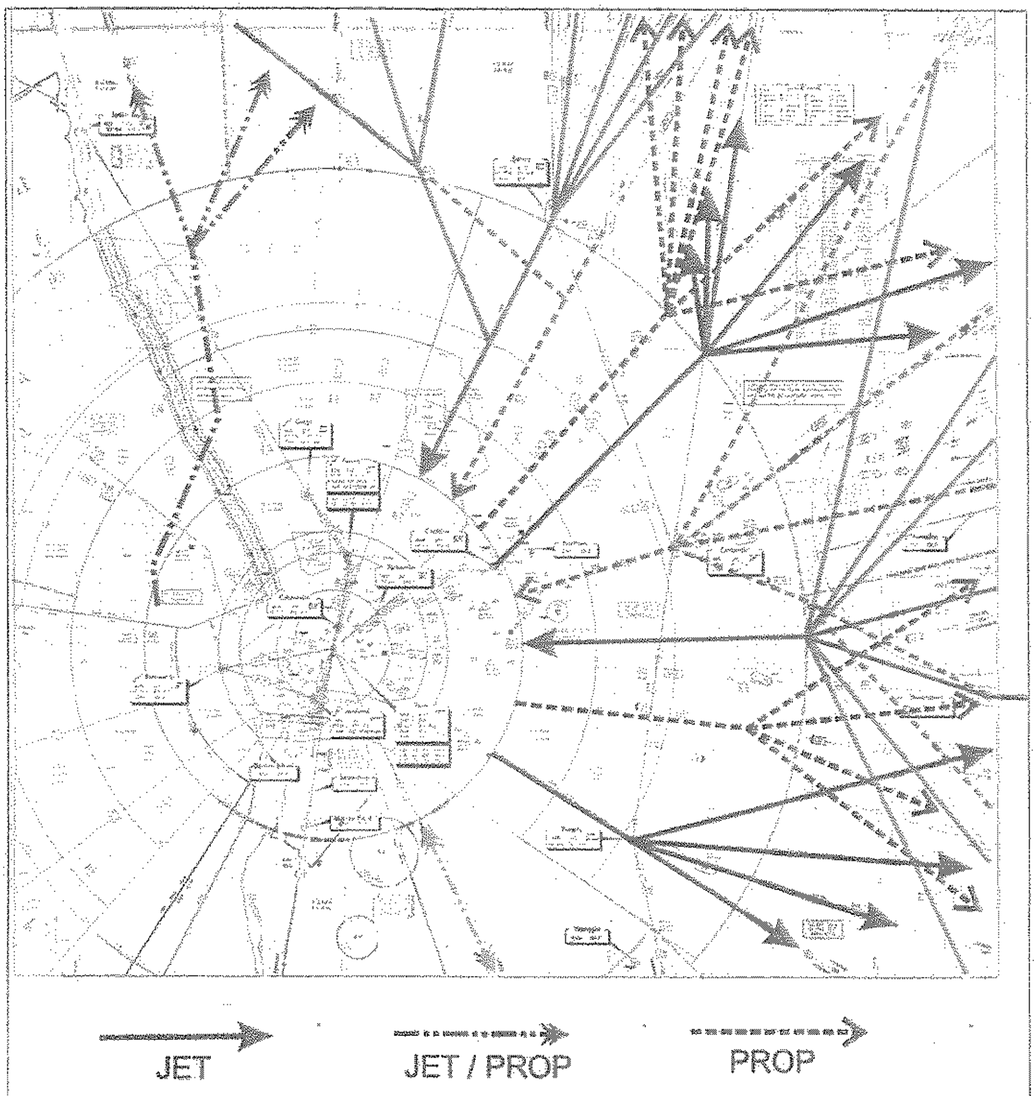
The graphic accessed from the link below displays the revised 3A structure from simulator trials.

The Perth Terminal Control Unit will shortly conduct simulator trials of a couple of SID/STAR opt preferred option will be posted on the website following the trials.

- Route Structure Proposal 3A graphic

Last Updated: November 10, 2006

Route Structure Proposal 3A



Proposal 3A - 6/11/06

November 24, 2006

Western Australia Route Review - Perth SID/STAR Simulator Trials

Over the weekend of the 10th to 12th November, Perth ATC conducted a simula
3A route structure. The trial plainly displayed the difficulties in developing SID/ST
previously on this site (100deg usable airspace to east, mix of prop and jet traffic
environmental factors etc).

The reality is that no design can satisfy all competing interests, it must therefore
safety clearly ruling as the paramount concern.

The information and graphics in the document accessed from the link below deta
Following the next trial animated PowerPoint graphics of the final SID/STAR pac

Please Note: Not all traffic management routing is shown, only major Jet/P

- Perth SID/STAR Simulator Trials (697Kb)

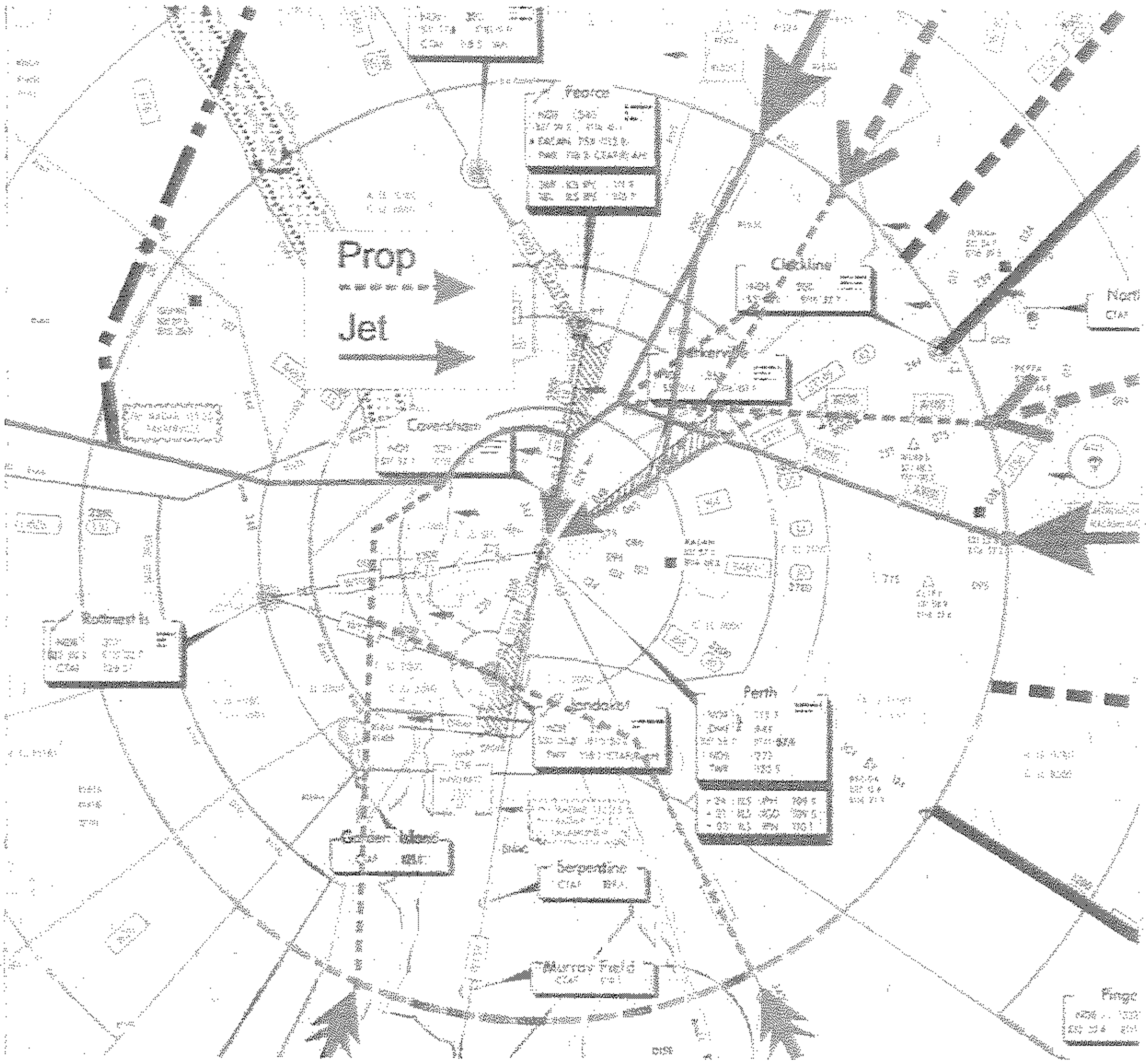
Last Updated: November 24, 2006

AIRSERVICES AUSTRALIA

Runway 21/24 Operations

The proposed 3A route structure approximates the existing runway 21/24 traffic management model and moderate traffic scenarios during the trial indicated the proposed SID/STAR package was suitable for 21/24 operations. A further trial, to be held shortly, with heavy traffic scenarios is expected to confirm this initial assessment.

Runway 21 STAR



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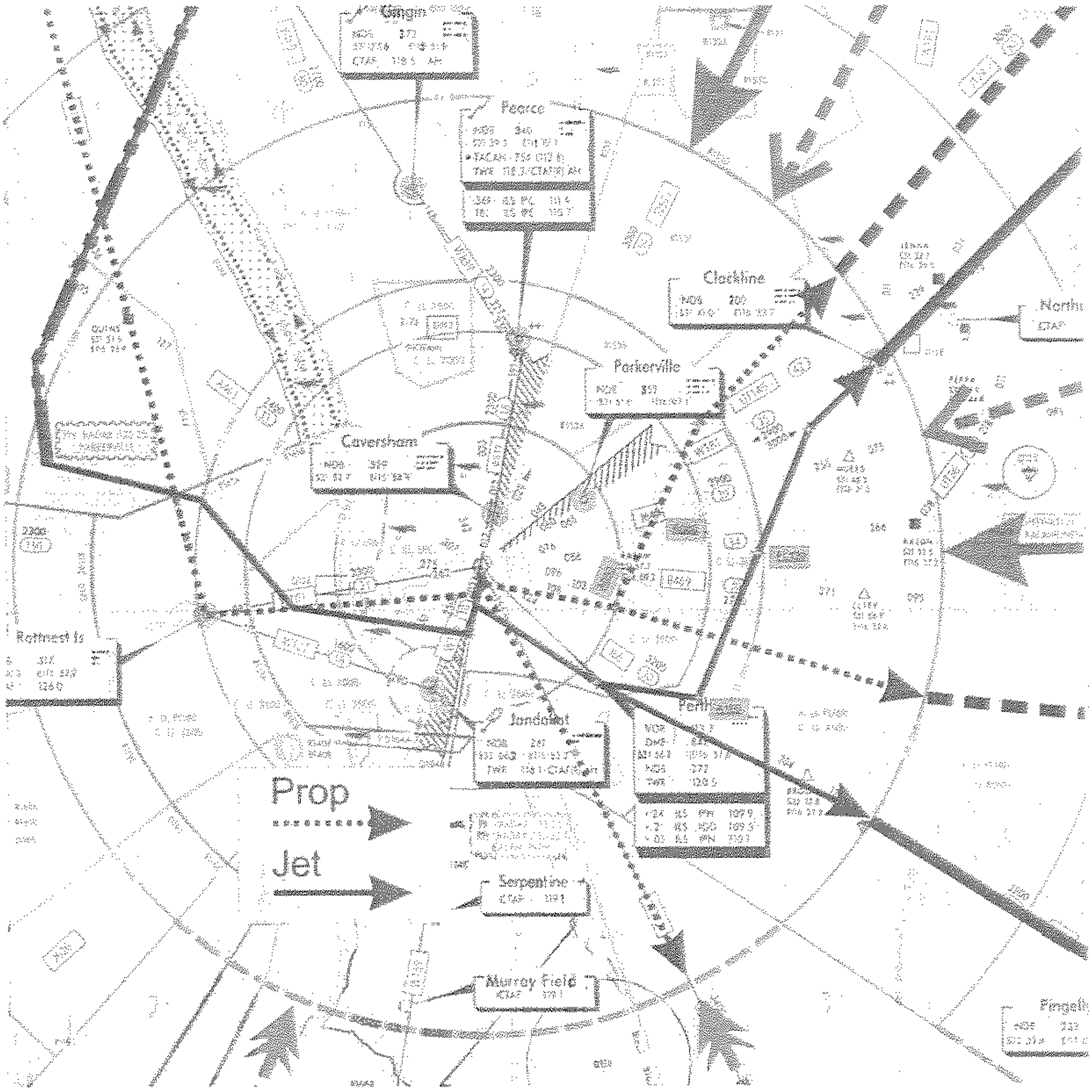
Runway 21 SID



AIRSERVICES AUSTRALIA

Runway 03/06 Operations

This is the most difficult mode of operation in Perth today. The trial confirmed this and highlighted a number of factors that in combination significantly impact operations.

- The strong N/W and N/E wind patterns prevalent during 03/06 operations
- The close proximity of base legs for instrument approaches to the edge of CTA
- The variation in VNAV and speed profiles for RPT prop and jet traffic into Perth
- The importance of available airspace, when needed, to safely vector aircraft to achieve a landing sequence

These factors, together with observations from the trial and historic experience, highlighted core principles that are fundamental to safe and effective traffic management of runway 03 operations.

1. All inbound traffic from east of the runway centreline should track to a common right base for final
2. Inbound prop and jet traffic should remain segregated until merged in the latter part of the STAR
3. Whenever possible the base leg should be as far from the CTA boundary as possible to allow vectoring, when required, for sequencing
4. Departing aircraft to the south east must be managed in a way that provides appropriate sanitised airspace for inbound vectoring and sequencing and also allows inbound traffic to maintain constant descent approaches

The options trialled were based on instrument STAR scenarios. It became clear however that factors peculiar to 03 operations require both visual and instrument STARs. To rely solely on instrument STAR tracking, whilst maintaining the safety of the sequence, would result in a reduction of acceptance rates with an increase in holding. The outcome was that visual STAR options were identified and will be evaluated in the next trial.

Processing of outbound jet traffic via PIY proved particularly difficult given the VNAV and tracking requirements of inbound traffic from the east, particularly for visual STARs. Many options were considered and rejected due to increased safety risks and departing traffic having to maintain unacceptably low levels until around 30nm PH. After much deliberation it was determined that the only safe and acceptable option is to remove south east jet departures from the stream of inbound traffic. This is achieved by south east jet traffic departing initially on a left turn to the west then around south to return to outbound track. Compared to various alternatives this is a significant safety improvement that removes a number of potential conflicts and provides unrestricted climb allowing the extra distance incurred to be absorbed as cruise phase miles.

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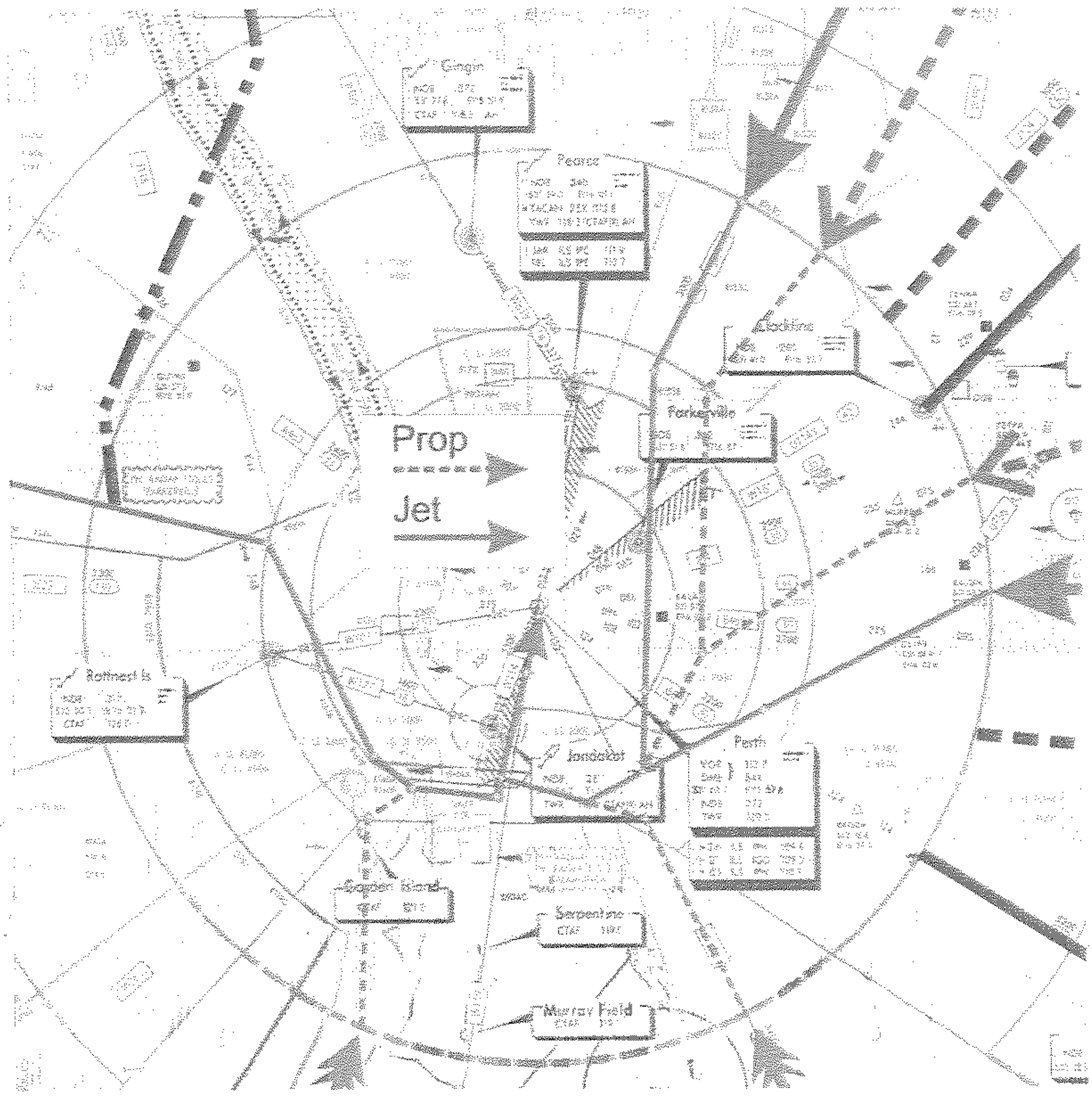
Runway 03 Instrument STAR



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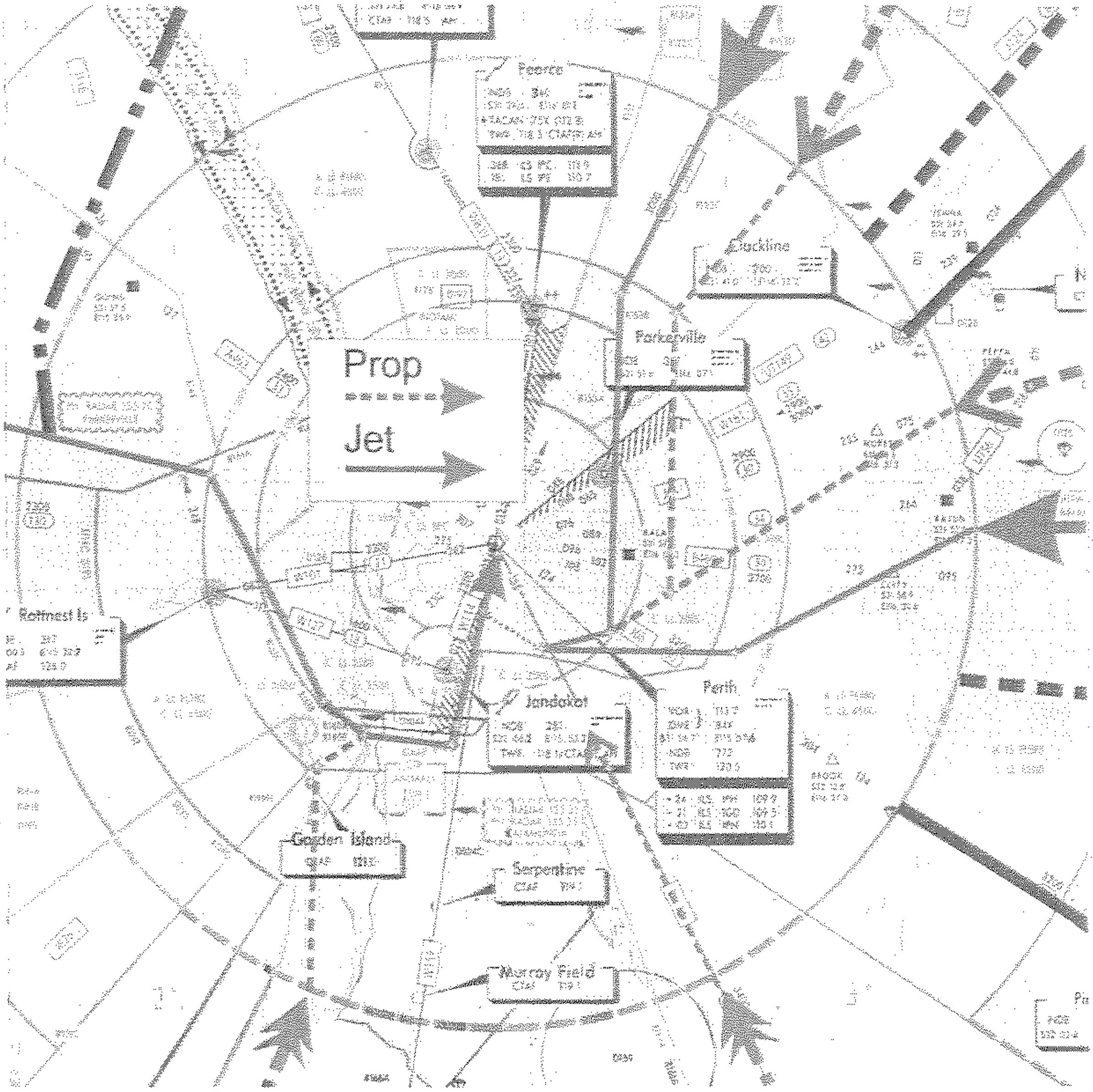
Runway 03 Visual STAR



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Runway 03 SID