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Preliminary Airspace Review of Tamworth

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1 Executive Summary

The *Airspace Act 2007* (Act)[1] provides the Civil Aviation Safety Authority (CASA) with authority to administer and regulate Australian-administered airspace and authorises CASA to undertake regular reviews of existing airspace arrangements.

The purpose of this review is to evaluate the airspace arrangements currently in place at Tamworth, New South Wales.

The scope of this review is to evaluate as to whether the airspace is fit for purpose as it currently is.

A multifaceted approach was used in conducting this review, including quantitative and qualitative analysis consisting of:

- Aerodrome traffic data;
- Airspace design;
- Australian Transport Safety Bureau (ATSB) incident data; and
- Stakeholder consultation.

With the forecast increase of flight training to be conducted at Tamworth, the Office of Airspace Regulation (OAR) undertook a preliminary airspace review. This was in order to determine whether the future needs of all airspace users, in particular flight training providers, will be met with the current airspace.

1.1 Summary of Conclusions

- The airspace in the vicinity of Tamworth is currently fit for purpose.
- Flying training organisations stated the benefit of the Tamworth Tower remaining open for a longer period after last light to facilitate night circuit training.
- A new flight training provider will commence operations during 2019. This new flying training operation will be training airline cadets for multiple airlines. A training organisation currently based at Tamworth will be increasing its current student numbers over the next five years.

1.2 Key Recommendations

The following recommendations are made as a result of CASA's analysis of the Tamworth airspace:

Recommendation 1:
The airspace classification in the vicinity of Tamworth should remain unchanged.

Recommendation 2:
The OAR should monitor the traffic levels in Tamworth over the next five years. During this time, if appropriate, conduct a supplementary review of the airspace, if traffic numbers or incident numbers rise to a significant level.

Recommendation 3:

Airservices Australia (Airservices) should conduct a cost benefit analysis of providing tower services for a greater time period after last light, taking into consideration daylight savings.

Recommendation 4:
Airservices should remove the Lake Keepit Visual Reporting Point (VRP) on the applicable Tamworth charts. Replace with a new VRP further south of Lake Keepit.

[1] A full list of acronyms and abbreviations used in this report can be found in Annex A.

Recommendation 5:
Airservices should explore options to allow for earlier climb to higher altitudes during identified periods of extreme heat.

Recommendation 6:
Education between the Flying Training Organisations and the Regular Public Transport (RPT) operators should be conducted in order to create awareness of the challenges faced by crews of high performance RPT aircraft.

1.3 Key Observations

1. At the time of this review, the airspace is fit for purpose, based on the following information.
    - BAE flight training are reducing their flight training program with a view to ceasing operations in mid-2020.
    - CAE Oxford flight training has indicated that they will increase their flight training activities in the short and long term.
    - A new flight training provider is expected to commence flight training activities at Tamworth. The commencement date for this operation is dependent upon the training provider being granted approval from an external entity. Once granted, better clarity will be available as to a commencement date. The provider estimates this to be late 2019 or early 2020.
2. A flight training provider suggested that Tamworth tower be staffed for a longer period after last light. The stakeholder believes that safety will be improved by better coordination of circuit traffic and RPT arrivals and departures during night hours.
3. Current traffic flow arriving at Tamworth from the west via Lake Keepit VRP, are often not on the correct radio frequency. Stakeholders suggested that if this reporting point were to be removed and a replacement VRP created to the south, relative to the existing VRP, the occurrence rate of aircraft being on the wrong very high frequency (VHF) radio frequency would be significantly reduced.

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2 Introduction

The Office of Airspace Regulation (OAR) within the Civil Aviation Safety Authority (CASA) has carriage of the regulation to administer and regulate Australian-administered airspace, in accordance with section 11 of the *Airspace Act 2007* (Act). Section 12 of the Act requires CASA to foster both the efficient use of Australian-administered airspace and equitable access to that airspace for all users. CASA must also consider the capacity of Australian-administered airspace to accommodate changes to its use and national security. In exercising its powers and performing its functions, CASA must regard the safety of air navigation as the most important consideration.[2]

Section 3 of the Act states that 'the object of this Act is to ensure that Australian-administered airspace is administered and used safely, taking into account the following matters:

a. protection of the environment;
b. efficient use of that airspace;
c. equitable access to that airspace for all users of that airspace;
d. national security.'

2.1 Overview of Australian Airspace

Australian airspace classifications accord with Annex 11 of the International Civil Aviation Organization (ICAO) and are described in the Australian Airspace Policy Statement (AAPS). Airspace is classified as Class A, C, D, E and G depending on the level of Air Traffic Service (ATS) required to best manage the traffic safely and effectively. Government policy also allows the use of Class B and Class F airspace, however these are not currently utilised in Australia. The airspace classification determines the category of flights permitted, aircraft equipment requirements and the level of ATS provided. Annex B provides details of the classes of airspace used in Australia. Within this classification system aerodromes are either controlled (i.e. Class C or Class D) or non-controlled (Class G).

2.2 Purpose and Scope

The purpose of this review was to address the recommendation from the 2010 review to monitor and ensure that the airspace was still fit for purpose. In addition, to ensure that the current airspace is fit for purpose with consideration given to a forecast increase in pilot training at the aerodrome.

The scope of the review includes:

- A risk assessment of the airspace within 45 nautical miles (NM) of Tamworth aerodrome up to 8,500 feet (FT) Above Mean Sea Level (AMSL)[3].
- Consultation with stakeholders to gather and validate data that will inform the airspace review.
- Review and update recommendations from the previous Airspace Review.

The scope of the review did not include on and off-airport infrastructure developments that will not impact current or future airspace arrangement.

The review process included:

- Stakeholder Engagement via email and through the New South Wales Regional Airspace and Procedures Advisory Committee (RAPAC).
- Direct Stakeholder contact via meetings held at Stakeholder locations.
- Recommendations from the previous review.

[2] Civil Aviation Act 1988, section 9A – Performance of Functions

[3] All elevations in the review are AMSL unless otherwise specified.

2.3 Objective

The objective of this review was to examine the current airspace in order to ensure it is currently fit for purpose and will remain so, given the expected increase in flight training over the next five years. It will also include:

- Analysis of aircraft movement data;
- Analysis of the mix of aircraft operations in the area;
- Analysis of the current aircraft movement levels to determine the suitability of existing airspace;
- Analysis of the incidents and occurrences within the review area;
- Identification of threats or risks to the safety of operations within the airspace; and
- Consultation and consideration of feedback from airspace users.

3 Aerodrome

Tamworth is a certified aerodrome and is located 9.2 kilometres West of the City of Tamworth. It is operated by Tamworth Regional Council. Aerodromes covered in the review included, Armidale, Quirindi, Gunnedah, Lake Keepit and a private airstrip called “The Skyranch”.

Figure 1: Tamworth local area map, reference Google Maps 2019.

3.1 Terminal Instrument Flight Procedures

The Instrument Approaches available at Tamworth airport include:

- Distance Measuring Equipment (DME) or Global Navigation Satellite System (GNSS) Arrival
- VHF Omnidirectional Range (VOR) Runway (RWY) 12 left (L)
- Instrument Landing System (ILS) or Localiser (LOC) RWY 30 right (R)
- VOR RWY 30R
- Non-Directional Beacon (NDB) APPROACH
- Area Navigation (RNAV) GNSS RWY 12L
- RNAV GNSS RWY 30R

3.2 Aeronautical Information

The details as listed for Tamworth in the Enroute Supplement Australia (ERSA) are correct – however, current practice differs to the following paragraph:

- *Flight Procedures – 6 Circuit Operation – c. – Report Downwind (ABM the upwind threshold) with intentions.*

  The current arrangement via a Letter of Agreement (LOA) between BAE Systems and Tamworth tower is for aircraft to report while on the base leg of the training circuit. In order to work in with Military flight training requirements, it was agreed that aircraft in the training circuit would make a call while on or turning onto the base leg of the duty runway assigned for circuit training. Refer 8.1 Page 15.

3.3 Aerodrome Facilities

Tamworth airport has the following runways available for use, see Figure 2.

Runways available:

- **RWY 06/24** Unrated Grassed Brown Clay Width (WID) 30 metre (M) Runway Strip Width (RWS) 90 M
- **RWY 12L/30R** Grooved Sealed WID 45 M RWS 150 M
- **RWY 12R/30L** Sealed WID 18 M RWS 90 M
- **RWY 18/36** Grassed Brown Clay WID 30 M RWS 90 M

Both sealed runways have taxiway links to the apron area at the terminal.

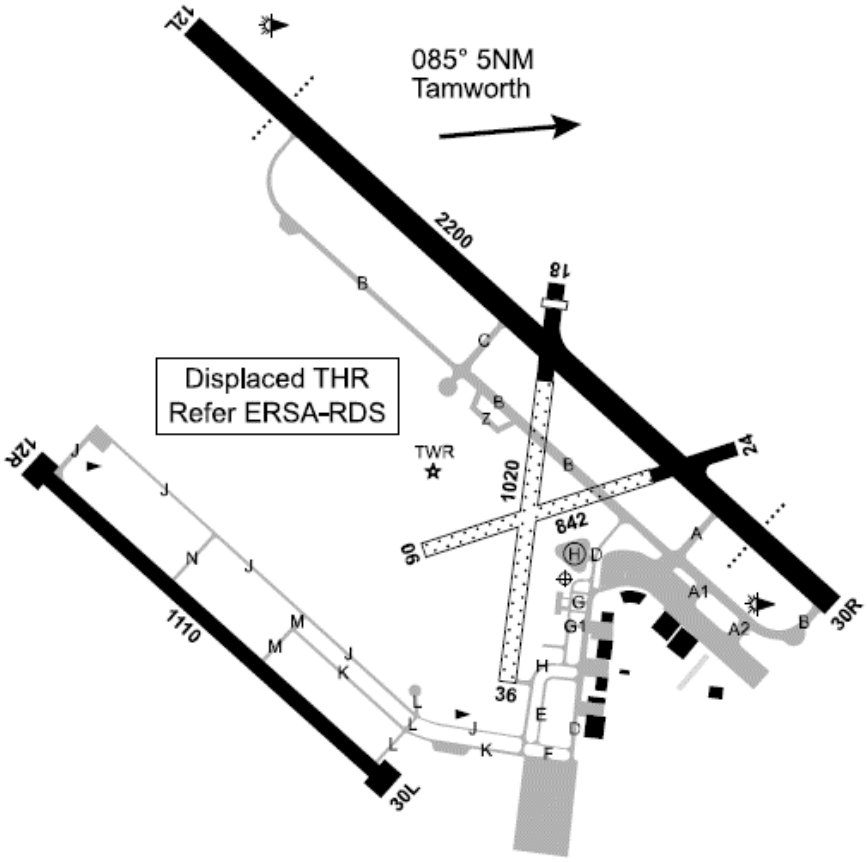

Figure 2: Extract of Tamworth Aerodrome Layout, Reference En Route Supplement Australia (ERSA)

Effective 28th February 2019.

Navigation and Instrument Approach Aids available:

Instrument Landing System (ILS) ITW 109.9 – upgraded ILS commissioned August 7th 2019.

LOC ITW 109.9

Glide Path (GP) ITW 333.8

VOR TW 116.0

DME TW 116.0

NDB TW 341

4 Airspace

4.1 Airspace Structure

Tamworth Tower (TWR) provides combined TWR and Approach (APP) Control (CTL) Services Within Class C and D airspace 8500 FT AMSL and below during TWR hours. Airways Clearances are obtained from TWR.

TWR hours can change at short notice and pilots are advised to check activity status via Automatic Terminal Information Service (ATIS) or ATS.

Outside TWR hours Tamworth Class C and D airspace 8,500 FT AMSL and below becomes Class G.

Figure 3 below outlines the airspace structure surrounding Tamworth aerodrome.

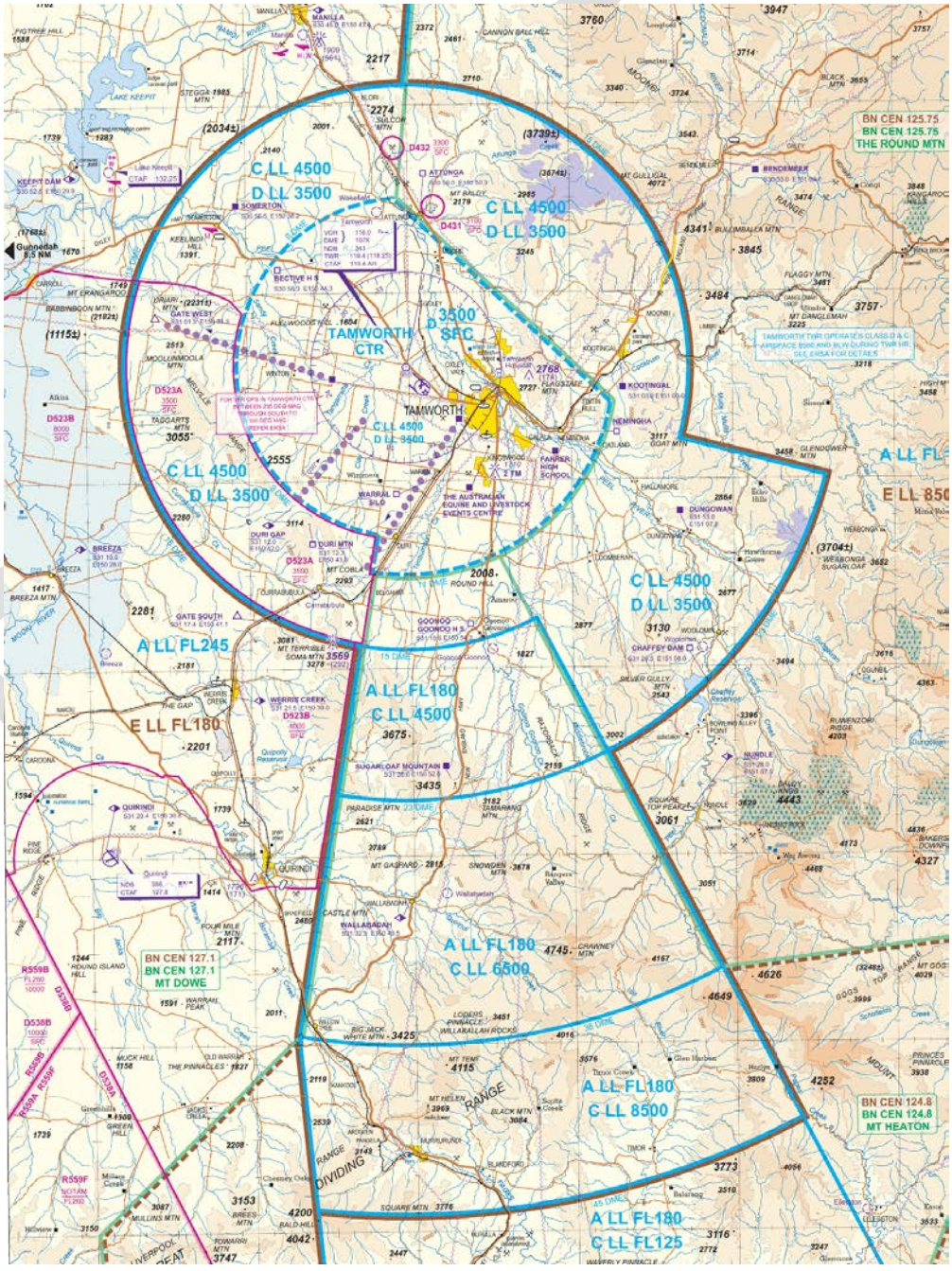

Figure 3: Extract of Tamworth Visual Terminal Chart (VTC), Effective 2 November 2018

4.2 Restricted and Danger Areas

The following list of Danger and Restricted Areas are within 45NM of Tamworth. Figure 4 displays the Danger and Restricted Areas as listed below.

Danger Areas:

D523A TAMWORTH – FLYING TRAINING

SFC – 3,500 FT AMSL CONTACT BAE Systems

D523B TAMWORTH – FLYING TRAINING

SFC – 8,000 FT AMSL CONTACT BAE Systems

D531A GUNNEDAH – FLYING TRAINING

SFC – 8,000 FT AMSL CONTACT SAFETY ASSURANCE BRANCH SYDNEY REGION

D531B GUNNEDAH – FLYING TRAINING

SFC – 5,000 FT AMSL CONTACT SAFETY ASSURANCE BRANCH SYDNEY REGION

D538A WILLIAMTOWN – MILITARY FLYING TRAINING

SFC – 7,000 FT AMSL CONTACT FLTCDR 453 SQN WILLIAMTOWN

D538B WILLIAMTOWN – MILITARY FLYING TRAINING

SFC – 10,000 FT AMSL CONTACT FLTCDR 453 SQN WILLIAMTOWN

D431 ATTUNGA – BLASTING

SFC – 3,100 FT AMSL CONTACT UNMIN

D432 SULCOR – BLASTING

SFC – 3,300 FT AMSL CONTACT UNMIN

Restricted Areas:

R559B WILLIAMTOWN – MILITARY FLYING – RA2

10,000 FT AMSL – FL260 CONTACT FLTCDR 453 SQN WILLIAMTOWN

R559D WILLIAMTOWN – MILITARY FLYING

10,000 FT AMSL – FL260 CONTACT FLTCDR 453 SQN WILLIAMTOWN

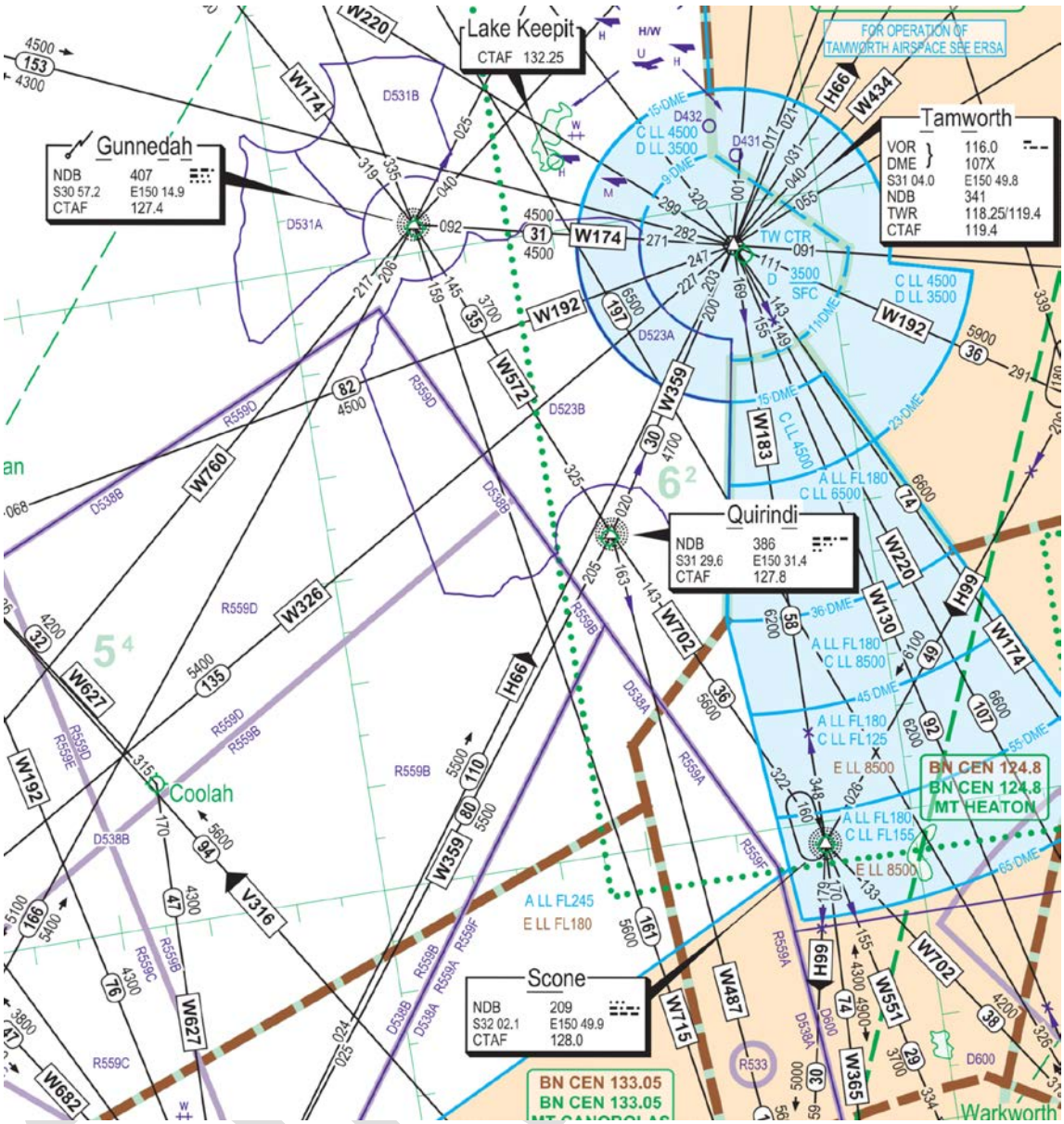

Figure 4: Restricted and Danger Areas / Extract En Route Chart (ERC) L3 Effective 8th November 2018.

4.3 Air Routes

The air routes over Tamworth are available for both High and Low altitude Instrument Flight Rules (IFR) traffic. In line with the scope of the review only the low altitude routes have been listed. Figure 4 on the previous page shows some of the routes listed below.

Routes designated with a H are a Domestic one way route

Routes designated with a W are Domestic two way route

- H66 Originates in Melbourne via Tamworth to Gold Coast
- W434 Tamworth to Armidale
- W684 Tamworth to Inverell
- W821 Tamworth to Port Macquarie
- W192 Originates at IFR waypoint ANBAN via Tamworth to IFR waypoint SANAD
- W174 Originates in Narrabri via Tamworth to Williamtown
- W220 Originates in Narrabri via TATO IFR waypoint KAMBA
- W130 to IFR waypoint IFR LOTIN
- W183 to Scone
- W359 to Mudgee
- W326 Originates in Dubbo via Tamworth to Amberley
- W318 Tamworth to Moree

4.4 Environment

The airspace within 45 NM of Tamworth was reviewed to examine if there are current aircraft environmental issues associated with:

- Noise;
- Gaseous emissions;
- Interactions with birds and wildlife; and
- Environment Protections and Biodiversity Conservation Act 1999 (EPBC Act) items.

No issues were raised regarding the above environmental considerations.

5 Traffic

Air traffic at Tamworth consists of Regular Public Transport (RPT) services that are operated by Fly Corporate that operate Saab 340 and Metroliner 23 aircraft, QantasLink operating Dash 8 aircraft and Virgin Australia with ATR 72 aircraft. Civil flight training and military flight training is largely conducted by the established flight training providers located at the airport. Flight training is expected to increase and currently contributes to the greatest aircraft movement numbers at Tamworth. Aircraft Charter is currently serviced by local operators and those located at surrounding airports.

5.1 Analysis of aircraft movements

The total aircraft movements have increased by 11.28% from 70,727 aircraft in April 2017 to 78,702 aircraft recorded end of March 2019 see figure 5 below.

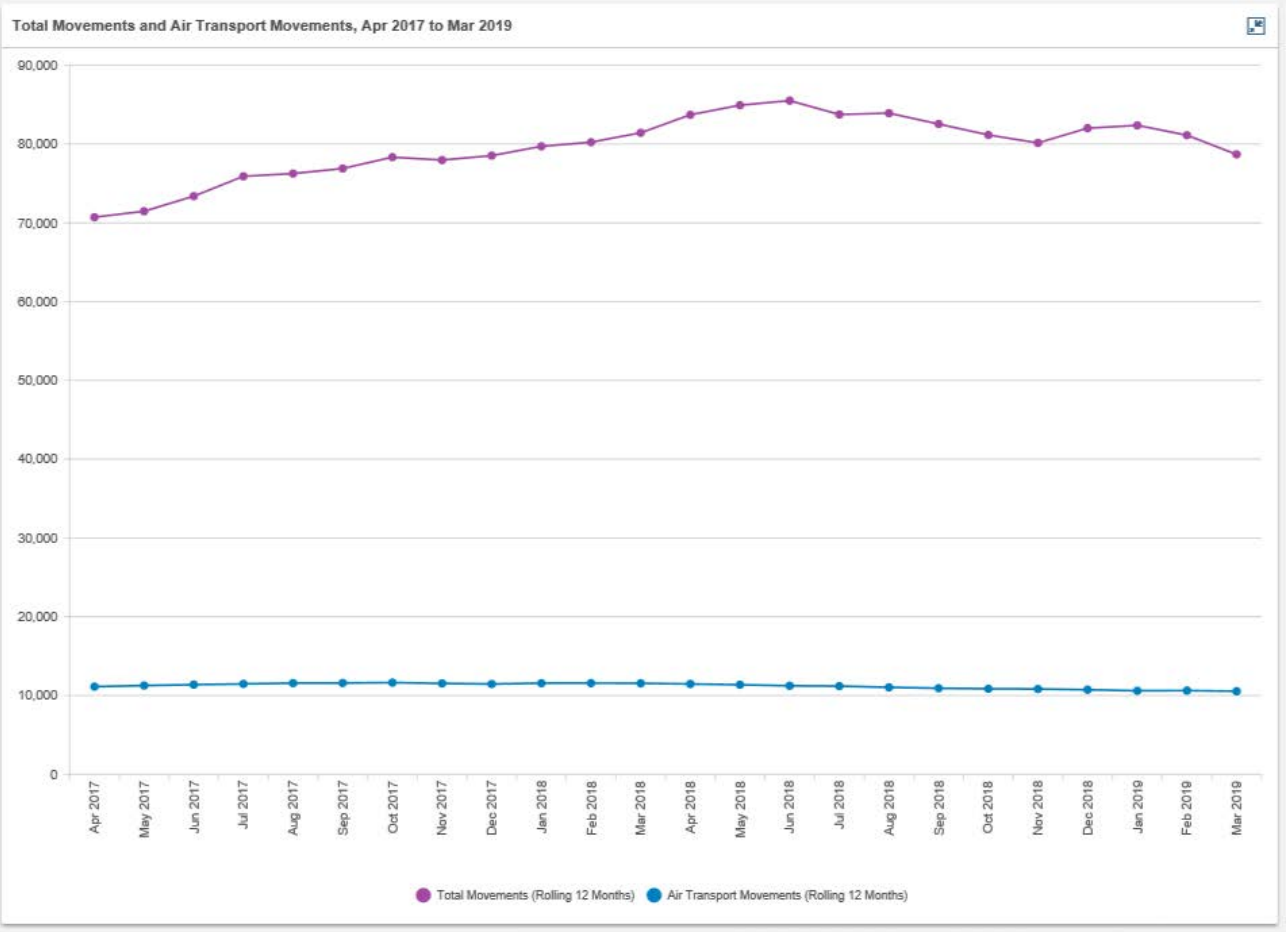

Figure 5 Total Aircraft Movements numbers April 2017 to April 2019.

5.2 Analysis of passenger numbers

The total passenger numbers have increased by 2.78% from 216,034 passengers recorded in April 2017 to 222,029 passengers recorded end of March 2019 see figure 6 below.

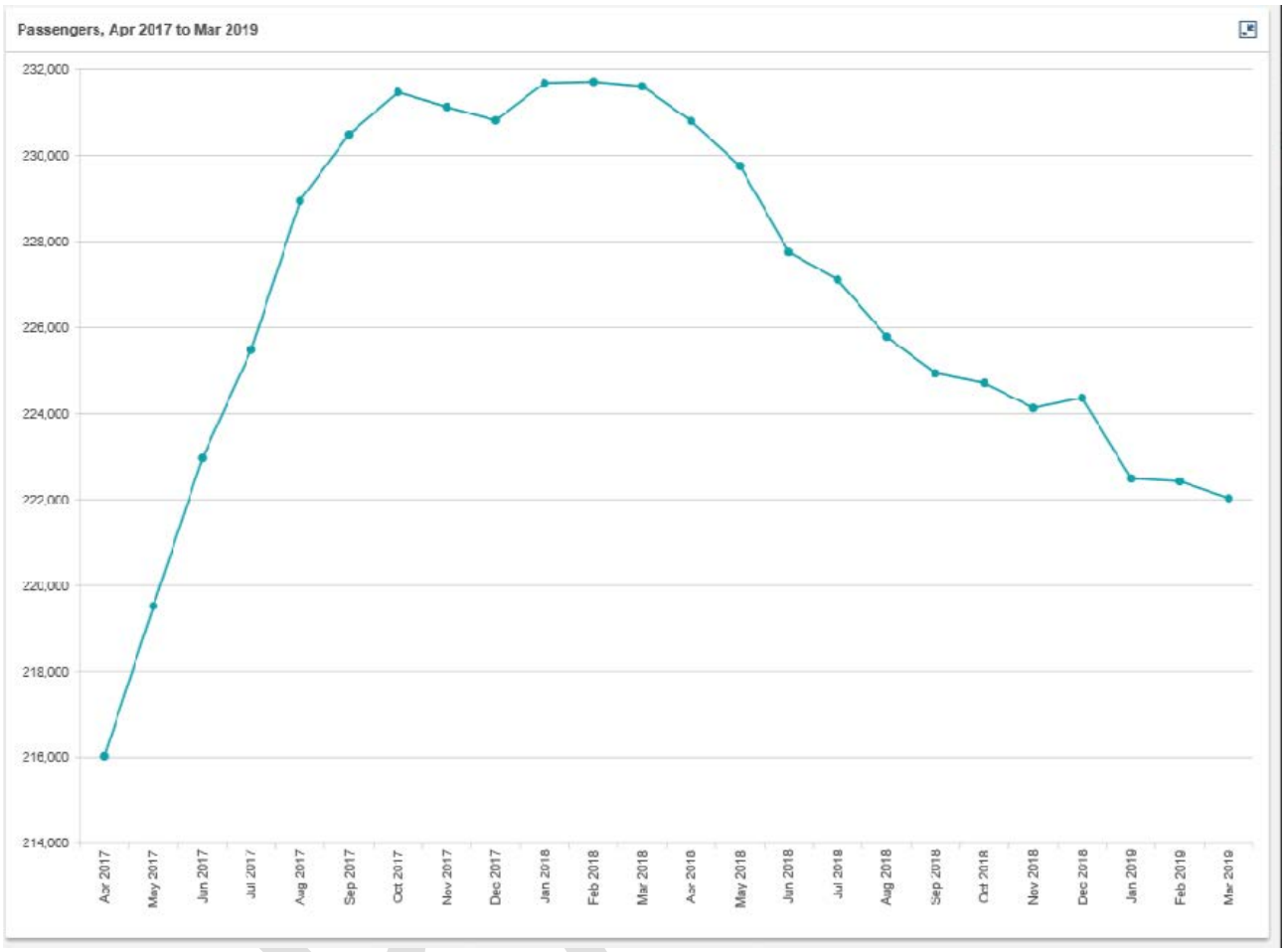

Figure 6 Total Passenger numbers April 2017 to April 2019

6 Aviation Incident Reports

All incidents and accidents involving Australian registered aircraft, or foreign aircraft in Australian airspace must be reported to the ATSB. The ATSB receives incident information via pilot reports, Airservices' Corporate Integrated Reporting and Risk Information System reports and the Australian Defence Forces' Aviation Safety Occurrence Reports.

The ATSB maintains its own database, the Safety Investigation Information Management System (SIIMS), in which all reported occurrences are logged, assessed, classified and recorded. The information contained within SIIMS is dynamic and subject to change based on additional and/or updated data. Each individual report is known as an Aviation Safety Incident Report (ASIR) and for identification purposes is allocated its own serial number.

CASA receives de-identified ASIR data for the purpose of improving safety. The airspace related incidents within 45 NM of Tamworth from January 2010 were reviewed.

6.1 ASIR Aviation Safety Incident Reports

Over the two-year period there were a total of 198 Occurrences, of which 37 were Airspace related.

Year	2017	2018	2019	
Aircraft Separation	7	11	1	19
Operational Non-Compliance	7	7	3	17
ANSP Operational Error	1	1	0	2
Airspace Infringement	1	0	0	1
Totals	16	19	4	39

Table 1: Airspace related incidents within 45NM of Tamworth Airport

April 10th, 2017 / April 10th, 2019 (ASIR data).

6.2 Breakdown of Incident data for the review period.

2017: The 7 Incidents that were categorised under Aircraft Separation comprised of the following:

- One due to air return emergency
- Five to pilot error / not complying with instructions
- One as a result of manoeuvring during normal operations.

2018: Incidents that were categorised under Aircraft Separation comprised of the following:

- Seven occurred at Flight Levels above the scope of the review
- Three to pilot error / not complying with instructions
- One due to radio failure.

2019: Aircraft separation incident comprised of:

- A departing aircraft that turned in front of an aircraft that was joining the circuit.

Overall the occurrences since 2017 have been largely due to pilot non-compliance. 2018 displayed many airspace incidents that were outside of scope of this review. Pilot education should reinforce the need for students in this region to comply with established published procedures.

7 Consultation and stakeholder feedback

Stakeholders were contacted and invited to provide comment or input to issues relating to Tamworth airspace. A list of stakeholders invited to contribute to this review can be found in Annex C.

8 Key Issues, Recommendations and Observations

8.1

Issue: Lake Keepit Visual Approach Point (VAP). Pilots overfly the VAP, call Tamworth Tower and as a result are not on Lake Keepit common traffic advisory frequency (CTAF). The percentage of pilots not on frequency has been quoted to be approximately 30%. Stakeholders have also advised that in their opinion, the uncontrolled airspace in the vicinity of Lake Keepit and Manilla is very busy due to heavy glider operations.

Finding: Pilots reporting at Lake Keepit inbound reporting point are required to transmit on Tamworth tower frequency, this action, for aircraft with single very high frequency (VHF) radio, can prevent the pilot from being able to maintain a listening watch on frequency of Lake Keepit CTAF. Stakeholders suggested removing the existing VAP from the VTC and determine an appropriate replacement VRP in consultation with industry. When agreed on a final location, create a new VRP on the Tamworth VTC. One proposed solution was to track via the Oxley Highway, thus moving traffic further to the south and a greater distance away from Lake Keepit.

Recommendation: Remove the existing VAP from the VTC and determine an appropriate replacement VRP in consultation with industry.

Issue: A stakeholder advises that helicopters are required to track around the Tamworth Control Zone instead of a direct transit through the airspace. The consequence of this indirect tracking is that it adds to the helicopter's flight time and therefore has both time and economic impacts to the operator.

Finding: IFR traffic is likely to be operating in the airspace at the time and hence possibly this IFR traffic is gaining priority over the VFR helicopter traffic.

Recommendation: ATC assist, where practicable, to provide a clearance for direct tracking to helicopters transiting the Tamworth airspace.

Issue: Establishing radio communication with Tamworth TWR can be difficult when at low altitudes in the North and North East quadrants.

Finding: Radio shielding due terrain in the North and North East regions is the probable cause of this communication difficulty. Industry feedback indicates that Tamworth tower cooperates as best it can with consideration given to the geographical limitations of radio transmission.

Recommendation: Consideration be given to the addition of a note, regarding possible inability to receive or transmit on the VHF frequency, added to ERSA. Supporting this, consideration be given to adding a notation on the Tamworth VTC, regarding the operational limitations of VHF radio communications in the sector relative to the airport.

Issue: Limited ATC availability at night, especially during daylight savings and on weekends. Without ATC to assist with traffic awareness, separation and alert warnings there is a heightened risk of airprox / mid-air collision.[4] As a result an operational restriction on night flying is in place when no ATC services are available.

Finding: Air Navigation Service Provider advises in their opinion that the current tower hours of coverage, are appropriate for RPT operations. The current period of tower activity provides reasonable periods of night flying for pilot training as per current practice as well as for daytime pilot training (from 0700 local).

Recommendation: Air Navigation Service Provider consider a cost benefit analysis of extending the operating hours of Tamworth Tower.

Issue: Gliders, Paragliding and Parachuting activities to the Northern area of Tamworth pose a risk to transiting aircraft both IFR and VFR.

Finding: Gliders are transmitting on their appropriate glider frequency and the current chart is marked with the activity for pilot awareness. Gliders are not monitoring the applicable Area VHF frequency due to single VHF radio carriage.

Recommendation: An ERSA entry, and / or text notation of activities on the VTC, advising to be vigilant of possible glider traffic in the region.

Issue: Delays encountered when arriving and departing due to a non-radar environment. Longer complicated radio calls are a result and may pose confusion to unfamiliar pilots. Stakeholder request for the introduction of Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs).

Finding: Current Procedural Separation Standards are utilised for separation of IFR aircraft.

Issue: Departures to the South could benefit from being granted a higher altitude clearance sooner after departure. Request for Training areas to the West, (D523A and D523B) to be made closer as departures on days of extremely hot temperatures can produce severe turbulence when departing via Duri Gap. Current tracking via Gate West and Gate South to the Training Area results in long flight times.

Recommendation: Airservices should explore options to allow for earlier climb to higher altitudes during these identified periods of extreme heat. This could be possibly be achieved as a result of Airservices transfer of Control Responsibility of Surveilled Class C Airspace from the ATC Control Tower to Enroute Controllers at Tamworth. This change would lead to reducing the time that flight crew are exposed to the effects of high temperature and at times severe turbulence at lower altitudes during the summer months.

Issue: An RPT stakeholder requests that student pilots display greater flexibility whilst operating in a high workload environment, for example, flying the circuit particularly at night. An ability for student pilots to make additional radio calls, when requested, will assist RPT crews with better situational awareness.

Finding: Low hour student pilots, some being solo, have limited experience and a limited ability to draw on knowledge to safely facilitate efficient manoeuvres.

Recommendation: Education between the Flying Training Organisations and the RPT operators in order to create awareness of the challenges faced by crews of high performance RPT operations. Local operators establish a Safety Forum with current stakeholders, initial

[4] Refer link page 22 - Aviation Safety Investigation Report 200203449

expertise to facilitate the inaugural meeting could be provided by CASA, with subsequent gatherings including the appropriate regional operators to be determined by the forum.

Issue: Pilots currently report multiple operational issues such as having obtained a clearance for departure, that the previously issued altitude limitations are frequently amended to a lower altitude upon line up. In addition, pilots report that they encounter delays while flying IFR through the Tamworth airspace having planned to transit overhead Tamworth Enroute. Delays also occur to faster aircraft as a result of having to maintain cruise altitude, when otherwise ready for descent, due to slower following aircraft.

Finding: Currently Procedural Separation Standards are in operation due to absence of radar surveillance at Tamworth.

Recommendation: Airservices should actively seek opportunities for improvement where possible to address the issues as listed above.

Issue: Circuit radio calls. The details listed in the En Route Supplement Australia (ERSA), for Tamworth under Flight Procedures. 6. Circuit Operation, states “report downwind (ABM the upwind threshold) with intentions. Stakeholder feedback advise that Tamworth ATC require a call to be made while conducting a turn onto or when established on the base leg of the duty runway assigned for circuit training.

Finding: A letter of Understanding (LOA) with BAE systems has been underway with Tamworth Tower since BAE’s involvement with military flight training for the specific use of Base Leg radio calls. BAE’s military flight training is currently decreasing and will do so over the next two years to the point of ultimate cessation of operations at Tamworth.

Recommendation: Tamworth Council submit an amendment proposal to Airservices, for the removal of this specific requirement to make radio calls while on Base Leg, during circuit training operations.

9 Conclusion

The OAR has completed a review of Tamworth.

The review ensured that the airspace complied with the requirements of the *Airspace Act (2007)*, Airspace Regulations (2007), the Australian Airspace Policy Statement (2018), the Minister's Statement of Expectation (2019) and CASA's Regulatory Philosophy.

The OAR has determined that the current airspace architecture is fit for purpose. The OAR proactively and regularly monitors traffic and incident data. The OAR also engages the aviation community on a regular basis to ensure that the airspace classification and published air routes are safe and efficient. In order to ensure continued fit for purpose status its recommended that aircraft movement numbers and incident reports be monitored over the next five years. A further review within the next five years is to be conducted, when in the opinion of the OAR based upon observed movement numbers and or incident reports, a review is warranted.

An assessment of airspace incidents was undertaken with the majority of feedback from stakeholders concluding there were no safety concerns that required changes to the existing airspace. There were however areas of potential improved efficiency by Tamworth tower identified raised by flight training providers. The assessment of Air Traffic Services however revealed the concerns from a current flight training operator which provided feedback relating to their need to enhance safety of flight during night training operations while in the circuit. The improvement to safety would directly be achieved by Tamworth Tower remaining active for a longer period during night circuit operations. In support of this, the current risk situation has been highlighted via their submission of an internal company Risk Assessment, which specifically addresses operations and risks associated with CTAF operations after tower closure. Secondly was the submission from an RPT airline regarding an occurrence report that has since been shared between themselves and the flight training provider whose aircraft was also flying in the circuit at night in Tamworth. Lastly the flight training organisation provided the ATSB report relating to an accident involving their aircraft while in the circuit at night at Moorabbin airport in Victoria. This report shows similarities between Moorabbin and Tamworth regarding aircraft circuit training at night, namely the volumes of aircraft and the ability to have misunderstanding between lower houred pilots with a resultant accident.

The following corrective and preventative measures have been initiated to mitigate the risk at Tamworth airport.

- The incident involving the RPT aircraft was captured in the company safety management system.
- A complete hazard identification and risk analysis completed on the occurrence.
- Initiation of a Safety Notice (NOTAC) to all Tamworth staff and students with new procedures for Night circuit operations.
- Amendments made to their operations manual including the new procedures and other measures for night solo students.

Annex A Acronyms and Abbreviations

Acronym/abbreviation	Explanation
AAPS	Australian Airspace Policy Statement 2018
ACP	Airspace Change Proposal
Act	Airspace Act 2007
ADS-B	Automatic Dependent Surveillance - Broadcast
Airservices	Airservices Australia
ALA	Aircraft landing area
ALARP	As Low As Reasonably Practicable
AMSL	Above Mean Sea Level
ANSP	Air Navigation Service Provider
ASA	Aviation Safety Advisor
ASIR	Aviation Safety Incident Report
ATC	Air Traffic Control
ATS	Air Traffic Services
ATSB	Australian Transport Safety Bureau
CASA	Civil Aviation Safety Authority
CCO	Continuous Climb Operations
CDO	Continuous Descent Operations
CTA	Control Area
CTAF	Common Traffic Advisory Frequency
CTR	Control Zone
DA	Danger Area
Defence	Department of Defence
DME	Distance Measuring Equipment
ERC	En Route Chart
ERSA	En Route Supplement Australia
FT	Feet
FL	Flight Level
GA	General Aviation
IAL	Instrument Approach and Landing
ICAO	International Civil Aviation Organization
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
km	Kilometre
kt	Knot
LL	Lower Level
LOA	Letter of Agreement
MM	Middle Marker
MLAT	Multilateration
NOTAM	Notice to air men
NM	Nautical Miles
OAR	Office of Airspace Regulation
OM	Outer Marker
PT	Passenger transport
PTO	Passenger Transport Operations
RA	Restricted Area
RAPAC	Regional Airspace and Procedures Advisory Committee

Acronym/abbreviation	Explanation
RFC	Request for Change
RNAV	Area Navigation
RPAS	Remotely Piloted Aircraft Systems
RPT	Regular Public Transport
SFC	Surface
SID	Standard Instrument Departure
STAR	Standard Arrival Route
TAC	Terminal Area Chart
TASWAM	Tasmanian Wide Area Multilateration
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VNC	Visual Navigation Chart
VTC	Visual Terminal Chart
WAM	Wide Area Multilateration

Annex B Australian Airspace Structure

Class	Description	Summary of Services/Procedures/Rules
A	All airspace above Flight Level (FL) 180 (east coast) or	Instrument Flight Rules (IFR) only. All aircraft require a clearance from Air Traffic Control (ATC) and are separated by ATC. Continuous two-way radio and transponder required. No speed limitation.
B	IFR and Visual Flight Rules (VFR) flights are permitted. All flights are provided with ATS and are separated from each other. Not currently used in Australia.	
C	In control zones (CTRs) of defined dimensions and control area steps generally associated with controlled aerodromes	• All aircraft require a clearance from ATC to enter airspace. All aircraft require continuous two-way radio and transponder. • IFR separated from IFR, VFR and Special VFR (SVFR) by ATC with no speed limitation for IFR operations. • VFR receives traffic information on other VFR but are not separated from each other by ATC. SVFR are separated from SVFR when visibility (VIS) is less than Visual Meteorological Conditions (VMC). • VFR and SVFR speed limited to 250 knots (kt) Indicated Air Speed (IAS) below 10,000 feet (FT) Above Mean Sea Level (AMSL)*.
D	Towered locations such as Bankstown, Jandakot, Archerfield, Parafield and Alice Springs.	• All aircraft require a clearance from ATC to enter airspace. For VFR flights this may be in an abbreviated form. • As in Class C airspace all aircraft are separated on take-off and landing. All aircraft require continuous two-way radio and are speed limited to 200 kt IAS at or below 2,500 FT AMSL within 4 NM of the primary Class D aerodrome and 250 kt IAS in the remaining Class D airspace**. • IFR are separated from IFR, SVFR, and provided with traffic information on all VFR. • VFR receives traffic on all other aircraft but is not separated by ATC. • SVFR are separated from SVFR when VIS is less than VMC.
E	Controlled airspace not covered in classifications above	• All aircraft require continuous two-way radio and transponder. All aircraft are speed limited to 250 kt IAS below 10,000 FT AMSL*, • IFR require a clearance from ATC to enter airspace and are separated from IFR by ATC and provided with traffic information as far as practicable on VFR. • VFR do not require a clearance from ATC to enter airspace and are provided with a Flight Information Service (FIS). On request and ATC workload permitting, a Surveillance Information Service (SIS) is available • within surveillance coverage.
F	IFR and VFR flights are permitted. All IFR flights receive an air traffic advisory service and all flights receive a flight information service if requested. Not currently used in Australia.	
G	Non-controlled	• Clearance from ATC to enter airspace not required. All aircraft are speed limited to 250 kt IAS below 10,000 FT AMSL*. • IFR require continuous two-way radio and receive a FIS, including traffic information on other IFR. • VFR receive a FIS. On request and ATC workload permitting, a SIS is available within surveillance coverage. VHF radio required above 5,000 FT AMSL and at aerodromes where carriage and use of radio is required.

Annex C Stakeholders

The following stakeholders were contacted to contribute to this review/study.

Organisation	Position
CASA	Flight Operation Inspector
CASA	Aviation Safety Advisor
Air Services Australia	Regulatory Services
Airspeed Aviation	Chief Pilot
Aspect Aviation	Chief Pilot
Australian International Flying College	Chief Flying Instructor
BAE Systems Australia	Chief Flying Instructor
CAE Oxford	Chief Flying Instructor
Corporate Air / Fly Corporate	Head of Flight Operations
Edwards Aviation	Chief Pilot
Fleet Helicopters	Chief Pilot
Gunnedah Aero Club	Chief Flying Instructor
Inverell Aviation	Chief Pilot
Kennedy Aviation	Chief Pilot
Lake Keepit Gliding	Chief Pilot
Macquarie Aviation	Chief Pilot
QantasLink	Chief Pilot
Quirindi Air	Chief Pilot
Royal Flying Doctor Service	Manager Aviation Systems
NSW Regional Airspace and Procedures Advisory Committee	Secretary
Tamworth Council	Airport Manager
Tamworth Aero Club	Chief Flying Instructor
Virgin Australia Regional Airlines	Chief Pilot
Westpac Rescue Helicopter Service	Chief Pilot

Annex D References

https://www.atsb.gov.au/publications/investigation_reports/2002/aair/aair200203449/

Summary:

At approximately 1840 Eastern Standard Time on Monday 29 July 2002, two Cessna Aircraft Company 172Rs, registered VH-CNW and VH-EUH, collided while on short final approach to runway 17 left (17L) at Moorabbin airport, Victoria. The two aircraft became entangled, with CNW on top of EUH. The entangled aircraft impacted the runway and came to rest after sliding a short distance along the runway surface.

The instructor and student pilot of EUH were conducting night circuit training and the pilot of CNW, the sole occupant, was conducting night circuits. Both aircraft were using runway 17L. The instructor and student pilot of EUH were able to exit their aircraft before fire engulfed both aircraft. The pilot of CNW was fatally injured.

Both aircraft were based at Moorabbin airport. The Moorabbin Air Traffic Control Tower was not in operation at the time of the accident and mandatory broadcast zone (MBZ)[5] procedures were in use, under which pilots are required to:

- See and avoid other aircraft,
- Carry a serviceable radio, and
- Make mandatory radio broadcasts when commencing to taxi for takeoff, when entering a runway for takeoff, prior to entering an MBZ when inbound or transiting and when inbound and joining the circuit.

Six aircraft were operating in the MBZ at the time of the accident. All were being flown by pilots who held a commercial pilot licence or some higher qualification.

The mandatory broadcast procedures in an MBZ provide a basic alert to assist pilots to see and avoid other aircraft and can be supplemented by additional discretionary broadcasts. A mandatory broadcast may contain insufficient information to enable pilots to see-and-avoid other aircraft, or to enable them to make a meaningful assessment of the location of other aircraft. The pilots of CNW and EUH made all the relevant mandatory broadcasts. They also made a discretionary broadcast at about the time they were established on the base leg of the circuit. Those broadcasts did not effectively alert either pilot to the collision potential with the other aircraft.

Even though the two aircraft were of the same type and were operating at similar speeds in the circuit, radar data indicated that the pilots of EUH conducted a wider circuit than the pilot of CNW. The EUH circuit would have taken approximately 7 minutes to complete, whereas the pilot of CNW conducted a circuit that would have taken approximately 4.5 minutes to complete. Both circuit dimensions were within the range of circuit dimensions that were being conducted by other pilots at the time and were not considered by the investigation to be contrary to procedures. While the dimensions of the circuits flown by the two accident aircraft were not unusual, the different circuit dimensions, and the consequent difference in the elapsed time, removed the natural spacing that would have typically resulted from the difference in take-off times. In the absence of any other defence or action, the different circuit dimensions led to the two aircraft converging on the final approach leg of the circuit. Neither of the pilots involved in the accident was aware of the impending collision.

The investigation identified the following significant factors:

- The different circuit dimensions negated the natural spacing provided by the difference in takeoff times, even though both EUH and CNW were the same aircraft type and were operating in the circuit at similar speeds.

[5] The term MBZ and its associated procedures are no longer used in Australia.

- None of the pilots involved in the accident saw the other accident aircraft in sufficient time to enable either of them to avoid the collision.
- The broadcasts made by the pilots did not assist their situational awareness.

Additionally, the investigation found deficiencies in the risk management process associated with the reduction in the Moorabbin airport air traffic control tower hours of operation. It could not be determined whether the reduction in tower hours contributed to the accident.

An earlier report found that human performance limitations in the visual scanning '…process can reduce the chance that a threat [potentially conflicting] aircraft will be seen and successfully evaded. These human factors are not "errors" nor are they signs of "poor airmanship". They are limitations of the human visual and information processing system which are present to various degrees in all pilots.

In particular, the practice of routinely re-analysing the information on which decisions are made, especially in airspace where the potential for a traffic confliction is relatively high, might help compensate for those inherent human performance limitations of the human visual and information processing system.

While not required under MBZ procedures at the time, prior to the accident, the flying school required its instructors and student pilots to make a base broadcast at the start of the base leg of the circuit. Subsequent to the accident, the flying school has amended the content of that broadcast. Instructors and student pilots are now required to append their perceived number in the landing sequence to the base broadcast.

In September 2002, Airservices Australia approved a plan for an ongoing airport movement review outside tower hours for ATC towers that were not open 24 hours per day, which included Moorabbin tower, to monitor the need for an air traffic control service.