Targeted Review of Melbourne Land and Hold Short Operations (LAHSO) Safety Assurance

C-REP0033

Final

Effective 20 March 2015

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Change summary

Version	Date	Change description
1.0	20 March 2015	Final

This document was created using Generic Document Template C-TEMP0047 Version 5.

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1 Executive Summary

Background

On 4 November 2014 Airservices received a letter from Senator Nick Xenophon in relation to an issue with Land and Hold Short Operations (LAHSO) at Melbourne Airport. Airservices subsequently undertook a review of LAHSO procedures and practices. The Review determined that whilst standard[1] LAHSO operations complied with the requirements of the Civil Aviation Safety Regulation (CASR) Part 172 Manual of Standards (MOS), the available safety risk modelling did not extend to the identified procedure application and practices in some circumstances.

As an interim measure the Air Traffic Control group issued a temporary local instruction to ensure passive, off mode LAHSO arrivals would be processed in accordance with the runway nomination criteria specified in the Manual of Air Traffic Services (MATS) and the Aeronautical Information Publication (AIP). The temporary local instruction was issued on 7 November 2014 instructing controllers not to allow aircraft to passively participate in LAHSO operations on a runway subject to wind condition exceeding the ATC runway nomination criteria.

The Review

The Review was commissioned by the Executive General Managers, Safety Environment & Assurance and Air Traffic Control on 25 November 2014. This occurred after an initial assessment identified inconsistencies between Airservices safety assessment of LAHSO and the interpretation of the applicable standards, rules and procedures. The Review was initiated to assess the application of Airservices Safety Management System (SMS) to the change management of local LAHSO procedures.

The terms of reference for a Targeted Review of Melbourne LAHSO Safety Assurance defined the following objectives of the review.

1. Examine the safety processes and activities that were applied to assure the ongoing safety of LAHSO type operations following the development of the approved 2011 Safety Assessment Report.
2. Determine what safety processes and activities should have been applied to assure the ongoing safety of LAHSO type operations.
3. Determine any differences between what happened and what should have happened.
4. Recommend improvements that can be made to the safety change process or supporting activities that would prevent divergence from the appropriate process.

The Terms of Reference included an examination of the following:

1. Changes in ATC standards, procedures or practices since the initial safety assurance work relating to LAHSO operations in Melbourne.
2. The application of Airservices Safety Management System (SMS) in the development of the changes identified in 1.

[1] LAHSO runway modes as defined in the Aeronautical Information Publication (AIP), Departure and Approach Procedures (DAP), Melbourne Noise Abatement Procedures and reflected in local instructions to guide the selection of a preferred runway.

3. Occurrence data for the period from the initial safety assurance report to 31 October 2014, detailing any ATC or pilot reports relating to the safety of LAHSO operations.
4. Assessment of changes to the risk in operations and review of the effectiveness of risk controls.
5. Communications, awareness and educational programs within Airservices and across the aviation industry regarding those changes.
6. Current assurance documentation regarding the safety of LAHSO type operations in their current form including Operational Risk Assessments (ORAs).

The Review was supported in its conduct by the cooperation of Airservices staff in the tower and terminal approach units, by other staff in Air Traffic Control East Coast Services South, the Office of Chief Air Traffic Controller and Safety Environment and Assurance.

Conclusions

The Review concluded that the subject of Senator Xenophon's correspondence related to LAHSO procedures at Melbourne, specifically, the use of local 'ad-hoc LAHSO' practices following the reintroduction of the runway 34/09 LAHSO mode in May 2014. "Ad-hoc LAHSO" was the application of LAHSO procedures during a preferred runway mode which did not incorporate LAHSO procedures. The practice involved the specific crossing runway (for the off mode LAHSO participant) not being broadcast on the Automatic Terminal Information Service (ATIS). Additionally, the crosswind/downwind for the passive LAHSO participant could exceed the ATC runway nomination limitations of ≤20 knots and ≤5 knots respectively.

Ad-hoc LAHSO was used by the Melbourne Terminal Control Unit (TCU) to reduce Enroute holding and/or traffic complexity in the TCU and Enroute environment when using a single arriving runway mode. There is no definition for 'ad-hoc LAHSO' in the Manual of Air Traffic Services (MATS), the Aeronautical Information Publication (AIP) or the CASA Manual of Standards (MOS) Part 172. Evidence was provided that the use of ad-hoc runway 34/09 LAHSO had been a long standing practice at Melbourne for over 10 years.

The runway 34/09 LAHSO mode was removed on 5 November 2011 when construction of the new Melbourne control tower reduced controllers' lines of sight of runway 27 departures and 09 arrivals from the existing control tower.

In May 2014, the runway 34/09 LAHSO mode was reintroduced following relocation to the new Melbourne control tower.

The Review concluded that the safety assessment for the removal and re-introduction of runway 34/09 LAHSO mode did not rigorously follow Airservices Safety Change Management Requirements (AA-NOS-SAF-0104).

In 2011, Airservices commenced a safety assessment of Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) resulting in the preparation of a Safety Assessment Report in November 2012. This Review has concluded that the scope of the Safety Assessment only considered current LAHSO and CROPS operations. The runway 34/09 LAHSO mode was not included in the assessment as the mode had been temporarily removed.

In June 2014 Melbourne Tower controllers raised concerns regarding the use of ad-hoc LAHSO. A determination was sought from the Continuous Service Improvement (CSI) team by Melbourne Tower management in relation to the interpretation and application of MATS and AIP pertaining to the practices associated with ad-hoc LAHSO. The Review concluded that the ATS Integrity Manager was the appropriate authority regarding advice on the intent and interpretation of the LAHSO procedures for runway nomination.

The Review determined that divergent opinions existed in relation to ad-hoc LAHSO practices at Melbourne. This was principally due to the absence of explicit criteria in the rule set regarding crosswind/downwind limitations for the passive participant and specific runway nomination on the ATIS.

LAHSO is defined as a dependant procedure involving two intersecting runways. The Review found that the practice of not broadcasting the passive runway on the ATIS was inconsistent with this dependency.

The Review notes an apparent incongruence between the runway nomination criteria that is applied to all nominated runways and LAHSO procedures where the crosswind/downwind criteria is only explicitly stated for the active runway. The Review determined that the rules governing the provision of Air Traffic Services do not explicitly prescribe crosswind/downwind limitations for the passive LAHSO participant. This determination was made by examining the Manual of Air Traffic Services (MATS), Aeronautical Information Publication (AIP) and the CASA Manual of Standards (MOS) Part 172.

Both formal and informal communication methods had been utilised to provide clarity and standardisation for LAHSO practices at Melbourne. This communication had not ensured a common understanding across the organisation of the practices associated with ad-hoc LAHSO.

Between 01 January 2012 and 31 October 2014, Airservices has identified 12 instances during LAHSO operations where aircraft landed in excess of the crosswind or downwind limitations for ATC runway nomination.

Recommendations

1. The Review recommends that the LAHSO procedures and practices at Melbourne and Adelaide are reviewed to ensure the application is consistent with the intent of the CASA Manual of Standards (MOS) Part 172, the Aeronautical Information Package (AIP) and the Manual of Air Traffic Services (MATS).
2. The Review recommends that a review of the training and support for personnel with National Request for Change (NRFC) safety management roles and responsibilities be completed to ensure safety change is managed in accordance with Safety Change Management Requirements (AA-NOS-SAF-0104).
3. The Review recommends that operational surveillance activities of sufficient scope and periodicity be scheduled to provide assurance that the application of procedures and practices remain consistent with national standards and the rule set.

4. The Review recommends a risk assessment of all LAHSO procedures and practices at Melbourne using additional top-down and bottom up techniques as described in AA-GUIDE-SAF-0105C to ensure the identification and assessment of all potential failure modes associated with all operational airspace and runway mode configurations. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, The Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be reviewed as necessary.
5. The Review recommends the definitions and terminology contained in national standards, rule set and procedures are reviewed to ensure consistency and application intent including:
    - The CASA Manual of Standards (MOS) Part 172
    - The Aeronautical Information Publication (AIP) Australia
    - The AIP (SUP) Differences from ICAO Standards, Recommended Practices and Procedures (H18/14)
    - The Manual of ATS Services (MATS)
6. The Review recommends a reassessment of the data modelling completed for the Melbourne Go-Around Study (Safety & Assurance Group - June 2013). The assessment should incorporate further analysis, including environmental conditions (crosswind/downwind components) and available data from 2012 to 2014 for all LAHSO runway modes. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, the Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be reviewed as necessary.

Actions

1. Conduct a review of the definitions and terminology contained in national standards, rule set and procedures to ensure consistency and application intent including:
    - The CASA Manual of Standards (MOS) Part 172
    - The Aeronautical Information Publication (AIP) Australia
    - The AIP (SUP) Differences from ICAO Standards, Recommended Practices and Procedures (H18/14)
    - The Manual of ATS Services (MATS)
2. Conduct a review of LAHSO procedures and practices at Melbourne and Adelaide to ensure the application is consistent with the intent of the CASA Manual of Standards (MOS) Part 172, the Aeronautical Information Package (AIP) and the Manual of Air Traffic Services (MATS).

3. Conduct a risk assessment of all LAHSO procedures and practices at Melbourne using additional top-down and bottom up techniques as described in AA-GUIDE-SAF-0105C to ensure the identification and assessment of all potential failure modes associated with all operational airspace and runway mode configurations. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, The Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be updated as necessary.
4. Complete a reassessment of the data modelling completed for the Melbourne Go-Around Study (Safety & Assurance Group - June 2013). The assessment should incorporate further analysis, including environmental conditions (crosswind/downwind components) and available data from 2012 to 2014 for all LAHSO runway modes. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, the Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be updated as necessary.
5. Conduct a review of the training and support for personnel with National Request for Change (NRFC) safety management roles and responsibilities to ensure safety change is managed in accordance with Safety Change Management Requirements (AA-NOS-SAF-0104).
6. Implement a scheduled programme of operational surveillance activities of sufficient scope and periodicity to provide assurance that the application of procedures and practices remain consistent with national standards and the rule set.
7. Conduct a study to determine whether alternative means of air traffic segregation (such as dependent runway operations) could be safely applied in Melbourne and Adelaide without material reductions to capacity.

2 Introduction

The Review was commissioned by the Executive General Managers, Safety Environment and Assurance and Air Traffic Control on 25 November 2014 following advice of a pilot complaint relating to the crosswind and downwind limitations for Land and Hold Short Operations (LAHSO) at Melbourne.

This Review was prompted after the initial assessment of the advice identified inconsistencies between Airservices safety assessment of LAHSO and the interpretation of the applicable standards, rules and procedures. The Review was initiated to assess the application of Airservices Safety Management System (SMS) to the change management of local LAHSO procedures.

3 Terms of Reference[2]

Terms of Reference for the Review were as follows:

1. Examine the safety processes and activities that were applied to assure the ongoing safety of LAHSO type operations following the development of the approved 2011 Safety Assessment Report.
2. Determine what safety processes and activities should have been applied to assure the ongoing safety of LAHSO type operations.
3. Determine any differences between what happened and what should have happened.
4. Recommend improvements that can be made to the safety change process or supporting activities that would prevent divergence from the appropriate process.

The Terms of Reference included an examination of the following:

1. Changes in ATC standards, procedures or practices since the initial safety assurance work relating to LAHSO operations in Melbourne.
2. The application of Airservices Safety Management System (SMS) in the development of the changes identified in 1.
3. Occurrence data for the period from the initial safety assurance report to 31 October 2014, detailing any ATC or pilot reports relating to the safety of LAHSO operations.
4. Assessment of changes to the risk in operations and review of the effectiveness of risk controls.
5. Communications, awareness and educational programs within Airservices and across the aviation industry regarding those changes.
6. Current assurance documentation regarding the safety of LAHSO type operations in their current form including Operational Risk Assessments (ORAs).

[2] Targeted Review of Melbourne LAHSO Safety Assurance, Safety Environment & Assurance, 5 November 2014.

4 Conduct of the Review

The Review was supported in its conduct by the cooperation of Airservices Australia Air Traffic Control - East Coast Services South, Office of Chief Air Traffic Controller and Safety Environment and Assurance.

The Review conducted interviews with Continuous Service Improvement Officers (CSIO), ATC Line Managers (ALM), Air Traffic Controllers and Check and Standardisation Supervisors (C&SS) from Melbourne Tower and Melbourne Terminal Control Unit. Interviews were also conducted with managers from Check Training and Standards, ATS Integrity and East Coast Services South.

5 Definitions

5.1 Runway selection and nomination

'Nomination' is used in the context of runway selection by an air traffic controller in both the AIP and the MATS.

The MATS states the tower controller **nominates** the runway(s) or direction to be used after coordination with approach[3]. The MATS also states the crosswind/downwind limitations for runway nomination. Refer Table 1.

Do not nominate a runway for use when:	
Runway conditions	**Wind**
Completely dry	Crosswind exceeds 20 kt[4] including gusts
	Downwind exceeds 5 kt including gusts
Not completely dry	Crosswind exceeds 20 kt including gusts
	There is a downwind component

Table 1 – Crosswind / downwind limitations for ATC runway nomination

The MATS also describes the 'Preferred Runway' as 'a runway nominated by ATC or listed in the AIP as the most suitable for the prevailing wind, surface conditions and noise sensitive areas in the proximity of the aerodrome'.

The AIP describes the conditions for the nomination of runways[5].

> ATC will nominate the runway, preferred runway or take-off direction. Where noise abatement procedures are prescribed, and ATC traffic management permits, the provisions of DAP NAP will be applied, except that ATC will not nominate a particular runway for use if an alternative runway is available (unless required by Noise Abatement legislation), when:
>
> a. the alternative runway would be preferred due to low cloud, thunderstorms and/or poor visibility;
>
> b. for runways that are completely dry:
>
> (1) the crosswind component, including gusts, exceeds 20KT;
>
> (2) the downwind component, including gusts, exceeds 5KT.
>
> c. for runways that are not completely dry:

[3] Manual of Air Traffic Services (MATS) Chapter 12.2 Runway selection, Version 28, Effective 28 May 2014

[4] Knots – kt or KT can be used interchangeably

[5] Aeronautical Information Publication (AIP) Australia, ENR 1.1-10, 13 November 2014

(3) the crosswind component, including gusts, exceeds 20KT;

(4) there is a downwind component.

d. wind shear has been reported.

Note: Notwithstanding the limitations detailed above, location specific crosswind/downwind limitations may be detailed in AIP DAP East/West NAP

There is no single definition for '**nominate**' available in the MATS, the AIP, CASA MOS Part 172 or ICAO Doc 8400.

The Macquarie Dictionary defines '**nominate**' as:

–verb (t) 1. to propose as a proper person for appointment or election to an office.

2. to appoint for a duty or office.

3. to enter (a horse, etc.) in a race.

4. Obsolete to entitle; name.

5. Obsolete to specify.

–verb (i) 6. to stand as a candidate: I'll nominate for preselection if there's a chance of winning.

–adjective / 7. having a particular name.

Nominate in the context of runway selection is a verb 'to appoint' or otherwise 'specify' the duty runway(s) or direction to be used. A controller is required to consider any limitations/conditions for nominating the duty runway(s).

The MATS requires controllers to nominate on the ATIS the runway(s) in use for arriving and departing aircraft[6]. As previously stated LAHSO is a dependant procedure involving dependent operations conducted on two intersecting runways.

5.2 LAHSO

The Civil Aviation Safety Regulations (CASR) Part 172 Manual of Standards (MOS)[7] Aeronautical Information Publication (AIP) Australia[8] and the Manual of Air Traffic Services (MATS) describe land and hold short operations (LAHSO) as a dependant procedure, with particular aircraft classified as either:

1. **active** – when an aircraft is issued a hold short requirement and is alerted about traffic on a crossing runway; or
2. **passive** – when an aircraft has unrestricted use of the full runway length and is alerted about traffic on a crossing runway.

The MOS and MATS state **active** participation is restricted to runways where the crosswind component including gusts does not exceed 20KT. The Review notes the apparent incongruence between the runway nomination criteria that are applied to all nominated runways and LAHSO procedures where the crosswind/downwind criteria are only explicitly stated for the active runway.

[6] The Manual of Air Traffic Services (MATS) Chapter 3.1.1.5 - Order of ATIS information, 1 to 9, Version 28, Effective 28 May 2014

[7] Version 1.7: January 2014

[8] Aeronautical Information Publication (AIP) Australia, ENR 1.1-59, 13 November 2014

The Review determined that the MATS, AIP and the (MOS) Part 172 did not prescribe explicit crosswind/downwind limitations for the **passive** LAHSO participant.

5.3 Ad-Hoc LAHSO

The Review determined that East Coast Services South (Melbourne Tower and TCU) used the term **'ad-hoc LAHSO'** to refer to the application of LAHSO procedures during a preferred[9] runway mode not associated with LAHSO procedures. The practice involved the off-mode crossing runway (usually the passive LAHSO participant) not being broadcast on the ATIS[10]. Additionally, the crosswind/downwind for the passive LAHSO participant could exceed the limitations for ATC runway nomination where the pilot would request/accept the runway[11].

The Review determined that there was no definition for 'ad-hoc LAHSO' in the MATS, the AIP or the CASA Manual of Standards (MOS) Part 172.

Ad-hoc LAHSO is used by Melbourne TCU to reduce Enroute holding and/or traffic complexity for TCU/Enroute and/or when using a single arriving and departing mode i.e. Runway 34 only.

Anecdotally the use of ad-hoc LAHSO has been the practice in Melbourne for in excess of 10 years. The Directorate of Safety Environment and Assurance Land and Hold Short Operations (LAHSO) Report of August 2001[12] discussed the practices being used in ad-hoc LAHSO at Melbourne.

Between 01 January 2012 and 31 October 2014, Airservices has identified 12 instances during LAHSO operations where aircraft landed in excess of the crosswind or downwind component for the ATC runway nomination criteria.

5.4 Safety Management System (SMS) requirements

In accordance with the Terms of Reference, the Review assessed the practices applied to the ongoing safety management of Melbourne LAHSO operations against the following Safety Management System (SMS) requirements.

The Safety Change Management Requirements (AA-NOS-SAF-0104)[13] defines the processes for conducting safety assessments for safety change management, including:

- The Safety Case Assessment and Reporting Determination (SCARD) must be used for changes to service levels, procedures or equipment, which will affect the performance, functional or technical specification of a system or service; and organisational changes affecting safety accountabilities.

[9] A preferred runway is a runway nominated by ATC or listed in the AIP as the most suitable for the prevailing wind, surface conditions or noise sensitive areas in the proximity of the aerodrome. Aeronautical Information Publication (AIP), GEN 2.2-20, Effective 13 November 2014

[10] Automatic Terminal Information Service (ATIS). 'The provision of current, routine information to arriving aircraft and departing aircraft by means of continuous and repetitive broadcasts' Source: The Manual of Air Traffic Services (MATS), version 30, Effective 13 November 2015.

[11] Aeronautical Information Publication (AIP) Australia, ENR 1.1-29 para 14.2, 13 November 2014.
'A pilot in command must ensure that the nominated runway or direction is operationally suitable'.

[12] Directorate of Safety and Environment Assurance Land and Hold Short Operations (LAHSO) Final Report, DSEA 71/2000, August 2001.

[13] Safety Change Management Requirements (AA-NOS-SAF-0104), Version 12, Effective 7 January 2014

- The SCARD is designed to assist users to evaluate the change proposal in order to determine what type of safety assessment and reporting is required. The SCARD must be completed at the start of a change process to ensure that the safety reporting requirements of the change are identified for all affected areas.
- The SCARD is not required to be completed where an existing SCARD applies (i.e. the change is covered within the defined scope of a change that has already undergone the SCARD process); or the change is due to scheduled or standard maintenance or administrative in nature.
- The outcome of the SCARD is the determination of the type of safety assessment and report (i.e. SCARD, Safety Statement, Safety Assessment Report or Safety Case) required in support of a change.

In addition to AA-NOS-SAF-0104, the National Request for Change (NRFC) Procedures Manual (C-PROC0138) states that:

- When no SCARD is required, the NRFC must record a statement regarding safety.
- If a SCARD is required, the SCARD documentation must be completed as per Safety Change Management Requirements (AA-NOS-SAF-0104). For all Safety Management System documents a Safety Statement must be completed.
- If a Safety Assessment Report or Safety Case is required, the RFC is directed to Safety Management and the Business Unit Manager for review.

The NRFC procedure requires a Safety Environment Finance and Training (SEFT) assessment to be completed for each change. Where a SCARD is not required a safety statement is required to be included.

6 Melbourne Tower/TCU LAHSO practices and application

LAHSO procedures and practices at Melbourne are applied using both published high capacity landing (LAHSO) runway modes[14] (27/34 and 34/09) and other published landing and take-off runway modes.

6.1 High capacity landing (LAHSO) runway modes

The AIP states that high capacity runway modes may be used during peak arrival periods when significant airborne delays would otherwise occur as defined in the Melbourne Departure and Approach Procedures (DAP) Noise Abatement Procedures[15]. Refer Appendix A.

[14] Runway modes are defined in the Aeronautical Information Publication (AIP), Departure and Approach Procedures (DAP), Melbourne Noise Abatement Procedures and reflected in local instructions to guide the selection of a preferred runway.

[15] Aeronautical Information Publication (AIP), Departure and Approach Procedures (DAP), Melbourne Noise Abatement Procedures, Effective 17 November 2011.

When operating in these modes the Review concluded that the procedures for LAHSO were consistently applied including:

- Runway nomination in accordance with the provisions of AIP with the crosswind component, including gusts, not exceeding 20KT[16].
- Runway nomination for active participation in accordance with the provisions of the MATS was restricted to runways where a crosswind component, including gusts, not exceeding 20kt[17].
- Alerting aircraft that LAHSO was in progress by notification on the ATIS or by directed advice, prior to transfer to tower, where ATIS was not serviceable[18].

6.2 Other published landing and take-off runway modes.

Other published landing and take-off runway modes are those modes not published for LAHSO. Refer Appendix A.

When operating in these modes the procedures for LAHSO were applied on an ad-hoc basis (ad-hoc LAHSO). This practice was to reduce airborne delays.

Where the crossing runway for the passive participant did not meet the criteria for ATC runway nomination the practice was that the pilot (passive participant) could accept or request the runway with a crosswind/downwind exceeding the nomination criteria. Additionally, controllers did not broadcast the crossing runway on the ATIS.

The practices and circumstances pertaining to the use of adhoc LAHSO at Melbourne include:

- Runway 27 nominated as preferred mode with adhoc LAHSO on Runway 34; and
- Runway 34 nominated as preferred mode with adhoc LAHSO on Runways 09 and/or 27.

6.2.1 Runway 27 nominated as preferred mode with ad-hoc LAHSO on Runway 34

With aircraft arrivals to runway 27 and where there is a benefit in reducing controller (TCU and ENR) workload and/or there are demand efficiency benefits, an aircraft might be placed on runway 34 with the expectation to land and hold short of runway 27. This reduces delays with other aircraft and Melbourne Tower and TCU would not be required to change airspace configurations[19]. Refer Figure 1. Note: The pilot may also request a change to a runway if they consider it is more suitable.

[16] Aeronautical Information Publication (AIP),ENR 1.1-10, 4.5 - Nomination of Runways, 13 November 2011

[17] The Manual of Air Traffic Services (MATS), Chapter 10.9.5.9 Conditions, Version 30, Effective 13 November 2014

[18] The Manual of Air Traffic Services (MATS),Chapter 10.9.5.10 Responsibilities, Version 30, Effective 13 November 2014

[19] Airspace configurations relate to the airspace boundaries between individual controller's areas of responsibility. In the TCU these are dependent on the runway configuration in use and in the Melbourne TCU must also take into account the runway in use at Essendon

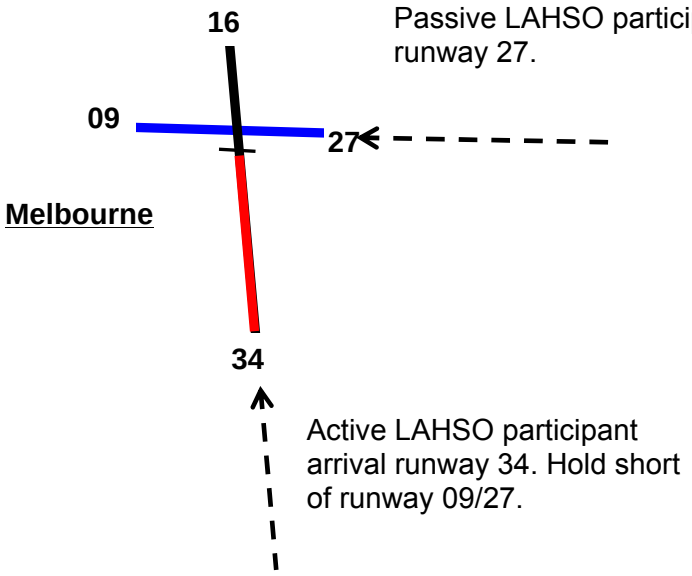


Figure 1 – Aircraft arrival runway 27 with ad-hoc LAHSO arrivals on runway 34.

In this scenario both runways meet the ATC runway nomination criteria as runway 27 is the nominated runway on the ATIS and runway 34 is the nominated runway for the active LAHSO participant.

Runway 27 and LAHSO IN PROGRESS is broadcast on the ATIS and the participating aircraft would be processed using LAHSO procedures by the Melbourne Tower. Below are examples of the information broadcast on the ATIS.

> RWY: 27 FOR ARR, RWY 34 FOR DEP N E, RWY 27 FOR ALL OTHER DEP.
> OPR INFO: LAHSO IN PROGRESS
>
> RWY: 27
> OPR INFO: LAHSO IN PROGRESS
>
> RWY: 27
> OPR INFO: LAHSO IN PROGRESS.
> RUNWAY 3 4 AVAILABLE TO DEPARTURES TO THE NORTH EAST ON REQUEST.

The Melbourne TCU Traffic Manager (TAC) would approve any ad-hoc use of LAHSO in accordance with the responsibility for overseeing traffic management within the TCU and liaising with Melbourne and Essendon towers to ensure optimum runway selection maximises capacity[20].

[20] Melbourne TCU Local Instructions (ATS-PROC-0047), Chapter 15-1-3 Primary Objectives, Version 56, Effective 29 May 2014.

6.2.2 Runway 34 nominated as preferred mode with ad-hoc LAHSO on Runways 09 and/or 27

With aircraft arrivals to runway 34 and where there is benefit in reducing controller (TCU and ENR) workload and/or there are demand efficiency benefits, an aircraft might be placed on the crossing runway as a passive LAHSO participant. A pilot may be offered a landing to runway 09 or 27. In this scenario, the pilot would be offered the option to land on runway 09 or 27 with the pilot accepting that the runway exceeds the ATC runway nomination limitations for crosswind/downwind. Refer Figures 2 and 3. Note: The pilot may also request a change to a runway if they consider it is more suitable.

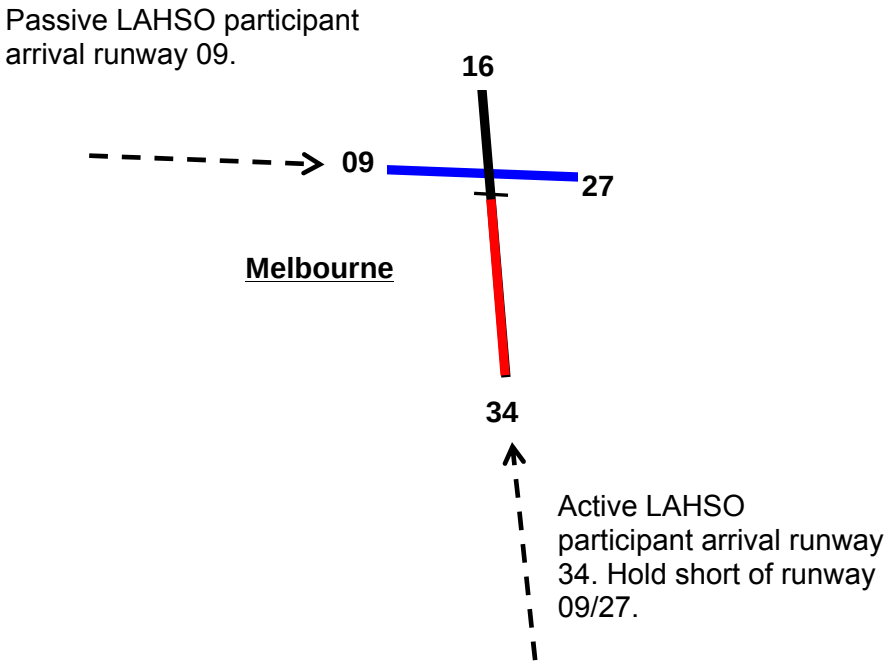


Figure 2 – Aircraft arrival runway 34 with ad-hoc LAHSO arrivals on runway 09.

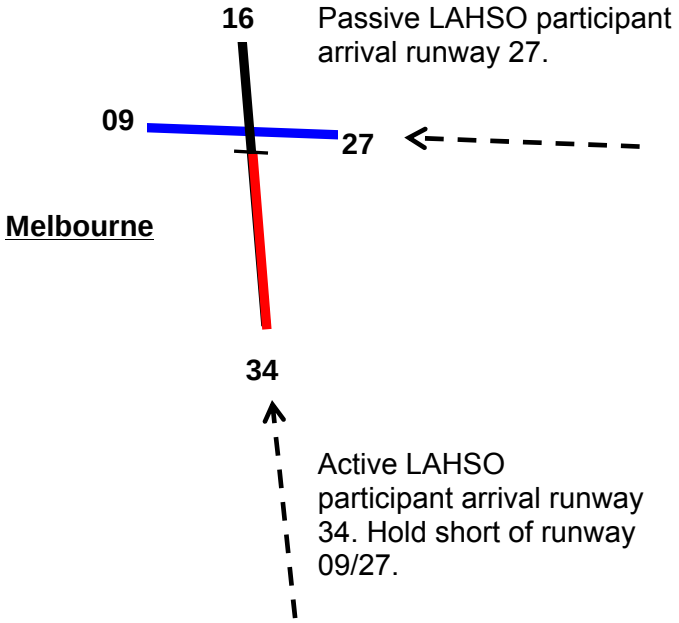


Figure 3 – Aircraft arrival runway 34 with ad-hoc LAHSO arrivals on runway 27.

In these scenarios runway 34 met the ATC runway nomination criteria however runway 09 and 27 may or may not have met the criteria for the passive LAHSO participant. Below is a de-identified example of the communications between ATC and the pilot regarding runway 09 where the crosswind is in excess of the ATC runway nomination criteria. Note: Aircraft callsign de-identified.

ATC *ABC123 we've just been offered runway zero nine for you but it would remove a current sixteen minute delay, there is a maximum crosswind of thirty knots with no downwind. Let me know if you can take that.*

Pilot *We can take runway zero nine and we're ready for the STAR*

Runway 34 and LAHSO IN PROGRESS is broadcast on the ATIS and the participating aircraft would be processed using LAHSO procedures by the Melbourne Tower. Below are examples of the information broadcast on the ATIS.

RWY: 34
OPR INFO: LAHSO IN PROGRESS

RWY: 34.
OPR INFO: RWY 09 AVBL FOR ARRIVING AIRCRAFT ON REQUEST. LAHSO IN PROGRESS.

The Melbourne TAC would approve any ad-hoc use of LAHSO in accordance with the responsibility for overseeing traffic management within the TCU and liaising with Melbourne and Essendon towers to ensure optimum runway selection maximises capacity.

There are additional traffic management considerations when processing ad-hoc LAHSO aircraft arrivals on runway 09 or 27 because of the proximity of Essendon runway 35. Coordination is required with Essendon Tower with regard to departures from Essendon runway 35 in potential conflict with an aircraft arrival on runway 27 or a go-around on runway 09. Refer Figures 4 and 5. Due to the nature of the potential conflicts, the ad-hoc use of runway 27 for LAHSO is a rarely used procedure whilst the ad-hoc use of runway 09 was more prevalent.

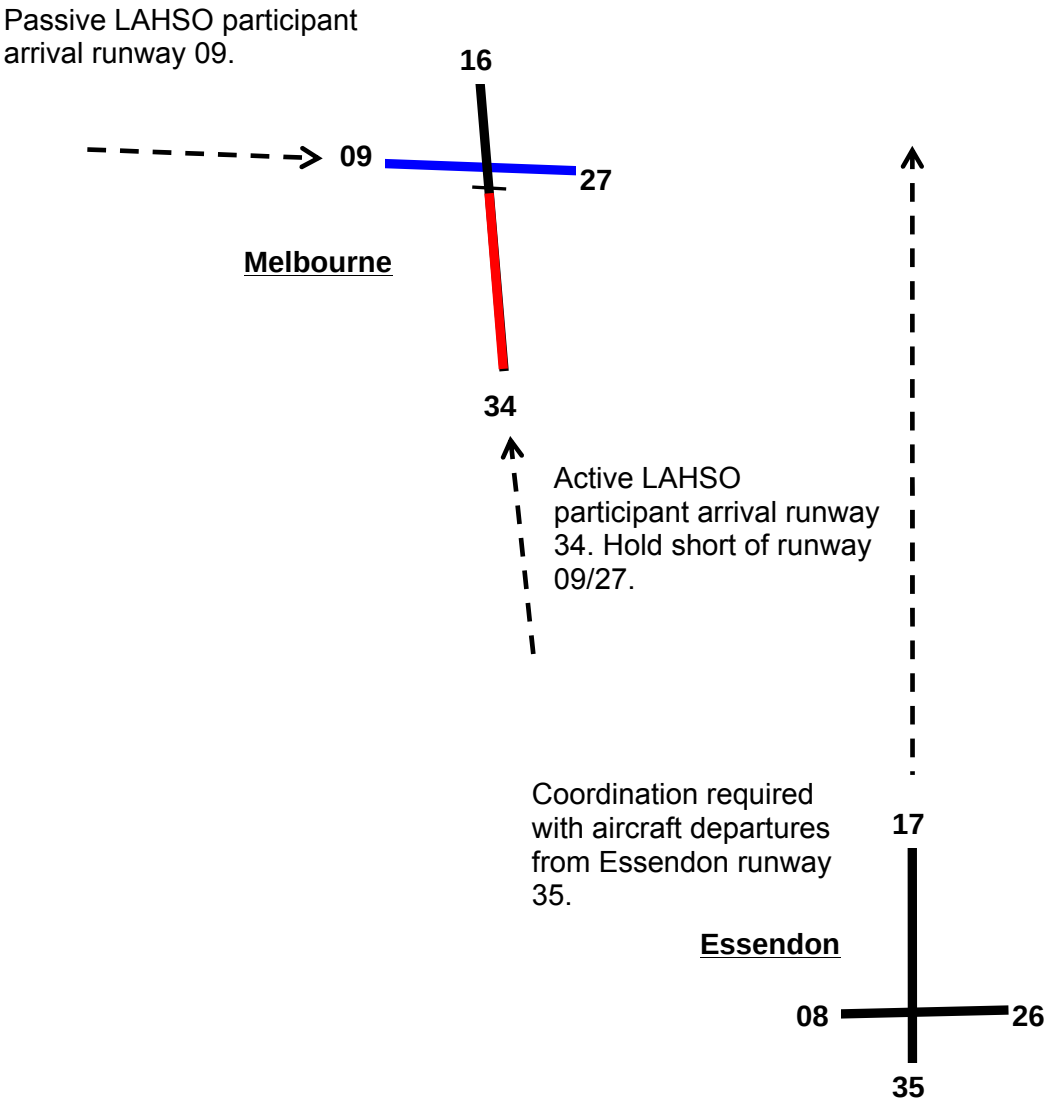


Figure 4 – Aircraft arrivals runway 34 with ad-hoc LAHSO arrivals on runway 09. Essendon aircraft departures runway 35.

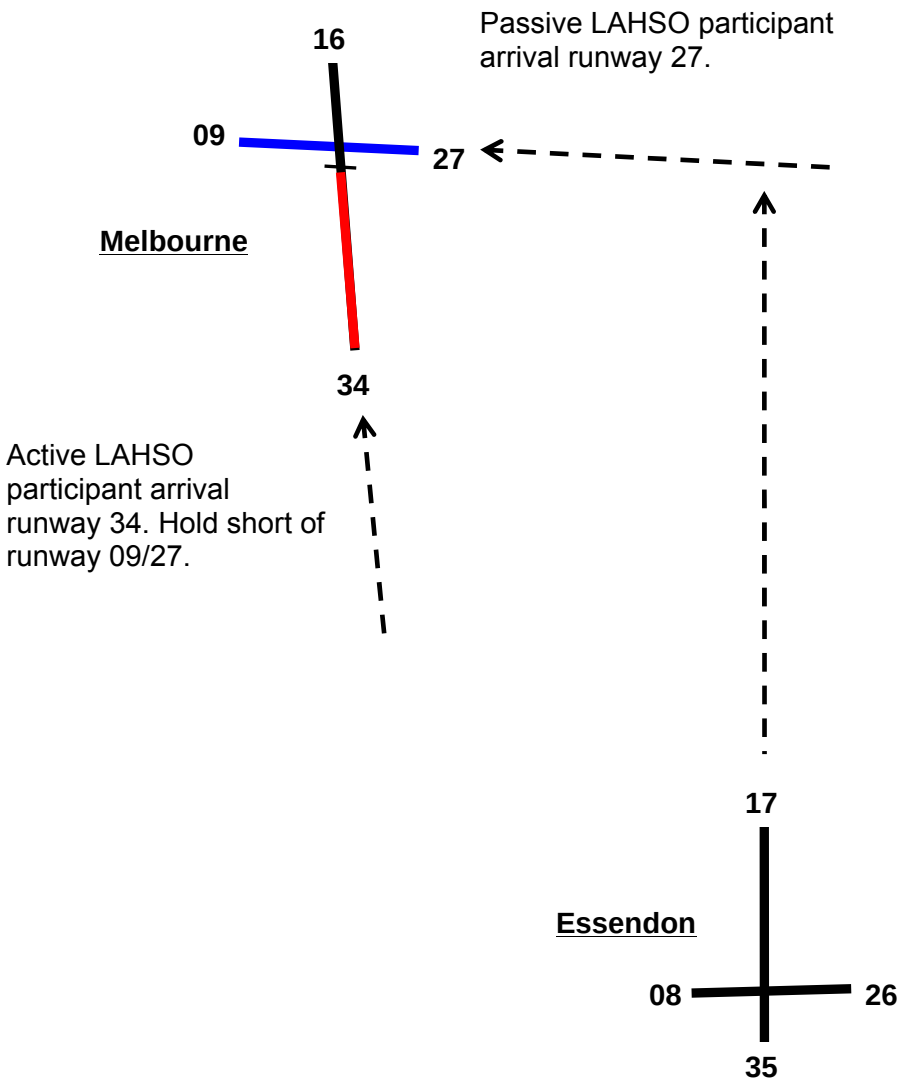


Figure 5 – Aircraft arrivals runway 34 with ad-hoc LAHSO arrivals on runway 27. Essendon aircraft departures runway 35.

7 Consideration of the Review Terms of Reference

1. Examine the safety processes and activities that were applied to assure the ongoing safety of LAHSO type operations following the development of the approved 2011 Safety Assessment Report.

2. Determine what safety processes and activities should have been applied to assure the ongoing safety of LAHSO type operations.

3. Determine any differences between what happened and what should have happened.

7.1 LAHSO procedures/practices (Prior to 2011)

LAHSO procedures and practices at Melbourne prior to 2011 were applied using both published high capacity landing (LAHSO) runway modes (27/34 and 34/09) and other published landing and take-off runway modes[21]. Refer Appendix A.

The practice when using ad-hoc LAHSO was that aircraft were not alerted that LAHSO was in progress by notification on the ATIS. The MATS however defined the following requirement when LAHSO was in progress[22].

> Alert aircraft that LAHSO are in progress by notification on the ATIS/CATIS/ DATIS or by directed advice, prior to transfer to tower, where ATIS/CATIS/ DATIS is not serviceable.

7.1.1 New Melbourne Tower construction and runway 34/09 LAHSO mode removal

In October 2010 the National Towers Program (NTP)[23] identified a hazard with the new Melbourne Control Tower obstructing lines of sight from the existing control tower on runway 27/09. The program identified a risk control that included not allowing runway 34/09 land and hold short operations [LAHSO].

To implement the risk control, the operational use of LAHSO on runways 34/09 (including ad-hoc practices) was removed initially via a Temporary Local Instruction (TLI)[24] issued on 5 November 2010. This TLI stated that arrival rates for runway 34/09 LAHSO were not available due to the obstruction created by the new Melbourne Tower affecting the lines of sight on runway 27 departures and 09 arrivals. Refer Appendix B.

[21] Aeronautical Information Publication (AIP), Melbourne Noise Abatement Procedures, MMLNA01-129, 17 November 2011.

[22] The Manual of Air Traffic Services (MATS),Chapter 10.9.5.10 - Responsibilities, Version 30, Effective 13 November 2014

[23] National Towers Program Melbourne Control Tower Site Determination Safety Case, SAF-SC-09011, Effective 29 September 2009

[24] Temporary Local Instruction (TLI_10_0340)

There were a further seven temporary local instructions[25] issued before the Letter of Agreement (LoA_542)[26] Melbourne Area Operational Procedures was issued on 22 December 2011 to indicate that the arrival rates for runway 34/09 LAHSO were 'not available' (N/A).

Although runway 27/34 LAHSO remained available, ad-hoc operations were subject to operational constraints and thus the use of ad-hoc LAHSO effectively ceased with the removal of runway 34/09 LAHSO.

7.1.2 Safety Assessment of the change (removal of runway 34/09 LAHSO mode)

The Safety Change Management Requirements (AA-NOS-SAF-0104) states that a SCARD is not required where the change is covered within the defined scope of a change that has already undergone the SCARD process. The National Towers Program had prepared both a CASR Part 171 and Part 172 SCARD which determined the requirement to develop a safety case. The scope of the safety case was to determine the siting requirements for the new Tower consistent with applicable safety and regulatory requirements.

The safety case had identified a hazard associated with obstructed lines of sight from the existing control tower whereby the removal of the published high capacity landing (LAHSO) runway mode (34/09) was identified as a risk control. The implementation of the risk control was not within the defined scope of the safety case and therefore was not assessed including the safety impact of the implementation of the risk control on the TCU, Tower or Enroute operational environment.

The removal of the published high capacity landing (LAHSO) runway mode (34/09), however, comprised a change to procedures that affected the performance of service delivery at Melbourne including increased periods of complexity for TCU and Enroute controllers, reduced runway mode flexibility and reduced arrival rates.

The assessment of the change required consideration of the significance of the change both within Airservices and industry including the operational safety impact. The implementation of the risk control, to remove the published high capacity landing (LAHSO) runway mode (34/09), was not within the defined scope of the change for the National Towers Program and therefore required the preparation of a separate SCARD.

The removal of the published high capacity landing (LAHSO) runway mode (34/09) including ad-hoc practices was accompanied by the preparation of a Safety Environment Finance and Training (SEFT)[27] form.

The SEFT referenced the Melbourne Tower Site Determination Safety Case where the risk control "do not allow 34/09 LAHSO" was identified[28] and did not detail any further safety assessment.

[25] Temporary Local Instructions (TLI_10_0360, TLI_10_0371, TLI_11_091, TLI_11_0246, TLI_11_0300, TLI_11_0301, TLI_11_0366)

[26] National Request for Change (NRFC) 18250, 16 December 2011. Letter of Agreement (LoA_542) Melbourne Area Operational Procedures, Version 23, Effective 22 December 2011.

[27] The National Request For Change (NRFC) Procedures Manual (C-PROC0138) requires a Safety Environment Finance Training (SEFT) assessment is completed.

All changes to operational procedures are subject to a Request for Change (RFC) process which ensures changes are endorsed and approved by staff with the appropriate delegated safety responsibilities and accountabilities.

The NRFC Procedures Manual (C-PROC0138)[29] describes the workflow and responsibilities for those staff involved in the process. A responsibility defined in the manual includes a 'Safety Coordinator' with the responsibility to ensure safety assessments are completed and recorded in accordance with Safety Change Management Requirements (AA-NOS-SAF-0104).

Following the assessment by the Safety Coordinator, the Business Unit Manager is required to review the safety assessment made by the Safety Coordinator where the Authoriser accepts that the appropriate safety and risk management processes have been fulfilled as per AA-NOS-SAF-0104.

The safety statement contained in the SEFT form incorrectly referenced the NTP safety case as evidence supporting a safety assessment for the removal of the published high capacity landing (LAHSO) runway mode (34/09). The inconsistency with the application of AA-NOS-SAF-0104 was not identified by either the Safety Coordinator or the Business Unit Manager.

Finding 1 The Review determined that the removal of runway 34/09 LAHSO mode warranted the use of the Safety Case and Reporting Determination (SCARD) process to make an assessment of the safety impact on the TCU, Tower and Enroute. The change affected the performance of service delivery at Melbourne including additional complexity for TCU and Enroute controllers, reduced runway mode flexibility and reduced arrival rates. When the performance of service delivery is affected, a SCARD is required under the Safety Change Management Requirements (AA-NOS-SAF-0104). The SCARD process was not followed to make this assessment.

7.2 LAHSO procedures/practices (December 2011 – May 2014)

7.2.1 CASA Melbourne LAHSO operational surveillance

In 2012 CASA completed a Melbourne LAHSO Operational Surveillance of Melbourne Tower. Following the surveillance activities CASA raised the following observation to Airservices on 02 February 2012.

> 'CASA was advised anecdotally that local practices included ad hoc LAHSO operations[30], on an opportunity basis, without LAHSO being notified on the ATIS. The MATS/Part172 MOS requirement stated that ATC must "alert aircraft that LAHSO operations are in progress by notification on the ATIS".
>
> This local procedure should be formalised including documenting co-ordination to the TWR and for activation of LAHSO lighting[31].'

[28] National Request For Change (NRFC) #15188, Safety Environment Finance Training (SEFT) #NRFC-63162, 04 November 2010.

[29] NRFC Procedures Manual (C-PROC0138), Version 10, Effective 24 January 2014.

[30] Although the use of ad-hoc LAHSO practices had effectively ceased, ATC applied the practice to runway 27/34 once during calendar 2012.

[31] CASA Melbourne LAHSO Operational Surveillance (2012 – 1201). Observation 1201-02 (SAIR ATC-1769). 02 February 2012

In response, ATC Continuous Service Improvement (CSI)[32] issued a Standardisation Directive – *LAHSO Requirements*[33] on 13 March 2012 communicating to controllers the application, requirements and responsibilities associated with the use of LAHSO. Refer Appendix C.

The purpose of the directive was to ensure controllers understood the requirement to broadcast LAHSO operations in progress on the ATIS when using LAHSO on an ad-hoc basis.

The following statement was contained within the directive.

> 'Controllers are reminded that the application, requirements and responsibilities for the use of LAHSO must be adhered to and as such ad-hoc LAHSO operations are not permitted.'

Of note is the statement '…as such ad-hoc LAHSO operations are not permitted'. The Review clarified with the author of the directive that the intent of the statement was that LAHSO was not permitted unless the operations were broadcast on the ATIS. This reflected the authors' understanding that LAHSO was not broadcast on the ATIS when ad-hoc LAHSO was in operation.

CASA had not observed the practices associated with ad-hoc LAHSO where the crosswind/downwind for the passive LAHSO participant could exceed the limitations for ATC runway nomination. Safety Environment and Assurance ATS Integrity[34] and ATC CSI were also not aware nor had observed these practices.

The Review determined there was not a shared understanding of the practices associated with ad-hoc LAHSO at Melbourne. This included that the crosswind/downwind for the specific runway for the passive LAHSO participant could exceed the limitations for ATC runway nomination and that the specific runway was not broadcast on the ATIS.

The action to address the CASA observation was therefore limited to reiterating to controllers the MOS Part 172 and MATS requirements for LAHSO to be broadcast on the ATIS. The directive did not explicitly state that the ATIS needed to include a specific passive runway.

Finding 2 The Review determined there was not a shared understanding of the requirements associated with LAHSO procedures and the use of off-mode runways. This included that the crosswind/downwind for the specific runway for the passive LAHSO participant could exceed the limitations for ATC runway nomination and that the specific runway was not broadcast on the ATIS.

7.2.2 LAHSO and CROPS All Phases Safety Assessment Report

In 2012 the Executive General Manager of Safety and Assurance, in consultation with the Executive General Manager of Air Traffic Control, commissioned a review to ensure that the level of risk associated with current Converging Runway

[32] Check, Training and Standards (formerly CSI) provides identification and delivery of service improvement requirements for the strategic direction and delivery of Air Traffic Management (ATM) Services, and to ensure the integrity of the national airways system in an efficient manner.

[33] Standardisation Directive 12_0038 – LAHSO Requirements valid from 13 March 2012 to 07 June 2012. (NRFC #18796)

[34] ATS Integrity (ATSI) sets, validates and maintains the standards and practices contained in the Manual of Air Traffic Services (MATS) while ensuring compliance with CASR Part 172, including the Manual of Standards (MOS), and the relevant ICAO standards and recommended practices.

Operations (CROPS) and LAHSO procedures was within the acceptable As Low As Reasonably Practicable (ALARP) region.

As part of the review, a Safety Assessment Report (SAR) was prepared. The purpose of the SAR was to collate and review past safety assurance assessments, evaluate the effectiveness of existing controls and identify any new hazards or controls to support ongoing LAHSO and CROPS. The SAR was unique in that it was not prepared to support a proposed change to services levels, procedures or equipment as per AA-NOS-SAF-0104. The SAR concluded that the overall risk associated with the current LAHSO procedures was within the ALARP tolerable range as defined in the Safety Risk Management Procedures (AA-PROC-SAF-0105).

The SAR also identified the opportunity to implement a number of additional controls to further reduce the overall risk associated with current LAHSO procedures.

7.2.2.1 LAHSO Hazard Identification Workshops[35]

In the preparation of the SAR both internal and external hazard identification workshops were conducted. The workshops were facilitated by Safety and Assurance Project Safety Services.

7.2.2.1.1 Internal (Airservices) hazard identification workshop

An internal (Airservices) hazard identification workshop was conducted on 01 February 2012 with representatives from Melbourne Tower, TCU, ATC (CSI) and ATS Integrity.

The objective of the workshop was described as:

> 'The aim of the workshop is to conduct a review of the current LAHSO procedures and identify any hazards as well as any current controls / mitigations that will manage the identified hazards.'

At the time the runway 34/09 LAHSO mode was not a current procedure as the arrival rates for runway 34/09 LAHSO were removed from the Letter of Agreement (LoA_542) Melbourne Area Operational Procedures on 22 December 2011. The runway 34/09 LAHSO mode is the predominant LAHSO mode at Melbourne due to the airspace constraints when using runway 34/27 LAHSO (including ad-hoc) modes. Refer Section 6 - Melbourne Tower/TCU LAHSO Practices and Application.

While the stated objective of the workshop was to assess current LAHSO procedures, runway 34/09 LAHSO procedures and practices (including ad-hoc) had only been removed until ATC relocated to the new Melbourne control tower.

The result of only assessing current procedures was that no analysis was undertaken of 34/09 LAHSO procedures and therefore any differences in practices or inconsistencies with the application of LAHSO procedures including (ad-hoc LAHSO) were not identified.

[35] Airservices Australia Land and Hold Short operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009) Version 1.0, 19 November 2012.

The analysis technique employed for the hazard workshop was a HAZid[36]. The minutes for the workshop stated that there was consideration given to Weather Conditions, Runway Facilities, Rejected Landings, Responsibility of Separation, Pilot Compliance and Training[37].

The methodology employed for the hazard identification workshop, using free form brainstorming and selected scenarios, did not identify and assess all potential failure modes associated with LAHSO procedures and practices.

Finding 3 The Review concluded that the hazard identification workshops conducted to support the LAHSO and CROPS Safety Assessment Report (SAR), did not identify and assess all LAHSO modes of operation and associated procedures and practices. Runway 34/09 LAHSO mode had been temporarily removed due to the National Towers project and was therefore not included in the scope of Safety Assessment Report.

The minutes recorded the following discussion associated with crosswind components including wind gusts not exceeding 20kt.

- The procedures in MATS state that the crosswind on the active runway must not exceed 20kts, there is no mention regarding the maximum crosswind on the passive runway. Question was asked from Adelaide 'What happens if an aircraft requests a LAHSO clearance and the crosswind on the passive runway is greater than 20kts?
- Action 3: A separate body of work needs to be created to address the review of procedures and to establish an agreed resolution to the issue raised between ATS integrity and Adelaide Tower controllers.
- For crosswinds on the active runway not exceeding 20kts the workshop considered this not to be a safety issue.

Action 3 was subsequently transferred and recorded in the Safety Assessment Report 'Action Tacker'[38] and closed with the following justification.

> 'Action has been closed as a directive has been raised to address the identified issues. Directive can be found: HO_CBO_2189277.'

The Standardisation Directive[33] referred to in the action above was the existing directive issued for the CASA observation regarding the notification of LAHSO on the ATIS.

The Review understands ATS Integrity considered that the standardisation directive provided sufficient direction as to the application, requirements and responsibilities associated with the use of LAHSO.

[36] Safety Risk Management Tool and Techniques (AA-GUIDE-SAF-0105C), Version 4.0, Effective 14 February 2012.

'The purpose of a HAZid technique is to identify hazards based on the interaction of various jobs, tasks and activities in a real field setting. HAZid is a workshop-based technique that is followed in two stages; the first step is freeform brainstorming of hazards asking questions such as "What can go wrong?" and "What if...?" Once a list of hazards has been generated the second step is to cross check (using checklist) to make sure that all relevant issues have been considered. The checklist should not be used directly to generate a list of hazards'

[37] Airservices Australia Safety Workshops – Internal Land and Hold Short Operations (LAHSO) Hazard Identification (HAZID) – Meeting Minutes, 01 February 2012.

[38] Airservices Australia Land and Hold Short operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009) – Action Tracker (HO_CB0-2197613) Version 1.0, 19 November 2012

However, this was based on a misunderstanding of Melbourne LAHSO practice and therefore the directive was not prescriptive in regard to the nomination of the passive runway on the ATIS. As a result, the directive did not ensure a consistent understanding of the requirements for passive participation including crosswind limitations on the runway.

Finding 4 The Review determined the action taken, arising from the LAHSO and CROPS Safety Assessment Report (SAR) hazard workshop, did not sufficiently clarify the maximum crosswind component for the passive LAHSO participant. The use of the extant Standardisation Directive (ATS_DIR_0038) was outside the original purpose of the directive to ensure LAHSO was broadcast on the ATIS when ad-hoc LAHSO was in operation.

7.2.2.1.2 External (Industry) hazard identification workshop

An external (industry) Hazard identification workshop was held on 08 February 2012 with representatives from Airlines, Melbourne Tower and ATS Integrity. The workshop was facilitated by Safety and Assurance Project Safety Services and followed a similar format to the internal hazard identification workshop. The objective of the workshop was the same as that stated for the internal workshop.

The minutes of the workshop did not record any discussion regarding the application of ad-hoc LAHSO at Melbourne.

7.3 LAHSO procedures/practices (May 2014 – November 2014)

7.3.1 Runway 34/09 LAHSO mode reintroduction

Following the relocation to the new Melbourne control tower and after a period of ATC consolidation, East Coast Services South determined there were no barriers to prevent reintroduction of runway 34/09 LAHSO procedures.

The Review notes the minutes from the Melbourne Airport Capacity Enhancement (ACE) meeting on 23 July 2014 and the following statement from an industry representative.

> 'More flexibility for off mode operations is requested by all airlines. MATS/AIP may preclude the nomination of a runway but this runway can still be operationally suitable and acceptable to the flight crew. All airlines present indicated 30 knots of cross wind is usually acceptable.'

On 29 May 2014 the Letter of Agreement (LoA_3348) Operational Procedure – Melbourne TCU and Melbourne Tower[39] reintroduced the arrival spacing for runway 34/09 LAHSO. Refer Appendix D.

The change to reintroduce runway 34/09 LAHSO was proposed by the Melbourne TCU. The supporting SEFT[40] stated that the change presented minimal or no safety issues because the change was considered a '*clarification of conditions currently assessed for arrival spacing and reintroduction of runway 34 & 09 as an*

[39] Letter of Agreement (LoA_3348) Operational Procedures – Melbourne TCU and Melbourne Tower, Version 4, Effective 29 May 2014. Note: LoA_3348 replaced LoA_542. (NRFC #25363)

[40] National Request For Change (NRFC) #25363, Safety Environment Finance Training (SEFT) #NRFC-123490, 13 May 2014.

airspace mode'. Melbourne Tower determined no training was required for the reintroduction. Applicable operational documentation was distributed to controllers.

The reintroduction of the published high capacity landing (LAHSO) runway mode (34/09), including ad-hoc practices, comprised a change to procedures that affected the performance of service delivery at Melbourne. This included changes to the complexity for TCU and Enroute controllers, runway mode flexibility and arrival rates with potential associated demand efficiency benefits for industry.

As such, the change required the use of a SCARD to assess the significance of the change and determine the appropriate supporting safety assessment.

The safety statement contained in the SEFT did not provide sufficient evidence to demonstrate that safety had been appropriately considered to support the conclusion that the change represented minimal or no safety issues.

While statements from the Melbourne TCU suggest that the reintroduction of runway 34/09 LAHSO mode was considered an overall net safety benefit for controllers, statements from the Melbourne Tower suggests the reintroduction represented an increase in complexity for Melbourne Tower controllers.

Finding 5 The Review determined that the reintroduction of runway 34/09 LAHSO mode warranted the use of the SCARD process in accordance with the Safety Change Management Requirements (AA-NOS-SAF-0104) as the reintroduction comprised a change to procedures that affected the performance of service delivery at Melbourne.

On 30 May 2014, following the reintroduction of runway 34/09 LAHSO, an Integrated Tower Automation Suite (INTAS) Human Machine Interface (HMI) issue arose where selection of 34/09 LAHSO as the runway mode in the Tower Data Management (TDM)[41] resulted in a number of incorrect Flight Data Element (FDE)[42] validation messages[43]. These restricted controller ability to manipulate the effected FDE, and prohibited clearance on the appropriate Standard Instrument Departure (SID). Consequently, on 7 July 2014 a TLI[44] was issued suspending 34/09 LAHSO being nominated as the runway mode. Refer Appendix E. This TLI instructed controllers that there was no restriction to ad-hoc use of LAHSO when runway 34 Arrivals/Departures (34 A/D) was the nominated runway mode.

Another TLI[45] was issued extending the suspension of 34/09 LAHSO continuing to advise that there was no restriction to ad-hoc use of LAHSO when runway 34 A/D was the nominated runway mode.

Following the reintroduction of the runway 34/09 LAHSO procedures Melbourne Tower were conducting ad-hoc runway 34/09 LAHSO where the crossing runway (for the passive participant) was not broadcast on the ATIS and the crosswind/downwind for the passive participant could exceed the limitations for ATC runway nomination.

[41] INTAS Tower Data Management (TDM) is used to display and manipulate flight data at, and between, Tower roles and between the Tower and external sites.
[42] INTAS Flight Data Entry (FDE) – Flight data entry / Electronic strips
[43] Airways System Issues Database (ASID) #76271 'Incorrect HMI for CWS5 SID during R34/09 LAHSO' 30 May 2014
[44] TLI_14_0180
[45] TLI_14_0254

7.3.1.1 Concerns expressed about ad-hoc LAHSO

Following the reintroduction of runway 34/09 LAHSO on 29 May 2014 Melbourne Tower controllers raised concerns with Melbourne Tower ATC Line Management regarding the ad-hoc LAHSO procedures. There was concern that they were conducting ad-hoc LAHSO procedures with a crosswind/downwind component on the specific runway used by the passive participant when the limitations for ATC runway nomination exceeded the criteria as required in the Manual of Air Traffic Services (MATS) [46].

The Melbourne Tower ATC Line Manager initially deferred to the SAR for evidence of an assessment of ad-hoc runway 34/09 LAHSO. The SAR did not provide the manager with adequate information to make an assessment of ad-hoc runway 34/09 LAHSO practices.

On 27 June 2014 the Melbourne Tower ATC Line Manager holding the Melbourne Tower procedures portfolio and the Melbourne Tower Check and Standardisation Supervisor (C&SS) sought clarification from the ATC Continuous Service Improvement Officer (CSIO)[47] (Radar Towers) regarding the conduct of ad-hoc runway 34/09 LAHSO. The clarification sought was in relation to the situation when only the active participant runway is nominated on the ATIS in conditions when the crosswind/downwind exceeded ATC limitations for nominating the passive participant runway. Specifically a question was asked about the level of risk associated with passive participation in these conditions.

The initial CSIO response indicated that when only the active participant runway was nominated on the ATIS the runway for the passive participant was also inherently nominated although not broadcast on the ATIS. The CSIO indicated that there was no rule to preclude the ad-hoc use of LAHSO. The Review notes that the MATS, AIP and the MOS Part 172 did not prescribe explicit crosswind/downwind limitations for the passive LAHSO participant.

The CSIO consulted with the CSIO (TMA) and they collectively determined that both the CASA MOS Part 172 and MATS did not preclude the ad-hoc use of LAHSO in these conditions and that ATS Integrity would be consulted. However, as the custodian of the rule set, ATS Integrity should have been consulted on this rule set [MATS] determination.

On 16 July 2014 the Melbourne Tower C&SS sought agreement from both the Radar Towers and TMA CSIOs to email the following information regarding the use of ad-hoc LAHSO procedures.

> 'Adhoc RWY09/34 LAHSO is permissible when the crosswind and downwind component for the PASSIVE runway exceed the criteria for nominating a duty runway.
>
> When LAHSO is annotated in the Operational Information of the DATIS, this implies that the ACTIVE Runway meets the criteria for conducting ACTIVE LAHSO and that it may be required if an arrival is landing on the PASSIVE runway. The criteria for LAHSO only has one wind restraint on the PASSIVE participant which is wind shear greater than light which prohibits LAHSO all together (MATS 10.9.5.9.6).

[46] Manual of Air Traffic Services (MATS) – Runway Selection, Version 28, 28 May 2014

[47] Continuous Service Improvement Officers (CSIO) provide input into a program that ensures standardisation across ATC that eliminates counterproductive variation in work practises. The CSIO also supports the change management program of work with Subject Matter Expert input.

> For LAHSO to be utilised, whether the configuration is nominated or not, LAHSO must be advertised on the DATIS. When RWY34 only and LAHSO are advertised, you have not specified another arrival runway. All this does is allow TCU to make available the option of using either RWY27 or RWY09 for PASSIVE LAHSO provided the Tower is informed and the PASSIVE participant accepts the conditions. When you do this ensure the pilots electing to land PASSIVELY have the correct wind components.
>
> After reading through the LAHSO Safety Assessment Report, emphasis was made in ensuring the ACTIVE participants are stable on approach and reducing the likelihood of them conducting a missed approach.
>
> There is no formalised documentation required as MATS, AIP and our LOA stipulate all these conditions. Here are some references which you may want to view before sending a response:
>
> MATS 10.9.5 LAHSO
> MATS 12.2 Runway Selection
> SAF-SAR-12009 Safety Assessment Report
> AIP ENR 1.1 par 29.'

On 23 July 2014 the CSIO (Radar Towers) made a determination endorsing the Melbourne Tower C&SS intended interpretation of the rule set [MATS and AIP] regarding ad-hoc LAHSO with one inclusion that the passive LAHSO participant 'accepts' the conditions.

The approval authority for MATS was delegated at the time to the ATS Integrity Manager though the Instrument of Authorisation SEA 001/14[48].

The ATC Group Documentation Procedures (ATS-PROC-0039) states a Directive (DIR) [49] contains authoritative direction or communication required to standardise or improve the overall efficiency of service delivery. A DIR is categorised as either Standardisation or System. The criteria for assisting with the decision to issue a DIR includes any requirement to provide clarification or interpretation of MATS or national level procedures.

The clarification and interpretation of MATS and AIP required by Melbourne Tower is consistent with the criteria for use of a DIR. When the interpretation of MATS and AIP was endorsed by the Continuous Service Improvement Officer (Radar Towers) a DIR was the appropriate mechanism in which to promulgate the ruling to controllers. Issuing a DIR would have required the use of NRFC and the required application of the safety management system.

The use of NRFC would have required additional consideration by subject matter experts and greater level of transparency of the determination. However the clarification and interpretation was promulgated to Melbourne Tower controllers using email.

Finding 6 The Review found the determination regarding the intent and interpretation of the LAHSO procedures for runway nomination in MATS (including the MOS and AIP for runway nomination and LAHSO procedures) was not made in consultation with the delegated authority.

[48] Instrument of Authorisation Safety, Environment and Assurance Airservices Australia, SEA 001/14, 01 July 2014.

[49] ATC Group Documentation Procedures (ATS-PROC-0039), Version 20, 14 August 2014. 'A directive (DIR) contains authoritative direction or communications required to standardise or improve the overall efficiency of service delivery.'

Finding 7 The Review determined that if a Standardisation Directive (DIR) was used in accordance with documentation procedures the consultation would have taken place. The directive mechanism would have required the use of NRFC resulting in additional consideration by subject matter experts and a greater level of transparency of the determination. However the clarification and interpretation was promulgated to Melbourne Tower controllers using email.

On 6 August 2014 the Melbourne Tower C&SS provided advice to the Melbourne Tower and TCU Coordinator and the Melbourne Tower ATC Line Manager holding the procedures portfolio that:

- The specific passive runway does not need to be broadcast on ATIS.
- Pilots should do their own wind calculations to determine runway suitability.
- ATC should reiterate the wind [to pilots] and through Airport Capacity Enhancement (ACE) and industry meetings Airservices can reiterate the option for pilots to request a runway that is not the broadcast runway on ATIS.

7.3.1.2 Requirement to broadcast the passive runway on the ATIS

The Manual of Air Traffic Services (MATS) defines LAHSO as:

A procedure involving dependent operations conducted on two intersecting runways whereby aircraft land and depart on one runway while aircraft landing on the other runway hold short of the intersection[50].

There is no definition for what constitutes a 'dependant procedure' available in the MATS, the AIP, CASA MOS Part 172 or ICAO Doc 8400.

The MATS Style Guide (ATS-GUIDE-0027) requires that terms be sourced from the Macquarie Dictionary, ICAO Doc 8400, Australian legislation, AIP and Frequently Used Terms in MATS and ATC Controlled Documents - Style Guide (ATS-GUIDE-0028).

The Macquarie Dictionary defines 'dependant' as:

adjective 1. depending on something else for aid, support, etc.

2. conditioned; contingent.

3. subordinate; subject.

4. (of a quantity or variable) depending upon another for value.

5. (of linguistic forms) not used in isolation; used only in connection with other forms.

6. hanging down; pendent.

In the context of LAHSO procedures 'dependant' is an adjective describing a procedure that is dependent on the conditions/requirements for two participants (active and passive) operating on two intersecting (crossing) runways.

The AIP SUPP H18/14 defines land and hold short operations (LAHSO) as:

> …a procedure used at selected airports and with conditions and approvals for use involving dependant operations conducted on two intersecting runways whereby aircraft land and depart on one runway while aircraft landing on the other runway hold short of the intersection.

Therefore the broadcast of LAHSO on the ATIS without reference to the dependant passive runway provides incomplete information to participant pilots.

The Review found that LAHSO is defined as a dependant procedure involving two intersecting runways and the practice of not broadcasting both runways on the ATIS appears inconsistent with this dependency. However, the determination regarding the intent and interpretation of the rule set rests with the delegated authority.

7.3.1.3 Off-Mode runway use for Landing Aircraft

On 4 November 2014 Airservices received a letter from Senator Nick Xenophon in relation to an issue with Land and Hold Short Operations (LAHSO at Melbourne Airport.

[50] The MOS paragraphs 10.13.5.3 and 10.13.5.4 and MATS paragraphs 10.9.5.3 and 10.9.5.4 specify the aircraft capabilities required to be eligible for active or passive participation in LAHSO.

Airservices undertook a review of LAHSO operational documentation and determined that there was potential confusion with the AIP requirements that permit a pilot to request any runway irrespective of wind conditions and the ATC runway nomination limitations for crosswind and downwind components.

As an interim measure ATC initiated an NRFC[51] on 7 November 2014 to ensure passive, off mode LAHSO arrivals were processed in accordance with the runway nomination criteria specified in MATS and AIP. Subsequently a TLI[52] was issued on the same day instructing controllers not to allow aircraft to passively participate in LAHSO operations on a runway subject to wind conditions exceeding the ATC runway nomination criteria. Refer Appendix F.

7.4 LAHSO safety assurance

The Airservices Australia Land and Hold Short operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAR)[53] Section 11 *Safety Performance Monitoring* described the processes and activities that were to be applied to the ongoing safety of LAHSO operations.

7.4.1 Operational Risk Assessment (ORA) Management

Prior to the finalisation of the SAR in 2012 the Melbourne Tower and TCU operational risk assessments (ORA) did not identify LAHSO procedures. Following a reported double go-around occurrence[54] an unscheduled Safety Services review of the Melbourne Tower ORA was initiated.

The ORA review also considered the hazards and controls identified in the draft SAR hazard register although the register was still in 'development'[55] and identified a number of 'yet to be met' controls. The register status workflow required the register to progress from 'development' to 'operational' where hazard register information is transferred to the respective operational risk assessments and assigned 'complete' following the post implementation review (PIR)[56].

Following this ORA review the threats 'Aircraft conducts a missed approach during LAHSO' and 'Aircraft is unable to hold short during LAHSO' were included in the Melbourne Tower ORA on 7 January 2013.

The controls identified in the ORA were existing procedural controls as described in the MATS, AIP and Melbourne Tower and TCU local instructions. Refer Appendix G.

[51] National Request For Change (NRFC) #27166. Off-mode runway use for landing aircraft.

[52] Temporary Local Instruction (TLI_14_0291), Off-Mode Runway Use for Landing Aircraft, effective 07 November 2014.

[53] Airservices Australia Land and Hold Short operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009) Version 1.0, 19 November 2012.

[54] ESIR 2012 02396 Melbourne Tower Loss Of Separation (HVN781 & QFA605), 18 May 2012.

[55] HAZLOG Business Rules (AA-PROC-SAF-0001) Version 8, Effective 1 September 2014. Chapter 9.2.1

'The Development register is used when the Register has been established but the project or risk management activity is under development and has not been implemented into operational service.'

[56] HAZLOG Business Rules (AA-PROC-SAF-0001) Version 8, Effective 1 September 2014. Chapter 9.2 Register Status.

7.4.2 Current (2014) Melbourne Tower and TCU ORAs

In accordance with annual review requirements of AA-NOS-SAF-0006 the Melbourne Tower and TCU operational risk assessment were reviewed in 2014. There were changes to the threats and barriers associated with LAHSO however the ad-hoc LAHSO practices were not explicitly identified in the ORAs. Refer Appendix H. Additionally, the review did not identify that the SAR LAHSO hazard register (HAZLOG #901) remained in 'development'.

7.4.3 Training and education

The SAR documented ATC training as a control to hazard #1 'A go-around at night causing a loss of the ability of ATC to provide separation and hazard #2 A go-around when the cloud base is below MVA causing a loss of the ability of ATC to provide separation.'

The control was to update the Melbourne Tower Trainee Workbook Coord and ADC (ATS-MAN-0069)[57] to incorporate scenario driven compromised separation training. This training was specific to trainees in Melbourne Tower.

Section 12.1.3 of the SAR required there to be sufficient contingency in the Melbourne Tower roster to ensure controllers had access to new exercises for go-arounds and training records were updated to ensure refresher training is kept current and up to date. There was no explicit action assigned to an accountable manager however, in response, Melbourne Tower had incorporated the requisite training into plans and subsequently delivered this training to current and endorsed controllers.

7.4.4 Hazard review (Double Go-Around)

The SAR identified a hazard of two aircraft performing a go-around[58]. The likelihood was assessed as occurring between 5-50 years and the consequence was classified as 'Major'. It was identified that a double go-around occurred at Melbourne during the preparation of the report however this was not associated with LAHSO operations. The SAR specified a requirement to update the risk should two aircraft go-around when LAHSO was in progress. The action to review the risk associated with double go-around was not explicitly assigned to an accountable manger.

The SAR LAHSO hazard register (Hazard #901/3) was reviewed in October 2012 after a query from Melbourne Tower regarding the assessed likelihood of a double go-around during LAHSO. The Manager Project Safety Services requested a quantitative analysis be conducted to revalidate the likelihood of a double go around which had been presented in the SAR

A Melbourne Go-around Study report[59] was provided to Project Safety Services and ATS Integrity in June 2013.

The report analysed LAHSO go-around rates for 2012 on runway 27 and runway 34, and defined a double go-around as two aircraft going around with a time interval less than 20 seconds at the intersection.

[57] Melbourne Tower Trainee Workbook Coord and ADC (ATS-MAN-0069), Version 5, Effective 10 October 2014.
[58] HAZLOG register #901 Land and Hold Short Operations, Hazard #10 'Two aircraft perform a go-around'.
[59] Melbourne Go-Around Study, Safety & Assurance Group, June 2013

The analysis concluded that a double go-around is expected to occur once every 175 years. This analysis validated the likelihood presented in the SAR, however, as runway 34/09 LAHSO mode was suspended during the data capture period the mode was not assessed.

Finding 8 The Review determined the data modelling completed to determine the likelihood of a double go-around did not incorporate the runway 34/09 LAHSO mode or environmental conditions including crosswind and downwind components.

7.4.4.1 Monitoring and Review - Post Implementation Review (PIR)

The SAR stated that a formal post implementation review was to be conducted three months after the [LAHSO] procedures were updated. The review was expected to include the following:

- Details of any new safety issues identified;
- Review of ESIR;
- Review of SAIR;
- Review of HAZLOG to confirm controls have been met;
- Arrangements for the ongoing management of any open hazards and controls;
- Review of generic and location specific ORAs to confirm hazards recorded in HAZLOG have been transferred and incorporated accurately;
- Any amendments required to ATC procedures; and
- Review of the action tracker to monitor the action status of any outstanding actions and to confirm appropriate measures are in place to ensure actions are completed (e.g. SAIR).

No post implementation review (PIR) was completed within the timeframe specified in the SAR.

Finding 9 The Review determined that no post implementation review (PIR) was completed within the timeframe specified in the Airservices Australia Land and Hold Short operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009).

7.5 Occurrence data (19 November 2012 – 31 October 2014)

The following is a summary of the analysis of Airservices ATS occurrence data from the initial safety assessment report 19 November 2012 to 31 October 2014. The analysis included all occurrences where LAHSO procedures were active at the time of the occurrence.

- No ATC or Pilot reports or complaints were reported during the period.
- There was one occurrence where the aircraft landing on the active runway had to be sent around due to the departure on the passive runway being non-LAHSO approved.
- There were a total of 132 occurrence reports submitted where LAHSO procedures were active at the time of the occurrence.
    - Five 'ACAS Resolutions'. Occurrences were not directly attributed to LAHSO procedures.
    - Two 'Callsign Confusion'. Not attributable to LAHSO procedures.
    - 10 'Facility Issues'. One occurrence resulted in the late recognition by the ATC of non-LAHSO approved aircraft resulting in a Loss of Separation (LOS).
    - 53 'Go-arounds'. The data set included both runway 27 and 34. One of the go-arounds also resulted in a LOS (refer above). There were multiple go-arounds due to the requirements to re-sequence non LAHSO approved aircraft.
    - Five 'Information Errors'. One of which was the result of callsign confusion with two Virgin Australia aircraft with similar callsigns.
    - Three 'LOS' occurrences. None were attributed to LAHSO procedures.
    - One 'Loss of Separation Assurance' (LOSA) - not attributed to LAHSO procedures.
    - 15 'Operational Deviations'. Predominantly as a result of Pilots notifying ATC non LAHSO approved later than mandated in AIP.
    - 33 'Other Non-Safety Related'. Not attributable to LAHSO procedures.
    - Three 'Other Safety Related'. Late notification by a pilot of LAHSO non participation;
    - Two 'Pilot Complaint/Report'. Not attributable to LAHSO procedures.

There were an additional 317 reports submitted by Melbourne Tower and Melbourne TCU although the analysis was inconclusive[60] that the occurrence was during LAHSO. There was no evidence available to suggest these occurrences were a result of LAHSO procedures.

[60] The occurrence reports did not provide sufficient detail to determine that the occurrences took place during the application of LAHSO despite evidence that a LAHSO mode was broadcast on the ATIS.

8 Findings

1. The Review determined that the removal of runway 34/09 LAHSO mode warranted the use of the Safety Case and Reporting Determination (SCARD) process to make an assessment of the safety impact on the TCU, Tower and Enroute. The change affected the performance of service delivery at Melbourne including additional complexity for TCU and Enroute controllers, reduced runway mode flexibility and reduced arrival rates. When the performance of service delivery is affected, a SCARD is required under the Safety Change Management Requirements (AA-NOS-SAF-0104). The SCARD process was not followed to make this assessment.
2. The Review determined there was not a shared understanding of the requirements associated with LAHSO procedures and the use of off-mode runways. This included that the crosswind/downwind for the specific runway for the passive LAHSO participant could exceed the limitations for ATC runway nomination and that the specific runway was not broadcast on the ATIS.
3. The Review concluded that the hazard identification workshops conducted to support the LAHSO and CROPS Safety Assessment Report (SAR), did not identify and assess all LAHSO modes of operation and associated procedures and practices. Runway 34/09 LAHSO mode had been temporarily removed due to the National Towers project and was therefore not included in the scope of Safety Assessment Report.
4. The Review determined the action taken, arising from the LAHSO and CROPS Safety Assessment Report (SAR) hazard workshop, did not sufficiently clarify the maximum crosswind component for the passive LAHSO participant. The use of the extant Standardisation Directive (ATS_DIR_0038) was outside the original purpose of the directive to ensure LAHSO was broadcast on the ATIS when ad-hoc LAHSO was in operation.
5. The Review determined that the reintroduction of runway 34/09 LAHSO mode warranted the use of the SCARD process in accordance with the Safety Change Management Requirements (AA-NOS-SAF-0104) as the reintroduction comprised a change to procedures that affected the performance of service delivery at Melbourne.
6. The Review found the determination regarding the intent and interpretation of the LAHSO procedures for runway nomination in MATS (including the MOS and AIP for runway nomination and LAHSO procedures) was not made in consultation with the delegated authority.
7. The Review determined that if a Standardisation Directive (DIR) was used in accordance with documentation procedures the consultation would have taken place. The directive mechanism would have required the use of NRFC resulting in additional consideration by subject matter experts and a greater level of transparency of the determination. However the clarification and interpretation was promulgated to Melbourne Tower controllers using email.

8. The Review determined the data modelling completed to determine the likelihood of a double go-around did not incorporate the runway 34/09 LAHSO mode or environmental conditions including crosswind and downwind components.

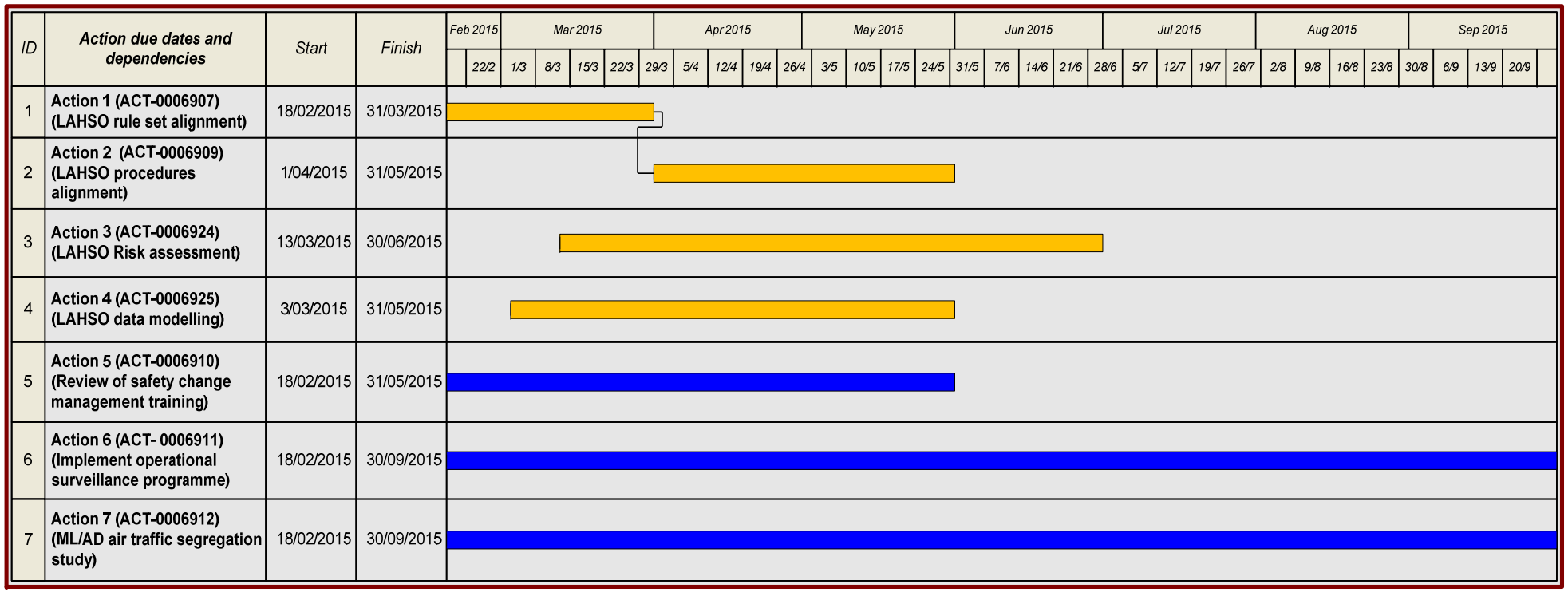
9. The Review determined that no post implementation review (PIR) was completed within the timeframe specified in the Airservices Australia Land and Hold Short operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009).

9 Recommendations

1. The Review recommends that the LAHSO procedures and practices at Melbourne and Adelaide are reviewed to ensure the application is consistent with the intent of the CASA Manual of Standards (MOS) Part 172, the Aeronautical Information Package (AIP) and the Manual of Air Traffic Services (MATS).
2. The Review recommends that a review of the training and support for personnel with National Request for Change (NRFC) safety management roles and responsibilities be completed to ensure safety change is managed in accordance with Safety Change Management Requirements (AA-NOS-SAF-0104).
3. The Review recommends that operational surveillance activities of sufficient scope and periodicity be scheduled to provide assurance that the application of procedures and practices remain consistent with national standards and the rule set.
4. The Review recommends a risk assessment of all LAHSO procedures and practices at Melbourne using additional top-down and bottom up techniques as described in AA-GUIDE-SAF-0105C to ensure the identification and assessment of all potential failure modes associated with all operational airspace and runway mode configurations. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, The Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be reviewed as necessary.
5. The Review recommends the definitions and terminology contained in national standards, rule set and procedures are reviewed to ensure consistency and application intent including:
    - The CASA Manual of Standards (MOS) Part 172
    - The Aeronautical Information Publication (AIP) Australia
    - The AIP (SUP) Differences from ICAO Standards, Recommended Practices and Procedures (H18/14)
    - The Manual of ATS Services (MATS)
6. The Review recommends a reassessment of the data modelling completed for the Melbourne Go-Around Study (Safety & Assurance Group - June 2013). The assessment should incorporate further analysis, including environmental conditions (crosswind/downwind components) and available data from 2012 to 2014 for all LAHSO runway modes. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, the Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be reviewed as necessary.

10 Actions

The Gantt chart below details the action due dates and dependencies for the Review findings and recommendations. A detailed table of actions is enclosed.



Review action due dates and dependencies

Number	Finding	Recommendation	Action	Action Reference	Action Due Date
1	***Finding 2*** The Review determined there was not a shared understanding of the requirements associated with LAHSO procedures and the use of off-mode runways. This included that the crosswind/downwind for the specific runway for the passive LAHSO participant could exceed the limitations for ATC runway nomination and that the specific runway was not broadcast on the ATIS.	***Recommendation 5*** The Review recommends the definitions and terminology contained in national standards, rule set and procedures are reviewed to ensure consistency and application intent including: • The CASA Manual of Standards (MOS) Part 172 • The Aeronautical Information Publication (AIP) Australia • The AIP (SUP) Differences from ICAO Standards, Recommended Practices and Procedures (H18/14) • The Manual of ATS Services (MATS)	Conduct a review of the definitions and terminology contained in national standards, rule set and procedures to ensure consistency and application intent including: • The CASA Manual of Standards (MOS) Part 172 • The Aeronautical Information Publication (AIP) Australia • The AIP (SUP) Differences from ICAO Standards, Recommended Practices and Procedures (H18/14) • The Manual of ATS Services (MATS)	ACT-0006907	31/03/2015

Number	Finding	Recommendation	Action	Action Reference	Action Due Date
2	***Finding 1*** The Review determined that the removal of runway 34/09 LAHSO mode warranted the use of the Safety Case and Reporting Determination (SCARD) process to make an assessment of the safety impact on the TCU, Tower and Enroute. The change affected the performance of service delivery at Melbourne including additional complexity for TCU and Enroute controllers, reduced runway mode flexibility and reduced arrival rates. When the performance of service delivery is affected, a SCARD is required under the Safety Change Management Requirements (AA-NOS-SAF-0104). The SCARD process was not followed to make this assessment. ***AIso Refer Finding 2***	***Recommendation 1*** The Review recommends that the LAHSO procedures and practices at Melbourne and Adelaide are reviewed to ensure the application is consistent with the intent of the CASA Manual of Standards (MOS) Part 172, the Aeronautical Information Package (AIP) and the Manual of Air Traffic Services (MATS).	Conduct a review of LAHSO procedures and practices at Melbourne and Adelaide to ensure the application is consistent with the intent of the CASA Manual of Standards (MOS) Part 172, the Aeronautical Information Package (AIP) and the Manual of Air Traffic Services (MATS).	ACT-0006909	31/05/2015

Number	Finding	Recommendation	Action	Action Reference	Action Due Date
3	***Finding 3*** The Review concluded that the hazard identification workshops conducted to support the LAHSO and CROPS Safety Assessment Report (SAR), did not identify and assess all LAHSO modes of operation and associated procedures and practices. Runway 34/09 LAHSO mode had been temporarily removed due to the National Towers project and was therefore not included in the scope of Safety Assessment Report.	***Recommendation 4*** The Review recommends a risk assessment of all LAHSO procedures and practices at Melbourne using additional top-down and bottom up techniques as described in AA-GUIDE-SAF-0105C to ensure the identification and assessment of all potential failure modes associated with all operational airspace and runway mode configurations. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, The Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be reviewed as necessary.	Conduct a risk assessment of all LAHSO procedures and practices at Melbourne using additional top-down and bottom up techniques as described in AA-GUIDE-SAF-0105C to ensure the identification and assessment of all potential failure modes associated with all operational airspace and runway mode configurations. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, The Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be reviewed as necessary.	ACT-0006924	30/06/2015

Number	Finding	Recommendation	Action	Action Reference	Action Due Date
4	***Finding 8*** The Review determined the data modelling completed to determine the likelihood of a double go-around did not incorporate the runway 34/09 LAHSO mode or environmental conditions including crosswind and downwind components.	***Recommendation 6*** The Review recommends a reassessment of the data modelling completed for the Melbourne Go-Around Study (Safety & Assurance Group - June 2013). The assessment should incorporate further analysis, including environmental conditions (crosswind/downwind components) and available data from 2012 to 2014 for all LAHSO runway modes. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, the Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be updated as necessary.	Complete a reassessment of the data modelling completed for the Melbourne Go-Around Study (Safety & Assurance Group - June 2013). The assessment should incorporate further analysis, including environmental conditions (crosswind/downwind components) and available data from 2012 to 2014 for all LAHSO runway modes. The assessment is to be incorporated as an addendum to the Land and Hold Short Operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009). In addition, the Melbourne Tower and TCU Operational Risk Assessments (ORA) are to be updated as necessary.	ACT-0006925	31/05/2015

Number	Finding	Recommendation	Action	Action Reference	Action Due Date
5	***Finding 5*** The Review determined that the reintroduction of runway 34/09 LAHSO mode warranted the use of the SCARD process in accordance with the Safety Change Management Requirements (AA-NOS-SAF-0104) as the reintroduction comprised a change to procedures that affected the performance of service delivery at Melbourne. ***Also Refer Finding 1***	***Recommendation 2*** The Review recommends that a review of the training and support for personnel with National Request for Change (NRFC) safety management roles and responsibilities be completed to ensure safety change is managed in accordance with Safety Change Management Requirements (AA-NOS-SAF-0104).	Conduct a review of the training and support for personnel with National Request for Change (NRFC) safety management roles and responsibilities to ensure safety change is managed in accordance with Safety Change Management Requirements (AA-NOS-SAF-0104).	ACT-0006910	31/05/2015
6	***Refer Finding 2***	***Recommendation 3*** The Review recommends that operational surveillance activities of sufficient scope and periodicity be scheduled to provide assurance that the application of procedures and practices remain consistent with national standards and the rule set.	Implement a scheduled programme of operational surveillance activities of sufficient scope and periodicity to provide assurance that the application of procedures and practices remain consistent with national standards and the rule set.	ACT-0006911	30/09/2015

Number	Finding	Recommendation	Action	Action Reference	Action Due Date
7	Not applicable	Not applicable	Conduct a study to determine whether alternative means of air traffic segregation (such as dependent runway operations) could be safely applied in Melbourne and Adelaide without material reductions to capacity.	ACT-0006912	30/09/2015
Not applicable	***Finding 4*** The Review determined the action taken, arising from the LAHSO and CROPS Safety Assessment Report (SAR) hazard workshop, did not sufficiently clarify the maximum crosswind component for the passive LAHSO participant. The use of the extant Standardisation Directive (ATS_DIR_0038) was outside the original purpose of the directive to ensure LAHSO was broadcast on the ATIS when ad-hoc LAHSO was in operation.	***Refer Recommendations 1 and 5***	Not applicable	Not applicable	Not applicable

Number	Finding	Recommendation	Action	Action Reference	Action Due Date
Not applicable	***Finding 6*** The Review found the determination regarding the intent and interpretation of the LAHSO procedures for runway nomination in MATS (including the MOS and AIP for runway nomination and LAHSO procedures) was not made in consultation with the delegated authority.	***Refer Recommendation 2***	Not applicable	Not applicable	Not applicable
Not applicable	***Finding 7*** The Review determined that if a Standardisation Directive (DIR) was used in accordance with documentation procedures the consultation would have taken place. The directive mechanism would have required the use of NRFC resulting in additional consideration by subject matter experts and a greater level of transparency of the determination. However the clarification and interpretation was promulgated to Melbourne Tower controllers using email.	***Refer Recommendation 2***	Not applicable	Not applicable	Not applicable

Number	Findings	Recommendation	Action	Action Reference	Action Due Date
Not applicable	***Finding 9*** The Review determined that no post implementation review (PIR) was completed within the timeframe specified in the Airservices Australia Land and Hold Short operations (LAHSO) and Converging Runway Operations (CROPS) All Phases Safety Assessment Report (SAF-SAR-12009).	Not applicable	Airservices has instituted an annual review of LAHSO and CROPS operations. The review scope includes a post implementation review (PIR)	Not applicable	Not applicable

11 References

Title	Number
The Australian Aeronautical Information Publication (AIP)	http://www.airservicesaustralia.com/aip/aip.asp
The Manual of Air Traffic Services (MATS)	NOS-SAF-2000
CASA Manual of Standards (MOS) Part 172 – Air Traffic Services	http://www.comlaw.gov.au/Search/Manual%20of%20Standards
Safety Change Management Requirements	AA-NOS-SAF-0104
Safety Risk Management Procedures	AA-PROC-SAF-0105
Operational Risk Assessment (ORA)	AA-NOS-SAF-0006
HAZLOG Business Rules	AA-PROC-SAF-0001
Melbourne Tower (INTAS) Local Instructions	ATS-PROC-0115
Manual of Air Traffic Services (MATS) Style Guide	ATS-GUIDE-0027
Operational Procedures – Melbourne TCI and Melbourne Tower Letter of Agreement	LoA_3348
Melbourne TCU Local Instructions	ATS-PROC-0047
The National Request For Change (NRFC) Procedures Manual	C-PROC0138
Melbourne Go-Around Study, Safety & Assurance Group, June 2013	N/A
Instrument of Authorisation Safety, Environment and Assurance Airservices Australia	SEA 001/14
Land and Hold Short Operations (LAHSO) and Converging Runway operations (CROPS)	SAF-SAR-12009
Airservices Risk Management Standard	AA-NOS-RISK-0001
Melbourne Tower Trainee Workbook Coord and ADC	ATS-MAN-0069
ATC Group Documentation Procedures	ATS-PROC-0039
Nation Tower Program Melbourne Control Tower Site Determination Safety Case	SAF-SC-09011
Directorate of Safety and Environment Assurance Land and Hold Short Operations (LAHSO) Final Report	DSEA 071/2000

Appendix A Melbourne Noise Abatement Procedures

MELBOURNE NOISE ABATEMENT PROCEDURES

1 - **PREFERRED RUNWAY MODES** (applicable to all aircraft)

1.1 (a) **0600 - 2300 HR local time**

RUNWAY MODE			
PRIORITY	**LANDING**	**TAKE-OFF**	**NOTES**
1 (equal)	Runway 16	Runway 27	*See Note 1*
1 (equal)	Runway 27	Runway 27 & 34	*See Note 2*
2	Runway 27	Runway 27	
3	Runway 34 or 16	Runway 34 or 16	
4	Runway 09	Runway 09	*See Note 3*

(b) **0600 - 2300 HR local time (high capacity landing modes)**

RUNWAY MODE			
PRIORITY	**LANDING**	**TAKE-OFF**	**NOTES**
1 (equal)	Runway 27 & 34 (LAHSO)	Runway 27	*See Note 4*
1 (equal)	Runway 34 & 09 (LAHSO)	Runway 34	*See Note 4*

(c) 2300 - **0600 HR local time**

RUNWAY MODE			
PRIORITY	**LANDING**	**TAKE-OFF**	**NOTES**
1	Runway 16	Runway 27	*Except as per Note 5* *See also Note 6*
2	Runway 27	Runway 27 & 34	*See Note 2 & 5*
3	Runway 27	Runway 27	
4	Runway 34 or 16	Runway 34 or 16	
5	Runway 09	Runway 09	*See Note 3*

Notes:

1. Runway 16 take-off permitted for south and east bound routes, subject to traffic by:
   i. propeller-driven aircraft, the noise emissions from which do not exceed 90EPNdB (eg: DHC8, SF34); or
   ii. jet aircraft up to B737/A320 size, but only when there is a significant ground delay for a departure from RWY 27.
2. Runway 34 landing is permitted, subject to traffic, for arrivals via the PORTS STAR through south-west to the WENDY STAR.
3. Runway 09 is equal first priority for landing but lowest priority for take-off. Ad-hoc landings on runway 09 may be available when suitable with overall traffic management.
4. High capacity modes may be used during peak arrival periods when significant airborne delays would otherwise occur.
5. Night jet departures: When there are jet departures requiring the longer runway for take-off, priority 2 mode may be nominated by ATC instead of priority 1.
6. Runway 34 landing is permitted, subject to traffic, for arrivals via the WENDY STAR.

MMLNA01-129

airservices

1.2 - Between the hours of 2300 and 0600 local, jet aircraft departing runway 16 must use the full runway length.

1.3 - Jet noise abatement climb procedures apply for runways 16 and 09.

2 - PREFERRED FLIGHT PATHS

2.1 - The minimum height over densely populated areas is:
- Jet aircraft 5000FT AGL;
- Non-jet aircraft 3000FT AGL;

except where impractical in the normal course of operation to and from the airport runways.

2.2 - ATC shall normally process IFR departing aircraft via Standard Instrument Departures. When a departing aircraft is not following a procedural SID, ATC shall process the aircraft via flight paths that approximate relevant SID tracks, where possible, and in compliance with para 2.1.

2.3 - IFR arriving aircraft must be processed via STAR tracks (where available), although aircraft may be radar vectored from STAR down-wind or base leg to final approach. Otherwise, STAR tracking may only be varied if essential for sequencing or separation. Non-STAR tracking must comply with para 2.1.

2.4 - When RWY 16 is in use:

Aircraft for left base will be tracked via:

i. STAR track via BOL NDB; or

ii. Visual track for left base to ROC NDB; provided that

(a) Aircraft must not be track shortened prior to HORUS waypoint (20 ML) from the LIZZI STAR or VALES waypoint (30 ML) from the BOYSE STAR; or

(b) If separation requires aircraft to be positioned north of the STAR base leg, ATC should route aircraft clear of Wallan township. If avoidance of Wallan is not possible, then overflight by jet aircraft should be at or above 6000FT AMSL whenever practicable.

2.5 - When RWY 34 is in use:

(1) Aircraft for right base:

I. Must follow STAR track via Essendon Airport; or

II. If separation requires, may be RADAR VECTORED south of Essendon Airport to intercept runway centreline.

(2) Aircraft for straight-in approach or left base:

i. Must follow the applicable STAR; or

II. Between 0600 and 2300 local only, may be RADAR VECTORED to be established on runway centreline not closer than 5 DME ML (3.5 NM from touchdown).

2.6 - Between the hours of 2300 and 0600 local, aircraft from the south-east must not proceed west of the Wonthaggi - MONTY track until MONTY, except that aircraft requiring to land on Runway 34 may proceed via the PORTS STAR for straight-in approach.

3 - TRAINING FLIGHTS

See AIP/ERSA

MMLNA02-129

Appendix B Melbourne RWY 09 Arrival rates (TLI_10_0340)

AIRSERVICES AUSTRALIA

CANCELLED

Air Traffic Control Group

TLI_10_0340

Title	**Melbourne RWY 09 Arrival Rates**
Valid from UTC *(10 fig)*	**1011051300**
Valid to	**1011191300**
Replaces	Nil
Units affected	**ML TWR** / **ML TCU**
Reference documents	LOA 542 – Melbourne Area Operational Procedures

Background

During construction of the new ML control tower, part of final approach RWY 09 will be obscured from the ML aerodrome controller. The National Towers Program - Melbourne Control Tower Site Determination Safety Case requires amendments to the RWY 09 arrival rates.

This TLI will be reviewed after the tower has been erected.

Instruction

During construction of the new control tower, the following arrival rates shall be applied to RWY 09.

RWY Mode	Distance behind aircraft over threshold - Maestro Rate			
	Visual	Instrument A (CAT I)	Instrument B (CAT I)	LVP
09 only	5 NM-20	5 NM-20	7 NM-18	N/A
34/09 LAHSO	N/A	N/A	N/A	N/A

Authority Susan Smith

References	**NRFC**	15188	**ASID**		**SAIR**

Issue Date: 04 Nov 2010 Page 1 of 1

Appendix C LAHSO Requirements Standardisation Directive (ATS_DIR_12_0038)

CANCELLED

Standardisation
DIRECTIVE
12_0038

LAHSO Requirements

Function:	ATS	**Replaces:**	Nil
Valid from:	13 Mar 2012	**Valid to:**	07 Jun 2012
Authorised:	Paul Reidy-Crofts, Senior Advisor UAS	**NRFC:**	18796
Contact:	Noel Paterson , CSIO - TMA		

Audience:	Adelaide TCU	Adelaide Tower	Melbourne TCU	Melbourne Tower
	Perth TCU	Perth Tower		

Context

Recent CASA observations have highlighted instances where LAHSO has been authorised without the correct procedures being followed. The MOS Part 172 and MATS detail the application, requirements and responsibilities associated with the use of LAHSO. Below are relevant excerpts from these documents:

Excerpts from MOS Part 172 - Chapter 10

10.13.5.8	LAHSO must only be permitted as follows:
(c)	'active' participation is restricted to runways where the crosswind component including gusts does not exceed 20 KT
10.13.5.9	In the application of LAHSO, **controllers must**:
(b)	alert aircraft that land and hold short runway operations are in progress by **notification on the ATIS**

Excerpt from MATS

10-55-900
LAHSO are subject to the following conditions

c. active participation is restricted to runways where the crosswind component including gusts does not exceed 20 KT.

10-55-950
ATC responsibilities when applying LAHSO

c. alert aircraft that LAHSO are in progress by notification on the ATIS.

Content

Controllers are reminded that the application, requirements and responsibilities for the use of LAHSO must be adhered to and as such ad-hoc LAHSO operations are not permitted.

Related to

MOS part 172
MATS

Appendix D Reintroduction of 34/09 LAHSO (LoA_3348 Arrival Spacing)

5.5 Arrival spacing

The following is the minimum spacing between successive ML arrivals unless coordinated.

RWY Mode	Distance behind aircraft over threshold			
	Visual No cloud BLW 2000 FT AMSL (Ceiling 1600 FT) and/or VIS > 8 km **LAHSO** No cloud BLW 2400 FT AMSL (Ceiling 2000 FT and/or VIS > 8 km	**Instrument A (CAT I)** No cloud BLW 1600 FT AMSL (Ceiling 1200 FT) and/or VIS > 8 km	**Instrument B (CAT I)** Cloud BLW 1600 FT AMSL (Ceiling 1200 FT) and/or VIS BTN 550 m and 8 km	**Instrument C (CAT II/III)** Cloud BLW 600 FT AMSL (Ceiling 200 FT) and/or VIS BLW 550 m
27 or 16 only or 27/34 DEDRAT	5 NM	5 NM	6 NM	15 NM (RWY 16 only)
34 only	5 NM	5 NM	6 NM	N/A
09 only	5 NM	5 NM	7 NM	N/A
27/34 LAHSO	5 NM	N/A	N/A	N/A
34/09 LAHSO	5 NM	N/A	N/A	N/A
16A/27D	3 NM	4 NM	6 NM	10 NM

Appendix E Suspension of 34/09 LAHSO (TLI_14_0180)

CANCELLED

Temporary Local Instruction

TLI_14_0180

Suspension of 34/09 LAHSO

Effective from:	**1407080412**	**Effective to:**	1410070700
Authorised:	Paul Reidy-Crofts, Acting CTSM	**Replaces:**	TLI_14_0179
NRFC:	25940	ASID:	CIRRIS:

Audience:	Melbourne TCU	Melbourne Tower	Mike Lockwood

Reference documents	LoA 3348

Background

Recent use of 34/09 LAHSO as the nominated runway mode highlighted an INTAS HMI issue. Selection of 34/09 LAHSO as the runway mode in the TDM resulted in a number of incorrect FDE validation messages that restricted controller ability to manipulate the affected FDE, and prohibited clearance on the appropriate SID.

Due to these INTAS HMI issues, the following instruction applies to the use of 34/09 LAHSO as the nominated runway mode.

Instruction

34/09 LAHSO must not be nominated as the runway mode.

Specifically, 34/09 LAHSO must not be input in the INTAS TDM or broadcast as the runway mode on the DATIS.

No restriction applies to the adhoc use of LAHSO when RWY 34 A/D is the nominated runway mode.

Appendix F Off-Mode runway Use for Landing Aircraft (TLI_14_0291)

Temporary Local Instruction

TLI_14_0291

Off-Mode Runway Use for Landing Aircraft

Effective from:	**1411070630**	**Effective to:**	1506070600
Authorised:	Paul Reidy-Crofts, Check, Training and Standards Manager	**Replaces:**	Nil
NRFC:	27166	ASID:	CIRRIS:

Audience:	Adelaide TCU	Adelaide Tower	Melbourne TCU	Melbourne Tower
	ML ORM			

Reference documents	AIP ENR 1.1-29 para 4.5 and para 14.2 Manual of Air Traffic Services (MATS) (NOS-SAF-2000) 10.9.5.9

Background

Guidance on the nomination of runways is provided in AIP ENR 1.1-10 para 4.5 and stipulates that ATC will not nominate a particular runway for use if an alternative runway is available, and the following conditions are exceeded:

- the crosswind component including gusts exceeds 20 knots
- the downwind component including gusts exceeds 5 kt for a dry runway, or any downwind component exists on a runway not completely dry.

Notwithstanding, the provisions of AIP ENR 1.1-29 para 14.2 does allow the pilot in command to elect to land on a runway other than nominated.

For active participants in LAHSO operations, Manual of Air Traffic Services (MATS) (NOS-SAF-2000) 10.9.5.9 specifies additional restrictions on runway nomination and runway use. This includes a restriction where the crosswind component including gusts does not exceed 20 knots regardless of pilot intentions.

For passive participation in LAHSO operations where the pilot in command elects to land on an off-mode runway where the crosswind exceeds 20 knots, or the applicable downwind component for runway nomination is exceeded, there is no specific reference in MATS and AIP.

The purpose of this instruction is to provide clarity on the crosswind and downwind restrictions for landing aircraft as passive participants in LAHSO operations.

Instruction

Do not allow landing aircraft to passively participate in LAHSO operations on a runway subject to wind conditions exceeding the following values:

Runway conditions	Wind
Completely dry	Crosswind exceeds 20 kt including gusts
	Downwind exceeds 5 kt including gusts
Not completely dry	Crosswind exceeds 20 kt including gusts
	There is a downwind component

Appendix G Melbourne Tower and TCU ORAs (LAHSO) – (2012 – 2013)

Bowtie case file name	**Melbourne Tower Vers 2.tc6**
Hazard	Operations by aircraft, vehicles or pedestrians receiving ATS on or in vicinity of runway, taxiway or apron
Top Event	Runway incursion or aircraft, vehicle or pedestrian in unsafe proximity to a ground obstacle
Threat	Aircraft unable to hold short during Land And Hold Short Operations (LAHSO)
Consequence	Collision between aircraft involving one or more high capacity passenger transport aircraft
Barrier(s)	Restrictions to 'active' and 'passive' participation (ref MATS 10-55-830, 840, 880 and 890)
	Pilot reporting requirements for participation (ref MATS 10-55-850 to 870)
	Criteria for LAHSO activation (ref MATS 10-55-900; AIP ENR 1.1 - 61; MLLI_TWR 10-1-1)
	Do not give a Hold Short requirement when wind shear is greater than Light (ref MATS 10-55-930)
	Only issue a Hold Short requirement when braking characteristics are considered GOOD (ref MATS 10-55-940)
	Obtaining pilot reports of runway braking characteristics (ref MATS 10-55-940)
	Responsibilities when applying LAHSO (ref MATS 10-55-950)
	Pilot confirmation of ability to hold short (ref MATS 10-55-960, 970 and 980)
Review Conducted	25 July 2012
Date Accepted	7 January 2013

Bowtie case file name	**Melbourne Tower Vers 2.tc6**
Hazard	Aircraft receiving ATS operating in the vicinity of other aircraft in the air
Top Event	BoS or Airprox
Threat	Aircraft conducts a missed approach during Land and Hold Short Operations (LAHSO)
Consequence	Collision involving one or more high capacity passenger transport aircraft
Barrier(s)	Restrictions to 'active' and 'passive' participation (ref MATS 10-55-830, 840, 880 and 890)
	Pilot reporting requirements for participation (ref MATS 10-55-850 to 870)
	Criteria for LAHSO activation (ref MATS 10-55-900; AIP ENR 1.1 - 61; MLLI_TWR 10-1-1)
Escalation Factor	Visibility reduces below required 8 km
Escalation Factor Control	Controller able to visually acquire aircraft before loss of surveillance standard (ref MATS 10-55-902 a)
	Cloud ceiling allows for visual separation during a missed approach (ref MATS 10-55-902 b and 10-55-905)
Escalation Factor	Aircraft unable to vector at low altitudes at night
Escalation Factor Control	Tower controller only permitted to vector aircraft by day (ref MATS 12-50-620)
	Only permit simultaneous take-off and landing by day (ref MATS 10-55-920)
Barrier(s)	Coordinated headings available to the tower (ref MATS 10-55-905)
	Responsibilities when applying LAHSO (ref MATS 10-55-950)
Review Conducted	25 July 2012
Date Accepted	7 January 2013

Bowtie case file name	**Melbourne TCU Vers 4.tc6**
Hazard	Aircraft in conflict
Top Event	Air Traffic Services contribution to an occurrence during Land and Hold Short Operations
Threat	T-2 Aircraft unable to hold short during Land And Hold Short Operations
Consequence	C-1 Collision between aircraft
Barrier(s)	B-2.1 Restrictions to 'active' and 'passive' participation (ref MATS 10-55-830, 840, 880, 890, 895, 1100, 1200)
	B-2.2 Criteria for LAHSO activation (ref MATS 10-55-900; AIP ENR 1.1 - 61; LoA_542 5.6)
	B-2.3 Do not give a Hold Short requirement when wind shear is greater than Light (ref MATS 10-55-930)
	B-2.4 Only issue a Hold Short requirement when braking characteristics are considered GOOD (ref MATS 10-55-940)
	B-2.5 Obtaining pilot reports of runway braking characteristics (ref MATS 10-55-940)
	B-2.6 Responsibilities when applying LAHSO (ref MATS 10-55-950; ATS-PROC-0047 11-1; LoA_542 5.1, 5.2; LoA_3136 2.6)
	B-2.7 Pilot confirmation of ability to hold short (ref MATS 10-55-960, 970, 980)
	B-2.8 Pilot reporting requirements for participations (ref MATS 10-55-850 - 870; LoA_3136 3.3)
Review Conducted	8 August 2013
Date Accepted	25 September 2013

Bowtie case file name	**Melbourne TCU Vers 4.tc6**
Hazard	Aircraft in conflict
Top Event	Air Traffic Services contribution to an occurrence during Land and Hold Short Operations
Threat	T-1 Aircraft conducts a missed approach during Land and Hold Short Operations
Consequence	C-1 Collision between aircraft
Barrier(s)	B-1.1 Restrictions to 'active' and 'passive' participation (ref MATS 10-55-830, 840, 880, 890)
	B-1.2 Pilot reporting requirements for participations (ref MATS 10-55-850 - 870; LoA_3136 3.3)
	B-1.3 Criteria for LAHSO activation (ref MATS 10-55-900; AIP ENR 1.1 - 61; LoA_542 5.6)
Escalation Factor	EF-1.3.1 Visibility reduces below required 8 km
Escalation Factor Control	EFC-1.3.1.1 Controller able to visually acquire aircraft before loss of surveillance standard (ref MATS 10-55-902a)
	EFC-1.3.1.2 Cloud ceiling allows for visual separation during a missed approach (ref MATS 10-55-902b, 10-55-905)
Barrier(s)	B-1.4 Coordinated headings available to the tower (ref MATS 10-55-905)
	B-1.5 Responsibilities when applying LAHSO (ref MATS 10-55-950)
Review Conducted	8 August 2013
Date Accepted	25 September 2013

Appendix H Melbourne Tower and TCU ORAs (LAHSO) – 2014

Bowtie case file name	**Melbourne Tower Vers 4.tc6**
Hazard	Aircraft in conflict
Top Event	Air Traffic Services contribution to an occurrence during Land and Hold Short Operations
Threat	T-1 Aircraft conducts a missed approach during Land and Hold Short Operations
Consequence	C-1 Collision between aircraft
Barrier(s)	B-1.1 Restrictions to 'active' and 'passive' participation (ref MATS 10-55-830, 840, 880, 890)
	B-1.2 Pilot reporting requirements for participations (ref MATS 10-55-850 - 870)
	B-1.3 Criteria for LAHSO activation (ref MATS 10-55-900; AIP ENR 1.1 - 61; ATS-PROC-0115 10-1-1, 12-6-59, 12-6-60)
Escalation Factor	EF-1.3.1 Visibility reduces below required 8 km
Escalation Factor Control	EFC-1.3.1.1 Controller able to visually acquire aircraft before loss of surveillance standard (ref MATS 10-55-902 a)
	EFC-1.3.1.2 Cloud ceiling allows for visual separation during a missed approach (ref MATS 10-55-902 b and 10-55-905)
Barrier(s)	B-1.4 Coordinated headings available to the tower (ref MATS 10-55-905)
	B-1.5 Responsibilities when applying LAHSO (ref MATS 10-55-950)
Review Conducted	6 January 2014 (INTAS transition)
Date Accepted	7 January 2014

Bowtie case file name	**Melbourne Tower Vers 4.tc6**
Hazard	Aircraft in conflict
Top Event	Air Traffic Services contribution to an occurrence during Land and Hold Short Operations
Threat	T-2 Aircraft unable to hold short during Land And Hold Short Operations
Consequence	C-1 Collision between aircraft
Barrier(s)	B-2.1 Pilot reporting requirements for participations (ref MATS 10-55-850 - 870)
	B-2.2 Criteria for LAHSO activation (ref MATS 10-55-900; AIP ENR 1.1 - 61; ATS-PROC-0115 10-1-1, 12-6-59, 12-6-60)
	B-2.3 Do not give a Hold Short requirement when wind shear is greater than Light (ref MATS 10-55-930)
	B-2.4 Only issue a Hold Short requirement when braking characteristics are considered GOOD (ref MATS 10-55-940)
	B-2.5 Obtaining pilot reports of runway braking characteristics (ref MATS 10-55-940)
	B-2.6 Responsibilities when applying LAHSO (ref MATS 10-55-950)
	B-2.7 Pilot confirmation of ability to hold short (ref MATS 10-55-960, 970, 980)
	B-2.8 Restrictions to 'active' and 'passive' participation (ref MATS 10-55-830, 840, 880, 890, 895, 1100, 1200; TLI_13_0316)
Review Conducted	6 January 2014 (INTAS transition)
Date Accepted	7 January 2014

Bowtie case file name	**Melbourne TCU Vers 5.tc6**
Hazard	Conflict in the air (LAHSO)
Top Event	Inappropriate or lack of control action or advice
Threat	T-1 Aircraft conducts a missed approach during Land and Hold Short Operations
Consequence	C-1 Aircraft Accident, C-2 Loss of Separation, etc…
Barrier(s)	B-1.1 Restrictions to 'active' and 'passive' participation (MATS 10.9.5)
	B-1.2 Pilot reporting requirements for participations (MATS 10.9.5; LoA_3136 3)
	B-1.3 Criteria for LAHSO activation (MATS 10.9.5; AIP ENR 1.1 - 61; LoA_3348 5)
Escalation Factor	EF-1.3.1 Visibility/cloud base reduces below requirement to nominate LAHSO
Escalation Factor Control	EFC-1.3.1.1 Cloud ceiling allows for visual separation during a missed approach (MATS 10.9.5)
Barrier(s)	B-1.4 Responsibilities when applying LAHSO (MATS 10.9.5 ; LoA_3348 5; LoA_3136 2)
	B-1.5 Coordinated headings available to the tower (MATS 10.9.5)
Review Conducted	1 September 2014
Date Accepted	16 September 2014

Bowtie case file name	**Melbourne TCU Vers 5.tc6**
Hazard	Conflict in the air (LAHSO)
Top Event	Inappropriate or lack of control action or advice
Threat	T-2 Aircraft unable to hold short during Land And Hold Short Operations
Consequence	C-1 Aircraft Accident, C-2 Loss of Separation, etc…
Barrier(s)	B-2.1 Restrictions to 'active' and 'passive' participation (MATS 10.9.5)
	B-2.2 Pilot reporting requirements for participations (MATS 10.9.5; LoA_3136 3)
	B-2.3 Criteria for LAHSO activation (MATS 10.9.5; AIP ENR 1.1 - 61; LoA_3348 5)
Escalation Factor	EF-1.3.1 Visibility/cloud base reduces below requirement to nominate LAHSO
Escalation Factor Control	EFC-1.3.1.1 Cloud ceiling allows for visual separation during a missed approach (MATS 10.9.5)
Barrier(s)	B-2.4 Responsibilities when applying LAHSO (MATS 10.9.5; LoA_3348 5; LoA_3136 2)
Review Conducted	1 September 2014
Date Accepted	16 September 2014

Appendix I Procedure Changes/Instructions/Directives involving LAHSO

Date	National Request for Change (NRFC)
20/07/2009	GENERAL INFORMATION - ML TCU MCO 15.7.2.0.6.1 Completed Jul 2009 **NRFC ID**:10771 **RFC Description:** TO PUT THE ARRIVAL RATES FOR 34/09 LAHSO IN LINE WITH THE 27/34 LAHSO RATES.
RFC ended	Melbourne RWY 09 Arrival Spacing Completed Oct 2010 **NRFC ID**:14984 **RFC Description:** During construction of the new ML control tower, final approach RWY 09 will be obscured fron the Aerodrome Controller.
04/11/2010	Melbourne RWY 09 Arrival Rates Completed NOV 2010 **NRFC ID**:15188 **RFC Description:** The National Towers Program Melbourne Control Tower Site Determination Safety Case required amended arrival rates for RWY 09.
19/11/2010	Melbourne RWY 09 Arrival Rates Completed Nov 2010 **NRFC ID**:15314 **RFC Description:** Extension of TLI_10_0340 due to construction delays.
03/12/2010	Melbourne RWY 09 Arrival Rates Completed Dec 2010 **NRFC ID**:15436 **RFC Description:** TLI_10_0360 expires 1012031300
18/04/2011	Melbourne RWY 09 Arrival Rates. Completed Apr 2011 **NRFC ID**:16229 **RFC Description:** Extension of current TLI.
22/09/2011	ML TWR and ML TCU RWY 09 Arrival Rates Completed SEP 2011 **NRFC ID**:17582 **RFC Description:** TLI mandates reduced arrival rates for RWY 09 due to obscured view from current ML TWR.
08/11/2011	Melbourne - Amended Arrival Spacing Completed Nov2011 **NRFC ID**: 17984 **RFC Description:** To take advantage of unused traffic capacity as part of the Airport Enhancement project.
02/04/2012	LOA_542 Melbourne Area Operational Procedures Completed Apr 2012 **NRFC ID**: 18938 **RFC Description:** Changes are either to incorporate new procedures, or are editorial, to clarify existing procedures.
22/02/2012	SA_AI_MATS LAHSO Exemption Completed Feb 2012 **NRFC ID**: 18203 **RFC Description:** Short notice changes to exemptions issued by CASA for LAHSO operations are not able to be accommodated in the MATS publication time frames. This information is held by CASA and can be more readily accessed via local instructions e.g. NAPM or more immediately and directly via the CASA website. This change will be published as a DCN.
22/02/2012	SA_AI_MATS LAHSO Exemption DCN Editorial Completed Feb 2012 **NRFC ID**: 18239 **RFC Description:** This is an editorial change to MATS which expands on MATS ATS_v18-DCN1 to include LAHSO passive participants. Original authorisation for intent of this change was provided by NRFC 18203. A re-issue of an NIC to include the new content is part of this update.
13/03/2012	LAHSO Standardisation Directive Completed Mar 2102 **NRFC ID**:18796 **RFC Description:** Recent CASA observations have highlighted instances where LAHSO has been authorised without the correct procedures being followed. The MOS Part 172 and MATS detail the application, requirements and responsibilities associated with the use of LAHSO.
31/05/2012	LOA_3136 Procedures between ML TCU and ECSS En Route/RGS SE Completed May 2012 **NRFC ID**: 19390 **RFC Description:** Updating procedures to accurately describe en-route requirements when issuing STAR's during navigation aid outages, label annotation requirements not covered in NAPM reference track shortening and removing LAHSO procedures when not nominated on the ATIS(now as per MATS)

Date	National Request for Change (NRFC)
24/10/2012	SA_AI_MATS LAHSO Completed Oct 2012 NRFCID: 19730 **RFC Description:** LAHSO was subjected to revised safety work after input was received from CASA. Airservices conducted HAZiD workshops to establish and reifne the baseline requirements for LAHSO. This RFC reflects the changes required to operate LAHSO. It incorporates changes to Visibility and cloud ceiling.
24/08/2012	TLI - ML TOWER Inclusion of LAHSO MVA in Local Instructions. Completed Aug 2012 **NRFC ID**: 20016 **RFC Description:** IMA V20_02 - Approach and Aerodrome Amendments including Minimum Fuel and LAHSO placed a requirement for the for the ceiling height required for LAHSO to be contained in Local Instructions. This TLI fulfils that requirement. This RFC is being created on behalf of ML TWR and TCU based on the attached email request and the ceiling has been amended from 2400 to 2000FT at the verbal request of the author of the email.
17/09/2012	Cloud ceiling for LAHSO (YMML) ATS_TLI_12_0216 Completed Sep 2012 **NRFC ID**: 20147 **RFC Description:** No change to current TLI. This TLI was initially submitted with a one month expiry, but needs to be extended until it is put into Local Instructions, which is currently under review.
14/12/2012	TLI LAHSO Glideslope Availability Completed Dec 2012 **NRFC ID**: 20992 **RFC Description:** Following industry review of LAHSO and at the direction of CSI (Iain Miller), a TLI is required to cover the availability of glideslope indication for LAHSO. CSI will be progressing a MATS amendment for March 2013.
04/03/2013	SA_AI_MATS LAHSO Glide Slope Guidance Completed Sep 2012 Completed Mar 2013 **NRFC ID**: 20536 **RFC Description:** Currently LAHSO conditions do not require glide slope guidance to be available. Literature review of FAA LAHSO procedures and feedback from industry has indicated that it is advisable to require glide slope guidance for the conduct of LAHSO. This requirement adds another level of safety to the procedure and is particularly relevant to HN operations of LAHSO.
25/03/2013	LOA_542_V28 Completed Mar 2013 **NRFC ID**: 21580 **RFC Description:** Following a review of LAHSO and CIRRIS act 1166, an amendment to LOA 542 is required to highlight the need for the required spacing. Arrival rates for LAHSO in Instrument A and B conditions have been deleted as LAHSO not available in these conditions. Additionally, the weather requirements for LAHSO are more stringent than the visual rates, therefore, these runway configurations have been removed and a separate paragraph added detailing the requirements for LAHSO.
26/08/2013	SA_AI_AIP LAHSO Completed Aug 2013 **NRFC ID**: 22706 **RFC Description:** Incorporates changes identified at Airservices internal and industry Hazard workshops. Cloud ceiling and visibility criteria amended to reflect the issues identified. Weather criteria have been amended to be in excess of the MOS part 172 minimum as the MOS minimums were seen as being unworkable when ATC separation responsibilities were considered.
02/12/2013	SA_AI_MATS LAHSO Completed Dec 2013 **NRFC ID**: 22730 **RFC Description:** MATS LAHSO section does not consistently use the term flight number callsign when advising of the requirements to participate in LAHSO. This change makes the term flight number callsign (FNC) the only term when referring to participation.
04/12/2013	SA_AI_AIP Glide Slope Established Completed Dec 2013 **NRFC ID**: 23652 **RFC Description:** As part of the review of LAHSO operations it was determined that not only must glide slope guidance be available but crews needed to be established on the glide slope. Whilst this could be achieved by ATC requiring each active participant to report established on the glide slope it was determined that the AIP already has instructions to crews regarding the responsibility for using glide slope guidance. Also company SOPs dictate that each arrival needs to conduct a stable approach, which requires use of glide slope to ensure operations are within the company SOPs.
06/12/2013	Non LAHSO Departure Annotation Completed Dec 2013 **NRFC ID**: 24005 **RFC Description:** TLI required to outline annotation methodology in INTAS.

Date	National Request for Change (NRFC)
14/02/2014	SA_AI_MATS LAHSO NIC info to MATS Completed Feb 2014 **NRFC ID**: 24024 **RFC Description:** Currently there are NICs referring to operational information with respect to LAHSO eligibility. The NIC is not readily accessible if controllers require current information regarding airline advised LDR and current exemptions. This change roles all the LHSO information contained in the NIC with MATS entries.
11/12/2013	Changes to LOA3348 and LOA3263 Completed Dec 2013 **NRFC ID**: 24011 **RFC Description:** Changes to reflect amended procedures with INTAS ML Tower. Addition of ADNOR procedure. Cancel TLI13_0293, and TLI13_0290.
06/03/2014	YMML - RWY 34 - amdts to STARs & RNAV-P (RNP) to improve track segregation with RWY 27 arrivals during LAHSO Completed Mar 2014 **NRFC ID**: 24490 **RFC Description:** Amend Melbourne STARs from the NE, East and SE and RNP approach via BOLTY. Justification: (1) STARs - request from TCU to amend tracks to the RWY 34 instrument STAR to improve track segregation with RWY 27 arrivals during LAHSO and for separation with Essendon arrivals. (2) RNAV-P (RNP) RWY 34 - Create new IAF east of BOLTY with TF leg of sufficient length to comply with MATS RNP approach intercept rule set.
21/05/2014	Amend LOA 3348 Re-introduction of 34/09 LAHSO Completed May 2014 **NRFC ID**: 25363 **RFC Description:** Change to arrival spacing table to reflect minimum distances required. Re-introduction of 34/09 LAHSO. Clarification of met conditions for Instrument C rate. D Scowen to endorse for TCU.
19/05/2014	ML TCU Arrival Spacing overhead console display Completed May 2014 **NRFC ID**: 25381 **RFC Description:** Adds the weather minima for the use of CatII/III approaches, and adds the arrival spacing for R34/09 LAHSO.
08/08/2014	Jetstar have advised Airservices that the B787 is now active and passive for LAHSO. This change will be originated by IMA Completed Aug 2014 **NRFC ID**: 25484 **RFC Description:** Jetstar have advised Airservices that the B787 is now active and passive for LAHSO. This change will be originated by IMA for effective date of 29 May.
25/07/2014	Jetstar B788 to Active LAHSO in MAESTRO Completed Jul 2014 **NRFC ID**: 25822 **RFC Description:** Add Jetstar B788 aircraft to the Active LAHSO category in MAESTRO.
08/07/2014	Suspension of 34/09 LAHSO Completed Jul 2104 **NRFC ID**: 25940 **RFC Description:** TLI required to suspend the use of a runway mode due to INTAS HMI issues,
21/11/2014	ML Maestro data changes Amendments to Maestro Completed Nov 2104 **NRFC ID**: 26917 **RFC Description:** Amendments to Maestro: - times from various fixes to better reflect current aircraft performance since the introduction of STAAS. - times for RWY34 instruments approaches since the changes to those STARs. - LAHSO participation to mimic the approvals for passive LAHSO in AIP. Airways Data Team - New TTGs attached. Simar rules for RWY27 and RWY09 - remove types for Perf. Cat. C to allow all Cat C types with VH rego to participate in passive LAHSO.
07/10/2014	Suspension of 34/09 LAHSO Completed Oct 2104 **NRFC ID**: 26797 **RFC Description:** It is the restriction of an existing procedure. Current NRFC due to the requirement to extend existing TLI (TLI_14_0180).
07/11/2014	Off-mode runway use for landing aircraft Completed Nov 2014 **NRFC ID**: 27166 **RFC Description:** This change consists of a restriction designed to ensure passive, off mode LAHSO arrivals are processed in accordance with the runway nomination criteria specified in MATS and AIP.