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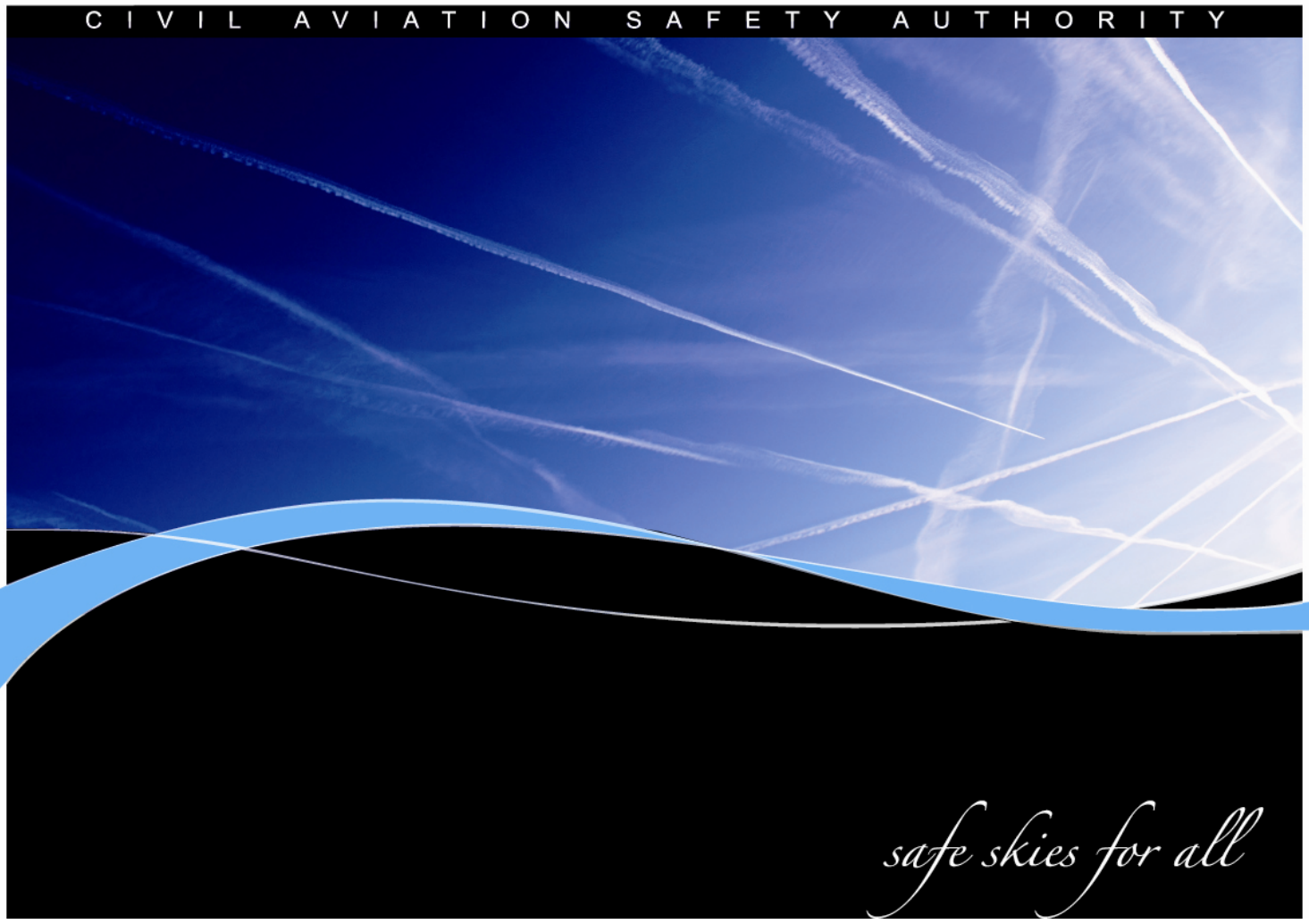
Airspace Review of Bathurst Aerodrome

June 2009



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1 Purpose

1.1 This report documents a safety review conducted of the airspace within 20 nautical miles (nm)[1] of Bathurst aerodrome, New South Wales. The review forms a part of the Office of Airspace Regulation (OAR) work programme and is required by the Australian Airspace Policy Statement (AAPS). The airspace around Bathurst was modelled by the OAR applying the Airspace Risk Model (ARM).

2 Scope

2.1 The scope of the airspace review involved sampling airspace users and stakeholders to identify risks that may not be evident from a desktop exercise. This included airlines, charter operators, scenic operators, flying training schools, aero clubs, the military, emergency services, the aerodrome operator and Airservices Australia.

2.2 It was beyond the scope of the review to examine aerodrome facilities unless the facilities significantly impacted on the safety of operations within the vicinity of the aerodrome.

3 Objectives

3.1 The objectives of the airspace review were to:

- Investigate current and future traffic levels and mix of aircraft operation at and in the vicinity of the Bathurst aerodrome;
- Determine the risks posed to those operations, focussing on the protection of passenger transport operations;
- Determine appropriate risk mitigators; and
- Make a determination, supported by findings of the risk and cost benefit analyses, which ensures the protection of passenger transport (PT) services at Bathurst aerodrome.

4 Background

4.1 Bathurst city (hereafter referred to as 'the city') is located on the central tablelands of New South Wales, 207 kilometres west of Sydney by road. The Bathurst region has approximately 37,500 residents.

4.2 The city is Australia's oldest inland settlement and as such was an important regional centre and gateway for much of the exploration and development that took place in inland New South Wales.

4.3 The city is a regional services centre, the home of one of the campuses of Charles Sturt University, and a tourism centre. It is a cathedral city, being the seat for the Anglican and Roman Catholic bishops of Bathurst.

4.4 The city is well known for the Mount Panorama motor racing circuit, venue for the Bathurst 12 Hour motor race each February and the Bathurst 1000 motor race each October.

4.5 The region combines rural, manufacturing and education industries with a lifestyle rich in sport, art and tourism.

[1] A Glossary is at Annex A

5 Aerodrome and Infrastructure

5.1 Bathurst aerodrome (hereafter referred to as 'Bathurst') is a certified aerodrome, owned and operated by the Bathurst Regional Council. It is located approximately 8.3 kilometres east of the city. The aerodrome was constructed in 1942 by the Department of Public Works. The ownership of the aerodrome was transferred from the Commonwealth to the Council as part of the Aerodrome Local Ownership Plan (ALOP) during the mid 1970s.

5.2 The Bathurst Regional Council do not charge landing fees at the aerodrome, for aircraft under 2,000 kilograms (kg) Maximum Take Off Weight (MTOW). The absence of landing fees attracts numerous training aircraft from Bankstown conducting navigation exercises.

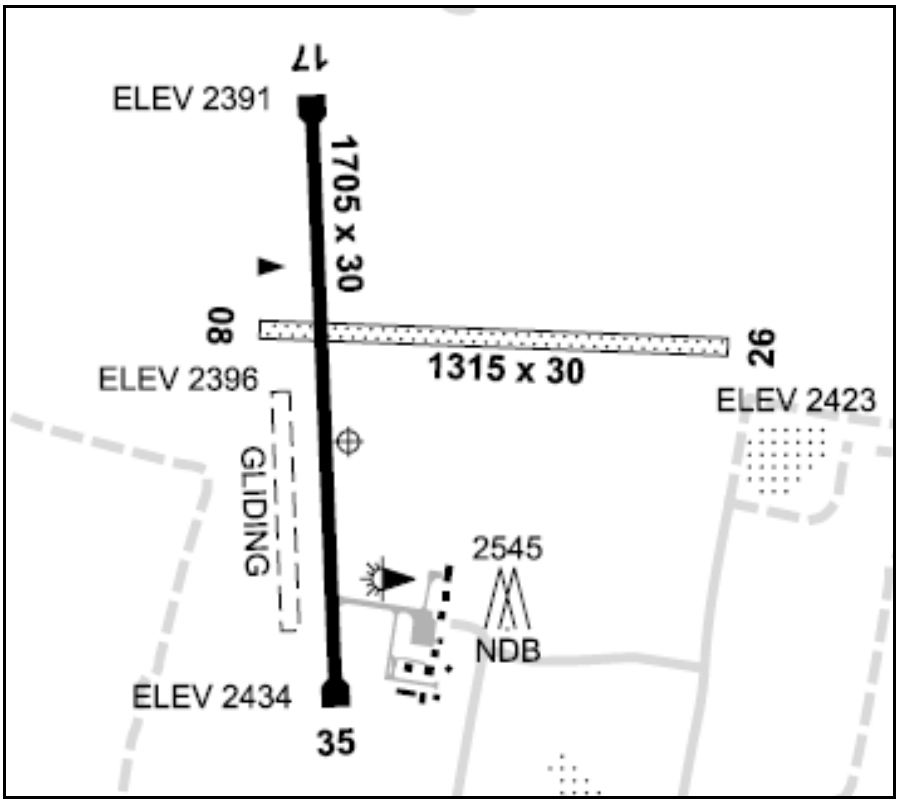

Figure 1: Diagram of Bathurst aerodrome (from the En Route Supplement of Australia (ERSA))

5.3 The aerodrome has a main, sealed runway (designated as runway 17/35) which is 1,705 metres long and 30 metres wide. It has a secondary runway (designated as runway 08/26) which is 1,315 metres long and 30 metres wide. The secondary runway is constructed of brown gravel.

5.4 The south western side of the main runway has a grassed area which is used for gliding operations.

5.5 The aerodrome has one major taxiway leading from the southern end of the main runway to the terminal building. Minor taxiways lead from the main taxiway and terminal apron, to various hangars and parking areas.

5.6 Regional Express Airlines (REX) operate daily return flights between Sydney and Bathurst, utilising the 33 seat, SAAB 340 aircraft.

5.7 The Bathurst Aero Club was founded in 1938 and is based at the aerodrome, and operate a four seat, Cessna 172SP aircraft. Club members own and operate small single engine aeroplanes, ultralight aircraft and gliders. To promote aviation safety, the Club conduct five flying competitions a year for members, regular Sunday afternoon information seminars and three night circuit socials are held in conjunction with one of the two professional flying schools based at Bathurst.

5.8 SmartAir operate a flying school and charter service from Albury and Bathurst. The fleet contains single engine aeroplanes such as the Piper Tomahawk and Cessna 172; small twin-engined aeroplanes and the nine seat, twin Turbo Prop, Beechcraft Super King Air.

5.9 WardAir offer professional flying training in a supportive environment. Being a small flying school, WardAir is able to provide individual and personalised flight training. The flying school is based at the aerodrome, and operate single engined Cessna aircraft. The company also operate the small, twin engine Beechcraft Duchess.

5.10 The Air Training Corp and gliding training have returned to Bathurst after several years absence. The camps are conducted during school holidays. This has resulted in traffic movements increasing significantly over the previous year. The Air Training Corp and gliding training conducted during school holidays may include fixed wing training in the future.

5.11 **Navigational Aids**

Bathurst is serviced by a Non-Directional Beacon (NDB). While it should be noted that Airservices Australia has a project to decommission NDBs across Australia, Bathurst is not included in the current plans.

5.12 **Instrument Approaches**

An NDB and Area Navigation (RNAV) Global Navigation Satellite System (GNSS) approaches are published for runway 17. Circling instrument approaches are also published for the RNAV/GNSS arrivals.

5.13 **Radio Communications / Facilities**

A Common Traffic Advisory Frequency (CTAF) frequency of 127.35 megaHertz (MHz) is promulgated for Bathurst aerodrome. The aerodrome utilises an Aerodrome Frequency Response Unit (AFRU) which is also known as a "beepback" unit. The AFRU automatically responds to a radio broadcast to notify the pilot of the frequency used.

The air traffic services/flight information area frequency of 135.25 MHz can be received on the ground.

An Automated Weather Information System (AWIS) is installed to broadcast current surface weather conditions. The AWIS is broadcast on the frequency 133.25 MHz.

Glider pilots use 122.70 MHz for circuit/training traffic at Piper's Field. Piper's Field is approximately 7 nm west of Bathurst. Information regarding the gliding operations in the area is in ERSA, under the Bathurst entry.

5.14 **Runway Lighting**

Aerodrome Pilot Activated Lighting (PAL) is available on frequency 120.60 MHz.

Night operations do not generally include extensive pilot training operations.

5.15 **Additional airfields**

There are a number of airfields within 20 nm of Bathurst. The majority of these are small, private (mainly agricultural) airstrips. The exception, is the gliding airfield, Piper's Field, Eglinton.

5.16 Piper's Field is approximately 7 nm west of Bathurst, and is owned by the Bathurst Soaring (Gliding) Club. The club operate from the airfield on weekends and public holidays. Piper's Field has five grass runways. The main runway is 800 metres in length, (designated as runway 03/21) and has a 400 metre bitumen takeoff strip in the 21 direction. The other runways are used occasionally for training and convenience but rarely for wind changes. The other runways are designated as 18/36 (650 metres in length); 15/33 (400 metres in length); 01/19 (560 metres in length) and 07/25 (400 metres in length) which is at the south end of the field but it is not always serviceable.

5.17 The Bathurst Aero Club occasionally utilise the Wardell airstrip for flying competitions. Wardell airstrip (near Perthville) is an agricultural airstrip, approximately 10 nm south west of Bathurst. It has one grass runway (designated as runway 18/36) which is 975 metres in length.

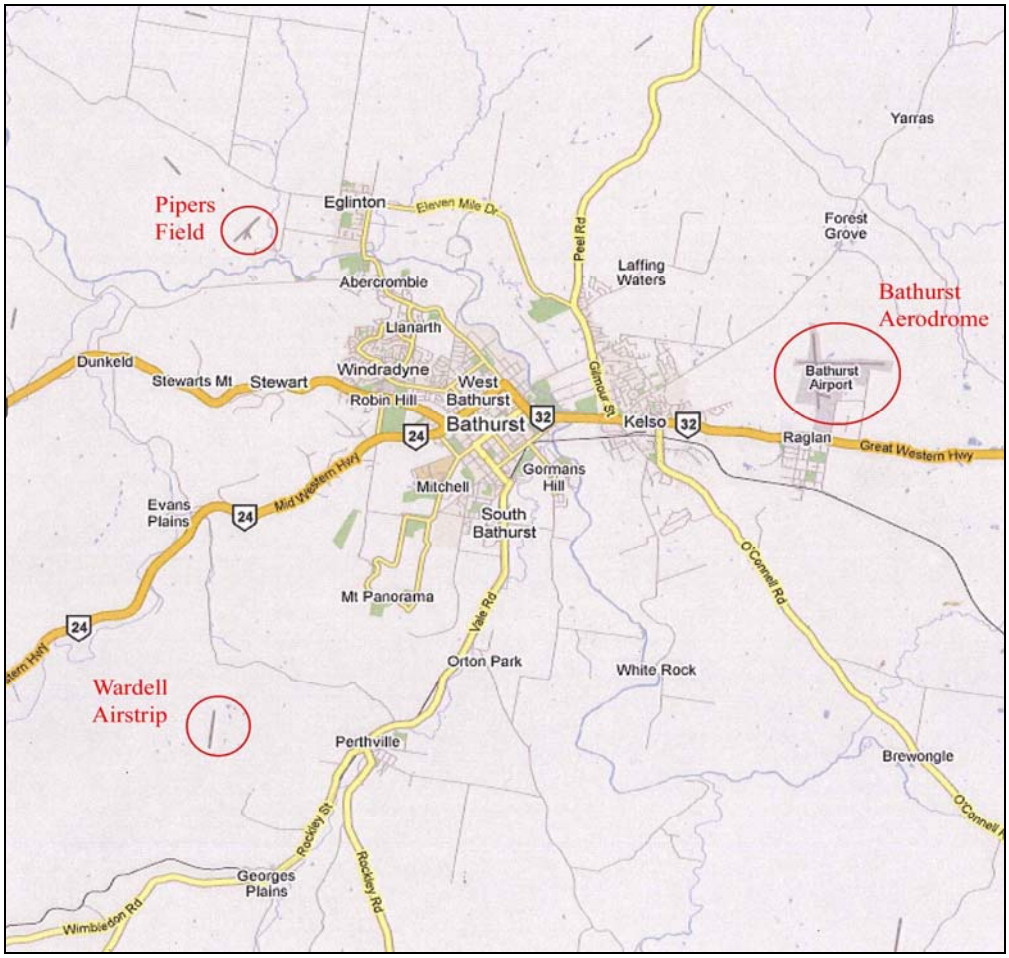

Figure 2: Map of Bathurst city, showing Bathurst aerodrome; Piper's Field and the Wardell airstrip. (Map courtesy of Google © 2009)

6 Overview of Bathurst airspace

6.1 In line with the International Civil Aviation Organization (ICAO) Annex 11 and as described in the AAPS, Australian airspace is classified into Class A, C, D, E and G, depending on the level of service required to manage traffic safely and effectively. The classification determines the category of flights permitted and the level of air traffic services (ATS) provided. Class B and F airspace is not currently used in Australia.

6.2 In Australia, aerodromes are either controlled (i.e. Class C or Class D) or uncontrolled. Uncontrolled aerodromes utilise either the CTAF procedure or the CTAF (radio required) (CTAF(R)) procedure. CTAF(R) procedures require all aircraft operating at the aerodrome to be equipped with a serviceable Very High Frequency (VHF) radio.

6.3 The airspace around Bathurst aerodrome is Class G, i.e. uncontrolled with no air traffic services, from the ground to an altitude of 8,500 feet (ft). Class E airspace exists above Bathurst between 8,500 ft and Flight Level (FL) 180. Class A airspace exists above FL 180.

6.4 CTAF procedures are in use at the aerodrome. As a CTAF is a procedure and not a volume of airspace, a CTAF has no vertical or lateral boundary.

6.5 Standard non-towered aerodrome communication procedures require aircraft to broadcast on the CTAF / CTAF(R) frequency when 'in the vicinity' of a non-towered aerodrome. The Aeronautical Information Publication (AIP) states the 'An aircraft is in the vicinity of a non-towered aerodrome if it is within a horizontal distance of 10 miles; and within a height above the aerodrome reference point that could result in conflict with operations at the aerodrome.' Whether or not a transiting aircraft could be '… in conflict with operations …' is left to the pilot of the transiting aircraft, who may have little or no knowledge of the types of operations (i.e. heavy jet) at the particular aerodrome.

7 Consultation

7.1 OAR representatives sought input from a number of stakeholders who operate in and around Bathurst aerodrome. Generative stakeholder interviews were conducted over the period of February and March 2009. Feedback on the draft report was received in May and June 2009.

7.2 Comments and feedback were received from the following stakeholders:

- Local private and commercial pilots
- Bathurst Aero Club
- Bathurst Regional Council
- Bathurst Soaring Club
- Regional Express Airlines (REX)
- WardAir

7.3 CASA employs Aviation Safety Advisors (ASA) throughout Australia as an integral mechanism for providing safety promotion and educational material to the various industry segments. A CASA Aviation Safety Advisor visited Bathurst in March 2009 to liaise with local operators, and discuss airspace issues. Feedback from this visit is included in this report.

7.4 Consultation was conducted with CASA Flight Operations Inspectors (FOI) from the region.

8 Methodology

8.1 **Methodology Outline** The review was conducted by members of the OAR over a two month period during February and March 2009. The study involved a review of documentation, data collection and analysis, an onsite visit by a CASA Aviation Safety Advisor, non-resident stakeholder consultation, a risk assessment and the development of recommendations. As the recommendations were of a minor nature, a cost-benefit analysis of the recommendations was not conducted.

9 Review of Documentation

9.1 Information on the Bathurst aerodrome is contained in the following AIP documents:

a. En Route Supplement of Australia (ERSA) - effective 12 March 2009.
b. Departure and Approach Procedures (DAP) East – effective 12 March 2009.
c. Australia En Route Chart (ERC) Low and High - effective 20 November 2008.
d. Terminal Area Chart (TAC) 5 - effective 20 November 2008.
e. Visual Navigation Chart (VNC) – Newcastle effective 20 November 2008
f. Visual Navigation Chart (VNC) - Sydney/Brisbane effective 20 November 2008.
g. Designated Airspace Handbook (DAH) effective 20 November 2008.
h. World Aeronautical Chart (WAC) #3456 (Sydney – Edition 17)
i. World Aeronautical Chart (WAC) #3457 (Canberra – Edition 16).
j. Notice To Airmen (NOTAM)

10 Stakeholders

10.1 The OAR identified stakeholders who operate in and around Bathurst aerodrome. Stakeholders include:

a. Air Freight Solutions
b. Air Link Pty Ltd
c. Aircraft Owners and Pilots Association (AOPA)
d. Airservices Australia
e. Australian Air Force Cadets (328 squadron)
f. Bankstown Flying Training organisations (Various)
g. Bathurst Aero Club
h. Bathurst Regional Council
i. Bathurst Soaring Club
j. Blue Sky Airlines Pty Ltd
k. Orange Aero Club
l. Orange Ultraflight
m. Panorama Airways
n. Regional Airspace and Procedures Advisory Committee (RAPAC)
o. Regional Express Airlines (REX)
p. Royal Flying Doctor Service (South Eastern Section)
q. SmartAir
r. WardAir

11 Data collection and analysis

11.1 The study reviewed aeronautical data from the following sources:

a. 12 months of data on aircraft movement figures and Electronic Safety Incident Reports (ESIRs) from Airservices Australia (Airservices);

b. passenger numbers from the aerodrome operator and Airservices;

c. Air Safety Incident Reports (ASIRs) from the Australian Transport Safety Bureau (ATSB)

12 Current Movements

12.1 The data in Table 1 was supplied by the aerodrome operator, through the Bureau of Infrastructure, Transport and Regional Economics (BITRE).

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Passenger Transport Passengers	18,203	12,806	13,916	15,478	19,659	21,137	24,152	24,941
Passenger Transport Movements	2,936	3,108	3,288	3,108	2,180	2,199	1,895	1,874
Total Movements				15,646	12,906	13,782	13,566	19,622
Percentage change					17.51%	6.79%	-1.57%	44.64%

Table 1: Change in Annual Movements 2000 – 2008

12.2 The BITRE data, which is collated from international, domestic and regional RPT services was analysed. The BITRE aerodrome figures show that for the previous five years, regular public transport flights accounted for less than 14.9% of the total movements. These figures do not account for charter flights; however, the inclusion of charter flights would result in only a marginal increase in this figure.

12.3 The increase in traffic movements for the period 2007/2008, is significant when compared to the previous year (an increase of 44.64%). However, the increase is not as dramatic when compared to the movements before the downturn that was experienced in 2004/2005. For the calendar year 2003, there were 16,816 movements. The movements in 2007/208 are an increase of 16.7% on the 2003 level. The increased traffic can be attributed to the return of activities of the Air Training Corp and gliding operations. An increase in itinerant traffic from Bankstown has also been experienced.

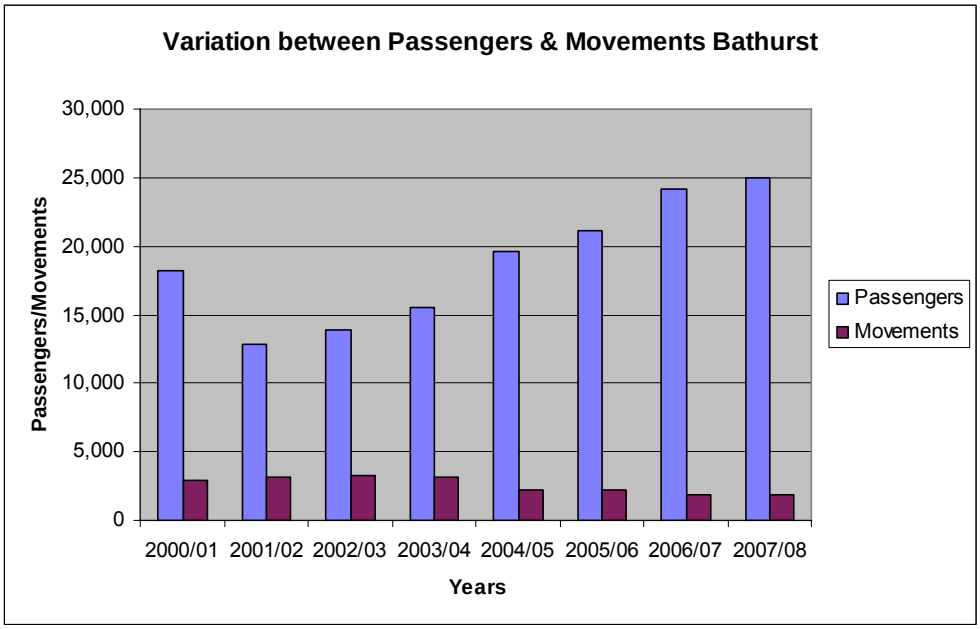

Figure 3: History of passenger and PT movement numbers 2000 - 2008

12.4 The Figure 3 and Table 1 show clearly the increase in passenger numbers and the decrease in movements. The average number of passengers per Passenger Transport movement has increased from approximately 4 to 13, indicating that the capacity of aircraft flying into Bathurst has increased.

12.5 The traffic mix is also depicted in Figure 4.

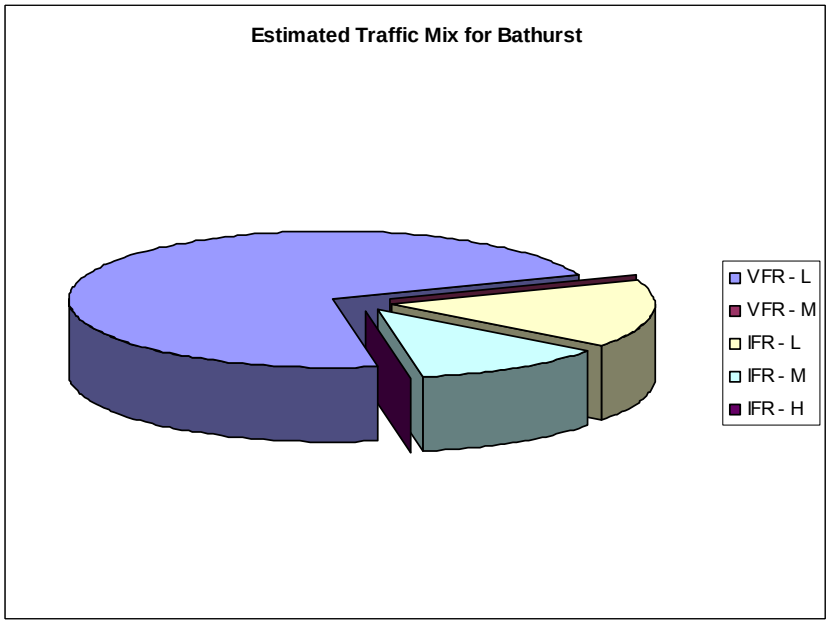

Figure 4: Estimated Traffic Mix at Bathurst aerodrome

13 Historical Data and Future Growth

13.1 According to the aerodrome operator, projections based upon recent activity indicate that the total number of passengers supported by the aerodrome is expected to remain steady.

13.2 Air Link Airlines was established in 1971 as an aircraft charter operation based in Dubbo, New South Wales. Regular regional airline services were commenced in 1991 and the company grew steadily over the years expanding services and the aircraft fleet. 2003 saw the introduction of pressurised turbine aircraft with a Beech 1900D regional airliner. Air Link conduct charter services, Australia - wide and provides aircraft engineering and maintenance services.

13.3 On 30 November 2005 Regional Express Holdings acquired all the shares in Air Link Airlines. In December 2008, Air Link Airlines ceased all scheduled passenger operations to Bathurst and all other NSW destinations. The company continues to operate as an independent air charter company.

13.4 REX airlines conduct daily flights between Sydney and Bathurst. The route has recently transitioned from the 19 Seat Beech 1900D (previously operated by Air Link) to the 34 seat Saab 340 (operated by REX) with no change in frequency. A decrease in frequency is not on the agenda but it is largely dependant on the commercial performance for the current frequency that is now operated with the Saab 340.

13.5 Two local flying schools operate from Bathurst. The aerodrome is frequented by training aircraft from Bankstown as part of navigational training flights.

13.6 Orange Ultraflight operate ultralight flight training one weekend a month at Bathurst. The company operate the Jabiru J160 aircraft which can be registered with Recreational Aviation Australia (RAA) or with CASA.

13.7 The Council have planned aerodrome capital expenditure over the next two years. The program includes: rehabilitation of the main taxiway (runway to apron) due in 2008/2009; major repairs to the terminal car park and progressive sealing of the general aviation taxiway and gravel pavement in 2009/2010.

13.8 The absence of landing fees for itinerant aircraft attracts numerous training aircraft from Bankstown conducting navigation exercises. The aerodrome at Mudgee (50nm North of Bathurst) charges landing fees for all aircraft – and experiences significantly less itinerant traffic. Owners of aircraft less than 2,000 kg, which are based at Bathurst, are charged a flat annual fee of approximately $300.

14 Incident Reports

14.1 For the 12 month period to the end of October 2008, six (6) Electronically Submitted Incident Reports (ESIR) were received for the Bathurst area. None of these were considered relevant in regard to airspace issues. A summary of the ESIR's are in Annex B.

14.2 For the 12 month period to the end of October 2008 there were no Aviation Safety Incident Reports (ASIR) reported to the Australian Transport Safety Bureau (ATSB).

15 Assumptions

15.1 214 collision pairs were calculated applying the CASA collision formula. The operational environment referred to in the model is uncontrolled non-radar, Class G terminal area. It has a radius of 15 nautical miles and extends to 5,000 ft above ground level. Collision types include aircraft operating under the Visual Flight Rules (VFR) and aircraft operating under Instrument Flight Rules (IFR). Conflict pairs were grouped into 16 categories and are listed in Table 2 below.

Collision Types	Collision Pairs
VFR - VFR	147
IFR(L) - VFR	29
IFR(L) - IFR(L) in VMC	6
IFR(L) - IFR(L) in IMC	1
IFR (M) - VFR	22
IFR(M) - IFR(L) in VMC	4
IFR(M) - IFR(L) in IMC	1
IFR(M) -IFR(M) in VMC	3
IFR(M) -IFR(M) in IMC	1
IFR(H) - VFR	0
IFR(H) - IFR(L) in VMC	0
IFR(H) - IFR(L) in IMC	0
IFR(H) - IFR(M) in VMC	0
IFR(H) - IFR(M) in IMC	0
IFR(H) - IFR(H) in VMC	0
IFR(H) - IFR(H) in IMC	0
Total	**214**

Table 2: Estimated conflict pairs for Bathurst

VFR including gliders and helicopters
IFR (L) = IFR Light - 10 passengers
IFR (M) = IFR Medium - 10 to 38 passengers
IFR (H) = IFR Heavy - more than 38 passengers

15.2 The conflict pairs were grouped in proportion to traffic and in addition the following assumptions were made:

- Factor up like pairs by 1.5
- Factor down unlike pairs by ⅔
- IFR-IFR pairs are 80% in Visual Meteorological Conditions (VMC) and 20% in Instrument Meteorological Conditions (IMC)
- In total 214 collision pairs were estimated.

16 Modelling

16.1 The OAR used the Airspace Risk Model (ARM) to model the airspace surrounding the Bathurst aerodrome. The ARM and a FN-curve was developed by CASA and utilised by the OAR.

16.2 CASA has developed 'acceptable risk' criteria with regards to the risk of midair conflicts within regional aerodrome terminal areas. The collision risk model, developed by CASA in 1996, is focused on a non-radar controlled terminal area model and no significant changes have been made since its development and presentation to the Review of the General Concept of Separation Panel, now the Separation and Airspace Safety Panel of the International Civil Aviation Organization (ICAO).

16.3 This method includes the ARM, which is used to calculate benefits in terms of fatalities avoided by implementing safety measures. The ARM presumes that there is a 'Potential Conflict Pair', i.e. a pair of aircraft whose manoeuvres are such that if no intervening action is taken, the aircraft will reach a point where it will be too late to take evasive action and chance becomes the determining factor in whether the aircraft collide or not. This is called the Loss of Control point in this review.

16.4 The ARM model is based on the Linear Criterion concept which stipulates that the frequency of an accident should be inversely proportional to its severity, i.e. an accident involving one fatality may happen ten times as often as an accident involving ten fatalities.

16.5 One scenario was modelled for Bathurst aerodrome – Class G airspace with CTAF procedures which is the baseline case. Collision pairs for this review were calculated applying the CASA regression formula. It was established that this formula usually over estimates collision pairs. It is therefore reasonable to assume that the real risk figures calculated for this review are lower.

17 Results

17.1 **Results of the Airspace Risk Model and FN-Curve**. The results for the scenarios are summarised in Table 4.

Scenario	Fatalities per Annum	Fatalities per Collision	Years between Collision
CTAF Procedures	4.73E-03	4	846

Table 3: Airspace Risk Model Results for Bathurst

17.2 Annualised movement data was applied to the ARM developed by CASA. The results are shown in **Figure 5** – FN Curve, on the following page.

17.3 The blue line in **Figure 5** indicates the risk level estimated for Bathurst when CTAF procedures are in place. The line is well below the scrutiny line however it is still in the middle ALARP (as low as reasonably practicable) region. It is estimated that a midair collision with 4 or more fatalities may occur only once in 846 years. Because it is assumed that the collision pairs are overestimated, it is reasonable to assume that a midair collision with 4 or more fatalities should occur less frequently than the results indicate.

17.4 While the FN curve plotted is well below the scrutiny line, it is important that all reasonable practices are in place at the aerodrome to ensure ALARP and any additional work should be focused towards aspects relating to good practice. Duty of care, which is the legal obligation to impose and adhere to all reasonable standards to prevent foreseeable harm to others, must prevail at all

times. The introduction of CTAF (R) procedures at Bathurst would only result in a slight safety benefit – whilst excluding regular users access to the airspace.

17.5 It is important to note that, for the purposes of the modelling, a CTAF(R) environment is equated to the old MBZ (Mandatory Broadcast Zone) and VFR compliance in this area was estimated to be in the range of 99% (*Manual of the Airspace Risk Model, Acceptable Risk Criteria, Value of Statistical Life*, Version 1: June 2006*)*.

17.6 "Considering the reportedly high radio equipage rates of Australian registered aircraft, it is Ambidji's assessment that the mandatory requirement for all aircraft to be radio equipped when operating in the vicinity of a CTAF(R) aerodrome alone offers only a small contribution to measured compliance rates and hence traffic separation safety.

17.7 The effective use of radio and adherence to prescribed procedures is a significant contributor to improved traffic separation safety at non-controlled aerodromes. Improved pilot training and education should be implemented to improve compliance with these aspects."[2]

17.8 Aircraft movements for the period 2008/2009 are expected to decrease from the previous year due to the current economic climate. The decrease is expected to be between 5 and 15%. "REX, the nation's largest independent regional carrier, revealed a 20 per cent slump in passengers in January."[3]

[2] Report into CTAF versus CTAF(R) by the Ambidgi Group Pty Ltd. http://casa.gov.au/oar/download/CTAFvCTAF_R.pdf
[3] Sydney Morning Herald 16th March 2009

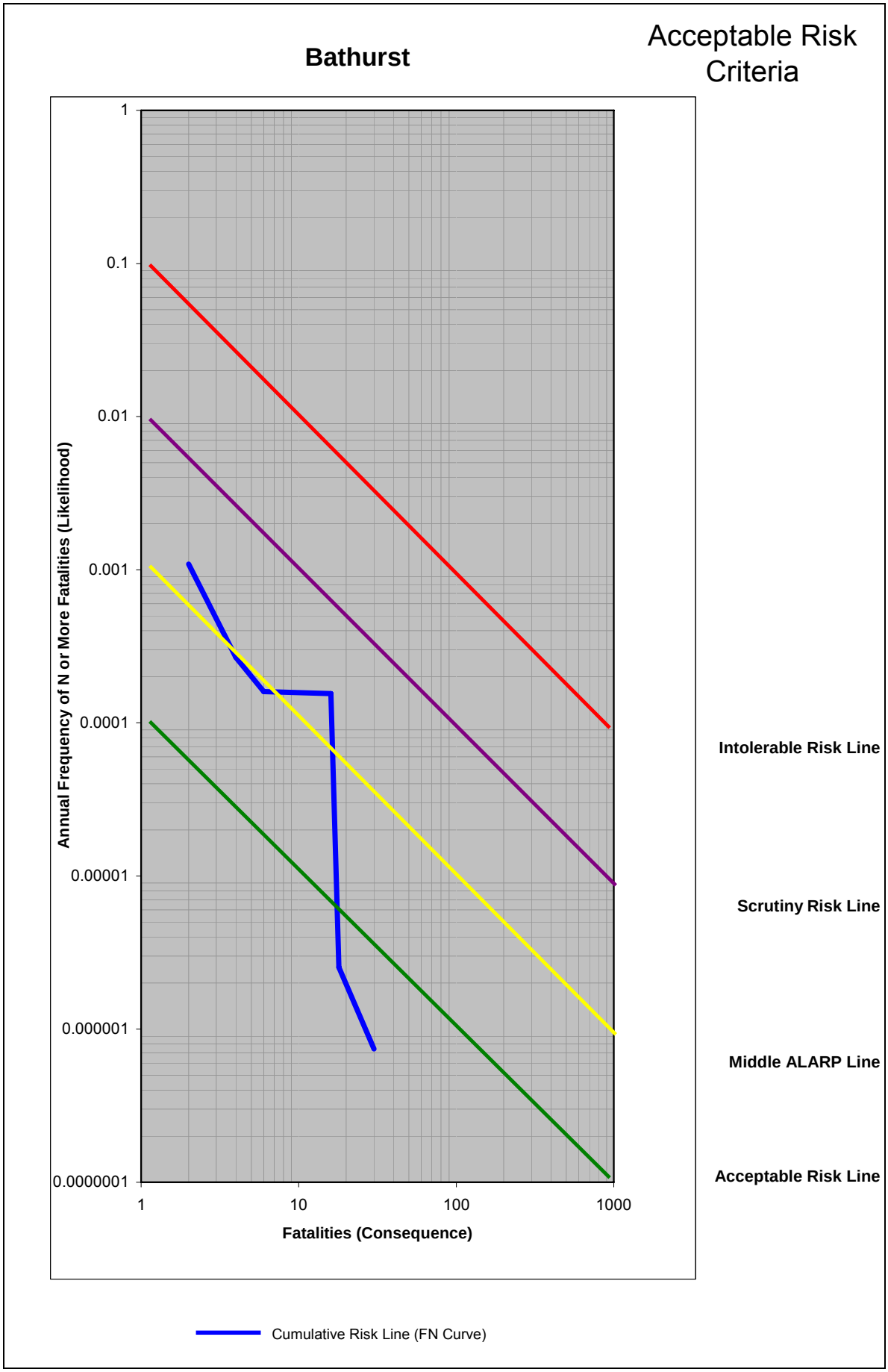

Figure 5: Results of the Airspace Risk Model for Bathurst

18 Results of Generative Interviews – Airspace Users

18.1 Below is a summary of the key issues raised by airspace users during the generative interviews. The issues have been broken into two categories: airspace and infrastructure as follows:

a. Airspace issues:

I. Gliding operations at Piper's Field.
II. Passenger Transport Service operations.
III. Gliders having a separate frequency in the CTAF.
IV. High traffic on Katoomba - Bathurst track.
V. Training Area (See Map – Annex C).
VI. RNAV training when Runway 35 is in use.
VII. Straight-in approaches.
VIII. Right hand circuit on Runway 35 at night.
IX. Itinerant training aircraft
X. Inaccuracies in IFR charts

b. Infrastructure issues:

XI. Taxiway network.
XII. Runway construction.

19 Discussion of Issues - AIRSPACE ISSUES

19.1 **Gliding Operations at Piper's Field.**
The Bathurst Soaring Club (BSC) average 30 combination (glider and Tug plane) take-offs per day throughout the year. This means 30 take-offs and 60 landings per day. They can peak well above this, with 60 take-offs being the record on a day. There could be between 1 and 40 gliders in the air at any particular time. During the afternoon in summer they would have in excess of 20 gliders in the air. In winter there would typically be 5 gliders in the air.

19.2 Gliding operations have had issues over the years with Bathurst commercial and private traffic flying through the Piper's Field circuit and training area. The Club have over the years had discussions with the commercial operators to come to agreements so the operators will not track overhead Piper's. Recently, Regional Express Airlines and BSC have met to improve the system by changing their instructions to pilots accordingly. This is consistent with a risk based approach of removing or mitigating hazards.

19.3 The Club have had some incidents around the local airfields (Bathurst and Orange) on cross country flights. These have sometimes been at considerable distances from the Airports where a high performance aircraft was on approach or departure.

19.4 The Soaring Club currently experience no problems with the circuit traffic at Bathurst.

19.5 **Passenger Transport (PT) operations**
Local operators raised a number of observations regarding PT operations. These issues have been presented to the airlines concerned. Communication between the local operators and the airlines will be facilitated.

19.6 **Gliders having a separate frequency to the CTAF frequency**
Gliders using Piper's Field use the radio frequency 122.70. Traffic operating at Bathurst use the CTAF frequency 127.35. When runway 35 is in use, a possible conflict with gliding traffic occurs on the downwind leg of the circuit (See map in Annex C). Conflict can also occur during operations on runway 08/26.

19.7 Having the gliders and regular traffic on the CTAF frequency may reduce the conflict – but would cause frequency congestion. Depicting Piper's Field and the area which 122.70 is monitored by glider pilots in ERSA will enhance the situational awareness of itinerant pilots. Gliders from Piper's Field, operating close to Bathurst should call on the Bathurst CTAF frequency if they believe they will be in conflict with circuit traffic at Bathurst.

19.8 **High traffic on Katoomba - Bathurst track**
Bathurst is frequently visited by student pilots from Bankstown (in western Sydney) during VFR navigation and IFR training exercises. The usual track is from Bankstown to Katoomba, to Bathurst and return.

19.9 High traffic in the area, combined with bad weather (often low cloud) mixed with frequency boundary changes and the Katoomba CTAF can, at times, result in congested airspace. Whilst the Katoomba area is outside the scope of this review, consultation with the flying school operators at Bankstown could result in changes to their navigational exercises, and reduce the airspace congestion around Katoomba.

19.10 **Training area frequency confusion**
The training area for Bathurst is to the South and is contained within 10 nm of the aerodrome, with an upper limit of 6,000 ft. Within 10 nm of the aerodrome, aircraft should be monitoring the CTAF frequency. The training area has overhead traffic en route from Katoomba to Lowdi to Orange. The IFR waypoint "Lowdi" is, actually, in the middle of the Bathurst training area.

19.11 As a CTAF is a procedure, it has no lateral or vertical boundaries. There is confusion among local operators as to which frequency they should monitor in an aircraft with one radio, whilst conducting upper airwork e.g. stalling.

19.12 The Lowest Safe Altitude (LSALT) for the Katoomba – Lowdi track is 5,900 ft (6,000 ft for the reciprocal track). The LSALT for the Lowdi – Orange (and reciprocal) track is 5,200 ft. As IFR traffic fly at either even or odd altitudes, the lowest altitude an IFR aircraft on the Katoomba – Orange track would be is 6,000 ft. The lowest altitude an IFR aircraft on the Orange – Katoomba track would be is 7,000 ft. Only IFR traffic on the Katoomba – Orange track would potentially be in conflict with the training aircraft around Lowdi.

19.13 Training aircraft have been calling Flight Information Service (FIS) to notify them that they are operating in the area around Lowdi – and will be monitoring the CTAF frequency. The FIS would pass the information on to any relevant IFR aircraft.

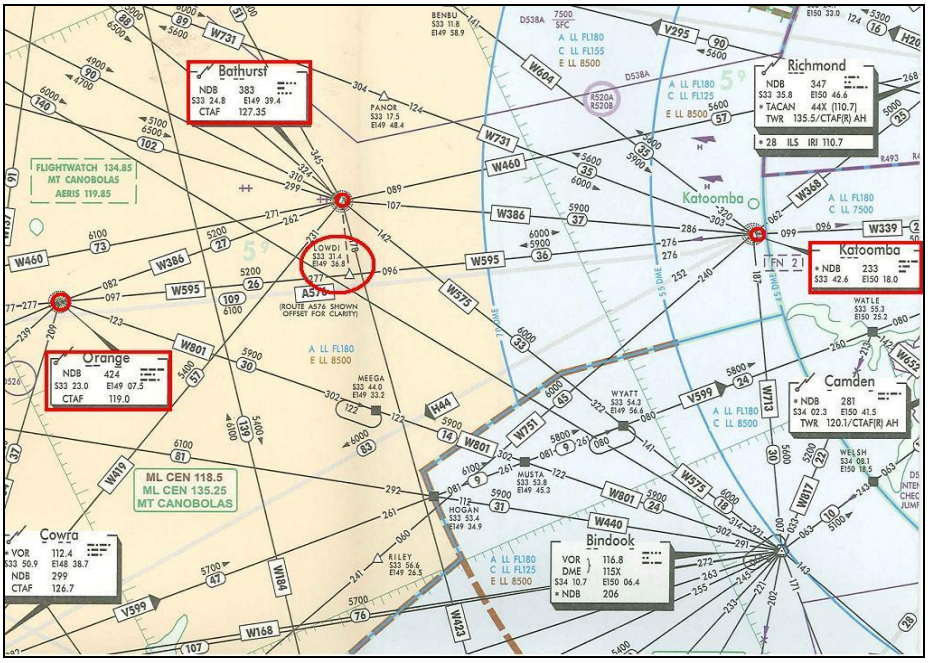

Figure 6: Terminal Area Chart showing Katoomba – Lowdi – Orange track

19.14 **RNAV training when Runway 35 is in use**

The only Area Navigation / Global Navigation Satellite System (RNAV/GNSS) approach published for Bathurst is for Runway 17. Aircraft practicing RNAV/GNSS approaches for runway 17 conflict with traffic using runway 35. An area of concern was that some aircraft did not break off the approach before entering the circuit area and the aircraft were not making an inbound radio call at 10 nm to alert circuit traffic of their intentions. The majority of IFR training aircraft are based at the Bankstown aerodrome.

19.15 **Straight-in approaches**

It was reported that pilots of aircraft conducting straight in approaches were not following correct procedures particularly when other aircraft are in circuit. The crews were not broadcasting their intentions at 10 nm, and are not established on final by 5 nm. All aircraft conducting straight in approaches were supposed to fit in with circuit traffic (not vice versa). This was reported as being particularly noticeable at night.

19.16 **Right hand circuit on Runway 35 at night**

The En Route Supplement of Australia (issue 12 March 2009) states:

> "Right hand CCTS RWY 35 BTN 2200 local and first light."

19.17 The use of right hand circuits are believed to have been introduced in a response to aircraft noise complaints by an individual living in Raglan. Local stakeholders raised three issues regarding the use of right hand circuits on runway 35 at night. These issues are:

I. Itinerant aircraft are using right hand circuits on runway 35 throughout the day – not just at night, between 2200 hours local and first light. The visiting pilots are not correctly reading the entry in ERSA. This leads to aircraft flying a circuit on the incorrect side of the aerodrome.

II. Right hand circuits result in aircraft turning away from the city lights, towards a “black hole” and high terrain. The lack of lights to the east, mean there is no visible horizon and therefore it is difficult to identify the high terrain. Aircraft arriving after 2200 hours generally have been on a long navigational exercise, and pilot fatigue is present. Flying with a visible horizon is easier.

III. It is possible to overfly Raglan while conducting right hand circuits on runway 35, if the pilot overshoots the turn from the base leg onto the final approach.

19.18 Local stakeholders have stated that having left hand circuits at night on runway 35 would prevent most of the issues that are currently experienced.

19.19 **Itinerant training aircraft**

Local stakeholders raised a number of issues regarding visiting training aircraft. The majority of the aircraft are based at Bankstown, Sydney. The issues are:

I. Aircraft arrive in “packs” which quickly leads to congestion in the circuit.
II. The aircraft do not make the correct CTAF calls.
III. Aircraft are on the incorrect radio frequency.
IV. Failure to follow CTAF procedures (poor circuit entry and flying the circuit at the incorrect altitude).
V. Poor situational awareness. The pilots do not keep a good lookout for other traffic and are unsure of their position in the circuit.
VI. Students with English as a second language struggle with radio calls – particularly if they are flying solo.

19.20 New rules contained in the Civil Aviation Regulation 166 (CAR 166) relating to minimum required calls by pilots operating at and in the vicinity of all non-controlled aerodromes are being finalised and will be mandated in the second quarter of 2009.

19.21 The new rules are available on the CASA website:
http://www.casa.gov.au/newrules/ops/nprm/0814os.htm

19.22 A national education program to be run in conjunction with the introduction of the new CAR 166 rules should remove the confusion relating to CTAFs.

19.23 **Inaccuracies in IFR Charts**

The review team found that the location of the gliding airfield (Piper’s Field) depicted in the Departure and Approach Procedures (DAP) for Runway 17 (both NDB and RNAV/GNSS procedures) is incorrect. The IFR charts mark the airfield 3 nm south of it’s correct location. The correct location of the airfield is: 33° 22.72’ S 149° 31.11’ E.

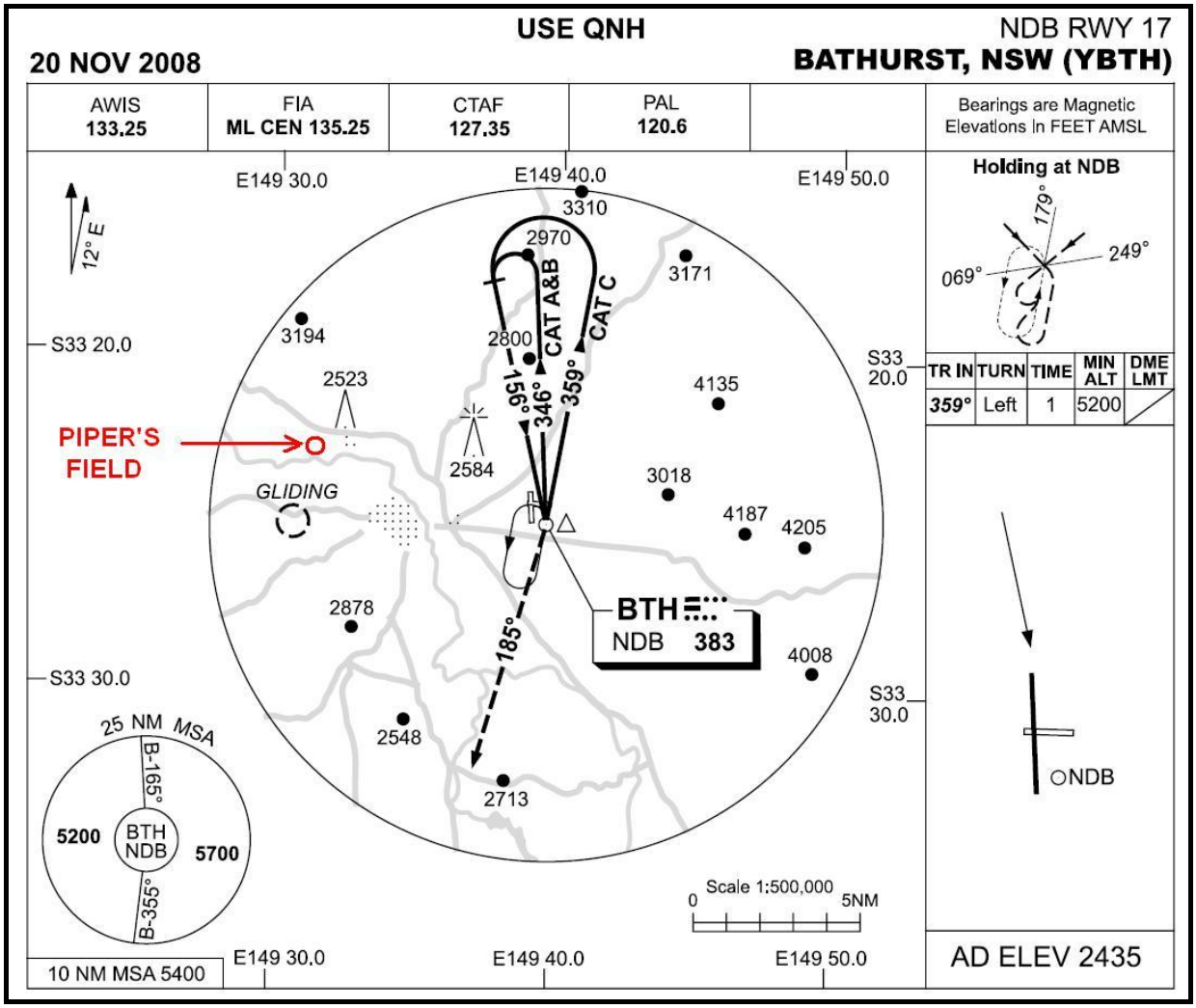

Figure 7: NDB Approach chart showing incorrect location (and correct) location of Piper's Field.

20 Discussion of Issues - INFRASTRUCTURE ISSUES

20.1 Taxiway network

Local stakeholders have stated that the absence of a full length, parallel taxiway causes delays, especially when runway 17 is in use. This results in traffic entering and backtracking the runway prior to departure and to backtrack after landing (if using runway 35). During the 1990's, Bathurst Council purchased land adjoining the airport to permit the construction of a taxiway the full length of runway 17/35. If insufficient funds are available for a sealed taxiway a well prepared grass taxiway could reduce congestion in a cost effective manner.

20.2 This report and the suggestion for the addition of a full length, parallel taxiway will be made directly to the aerodrome operator.

20.3 The Council have stated that no major capital works are planned.

20.4 **Runway construction**

The En Route Supplement of Australia (issue 12 March 2009) states:

> "Due to grades on RWY 17/35, the opposite ends of the RWY are not visible when taking off. Radio calls are advisable."

20.5 Bathurst aerodrome utilises CTAF procedures, (i.e. there is no requirement for aircraft to have a VHF radio installed), and as it is impossible for an aircraft at one threshold to see an aircraft at the opposite threshold, the potential for an accident is present.

20.6 As over 96% of aircraft flying into and out of Bathurst are equipped with VHF radios, operators believe that the likelihood of an accident caused by the runway grade, is extremely low.

21 Evaluation of Airspace Models

21.1 The modelling reveals that the current situation lies within the ALARP region and that Class G airspace and CTAF procedures, should be the minimum service level maintained at the Bathurst aerodrome.

21.2 However, indications are, that traffic movements are reaching a level which may require additional mitigating measures to be introduced to lower the collision risk at the aerodrome.

21.3 Ongoing monitoring of the airspace around the Bathurst aerodrome should focus on the following:

a. Periods of frequency congestion,
b. Increase in PT schedules,
c. Increase in size of aircraft utilised for PT operations,
d. Increase in traffic and / or passenger numbers,
e. Increased operations by resident operators,
f. Changes to the needs of the gliding community
g. An increase in safety-related incidents.

22 Findings

22.1 Stakeholder comment covered many areas, most related to airspace issues.

22.2 The application of the Airspace Risk Model (ARM) revealed that the current situation lies close to the 'as low as reasonably practicable' (ALARP) region and that Class G airspace and CTAF procedures, should be the minimum service level maintained at the Bathurst aerodrome.

22.3 Traffic movements are approaching 20,000 annual movements.

22.4 A significant increase in traffic movements was experienced during the period 2007/2008 compared to 2006/2007.

22.5 Itinerant (predominately training) aircraft cause congestion due to arriving 'in packs', mid morning and mid afternoon.

22.6 Itinerant (predominately training) aircraft, often do not follow CTAF procedures.

22.7 The use of ultralight aircraft (registered through the RAA) is increasing.

22.8 The Air Training Corp and gliding training have returned to Bathurst after several years absence. The camps are conducted during school holidays.

22.9 Night circuits on Runway 35 (after 10.00pm) are a concern for local stakeholders.

22.10 The review found that the location of the gliding airfield (Piper's Field) depicted in the Departure and Approach Procedures (DAP) for Runway 17 (both NDB and RNAV/GNSS procedures) is incorrect.

23 Recommendations

23.1 The report makes the following recommendations:

- That a diagram be included in the En Route Supplement Australia (ERSA) entry for Bathurst aerodrome depicting the location of the Piper's Field airstrip, and the area which the gliders are using the 122.70 MHz frequency.

- The diagrams for the instrument approaches for runway 17 (NDB and RNAV/GNSS) in the DAP be amended to show the gliding airfield in its correct location (33° 22.72' S 149° 31.11' E)

24 Next step

24.1 Stakeholder comment on the draft report has been included in this final report.

24.2 A submission has been presented Airservices Australia for the diagrams for the instrument approaches for runway 17 (NDB and RNAV/GNSS) in the DAP be amended to show the gliding airfield in its correct location. The corrections should appear on the November 2009 charts.

24.3 A submission has been made to Airservices Australia for a diagram be included in the En Route Supplement Australia (ERSA) entry for Bathurst aerodrome depicting the location of the Piper's Field airstrip, and the area which the gliders are using the 122.70 MHz frequency. The diagram is scheduled to appear in the November 2009 edition of ERSA.

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Annexes:

A. Glossary

B. Summary of Reported Incidents at Bathurst during the 12 months ending 31 October 2008

C. Map of the area utilised for flying training around Bathurst.

Annex A – Glossary

AAPS	Australian Airspace Policy Statement
ACAS	Airborne Collision Avoidance System
AFRU	Aerodrome Frequency Response Unit (also known as a 'beepback' unit)
AIP	Aeronautical Information Publication
Airservices	Airservices Australia
ALARP	As Low As Reasonably Practicable
ALOP	Aerodrome Local Ownership Plan
ARM	Airspace Risk Model
ASA	Aviation Safety Advisor (CASA)
ASIR	Air Safety Incident Reports
ATS	Air Traffic Service
ATSB	Australian Transport Safety Bureau
AWIS	Automated Weather Information System
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BTN	between
CASA	Civil Aviation Safety Authority
CCTS	Circuits
Class G	An ICAO Airspace Classification
CTAF	Common Traffic Advisory Frequency
CTAF (R)	Common Traffic Advisory Frequency (Radio Required)
DAH	Designated Airspace Handbook
DAP	Departure and Approach Procedures (AIP)
ERC L2	En Route Chart Low (Chart number 2) (AIP)
ERSA	En Route Supplement of Australia (AIP)
ESIR	Electronic Safety Incident Reports
FIS	Flight Information Service
FL	Flight Level
FOI	Flight Operations Inspector (CASA staff member)
ft	feet
GNSS	Global Navigation Satellite System (Navigational Aid)
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IMC	Instrument meteorological conditions
kg	kilograms
km	kilometre(s)
LSALT	Lowest Safe Altitude
m	metre(s)
MBZ	Mandatory Broadcast Zone
MHz	megaHertz
MTOW	Maximum Take Off Weight
NDB	Non-Directional Beacon (Navigational Aid)
nm	nautical mile(s)

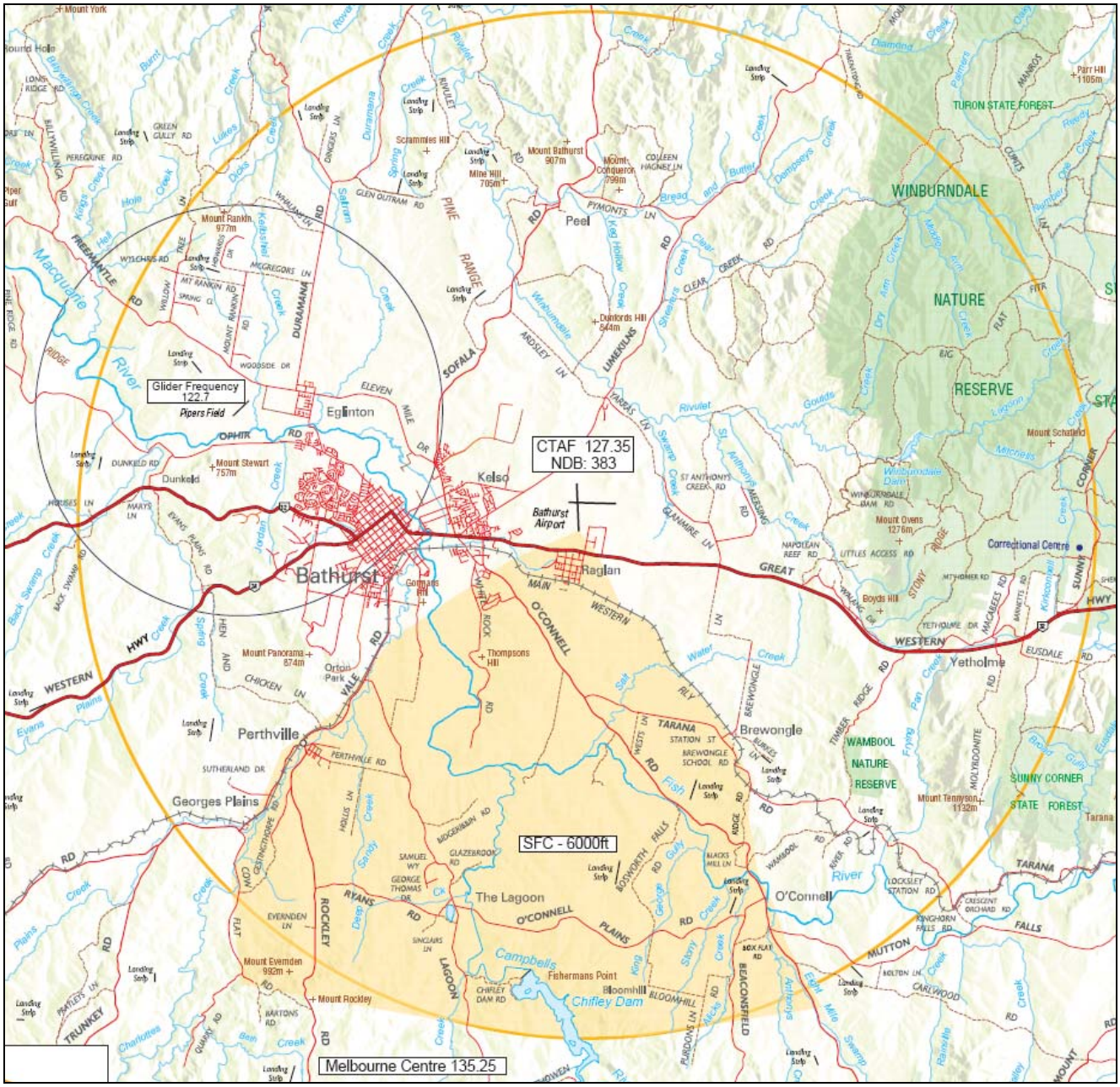
NOTAM	Notice to Airmen
OAR	Office of Airspace Regulation (CASA)
PAL	Pilot Activated Lighting
PT	Passenger Transport (Includes Regular Public Transport and non-freight-only charter)
REX	Regional Express Airlines Pty Ltd
RNAV	Area Navigation System (Navigational Aid)
RPT	Regular Passenger Transport
RWY	Runway
TAC	Terminal Area Chart
TCAS	Traffic Alert and Collision Avoidance System, a type of ACAS
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VNC	Visual Navigation Chart (AIP)
VTC	Visual Terminal Chart (AIP)
WAC	World Aeronautical Chart (AIP)

Annex B – Summary of Reported Incidents at Bathurst during the twelve months ending 31st October 2008

Source	Incident No.	Incident Date	Occurrence Type	Class	Incident Summary
ESIR	200705916	200711142132	FAILURE TO COMPLY ATS INSTR/PROC	3B	[original] POD [amended] Aircraft commenced descent without clearance.
ESIR	200801769	200803300514	EMERGENCY OPERATIONS:IFER	Unknown	PFE Diverted to YBTH due vibrating aeroplane.
ESIR	200802301	200804240528	EMERGENCY OPERATIONS:IFER	Unknown	Helicopter RSCU21 called PAN, PAN shutting one engine down due to low oil pressure, diverting to Bathurst from approx 30nm East
ESIR	200803593	200806240945	SARTIMES	3B	Pilot of CF4 called Flightwatch and cancelled SARTIME which was not held in CENSAR. Following discussion with the pilot he suggested that he made an error in ommision by submitting a Flight Plan without the SARTIME.
ESIR	200804651	200808160240	INFORMATION DELIVERY/DISPLAY ERROR	3B	ATC activated the Flight Data Record for VH-RUE in error, following movement advice from VH-RUI
ESIR	200804924	200808300136	EMERGENCY OPERATIONS:IFER	Unknown	Code 7700 observed BTH area.

Source: Australian Transport Safety Bureau, 16th February 2009

Annex C - Training area – Bathurst



Map showing the Bathurst training area (Brown shaded area); the area gliders use the 122.70 MHz frequency around Piper's Field, and the 10 nm boundary of Bathurst, where CTAF procedures apply.

Map courtesy of WardAir, based on a map from the NSW Department of Lands.