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Mangalore Aeronautical Study

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1 Executive Summary

The *Airspace Act 2007* (Act) 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 Office of Airspace Regulation (OAR) conducted an aeronautical study (the study) of an area within a 25 nautical mile (NM) radius of Mangalore Airport from the surface to 8,500 feet (FT) above mean sea level (AMSL). The study examined the airspace architecture, airspace classification and the services within that airspace to ascertain the appropriateness for all airspace users. The study encompassed Puckapunyal, Euroa and Locksley Field aerodromes.

The study applies with CASA's regulatory philosophy which considers the primacy of air safety, while considering the environment, security, cost and is consistent with the Australian Airspace Policy Statement (2021) and the Minister's Statement of Expectations (2022).

The study included analysis of:

- Aerodrome traffic data.
- Airspace design.
- Australian Transport Safety Bureau (ATSB) incident data.
- Airservices Australia incident data and relevant submitted documents; and
- Stakeholder consultation.

Prior to the final version of the study being published, Recommendation 2 was closed. The four aerodrome entries En Route Supplement Australia specific to Recommendation 2 had wording amended to clarify the requirements for the additional 1,000 FT to prescribed altitudes during practice instrument approach procedures and became effective 8 September 2022.

1.1 Summary of Conclusions

The OAR has undertaken a pragmatic, practical and proportionate approach in relation to the recommendations and observations related to the safety of air navigation in the review area.

The OAR determined the airspace classification for airspace around Mangalore is appropriate. Recommendations and options to enhance safety were identified.

The aeronautical study determined:

- 59% of users surveyed through the CASA Consultation Hub considered the existing airspace is safe or mostly safe. 21% indicated that the airspace was neither safe nor unsafe and 19% recorded the airspace as unsafe or mostly unsafe.
- Aerodromes and aircraft landing areas (ALAs) in the area operate under unique circumstances. Each location is primarily involved in different aviation activities, providing a separation of aviation activities within the study area.
  - Mangalore airport – flying training and transiting aircraft;
  - Nagambie-Wirrate and Euroa – parachuting;
  - Wahring Field – gliding;
  - Locksley Field – hang gliding, paragliding;
  - Puckapunyal – Defence and military operations.
- Between 2015 to 2021:
  - ATSB data identified 58% of the airspace incidents occurred in the circuit area or while aircraft were on approach into Mangalore.

  - Airservices Australia (Airservices) data identified a yearly average, nearing 69% of the total reported incidents related to aircraft entering a Restricted Area without a clearance.

- Frequency congestion was identified as having a negative impact on pilot situational awareness, caused by the number of aircraft operating in the area, use of non-standard phraseology by pilots and users from non-English speaking background requiring additional or repeat transmissions.
- A 20 NM mandatory broadcast area is not the appropriate airspace solution as this will not address identified issues within the vicinity of a non-controlled aerodrome and will likely increase frequency congestion.
- The Mangalore Very High Frequency Omnidirectional Range (VOR) ground-based navigation aid is frequently used for training aircraft.

1.2 Recommendations

The following recommendations, observations, or opportunities to enhance services are made because of CASA's analysis of the airspace within the aeronautical study:

Recommendation 1
CASA Aviation Safety Advisors should conduct a safety seminar at Mangalore and surrounding aerodromes with an agenda that focusses on awareness and safety for operations within the vicinity of a non-controlled aerodrome and the importance of precise and concise radio calls.

Recommendation 2
Enroute Supplement Australia entries at Mangalore, Ballarat, Latrobe Valley and Busselton be amended to remove or clarify the requirements for the addition of 1,000 FT to prescribed altitudes during practice instrument approach procedures.

Observations/Opportunity to enhance regional services.

(1) Local operators should consider the need for additional visual flight rules (VFR) approach points and/or VFR routes to enhance situational awareness using the Melbourne Visual Navigation Chart (VNC). The OAR, where appropriate, should assist operators in preparing an airspace change proposal (ACP).
(2) The Mangalore Aerodrome operator should amend the En Route Supplement Australia (ERSA) entry for Mangalore to include the flying training area used by local operators. The area should be designed to avoid the circuit area at Mangalore.
(3) The OAR should identify and arrange for the addition of gliding symbols on the Melbourne VNC (and other appropriate aeronautical information publications).
(4) The OAR will update the contact information for Danger Area D333.

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2 Introduction

The Office of Airspace Regulation (OAR) within the Civil Aviation Safety Authority (CASA) has conducted an aeronautical study (the study) within a 25 nautical mile (NM) radius of Mangalore Airport (Mangalore). The study examined the airspace architecture, airspace classification and the services within that airspace from the surface to 8,500 feet (FT) above mean sea level (AMSL).

The OAR is responsible for the administration and regulation of 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. It requires that CASA must 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.[1]

Section 3 of the Act states the object of the 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 2021 (AAPS). Airspace in Australia 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 allows the use of Class B and Class F airspace however, these classifications are not currently utilised in Australia.

The airspace classification determines the category of flights permitted, aircraft equipment requirements and the ATS being provided. Within this classification system aerodromes are either controlled, i.e. Class C or Class D or non-controlled, i.e. Class G. Annex B details the classes of airspace used in Australia.

2.2 Purpose and Scope

The purpose of the study was to satisfy CASA that the airspace architecture, classification and the services within the airspace are safe and appropriate for all airspace users.

The scope of this study included:

- An analysis of the aerodromes and surrounding airspace architecture in the vicinity of Mangalore.
- An analysis of risks identified detailed in safety incident reports provided by the Air Navigation Service Provider (ANSP) and the Australian Transport Safety Bureau (ATSB).
- Stakeholder engagement program focusing on the airspace risk apparent in the study area including potential mitigation options for discussion, if appropriate.
- Considering the need for any airspace modifications including the possible need for changes in airspace classification, architecture or volume.
- An evaluation of the ICAO airspace classifications and the need/justification for any Special Use Airspace within the study area; and

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

- Other issues determined by the aeronautical study team to be applicable to the objectives.

The scope of the study did not include aircraft operations above 8,500 FT AMSL, aerodrome facilities or developments including off-airport development, or surrounding infrastructure, unless a significant safety issue related to airspace operations was identified.

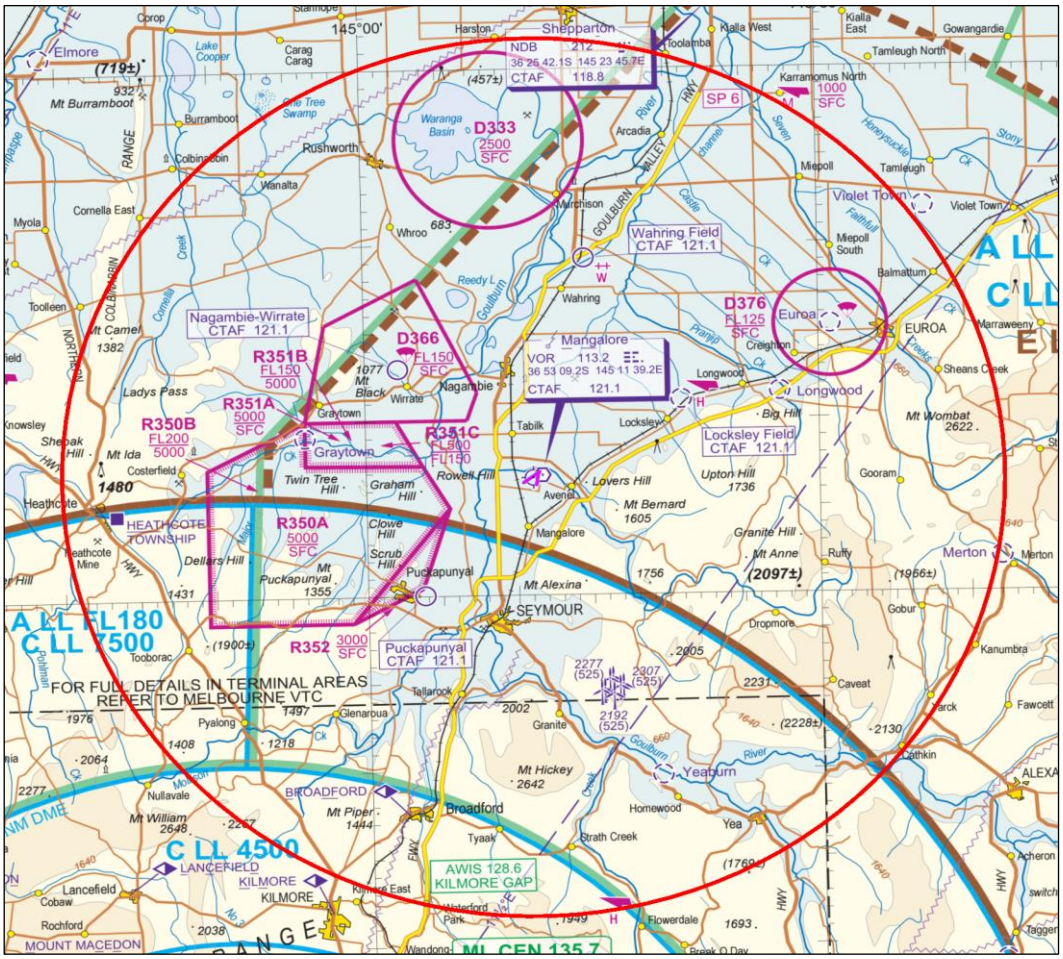


Figure 1: Mangalore Aeronautical Study area[2]

2.3 Objective

The objective of this study was to evaluate the suitability of the airspace within the study area. Factors considered:

- Safety of operations and risk of mid-air collision within the airspace.
- Efficient use of the airspace.
- Equitable access to the airspace for all users of that airspace.
- National security issues.
- Appropriateness of the airspace classification.
- Environmental issues (aviation specific); and
- Appropriateness of the existing services and facilities provided by the ANSP.

The study:

- Examined all information provided to the OAR through consultation and feedback.
- Considered safety data and information to inform recommendations to address safety related matters and findings.

[2] Melbourne Visual Navigation Chart (VNC) effective 17 June 2021, Airservices Australia

- Ensure there was sufficient evidence, risk analysis and justification to support recommendations.
- Consider risk mitigation based on the cost to industry.

2.4 Background

The study examined the aerodromes and aircraft landing areas (ALAs) within the Mangalore area, analysed air traffic and passenger movement date, reviewed incident reports and information relevant to the study.

The aerodromes and ALAs located within the study area are non-controlled. Each aerodrome and ALA support specific types of aviation activity, however they are all available for general aviation activity. For example, Mangalore aerodrome is mainly used for flying training and as a transit point into and out of the Melbourne basin. Nagambie-Wirrate and Euroa ALAs are located within Danger Areas (DA) where parachuting operations are conducted. Wahring Field and Locksley Field respectively primarily have gliding activities and hang gliding and paragliding activities conducted at these locations.

Puckapunyal is a military base, and the aerodrome is used for Defence operations. Puckapunyal aerodrome is located under and adjacent to several Restricted Areas (RA) that are subject to conditions of entry during their hours of activity. In addition to the published RAs, a temporary restricted area (TRA) is promulgated during military training exercises which encapsulates the existing RAs to create a single area.

Mangalore total aircraft movements fluctuated during the January 2015 to November 2021 period[3]. The data showed:

- During the 2015 and 2020 study period, total aircraft movements declined by 15.7% from 10,800 to 9,100.
- Between 2015 and 2017, total aircraft movements declined by 33.2% from 10,800 to 7,218.
- Between 2017 and 2021, including during COVID-19 restrictions, total aircraft movements increased by 24.7% from 7,218 to 9,000.

Flight training and flight-testing are major operations within the study area. Mangalore has a Very High Frequency Omnidirectional Range (VOR) ground-based navigation aid that can be used for flight training. The Mangalore VOR is one of a very few of this type of ground-based navigation aid outside the Melbourne basin.

The Common Traffic Advisory Frequency (CTAF) 121.1 MHz is shared with Mangalore, Locksley Field, Nagambie-Wirrate and Puckapunyal aerodromes. This generates a possibility of over transmission and missed radio calls by pilots operating on the CTAF. The Flight Information Area (FIA) frequency is 122.4 MHz where users communicate with air traffic control (ATC) located at the Air Traffic Service Centre in Melbourne (Melbourne Centre).

On 19 February 2020, a mid-air collision (MAC) occurred approximately 8 kilometres (km) south of Mangalore. This matter was investigated by the Australian Transport Safety Bureau (ATSB). The final ATSB report into this matter was published 31 March 2022, after the information for this aeronautical study had been collated and reviewed.

There has been no previous aeronautical study conducted within this area.

[3] Air transport movements does not mean regular passenger transport (RPT) where specific routes have fixed schedules and on which the public and/or cargo space is available.

3 Aerodromes and Aircraft Landing Areas

Mangalore is the largest aerodrome in the study area. Puckapunyal, a military aerodrome and not available for public use, is located approximately 9.0 NM (16.7 km), southwest of Mangalore VOR. Uncertified aerodromes, also known as ALAs, located in the study area include:

- Nagambie-Wirrate approximately 9.2 NM (17.1 km) northwest of Mangalore VOR.
- Wahring Field approximately 12.8 NM (23.7 km) north of Mangalore VOR.
- Euroa approximately 18.0 NM (33.4 km) east-northeast of Mangalore VOR; and
- Locksley Field approximately 9.0 NM (16.7 km) east-northeast of Mangalore VOR.

3.1 Mangalore

Mangalore is a certified aerodrome operated by Mangalore Airport Pty Ltd and located approximately four kilometres west of rural town of Avenel, Victoria. Mangalore is centrally placed in Victoria which enables access from all directions however, this access can be limited by activation of the RAs west of Mangalore. The RAs are detailed in Section 5.3.

Mangalore has an elevation of 467 FT AMSL and two designated sealed runways. Runway (RWY) 05/23 and RWY 18/36 which has the following characteristics:

RWY 05/23

- Runway length is 2,027 metres (m) and runway width is 23m.
- RWY 05 threshold elevation is 457 FT AMSL.
- RWY 23 threshold elevation is 464 FT AMSL; and
- Runway strip width (RWS) is 90m.

RWY 18/36

- Runway length is 1,461m and runway width is 23m.
- RWY 18 threshold elevation is 463 FT AMSL.
- RWY 36 threshold elevation is 466 FT AMSL; and
- Runway strip width (RWS) is 90m.

These two runways converge at the northern end of the aerodrome. The runways are not serviced by full length taxiways. The existing taxiway system requires taxi and back track on a runway prior to departure e.g. aircraft departing on RWY18 use taxiway A and backtrack on RWY05/23 and aircraft departing on RWY25 use taxiway C and backtrack on RWY18/36. The purpose of this is to minimise backtracking on the active runway to increase runway and thereby, airspace efficiency.

Appendix 1 depicts the runway and facilities at Mangalore.

In the preceding 12 months to November 2021, Mangalore recorded the fourth highest total traffic movements at a non-controlled aerodromes within in Victoria behind Ballarat, Mildura and Warrnambool. There are no RPT operations at Mangalore however the airport has developed a flying training facility responsible for the majority of aircraft movements.

Other flying training organisations fly to Mangalore for training purposes including those established at Bendigo, Shepparton, Albury and those within the Melbourne basin at Moorabbin, Essendon and Tyabb. Mangalore is also regularly overflown by aircraft transiting through the airspace to or from the Melbourne basin area.

Common types of aircraft operating at Mangalore include Piper Seminole (PA44), Beechcraft King Air (BE90), Cessna 172 (C172), Cirrus SR22 (SR22), AgustaWestland AW139 (A139) and Aerospatiale AS55 (AS55).

3.1.1 Radio Communications

Mangalore CTAF is 121.1 MHz. This frequency is used at Puckapunyal, Nagambie-Wirrate, Wahring Field and Locksley Field.

An Aerodrome Frequency Response Unit (AFRU) that provides an automatic response when pilots transmit on the CTAF is normally operational at Mangalore. Currently the AFRU is unserviceable and being replaced.

The ATS FIA frequency 122.4 MHz can be received on the ground at Mangalore.

An Automatic Weather Informaton Service (AWIS) is broadcast on frequency 128.825 MHz. The AWIS broadcasts on a discreet frequency and provides weather conditions at the aerodrome which is required by aircraft before taking off or approaching and landing.

3.1.2 Navigational Aids

The Mangalore VOR is part of the Backup Navigation Network (BNN)[4]. The nearest VOR, outside the Melbourne basin is at Albury Airport (Albury), approximately 98 NM north-east of Mangalore. Other VORs and their approximate distance are located at:

- Melbourne 49 NM
- Avalon 78 NM
- Wagga Wagga 151 NM
- Canberra 217 NM
- Mildura 220 NM

The VOR is used for flight training and flight-testing of ab-initio to renewal of pilot licence ratings. Access to the VOR in Class G airspace enables users more flexibility for their operations compared to operations within controlled airspace which involves a booking system and fee. The Mangalore VOR is also used for tracking into and out of Melbourne.

3.1.3 Landing Aids

Mangalore has an aerodrome beacon located on the terminal building. There is an illuminated wind direction indicator (WDI) centrally located between the two runways and north of the apron area. There is an unlit WDI located on the left-hand side near the approach threshold of RWY36 and another unlit WDI near the intersection of RWY18 and RWY23 which is positioned on the north-western side of these runways. The WDIs are serviceable to each identified runway end.

Each runway has Low Intensity Runway Lighting (LIRL); stand-by power is available.

3.1.4 Local Flight Procedures

Local flight procedures are detailed in the Enroute Supplement Australia (ERSA) and includes information on operations, particularly within the circuit area of the aerodrome. Mangalore local flight procedures state:

- Night circuits are to be conducted to the west for all fixed wing aircraft.
- Where possible, aircraft departing using RWY23 or RWY18 should use taxiway C or taxiway A and use the non-active runway to reduce backtracking.
- Pilots practising terminal instrument flight procedures (TIFPs) should add 1,000 FT to the advised altitude.
- All aircraft to illuminate their landing and taxi lights within 10 NM of the airport and when established in the circuit.

[4] The Navigation Rationalisation Project (NRP) decommissioned several radio navigation aids as part of the transition towards using satellite-based navigation systems for IFR operations. The remaining navigation aids were retained for contingency navigation purposes. However, navigation aids are needed for IFR training where 2D and 3D approaches are required to be tested.

- Occasional helicopter operations take place on the runway, the grass areas and outside the runway strip width. Required
- Minimum radio broadcasts as taxiing, entering, departing and for circuit: inbound, joining, base and final with position, altitude and intentions.
- Base/Final broadcast to include aircraft landing sequence number.

The practise of terminal instrument flight procedures by adding 1,000 FT to the prescribed altitude is detailed later in this study, including Section 11.3.

The study does not identify critical issues involving the minimum radio broadcasts, however, concerns about frequency congestion is highlighted. Multiple aircraft making these minimum broadcasts can create frequency congestion, depending on air traffic operating in the area.

3.1.4.1 Additional Information

Additional information in ERSA identified extensive fixed wing flight training at Mangalore including the area bounded by Seymour, Nagambie, Stanhope, Euroa, Seymour from the surface up to 8,500 FT AMSL between 7am to 11pm (local time). The following diagram displays a representation of this information.

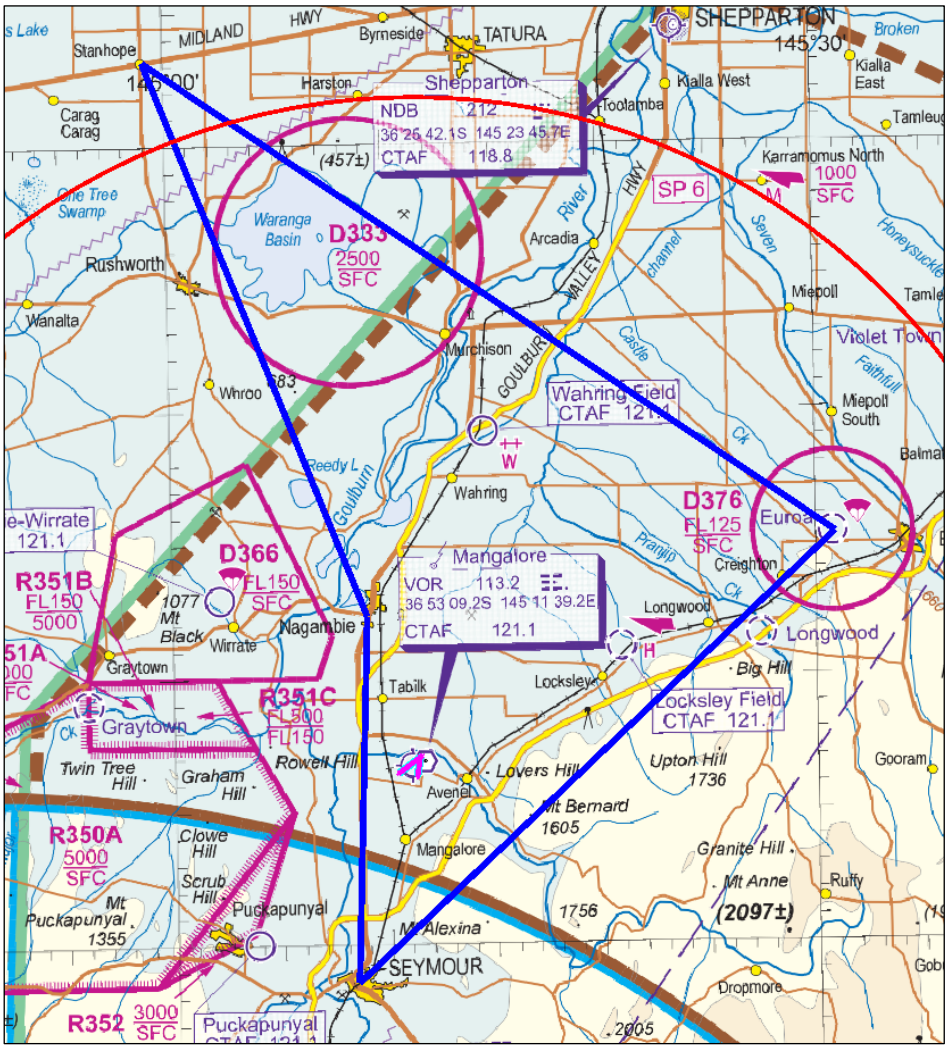


Figure 2: Training Area as indicated in ERSA[5]

Parachute Jumping Exercises (PJE) are conducted during daylight hours at Nagambie-Wirrate ALA and aerobatic operations are conducted above Mangalore airport and within the lateral boundary of, but above Danger Area D333 during daylight hours.

[5] Melbourne VNC effective 17 June 2021, Airservices Australia

3.1.5 Terminal Instrument Flight Procedures

Mangalore is the only location within the study area with promulgated TIFPs in the Departure and Approach Procedures (DAP). There were no safety issues identified with the TIFPs in relation to the design of the procedures at Mangalore.

Four TIFPs have straight-in minimum descent altitudes (MDAs) promulgated. These procedures comprise of one VOR procedure to RWY23 and three Area Navigation (RNAV) Global Navigation Satellite System (GNSS) approaches published for RWY18, RWY23 and RWY36.

GNSS Arrival Procedures that enable aircraft to reach a minima to facilitate a circling approach are published for two sectors. Sector A for arrivals from the northwest to northeast and Sector B for arrivals from the east to the south of Mangalore.

3.2 Puckapunyal

Puckapunyal aerodrome is a military aerodrome that has an elevation of 550 FT AMSL and located approximately 16.7 km southwest of Mangalore. The aerodrome is not available for public use and prior permission is required for military, medical or emergency aircraft to operate at this location. The aerodrome has one sealed runway RWY03/21 which is approximately 760m in length.

The CTAF is 121.1 MHz and the ATS FIA radio frequency is 122.4 MHz.

Due to the location of the aerodrome and surrounding or adjacent active restricted areas, a separate clearance is required for each restricted area i.e. a clearance through one area does not constitute a clearance for any other area.

Appendix 2 depicts the runway and apron at Puckapunyal.

3.3 Nagambie-Wirrate

Nagambie-Wirrate aerodrome (Nagambie) is an uncertified aerodrome located approximately 17.1 km northwest of Mangalore. Nagambie is operated by Skydive Nagambie and has an elevation of 475 FT AMSL. There is one sealed, unrated runway RWY17/35 that has no line markings. The runway is approximately 900m in length.

Nagambie is located within D366 and primarily used by sports aviation for PJE. The PJE can be conducted into flight levels[6] and within controlled airspace (CTA). Parachute descents through cloud are approved at Nagambie.

There are no recorded movements for Nagambie, however regular operations were conducted during the study period with the majority of cliental travelling from the Melbourne area. As a result of the COVID restrictions, operations have significantly reduced.

The CTAF is 121.1 MHz and the ATS FIA radio frequency 122.4 MHz.

Appendix 2 depicts the Nagambie-Wirrate ALA.

3.4 Wahring Field

Wahring Field aerodrome (Wahring) is an uncertified airport located approximately 23.7 km north of Mangalore. Wahring is operated by the Nagambie Soaring Centre Pty Ltd and is primarily used by gliding aircraft. Winch and aerotow launching are conducted at the ALA with the winch cable located on the eastern side of the runway.

[6] A flight level is an altitude at international standard atmospheric pressure (1013 hPa) that is expressed in hundreds of feet. In Australia, flight levels are utilised above 10,000 FT AMSL.

Wahring has an aerodrome elevation of 410 FT AMSL and has one unsealed RWY03/21, approximately 810m in length.

The Wahring CTAF is 121.1 MHz and the ATS FIA frequency that can be used in the circuit area is 122.4 MHz.

The aerodrome has a WDI located on the eastern side of RWY03/21 and is positioned nearer to the RWY03 end.

Refer to Appendix 2 for a diagram of Wahring Field ALA.

3.5 Euroa

Euroa aerodrome (Euroa) is an uncertified aerodrome located approximately 4.6 km west of the Euroa township and approximately 33.4 km east-northeast of Mangalore. Euroa has an elevation of 555 FT AMSL, operated by Skydive Euroa and is commonly used for PJE. Prior permission is required from the aerodrome operator to operate at Euroa.

Euroa has one unsealed runway, RWY01/19, approximately 1,100m in length. There are WDIs located at various positions on the airfield to the eastern side of the runway.

The Euroa CTAF is 126.7 MHz and the ATS FIA frequency that can be used in the circuit area is 122.4 MHz.

Euroa is centrally located within D376 and PJE activity can be conducted in flight levels (FL).

Refer to Appendix 2 for a diagram of Euroa ALA.

3.6 Locksley Field

Locksley Field aerodrome is an uncertified aerodrome located approximately 16.7 km east-northeast of Mangalore. The aerodrome is located approximately one nautical mile south of the nominal flight path along the intermediate segment of Mangalore RNAV(GNSS) RWY23 procedure.

Locksley Field has an elevation of 540 FT AMSL and is operated by Secure Air Flight Training Pty Ltd. Locksley Field is commonly used by sports aviation aircraft and has one unsealed runway, RWY01/19, which is approximately 1,730m. Launch vehicles are used to assist with take-offs as well as training and development of hang glider pilots.

The Locksley Field CTAF is 121.1 MHz and the ATS FIA frequency that can be used in the circuit area is 122.4 MHz. ERSA also stipulates all launch vehicles and aircraft must communicate on the CTAF.

Refer to Appendix 2 for a diagram of Locksley Field.

3.7 Hang gliding and paragliding activity locations

Landscape[7] and Mount (Mt) Broughton are two locations within the study area known for hang gliding and paragliding activities.

Landscape is used by the more experienced operators and is a mountain ridge that overlooks the township of Seymour with north and west facing ground ramp launches.

Mt Broughton is a large grassy hill that enables launches to the southwest and used for training or those at an intermediate (or higher) level of experience.

Appendix 2 displays the location of Landscape and Mt Broughton.

[7] Landscape is a launch location known by the Sport Aviation Federation of Australia. Retrieved 1 July 2022 from Australian National Site Guide Map

4 Aeronautical Information Publications

4.1 General

The study identified some ambiguities, omissions or inconsistencies within aeronautical information publications. None of the identified issues were of a critical safety nature however, the publication of updated information will assist with guidance and best practice for users.

4.2 Departure and Approach Procedures

Mangalore RNAV (GNSS) procedures will be amended from RNAV (GNSS) to RNP in accordance with ICAO change to naming procedures. For example, RNAV (GNSS) RWY 23 will be amended to RNP RWY 23.

Airservices Australia (Airservices) is in the process of amending procedures published in DAP to reflect the new ICAO naming arrangement.

4.3 Designated Airspace Handbook

The Designated Airspace Handbook (DAH) lists the lateral and vertical limits as well as important information of airspace types. In regard to Danger Areas, this information includes identifying a contact for that DA.

D333 Waranga Basin Unmanned Aerial Vehicle Testing published contact is Flight Data Systems Victoria. The name of the contact has changed to Swoop Victoria. The contact number published in ERSA will need to be changed.

The OAR will forward the updated contact details to Airservices.

4.4 Enroute Supplement Australia

Aerodrome operators are responsible for information pertaining to their aerodromes promulgated in ERSA which includes detailed information relating to the operations at the aerodrome.

There is some ambiguity between users regarding text located in Flight Procedures that related to practice instrument approaches. Users expressed differing interpretations regarding adding the additional altitude (1,000 FT). Users have added the additional 1,000 FT to the minimum descent altitude (MDA) while others advised the additional 1,000 FT altitude was applied to all published altitudes on the procedure. A similar issue was identified in the Ballarat Airspace Review August 2017[8].

The matter is not a critical safety issue, but clarification is required to ensure the standardisation of the procedure when being used at all locations, including the consideration of removing the text.[9]

Mangalore ERSA entry identifies extensive fixed wing flight training is conducted in the area bound by Seymour, Nagambie, Stanhope, Euroa, Seymour (see **Figure 2**). It was identified the current flight training is conducted at or north of Mangalore. Updating the training area, including considering an indicative map, would improve guidance and awareness for pilots.

The aerobatic activity information requires amending as the indicated frequency does not align with the ERSA.

[8] Ballarat Airspace Review August 2017, Office of Airspace Regulation, Canberra, 2017

[9] Prior to publication of the final version of this aeronautical study, the ERSA effective 8 September 2022 was updated for Ballarat, Busselton, Latrobe Valley, and Mangalore providing clarification to the addition of 1,000 FT for aircraft conducting practice instrument approaches.

4.5 Visual Navigation Chart

Melbourne Visual Navigation Chart (VNC) identifies various points of reference including aerodromes, ALAs, CTA boundaries, visual reporting points and activities being conducted in a particular area such as manned balloon ascents, ultralight aircraft activity, hang glider, model aircraft, model rockets, meteorological balloon ascents, winch or auto tow launching operations, blasting or gliding operations.

There is one VFR approach point (Broadford) and one tracking point (Heathcote Township) in the study area. The Kilmore VFR approach point is located outside the study area however Broadford/Kilmore VFR approach points guide VFR aircraft into and out of the Melbourne basin. The topography and RAs funnel aircraft along this route. The following figure shows the contour funnel-shaped information for the study area and the positions of the Broadford and Kilmore VFR approach points.

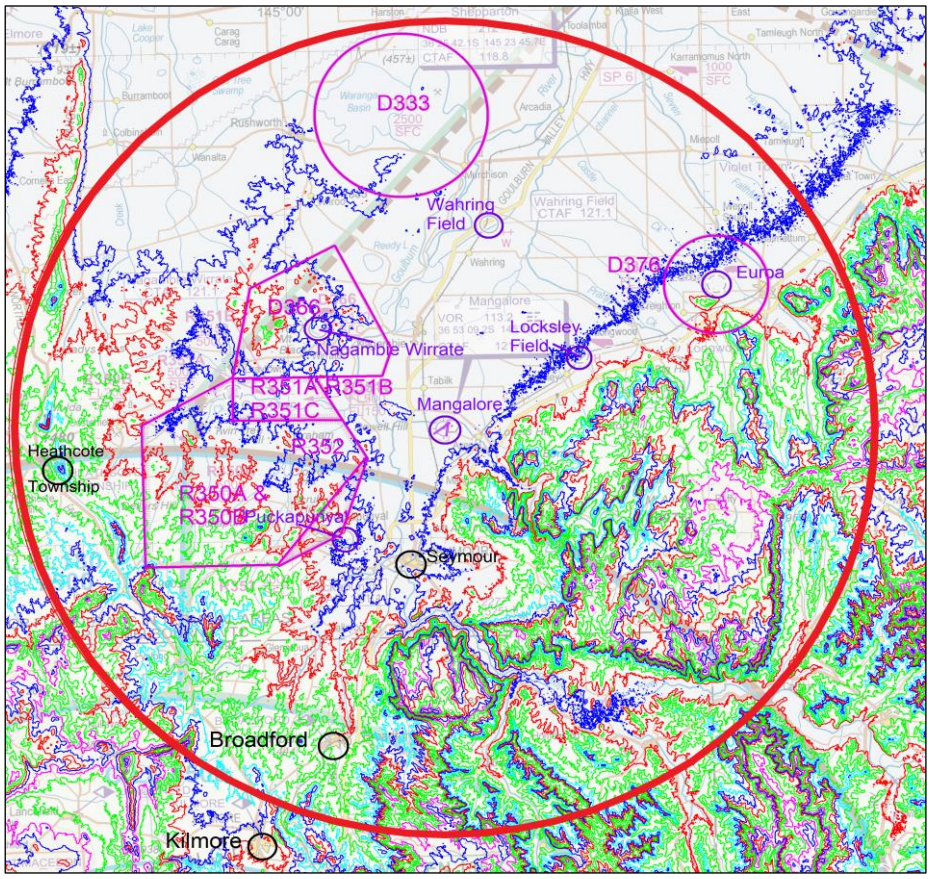


Figure 3: Mangalore study area contour information[10]

The Heathcote Township provides a fix between the Melbourne basin to Bendigo, at the intersection of the Northern and McIvor Highways (see **Figure 1**).

Additional VFR approach or tracking points in the study area would provide increased awareness for aviation activities.

Hang gliding activities are conducted at Locksley Field and at Landscape and Mt Broughton. These areas are overflown by VFR aircraft, particularly those tracking into or out of the Melbourne basin. The addition of hang-gliding symbols at these locations would increase awareness of the activity to pilots.

[10] Melbourne VNC effective 17 June 2021, Airservices Australia. Digital Topographical Data, Victoria, Geoscience Australia 2006 Contouring information is shown in 40m increments commencing at around Mangalore. Elevations are AMSL: 160m-Blue, 200m-Red, 240m-Green, 280m-Light Green, 320m-Cyan. Colours repeat at next incremental level i.e., 360m-Blue, 400m-Red, 440m-Green etc. Magenta contour shows 520m.

5 Airspace

5.1 General

The airspace classification in this study is predominantly Class G airspace, from the surface to 8,500 FT AMSL or from the surface to the base of controlled airspace. There are two separate sectors of Class C controlled airspace in the study area. These sectors are located:

i. between 30 and 45 NM from the Melbourne distance measure equipment (DME) and to the west of the Puckapunyal RAs. The lower limit of Class C airspace is 7,500 FT AMSL. It is surrounded either side by Class C airspace with a lower limit of 8,500 FT AMSL between the same lateral area (and is outside the scope of this study).

ii. between 20 NM DME and 30 NM DME from Melbourne and the lower limit of Class C airspace is 4,500 FT AMSL.

This study focused on reported occurrences within Class G airspace.

The Restricted Areas located at Puckapunyal and Graytown are controlled by Department of Defence (Defence). The Danger Areas located at Nagambie-Wirrate, Euroa and Waranga Basin have designated activities and contacts which are detailed in Section 5.3.

The airspace overlies high terrain with a valley in a north-south direction. This terrain provides idyllic conditions for producing thermals in which gliding, hang gliding etc. activities are undertaken. However, the terrain also impacts weather i.e. developing clouds thereby impacting visual meteorological conditions (VMC).

5.2 ICAO Airspace Classification

The Australian airspace classifications accord with ICAO Annex 11 Air Traffic Services and are described in the AAPS.

Class G airspace is non-controlled airspace where IFR and VFR flights are permitted. Flights do not need to contact ATC to enter or land but aircraft are subject to weather conditions, speed limitations below 10,000 FT AMSL and radio requirements. In Class G airspace, ATC provide a Flight Information Service (FIS) which includes traffic information and advice for the safe and efficient conduct of flights to IFR aircraft and upon request and workload permitting to VFR aircraft.

In non-controlled airspace, ATC do not provide a control service and pilots remain responsible for separation from other aircraft and collision avoidance. The following methods are used by aircraft for separation purposes within non-controlled airspace:

- Climbing, descending, maintaining different altitudes.
- Referencing ground features such as roads, rivers, townships identifiable or landmarks such as rail lines, solar farms that are visible from the air.
- Navigation references such as a bearing or radial and/or distance or GPS distance.
- Clock reference codes which assist with sighting aircraft.

5.3 Special Use Airspace

The declaration and architecture for a DA or a RA are detailed in Annex C. The RA is created to restrict the flight of an aircraft in accordance with specified conditions. Clearances to fly through an active RA are generally withheld when activities hazardous to the aircraft are taking place, or when military activities require absolute priority.

The RAs and DAs located within the study area are identified in Figure 1. RAs and DAs are promulgated in DAH which indicates the types of activity and time of activation. The RAs and DAs in the study are described as follows:

R350A Puckapunyal is approximately 10 km west of Mangalore that is used by Defence for military flying and non-flying activities. The area is activated 24 hours each day (H24) and has a conditional status of RA3 (refer Annex C). The vertical limitations are from the surface to 5,000 FT AMSL.

R350B Puckapunyal is situated directly above R350A, operated by Defence and undertakes the same activities as R350A. The vertical limitations are from 5,000 FT AMSL to FL200. The hours of activity are from 0700 hours to 2200 hours (local time) or as amended by a Notice to Airmen (NOTAM). The conditional status is RA2.

R351A Graytown is adjacent to and north of R350A and R350B. R351A is operated by Defence and used for military non-flying activities. The vertical limitations are from the surface to 5,000 FT AMSL, operational H24 and has an RA3 conditional status.

R351B Graytown is situated directly above R351A, operated by Defence, and undertakes the same activities as R351A. The vertical limitations are from 5,000 FT AMSL to FL150. The hours of activity are from 0700 hours to 2200 hours (local time) or as amended by NOTAM. R351B conditional status is RA2.

R352 Puckapunyal is adjacent to and based along the south-eastern border of R350A and R350B. Triangular is shape, the area uses Puckapunyal aerodrome as the apex point from the base. The RA is used by Defence for military flying and non-flying activities. The vertical limitations are from the surface to 3,000 FT AMSL. The hours of activity are advised by NOTAM and the conditional status is RA2.

D333 Waranga Basin Unmanned Aerial Vehicle Testing is located to the southwest of Shepparton. The area is a circle radius of 5 NM centred on a position over the Waranga Basin. The area is activated by NOTAM with vertical limits from the surface to 2,500 FT AMSL. The contact has changed from Flight Data Systems Victoria to Swoop Aero Victoria.

D366 Nagambie-Wirrate Parachuting is a five-sided shaped area around Nagambie-Wirrate ALA. The area operates each day or as amended by NOTAM from the surface to FL150. The contact is Skydive Nagambie.

D376 Euroa Parachuting is a circle with a 3 NM radius over Euroa ALA. The area operates daily or as amended by NOTAM from the surface to FL125. The contact is Skydive Euroa.

A TRA may be declared for special events where there may be a public safety issue such as an air show, a military exercise or a police activity, that requires control access to airspace in a particular area. A recurring military exercise in the study area is Chong Ju. TRAs are established for the purpose of these exercises and generally encapsulate the existing RAs into one area.

5.4 Air Routes

The majority of the low-level air route structure in the study area is based on the Mangalore VOR. These routes supports the significant majority of aircraft activity into and out of Mangalore. The air route structure is such that most aircraft arrive from sectors between the northwest and northeast or the southeast and southwest of Mangalore.

Route W465 is a two-way route between Mangalore and Albury, takes aircraft over or through hang gliding and paragliding activities at Locksley Field and PJE within D376 at Euroa.

The route structure is also designed to avoid the Puckapunyal and Graytown RAs.

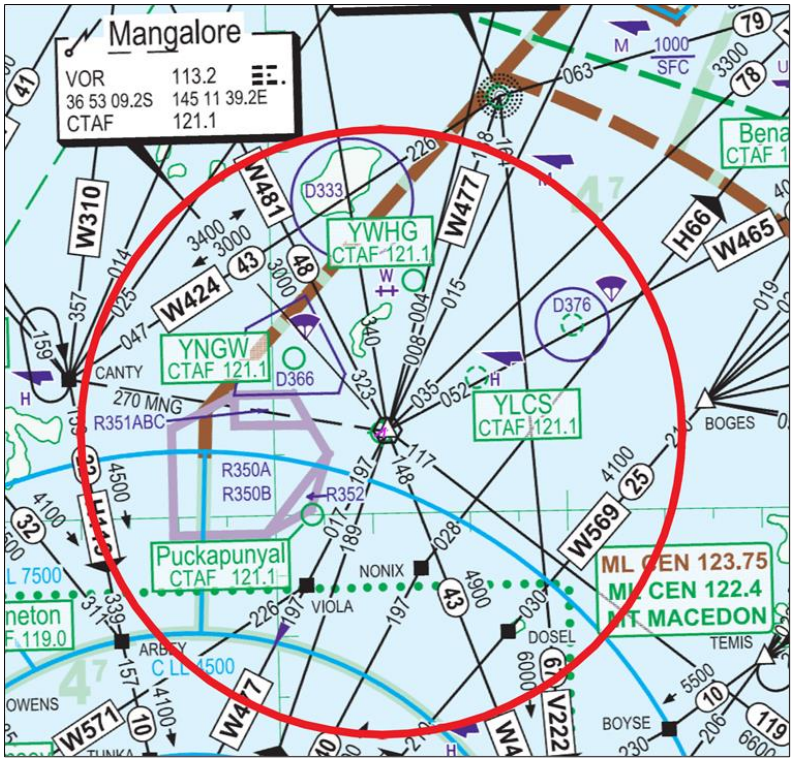


Figure 4: Air routes used by aircraft operating at below FL200[11]

VFR aircraft generally travel as required, remaining clear of the activated RAs and operating in VMC. There are no promulgated VFR lanes on the VNC within the study area. As previously indicated, additional VFR approach or tracking points in the study area would provide increased awareness for aviation activities.

VFR aircraft transiting between the Melbourne basin area and Mangalore area normally track along Kilmore-Broadford-Tallarook-Seymour. This track funnels aircraft through a narrower area into the open valley area.

VFR approach points are located at Kilmore and Broadford where townships, high power transmission lines and the highway provide a visual reference to users.

5.5 Surveillance

ATC surveillance in the study area includes secondary surveillance radar (SSR) and Automatic Dependent Surveillance – Broadcast (ADS-B). ADS-B is a system whereby suitably equipped aircraft automatically broadcast their location via a digital data link. The data is received by ATC ground stations and can be displayed on air traffic radar screens. This enables ATC to provide a

[11] Enroute Chart Low (ERC-L) are used for operations below FL200. These charts show significant air traffic route areas, CTA, SUA, air routes and radio navigation aids.

radar-like surveillance service. The data can also be received by other suitably equipped aircraft for situational awareness and to enable detect and avoid capability.

Airservices provides air traffic services from the Melbourne Centre. Mangalore is located within the Alpine Group.

There are two radar sites and three ADS-B sites that provide surveillance coverage within the study area. These sites are located at:

- Mount Macedon, Victoria –SSR and ADS-B ground station.
- Gellibrand Hill, Victoria – Primary Surveillance Radar (PSR) and SSR.
- Dederang, Victoria – ADS-B ground station; and
- Mount William, Victoria – ADS-B ground station.

Surveillance coverage of the area does vary and is impacted by terrain shielding in the area. The following diagrams identify the radar and ADS-B coverage of the Mangalore area.[12]

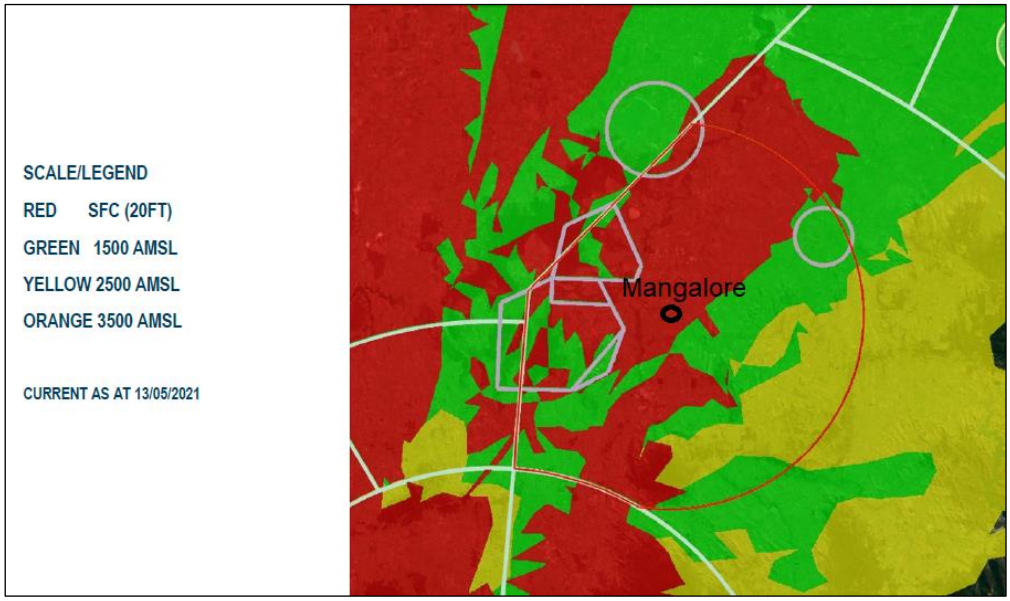


Figure 5: Radar coverage at Mangalore

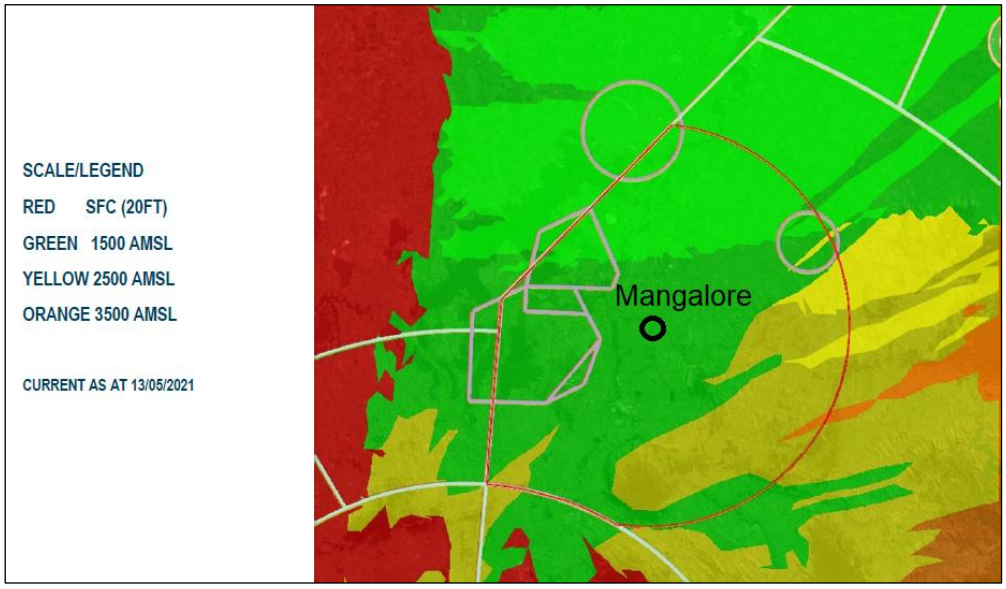


Figure 6: ADS-B coverage at Mangalore

[12] Mangalore Radar and ADS-B Surveillance Coverage, Airservices Australia 2021

5.6 Environment

The airspace within 25 NM of Mangalore 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.

There were no substantially adverse and enduring environmental issues identified that impact the administration of the reviewed airspace. Matters relating the interactions with birds and wildlife are the responsibility of the airport's wildlife management program and are normally detailed within the respective Aerodrome Operations Manual.

5.7 Airspace Protection

The aim of airspace protection is to ensure aircraft are not exposed to obstacles or hazards in navigable airspace. Certified aerodromes identify surfaces that need to be protected based on the obstacle limitation surface (OLS) and where appropriate, the PANS-OPS surfaces.

Mangalore Airport is being developed as an internationally competitive training facility for the aviation industry and the zoning plan of the airport precinct by Strathbogie Shire Council protects the development of aviation services within this area.

No airspace protection issues were identified during this study.

6 Traffic

6.1 General

The overall recorded aircraft and passenger movement data for the airfields in the study area is of limited quality i.e. there is limited data regarding traffic for the ALAs including Euroa and Locksley Field. The data for Mangalore is recorded below and anecdotal information regarding aircraft movements at other locations was provided by stakeholders.

Mangalore movement data recorded decreases between 2015 to 2017 however there were increased movements between 2017 to 2021. This increase can be attributed to the flying training being conducted in the study area.

The following table and figure detail and illustrate the recorded data for Mangalore between 2015 and 2021.

Mangalore Movement Data for the 12 months ending

Month/Year	Total Movements	Air Transport Movements	Passengers	VFR Movements	IFR Movements
December 2015	10,800	1,555	6,000	9,392	1,408
December 2016	9,900	1,321	5,600	8,630	1,270
December 2017	7,218	836	4,057	6,298	920
December 2018	8,900	1,063	4,400	7,906	994
December 2019	8,372	1,001	4,183	7,392	980
December 2020	9,100	1,131	4,800	7,984	1,116
November 2021	9,000	1,135	4,995	7,840	1,160

Table 1: Airservices Australia movement data for Mangalore, 2015 to 2021[13]

[13] Source: Airservices Australia Passenger and Aircraft movement data Mangalore Aerodrome 2015-2021

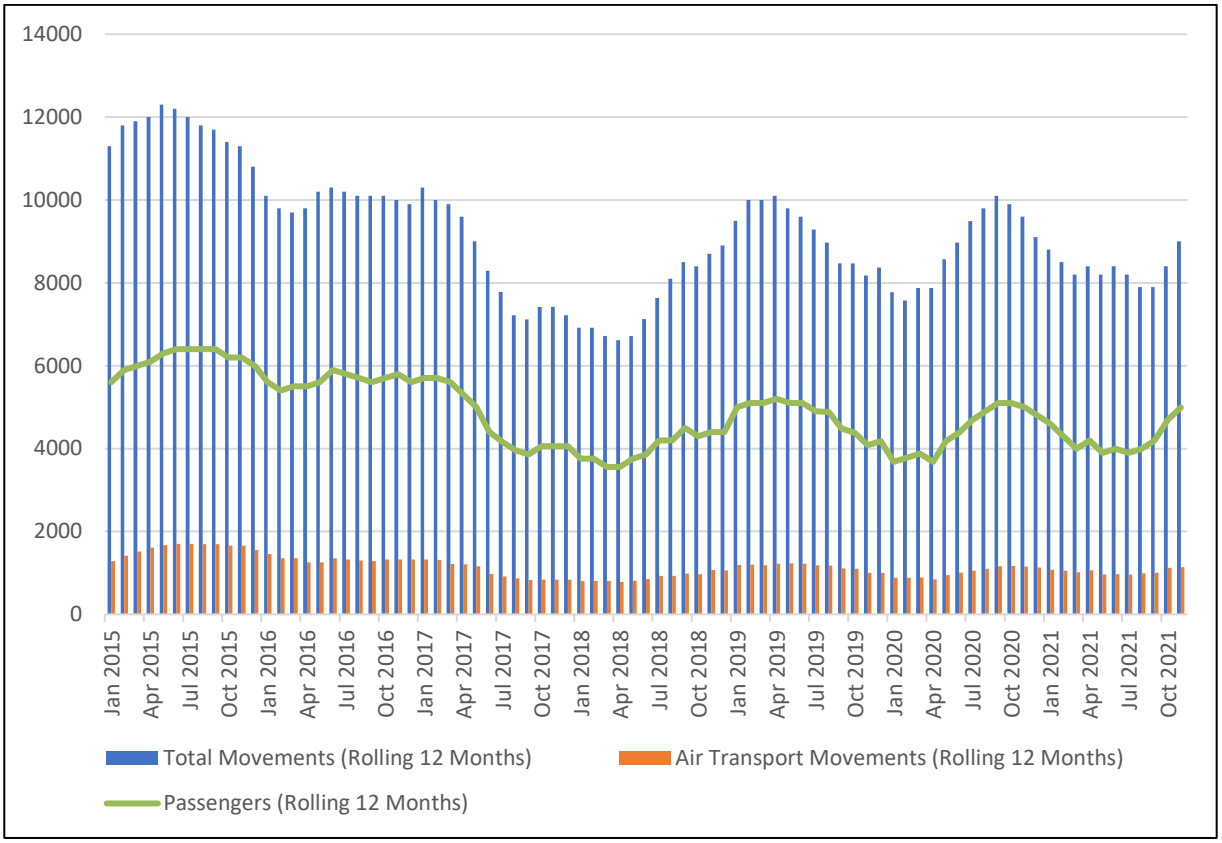


Figure 7: Aircraft and Passenger Movement Data Rolling 12-month data – Mangalore 2015-2021

6.2 Analysis of aircraft movements

The analysis of aircraft movement data determined that that no change to the airspace classification was generated based on aircraft movements.

Total aircraft movements within the study area are projected to grow from existing COVID impacted levels over the next five years.

The majority of aircraft movements are centred around Mangalore, but the nature of operations at surrounding airfields contains a variety of airspace activities by the mix of aircraft type, performance and operation. For example, during events at Nagambie, there can be four drops made each hour, during hours of operations and there can be 20+ hang gliders operating during the day at Locksley Field.

The types of aircraft range from recreational or sports aviation aircraft including hang gliders, paragliders and gliders to general aviation aircraft, air medical helicopters and Defence aircraft. Aircraft operating in the airspace, normally track in a north/south direction around Mangalore, avoiding the restricted areas around Puckapunyal and Graytown and the open areas north of Mangalore (refer **Figure 3**).

VFR aircraft, particularly flight training aircraft account for the majority of aircraft activity in the region. South of Mangalore, aircraft generally followed the track between Kilmore-Broadford. There have been no recorded incidents or occurrences relating to airspace congestion along this track despite being a well-used pathway into or out of the area.

Flight training aircraft prefer Mangalore due to the accessibility of the VOR and lack of availability of other ground-based navaids near Melbourne.

Airspace infringements caused by aircraft entering the restricted areas without a clearance was the most common type of occurrence and is detailed later in the study.

6.3 Analysis of passenger numbers

The analysis of passenger movement numbers in the study area did not identify a need to change the airspace classification based on passenger numbers.

Passenger movement data for Mangalore showed a similar fluctuation to total aircraft movement numbers (refer **Figure 7**).

As previously noted, there are no RPT operations at Mangalore. The ratio between total aircraft movements and passenger movements indicates each aircraft on average has one or two people on board. This is further supported by the types of aircraft common to the area.

7 Aviation Occurrence Reports

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

The ATSB maintains its own database in which all reported occurrences are logged, assessed, classified, and recorded. The information contained within the database 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).

For identification purposes each ASIR is allocated its own serial number, detailed as an incident, serious incident or accident, and is assigned one of the following Level 1 Descriptions:

- Airspace – includes airspace infringements, loss of separation, loss of separation assurance, breakdown of coordination/information error, error by ANSP instruction or pilot actions, encounter with a remotely piloted aircraft (RPA), Airborne Collision Alert System (ACAS) Warning.
- Consequential Events – includes aircraft conducting missed approaches, fuel dumping, diverting or returning to aerodrome.
- Environment – most common description for a bird strike, evidence of bird strike after landing or locating animals during runway inspections. Also includes lightning strikes, turbulence, windshear and microbursts and interference from ground issues.
- Infrastructure – such as runway lighting, approach lighting and radio frequency failures.
- Operational – considers pilot actions and runway incursions (resulting in events including Loss of Separation), ground proximity warnings, terrain collisions, crew, and cabin safety, smoke, or fumes events, avionics, and equipment issues; and
- Technical – includes airframe, systems such as landing gear indications and power plant matters e.g., engine running rough, engine failure.

A CIRRIS report is an electronically submitted air safety occurrence report which forms part of the risk information system maintained by Airservices. Not all information in CIRRIS is required to be reported to the ATSB and there may be differences between the two reporting systems.

The airspace related incidents within 25 NM of Mangalore from January 2015 to December 2021 were reviewed.

7.1 ATSB Aviation Safety Incident Reports

The following table identifies the total number of ASIRs recorded between January 2015 and December 2021.

Number Recorded between January 2015 & December 2021

Primary Occurrence	2015	2016	2017	2018	2019	2020	2021
Airspace	1	0	2	0	3	6	3
Consequential Events	0	0	0	0	0	0	0
Environment	1	1	2	1	4	1	3
Infrastructure	0	0	0	0	0	0	0
Operational	5	2	1	2	3	3	8
Technical	8	12	5	4	9	2	6
Total occurrences	**15**	**15**	**10**	**7**	**19**	**12**	**20**
Total Aircraft Movements	**10,800**	**9,900**	**7,218**	**8,900**	**8,372**	**9,100**	**9,000***

Table 2: ASIR Occurrences within the study area between January 2015 to December 2021
*Recorded movements to November 2021

Fifteen 'Airspace' related incidents were recorded during 2015-2021. However, a review of other incident summaries identified additional occurrences where aircraft entered restricted airspace without a clearance, i.e., an airspace infringement. These matters are included in the table below and the summaries are tabled in Annex D.

Number Recorded between January 2015 & December 2021

Airspace Related Occurrence Type	2015	2016	2017	2018	2019	2020	2021
Aircraft Separation	1	0	1	0	2	6	2
Airspace Infringement	0	0	1	0	0	3	3
Encounter with RPA	0	0	0	0	1	0	0
Operational Non-Compliance	0	0	0	0	0	0	0
Total occurrences	**1**	**0**	**2**	**0**	**3**	**9**	**5**

Table 3: ASIR Airspace Occurrence Description within the study area 2015-2021

Twelve aircraft separation incidents were recorded during 2015-2021. The most serious event was a mid-air collision (MAC) between a Piper Seminole (PA44) and a Beech Travel Air (D95A) approximately 8 km south of Mangalore. Seven occurrences were recorded for aircraft within the Mangalore circuit area or when an aircraft was on approach to Mangalore. Four occurrences are likely to have occurred overhead Mangalore or outside the Mangalore circuit area based on the incident summaries.

7.1.1 ATSB safety investigations and reports

The ATSB's primary focus is the safety of the travelling public. The ATSB prioritises investigations based on accidents and the most serious incidents that are considered most likely to enhance aviation safety. Between January 2015 and December 2021, the ATSB conducted three investigations into the incidents that occurred at Mangalore.[14]

On 16 June 2016, a training flight from Mangalore experienced carburettor icing that resulted in the engine failing and the aircraft conducted a forced landing in a field near Mangalore aerodrome. The instructor and student were not injured, and the aircraft did not sustain any damage. The report into this issue was released in September 2016 which highlighted the nature of carburettor icing and the speed with which it can occur in favourable environmental conditions.

[14] Source: Australian Transport Safety Bureau website Safety investigations & reports (atsb.gov.au) 5 November 2021

On 19 February 2020, two IFR aircraft were involved in a mid-air collision within five nautical miles south of Mangalore resulting in four fatalities. The final report was published 31 March 2022.

On 6 June 2021, during a cruise in instrument meteorological conditions (IMC) overflying Mangalore, a rotary winged aircraft received a Traffic Collision Avoidance System Resolution Advisory (TCAS RA) on another fixed winged aircraft which was conducting a missed approach. The preliminary summary has been published online however the final report was still to be released at the time of completing this study.

There were two ATSB reports from 2011 and 2014 which involved a close proximity between aircraft and a near collision event. A common issue in these events was communication between aircraft when operating in the vicinity of a non-controlled aerodrome. A summary of each incident follows:

- 27 September 2011 in the circuit at Mangalore a proximity event between two company aircraft involved in flight training occurred. One training aircraft was operating IFR and the other training aircraft, VFR.
- 10 January 2014 a departing aircraft failed to respond to radio communications or clarify intentions from an IFR aircraft conducting airwork overhead Mangalore.

7.2 Airservices CIRRIS data

CIRRIS Reports between January 2015 & December 2021

Primary Occurrence Type	2015	2016	2017	2018	2019	2020	2021
Aircraft Accident	0	0	0	0	0	1	0
Aircraft Confliction	0	0	0	0	1	0	1
Airspace Infringement SUA	18	23	17	11	16	8	10
Airspace Infringement CTA	0	0	0	0	0	0	0
Emergency Operations	1	2	1	0	1	0	2
Facility Issue	0	0	0	1	0	0	0
Information Error	0	2	0	3	2	1	1
Laser	3	0	1	1	1	0	2
Loss of Separation - Aircraft	0	0	0	1	0	0	0
Loss of Separation with SUA	2	1	0	0	0	0	0
Malfunction - Aircraft System	0	0	0	3	2	0	1
Operational Deviation	0	3	2	1	1	0	0
Other - Safety Related	1	1	0	0	0	0	0
Total CIRRIS reports	**25**	**32**	**21**	**21**	**24**	**10**	**17**
Total aircraft movements	**10,800**	**9,900**	**7,218**	**8,900**	**8,372**	**9,100**	**9,000***
Percentage of airspace infringements SUA to total CIRRIS reports	72%	71.8%	80.9%	52.3%	66.7%	80%	58.8%

Table 4: CIRRIS data within the Mangalore study area between 2015-2021
*Recorded movements to November 2021

The ratio of CIRRIS reports to the number of total aircraft movements at Mangalore is low. However, reported airspace infringements in restricted airspace averaged 68.8%, more than two thirds of all submitted CIRRIS reports. A common factor during these airspace infringements were aircraft not responding to radio calls. The failure to respond to, or acknowledge radio calls, increases the risk to operations within any airspace.

7.3 Evaluation of occurrence reports

The majority of the ATSB ASIR recorded incidents occurred within close proximity to Mangalore, i.e. while aircraft are on approach or within the circuit area. This resulted in aircraft taking action other than originally planned to increase separation.

Another common occurrence supported by the CIRRIS data, were aircraft entering restricted airspace while not in normal communications with ATC. This type of occurrence represents more than two-thirds of all CIRRIS incidents reported and occurred well outside the circuit area of Mangalore.

Compliance with the Civil Aviation Safety Regulations (CASR) Subpart 91.D Operational Procedures for operations in the vicinity of non-controlled aerodromes and issues relating to radio communications will improve situational awareness and safety for all pilots flying in the area.[15]

[15] CASR Part 91 superseded the information contained within the Civil Aviation Regulations Regulation 166 (CAR 166) on 2 December 2021

8 Mangalore Airspace Risk Assessment

8.1 General

An OAR airspace risk assessment was conducted to determine the level of risk present in the airspace surrounding Mangalore Airport. Data for the risk assessment was provided by various sources including the ATSB, stakeholders and operators. CASA also referenced information contained in reports prepared by Airservices.

CASA appreciated the opportunity to review information provided by Airservices as part of their Surveillance Flight Information Service (SFIS) Mangalore Conflict Analysis Version 2.0[16] (Mangalore Conflict Analysis). This provided context to the consequence and likelihood assessment of aircraft interactions within 25 NM of Mangalore.

The risk assessment identified existing risks in the airspace that would inform the need for additional safety enhancements or risk mitigation options.

The majority of risks were communications and frequency related. These were caused by frequency congestion and the flight training traffic based on the scale and variety of operations, using the Mangalore area.

Despite a very low likelihood of occurrence, it is clear from the accident in February 2020, a MAC can occur in Class G airspace. It must be acknowledged however, almost all MACs are preceded by a number of precursory safety occurrences and related consequences. Essentially, the MAC is the final event in a consequential chain.

The eventuation of a MAC is so rare, it is common practice to risk manage those risks the airspace users have a high degree of exposure to and occur more routinely. The intent of this practice is to recognise, manage, and ultimately reduce the risks and consequences which contribute both directly and indirectly to a MAC, thereby reducing the overall likelihood of the MAC occurring.

Information relating to the Mangalore Risk Assessment is in Appendix 4.

8.2 Airspace Risk Assessment Methodology

For this assessment, only those risks identified and supported through safety occurrence and operator feedback specific to Mangalore, were considered. The methodology included analysis of stakeholder feedback, information related to available surveillance data and a review of potential for collision conflicts as supplied in the Mangalore Conflict Analysis.

The Mangalore Conflict Analysis provided information regarding potential conflicts for IFR-VFR and IFR-IFR interactions within 20 NM of Mangalore while considering the time between flight paths and the height difference using probability overlap methods. Each potential conflict provided an estimated risk of collision if the pilots did not react to avoid a potential collision.

Due to limited aircraft movement data the analysis included the addition of core assumptions that were necessary to enable computations to be completed. This analysis was then extrapolated into a Hazard Identification process, to clearly identify airspace hazards around Mangalore. The variety of information sources used as part of this analysis provided validation that ensured a wholistic approach to airspace hazard identification and delivered logical conclusions.

Once identified, the hazards were incorporated into the CASA Aviation Safety System (CASS) risk assessment framework. The purpose of this was to determine the airspace risks associated with each hazard and the extent to which they were present. This then resulted in a final indicative risk determination. This information can be used to explore risk mitigation options.

[16] Mangalore Conflict Analysis, Version 2.0, Risk Intelligence, Safety and Risk, Airservices Australia, 21 June 2021

8.3 Review of stakeholder feedback

Stakeholder feedback was summarised as a collection of issues related to increased training flights, congested communications and adherence to correct communication procedures.[17]

Many operators referred to frequency congestion and the associated risks to their operations. Operators felt this was attributed to the number of aircraft operating within the vicinity of Mangalore, caused by the limited number of ground-based navigation aids available within the Melbourne basin. Frequency congestion was also impacted by aviation activity at the other ALAs operating on the same CTAF 121.1 MHz i.e., Puckapunyal, Nagambie-Wirrate, Locksley Field and Wahring Field. Activities at one location can affect operations at another e.g. PJE broadcasts at Nagambie-Wirrate can be delayed due to flight training broadcasts being made at Mangalore.

Pilot situational awareness was degraded by the poor accuracy, clarity and conciseness of broadcasts made by other pilots in the area. The use of non-standard phraseology or unclear transmissions by pilots, increased frequency congestion as transmissions were repeated. ERSA entries for locations within the study area that included minimum broadcasts requirements can also congest the frequency.

Adherence to correct communications procedures for non-controlled aerodromes were highlighted. Stakeholders advised that over transmission, inaccurate reporting (position and estimates) and lack of broadcasts were a problem.

8.4 ASIR Data

The ATSB ASIR data recorded between January 2015 to December 2021 was analysed for the airspace risk assessment. Occurrences relating specifically to aircraft separation and the associated issue of communication were examined. Given the relationship between the two types of occurrences, many were coded against Airspace (aircraft separation) and Operational (communications).

8.4.1 Aircraft Separation

Twelve occurrences involving aircraft separation incidents occurred in the study area during the study period.

- Seven incidents occurred within the Mangalore circuit area.
- One MAC approximately 8 km south of Mangalore.
- Two incidents were recorded approximately 20 km and 46 km south of Shepparton (one occurrence involving a rotary winged aircraft receiving a Traffic Collision Avoidance System Resolution Advisory (TCAS RA) on another aircraft and one issue where three hang gliders were observed on a converging track with a fixed wing aircraft); and
- One incident near Mangalore where a rotary winged aircraft received a TCAS RA on another aircraft.[18]
- One incident overhead Mangalore where a rotary winged aircraft received a TCAS RA on a fixed winged aircraft operating at Mangalore.

The types of aircraft involved in these incidents were a mix of recreational and general aviation aircraft, sports aviation (hang gliding) and rotary winged air medical aircraft.

The occurrences supported common themes that included aircraft operating in the proximity of another aircraft while established in the circuit or on approach, and the lack of radio communication.

[17] Training traffic includes ab-initio, flight testing, recurrent and or renewal licensing requirements for VFR and IFR operations.
[18] A TCAS will issue traffic advisories (TA) and resolution advisories (RA) when applicable in a coordinated manner. When an RA is issued to conflicting aircraft the pilot is required to respond immediately including if contrary to ATC instruction.

8.4.2 Communications

Seven occurrences were recorded where aircraft entered restricted airspace without a clearance while the aircraft were not in normal communications with ATC.

These incidents showed the significance of constant, effective communication in aviation.

8.5 Airservices Australia Conflict Analysis

Airservices proposed a SFIS for Mangalore to mitigate their assessment of airspace risk to operations in the area. Airservices supported the use of their report by CASA as part of the aeronautical study.

The conflict analysis data was based on observed tracks and informed the potential collision risk modelling for aircraft within two areas of Mangalore; inside 5 NM and between 5 NM to 20 NM of the aerodrome.

The analysis identified that inside 5 NM of Mangalore, the final segment of approaches, the circuit area and the extended runway centrelines contained most of the IFR-VFR potential collision risk. Between 5 NM to 20 NM in an area to the northeast of the Mangalore which contains most of the IFR-VFR potential collision risk as well as majority of the VFR traffic. IFR-IFR potential collision risk is mostly located along commonly used routes within the airspace.

The analysis did not identify any locations with disproportionately high collision risk and there were no periods with unduly high levels of activity.

8.6 Aircraft movements

Despite a potential increase in aviation activity as COVID 19 restrictions are lifted, the geographical spread of the potential collision risk is not expected to change.

8.7 Risk Assessment

The risk assessment accorded with the risk assessment methodology detailed in the CASS manual which enables determination of risks and existing controls.

Current Situation					Consequence and Likelihood Assessment			Control Effectiveness		Exposure Assessment		Overall Risk Level
ID Number	Hazard	Description of Risk	Existing Controls	Consequence	Consequence severity	Likelihood	Initial Risk Score (number between 1 - 8)	Overall Control Effectiveness	Interim Score (number between 1 - 32)	Exposure Description	Final Risk Score	Final Determination
#01	Frequency congestion	Mishandling the aircraft during a critical phase of flight due to inability to receive or transmit critical information.	CAAP 166 - Operations in vacinity of non-towered aerodrome ERSA entry Mangalore: visiting aircraft PPR to conduct circuit training at aerodrome. Assists with numbers in the area.	Aircraft are forced to hold or make unanticipated tracking changes, or conduct missed approaches.	Moderate	Likely	5	Partially Effective	10	Infrequent	20	Low
#02	Lack of transmissions between aircraft within the YMNG area	Pilots do not make transmissions information informing other aircraft of critical flight information	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) ERSA entry Mangalore Local Procedures and Additonal Information recommends all aircraft within 10NM illuminate landing & taxi lights	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticipated proximity of other traffic.	Major	Possible	5	Effective	5	Infrequent	10	Low
#03	Pilots making non-standard transmission	Information provided by some pilots results in uncertainty and ambiguity of critical flight information	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) Flying Instructors providing guidance on RT to trainees. CASA Safety Advisors providing briefings on comms related issues.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticipated proximity of other traffic.	Major	Possible	5	Effective	5	Infrequent	10	Low
#04	Incorrect operation and/or fault with VHF radio	Pilots incorrectly operate their radio, or their radio has a fault, leading them to believe that they are correctly transmitting, when they actually are not.	Flight training - correct operation of communications equipment Adherance to maintenance requirements Pre-flight checks of aircraft equipment	The pilot fails to be heard, or to hear other traffic, and come within close proximity of that traffic.	Major	Unlikely	4	Partially Effective	8	Seldom	8	Low
#05	Procedures around standardised information transmitted by the airspace users often lead to verbose broadcasts with duplicate information	The extended and non standard transmissions can prevent aircraft making timely and accurate transmissions	CAAP 166 - Operations in vacinity of non-towered aerodrome Flight Training Organisations - standards within Operations Manual. Safety Briefings - CASA & Training Orgs?	Aircraft are prevented from transmiting as required, resulting in delays or increased holding. Aircraft are placed in unsafe proximity to one another due to unanticipated positioning or lack or traffic awareness.	Moderate	Likely	5	Limited Effectiveness	20	Infrequent	40	Medium
#06	Lack of available taxiways servicing runway thresholds	Aircraft occupy both runways for a prolonged period of time as they enter and backtrack	CAAP 166 - Operations in vacinity of non-towered aerodrome ERSA instruction on reducing runway backtracking.	Inbound aircraft are forced to conduct go-arounds or missed approaches, or hold, due to not being able to land.	Insignificant	Possible	2	Partially Effective	4	Infrequent	8	Low
#07	Overlapping flying training area and YMNG circuit area.	While trying to avoid traffic within the (area) YMNG CCCT, aircraft infringe the Restricted Area.	Flight planning / avoidance of R351AB boundary (RA boundaries) Surveillance enabling identification of aircraft infringing area. RCO advising of infringements. NOTAMs?	Civil aircraft unknown to those operating with RA come within unsafe proximity of military aircraft and military ordinance undertaking training manoeuvres.	Moderate	Unlikely	3	Limited Effectiveness	12	Seldom	12	Low
#08	Overlapping flying training area and YMNG circuit area.	Pilot in Class G airspace loses SA on other training traffic leading to inability to deconflict flight path from other traffic. This leads to the possible development of a collision pair unsafe situation.	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) ERSA entry Mangalore Local Procedures and Additonal Information recommends all aircraft within 10NM illuminate landing & taxi lights. Provides advice where departing aircraft will track & minimum radio broadcasts.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticipated proximity of other traffic.	Major	Possible	5	Limited Effectiveness	20	Infrequent	40	Medium
#09	Converging Runways and flight paths	Aircraft taking off from RWY 05 and 36 converge and result is crossing departure paths.	CAAP 166 - Operations in vacinity of non-towered aerodrome ERSA entry Mangalore details minimum radio broadcasts including taxiing, entering & departing. ERSA entry Mangalore instructs use of TXY A and TWY C for specific departure runways.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticipated proximity of other traffic.	Major	Likely	6	Partially Effective	12	Infrequent	24	Medium
#10	ERSA discribes practice IFR approaches should add 1,000FT to the altitude	1,000FT in altitude is suggested in an attempt to de-conclict with VFR CCT traffic. This altitude requirement has the potential to introduce different inturpretations on where the 1,000FT hight should be calculated.	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) Pilot flight notification and ATC traffic information services (IFR-IFR) Class G ERSA entry Mangalore outlines PPR for visiting aircraft doing circuits, identifies training area, recommends aircraft within 10 NM illuminate landing & taxi lights. Aircraft practicing instrument approaches to add 1,000ft to prescribed altitude to reduce interference with circuit traffic.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticipated proximity of other traffic.	Major	Likely	6	Partially Effective	12	Regular	36	Medium
#11	Increasing levels of VFR and IFR flight training traffic converging the YMNG airspace, immediate surrounds and to utilize the limited ground based NAVAIDS for IFR training.	Pilot in Class G airspace loses SA on other training traffic leading to inability to deconflict flight path from other traffic. This leads to the development of a collision pair unsafe situation.	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) Pilot flight notification and ATC traffic information services (IFR-IFR) Class G ERSA entry Mangalore outlines PPR for visiting aircraft doing circuits, identifies training area, recommends aircraft within 10 NM illuminate landing & taxi lights. Aircraft practicing instrument approaches to add 1,000ft to prescribed altitude to reduce interference with circuit traffic.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticipated proximity of other traffic.	Major	Likely	6	Partially Effective	12	Infrequent	24	Medium

9 Consultation and stakeholder feedback

Stakeholders were invited to provide comment on safety issues relating to Mangalore airspace.

9.1 CASA Internal

Discussions with CASA inspectors from Aerodromes and Aviation Safety (Air Traffic Management (ATM)) teams did not identify any airspace issues.

Consultation with CASA Aviation Safety Advisors who attend the Mangalore area did not identify any areas of concern.

9.2 Air Navigation Service Provider

Airservices is the only ANSP in the study area. Airservices has proposed the establishment of an SFIS for the Mangalore area. Airservices encouraged CASA to consider the proposal (SFIS at Mangalore) including the associated risk and safety information as part of the aeronautical study.

On the 12 August 2021, Airservices commenced the provision of a Safety Alerting service on the Mangalore CTAF. The service is provided between 2200-0800 UTC daily on the CTAF 121.1 MHz by the same controller who manages the Dookie sector area frequency 122.4 MHz which surrounds Mangalore. Safety Alerts are issued by the controller when they become aware that an aircraft is about to be in unsafe proximity to terrain, obstacles, restricted areas, or other aircraft, using the phrase ‘Safety Alert’. When providing an ATS surveillance service, ATC will issue avoiding action advice when they become aware that an aircraft is at risk of a collision with another aircraft, using the phrase ‘Avoiding Action Suggest’.

The Safety Alerting service on CTAF may increase controller situational awareness and allow monitoring of pilot self-separation where required.

At the time of completing this report, the OAR had received two notifications of an incident involving the Safety Alerting Service.

- November 2021, a single engine recreational aircraft declared a Mayday on the Mangalore CTAF due engine failure. The aircraft landed safety at Mangalore.
- December 2021 an unidentified aircraft was observed close to R351A/B. A safety alert was issued on the FIA and CTAF. Aircraft observed to enter 2 NM of R351A/B; a hazardous activities broadcast was made; the aircraft acknowledged the exited the area.

9.3 Airspace Users

The most frequent types of flying operations conducted in the study area are private or recreational activity, sports aviation, flight training, air work and business or charter operations. Defence operations are generally contained within the limits of the RAs.

Common points raised by users were the proposed SFIS and the effect of reduced ground-based navigation aids due to the Navigation Rationalisation Project (NRP).

9.3.1 Stakeholder 01 Comments – Mangalore Operations

The SFIS proposal appeared to be developed in isolation because it was the only solution being put forward by Airservices. Consultation may have been undertaken however the aviation community around Mangalore were consulted once the proposal had been developed. There are issues that remained unresolved.

The lack of navigation aids within the region has resulted in aircraft using Mangalore VOR for IFR training purposes. Pilots with varying levels of ability are operating in the immediate area of

Mangalore which does increase the risk to operations, particularly when high numbers of aircraft are operating. Planning and awareness do provide some mitigation to the risks however having more ground-based navigation aids would reduce traffic numbers.

The number of paths leading to Mangalore for VFR aircraft has created choke points in the vicinity of the aerodrome. Similar to, but less than, traffic using 2RN in Sydney, choke points are created where aircraft track to the same location, at the same time. Company operations stagger departures via the Nagambie Mine (north of the airfield) and arrivals are via Avenel, following the highway. These procedures can inadvertently create choke points along these paths due traffic.

VFR operations in the study area are an issue. Some private pilots with little experience do not comply with standard practices such as not broadcasting intentions or incorrect circuit operations. Most training aircraft operating in the area are good however, there are occasions when exceptions have been witnessed that are less than satisfactory.

Frequency congestion is an issue. Operations at Mangalore, Locksley Field, Nagambie, and Puckapunyal create frequency congestion. Aircraft not being able to effectively make broadcasts does increase the risk to operations, particularly when there are several aircraft operating on the same frequency at different locations.

There is a good operational relationship between Mangalore and Locksley Field as both airfields work well together.

The training area published in ERSA. There are approximately 20 students for each intake and having six to eight training aircraft results in multiple aircraft operating in the area as student progress through the course. Most of the training is undertaken in areas north of the airfield.

Regarding SFIS, ATC interaction with IFR aircraft is good and ‘alerted see and avoid’ is better than ‘see and avoid’ however there is still a misunderstanding how the flight information service will be applied. For example, Shepparton aerodrome is outside the Mangalore SFIS area, yet Shepparton is a factor in attracting traffic to Mangalore. Shepparton has a non-directional beacon (NDB) and Mangalore a VOR. Timely traffic advice for aircraft entering or leaving the Mangalore SFIS area hasn’t been effectively communicated. Questions remain about what information pilots would receive as part of this service. Further, there has been no information about other options that were considered before the SFIS proposal.

9.3.2 Stakeholder 02 Comments – Mangalore operations

The airspace over Mangalore is compacted by the military restricted areas to the west and the terrain to the east. This does funnel aircraft over Mangalore and can, at times, create congestion in the airspace. The establishment of VFR routes via the freeways to the east and west of Mangalore would likely move traffic away from overhead Mangalore.

The majority of times operations are not impacted by circuit operations. Communication between the operators based at Mangalore is excellent, particularly on safety related matters.

Aerobatics are being conducted overhead the aerodrome on weekends. This does occur on a regular basis however the timing of the activity varies.

Mangalore is a training aerodrome. This does require pilots, who were once trainees, some latitude as they develop their aviation and communication skills. At times, interpretations of the radio transmissions are required as phraseology develops. Frequency congestion is an issue at times. The use of nonstandard phraseology and repeat transmissions can create congestion. Additionally, when Wahring Field is operating and Nagambie is undertaking regular drops and aircraft are tracking to Mangalore for flight training purposes, this does increase the probability of frequency congestion occurring.

Mangalore airspace can become congested however the majority of the time the airspace is not congested and safe. The introduction of the SFIS would only cause further frequency congestion.

9.3.3 Stakeholder 03 Comments – Locksley Field operations

Locksley Field is the main location for operations. The long runway enables the (hang) gliders to be towed so users can bunny-hop i.e., practice take-off and landing at a low altitude. Training is normally conducted in the morning before the temperature increases which then enables users to undertake cross country flights. There can be up to 12 students and 34 tows on a good day at Locksley Field. This does not include the other experienced cross-country users that turn up later in the day.

Locksley Field is 9 NM from Mangalore. There is a good understanding about operations conducted at each location and the use of the CTAF for communication. Users often hear Mangalore traffic but generally do not see them at or around Locksley Field.

Pilots that operate at Locksley Field have significant flying experience.

The ability to effectively communicate when in the air means hang gliders and paragliders will try to avoid busy CTAF areas or where there is Class E airspace. Operators have radios and normally can hear broadcasts however users are required to reach for the radio for transmitting thus reducing the ability to control the aircraft. This does not prevent pilots from transmitting however, for paragliders particularly, the radio is likely to be out of reach.

Users can easily monitor the frequency and ‘spotters’ or the tug can broadcast on Very High Frequency (VHF) CTAF and Ultra High Frequency (UHF) to communicate to the group.

Two other locations for hang gliding etc. operations are at Landscape (near Seymour) for the more advanced/experienced user and Mount Broughton which has a smooth top and can be used for those gaining experience.

The SFIS, particularly the establishment of the BA, would have significant impact to hang gliding, paragliding and other sport aviation operations in the area. The requirement to make broadcasts does compromise the safety to their operations. Users face the risk of broadcasting or changing radio frequencies while wearing gloves and operating the aircraft with one hand. This is an impractical, high-risk and unacceptable operation.

9.3.4 Australian Airline Pilots’ Association

The Australian Airline Pilots’ Association (AusALPA) provided a written submission to the OAR that included support for rational, risk and evidence-based safety behaviour to balance long-held ambitions for airspace architecture modification. In this context AusALPA stated that the assertions that Class E airspace is the solution to the collision risk are presumptuous and, in their opinion, not supported by rigorous safety cases available in the public domain.

AusALPA provided information outlining systemic influences which was acknowledged as being outside the scope of the aeronautical study, however, these were related to Mangalore. This included the availability of ground-based navigation aids for IFR rating and flight-testing. The same limited number and wide geographical spacing of the remaining navigation aids fails its primary purpose means due to the imposition of increased transit distances, thus increasing the cost, while decreasing the efficiency of training delivery. AusALPA believes that the BNN requires supplementation to lessen the current increase in traffic density because of IFR training demands.

Surveillance coverage using ADS-B ground stations requires line-of-sight. It is noteworthy that Ballina and Mangalore have restricted surveillance coverage at lower levels (at or below 3,000 FT AMSL) due to terrain issues, despite their proximity to major centres.

Communication is a common factor to success regardless of the airspace classification. There are many reasons why communication issues are systemic failures rather than simple individual failures. A strong contributor is the different navigation concepts between VFR and IFR aircraft, as is lack of clarity, but they are transcended by frequency congestion and having to monitor multiple frequencies. Frequency congestion can easily occur when individuals lack both clarity and courtesy

for other users. It can be exacerbated by other factors such as mandating too many calls, having ATC sectors combined, too many aerodromes on the same frequency or having little time when descending from controlled airspace into non-controlled airspace.

The practice of combining ATC sectors needs to be reviewed. AusALPA is concerned that "workload management" can be a euphemism for inadequate resources as well as genuine load sharing. We are also concerned that the baseline workload presumption may of itself preclude the provision of additional alerting services, particularly when the geographic area of paired sectors becomes inappropriately enlarged.

Joining the Mangalore and Wagga Wagga sectors increases the number of aerodromes that may generate radio chatter, much of which is entirely irrelevant to operations at either hub. Similarly, superimposing other services or requirements such as a BA, SFIS, or a Certified Air/Ground Radio Service (CA/GRS) can further complicate the issue by increasing the communications traffic. In the latter cases, both services introduce additional participants with sound intentions but incomplete information on the CTAF. It must therefore remain front of mind that each of these add-on services, albeit intended to mitigate some existing risks, may nonetheless create their own.

AusALPA strongly recommend that those who feel the need to be seen to be doing something because of the noise generated in relation to Mangalore by vested interests should not be provoked into precipitous action. Instead, support a measured process that identifies all real airspace problems, procedural issues and infrastructure shortfalls that require rectification and far greater government priority and focus.

9.3.5 CASA Consultation Hub feedback

Between 6 – 30 September 2021, the CASA Consultation Hub sought input regarding users' experiences flying in the Mangalore area and information regarding the SFIS proposal. There were 172 responses received with most users involved in private or recreational aviation, sports aviation, flight training and air work operations. This is consistent with the aviation activity conducted in the study area.

The survey results showed that users found the airspace to be safe or mostly safe, users had equitable access to the airspace and the airspace was regarded as neither efficient nor inefficient. Issues regarding radio procedures and frequency congestion were highlighted. Causal factors were low time training pilots/flight training, access to nav aids, weather and topography. The majority of those surveyed indicated that the broadcast area (BA) or SFIS would not be beneficial to their operations and increase frequency congestion.

Additional information examining the results of the Consultation Hub is in the next section and in Appendix 6.

9.4 Aerodrome Operators

Mangalore

Having the only VOR in the area for some distance, Mangalore remained a popular location for flying training organisations to come to and this does increase the amount of air traffic operating in the airspace. ERSA indicates prior permission is required (PPR) for visiting aircraft coming to Mangalore for circuit training. This does assist with managing the amount of traffic in the circuit at various times of the day. Some flying training organisations follow ERSA and the process was working.

ERSA also contains information about aerobatics over the airfield daily. Although Moorabbin Aviation Services (MAS) does undertake aerobatics as part of their curriculum, it is conducted away from the aerodrome.

The published flying training area was entered at the request of flying training organisation. Mangalore aerodrome will support the flying training organisations operating at the airfield.

Mangalore AFRU is unserviceable. A new unit is ready for installation however existing infrastructure issues are being addressed before finalising installation of the new unit.

Euroa

Euroa is operated by Skydive Euroa who is also the contact for D376 Parachuting. The airfield is used for parachuting operations and prior permission is required for operations at the ALA.

The introduction of the proposed SFIS would require a change to the CTAF at Euroa. The operator did not have any objection to that change however the preference was not to change due frequency congestion issues. Existing practises ensure broadcasts are made by pilots on 'high and low' frequencies due to operations in flight levels but changing the Euroa CTAF to the Mangalore CTAF would create workload and cockpit management issues for staff. Currently pilots 'chit chat' on the Mangalore CTAF while others are trying to make broadcasts. Operations at Euroa are not impacted by this due to the separate frequency.

It was acknowledged that ATC does a good job during their operations however other airspace users often overfly the area when parachuting operations are being undertaken. Air route W465 overflies the aerodrome, and it appeared to the operator, that some pilots are ignorant or not familiar with the PJE activities, resulting in aircraft overflying the aerodrome when a drop is about to commence.

Operations at Euroa have declined significantly and are now currently rebuilding with restrictions easing. People from Melbourne and regional areas in Victoria and New South Wales go to Euroa due to its convenient location.

Traffic going to Mangalore VOR for flight training or flight testing increases the congestion in the airspace and radio. This does, on occasion, impact their operations.

Locksley Field

The operator did not raise any issues for the study and deferred to the main users of the airfield.

The ALA is primarily used by sports aviation including hang gliding and some gliding activities. Training in these activities occurs at this location. Due to the proximity with Mangalore all aircraft and launch vehicles are required to communicate on the CTAF. There are no issues between the operations at Mangalore and Locksley Field.

Nagambie-Wirrate

Nagambie-Wirrate ALA is operated by Skydive Nagambie who is also the contact for D366 Parachuting. Prior to the COVID restrictions, there was regular activity at the airfield. Most of the business for operations at this field came from people within the Melbourne area.

The processes established for the operations within D366 have and continue to work well between Skydive Nagambie and Airservices Australia. Operations must be within D366 and after dropping the aircraft heads down and to west. This ensures separation from the divers and other aircraft traffic that could be within the Mangalore area. There has been, on the rare occasion, an aircraft entering D366 during parachuting operations however there have not been any serious incidents resulting from that occurrence. Aircraft are allowed to enter the danger area.

There is support for the SFIS to operate in the area, however with five aerodromes in the area operating on the same frequency is a significant issue that has not been adequately addressed. Currently there are frequency congestion issues, and this does hamper broadcasts to enable pilots to develop or maintain situational awareness.

Puckapunyal

The airfield is located within R352 and adjacent to R350A. The main safety issue raised by Defence were the number of airspace infringements. There are several light planes that have been observed in the area, operating at low levels. These aircraft have had identifying features removed and cut through the RAs before coming up to an altitude where the aircraft can be identified through surveillance. Aircraft also fail to respond to radio calls although some do track in a direction when advised by ATC. However, the aircraft still does not respond to radio calls.

This type of activity can create a risk to them and Defence personnel during live firing events which occur at Puckapunyal.

Operations at Puckapunyal ALA do increase when Operation Chong Ju is run. A TRA is published during that period. The area generally encapsulates at the RAs at Puckapunyal and Graytown. This has resulted in airspace infringements of the TRA.

The SFIS has no bearing on Puckapunyal operations except when aircraft leave the RA.

Wahring Field

Wahring Field is operated by the Nagambie Soaring Centre Pty Ltd. Gliding operations are the main activity at this ALA.

Gliding operations at Wahring Field already monitor the frequency. Most gliders have a radio, and all modern gliders have a radio.

The SFIS appears opportunistic and the information provided is confusing. Some of the confusion due to the lack of briefings and also the interpretation by different pilots. Frequency congestion is a major concern. VHF radio is unlikely to hear ground calls from Wahring Field.

10 Consultation Hub Additional Analysis

10.1 General

As stated previously, the OAR sort feedback from users via the CASA Consultation Hub. The survey questioned users regarding airspace safety, congestion and efficiency including identifying risks and causal factors. The survey examined the types of aircraft the respondents operated and aircraft equipment. Appendix 6 details the responses from the survey.

The majority of users recorded the airspace to be safe or mostly safe although 20% of respondents recorded the airspace to be mostly unsafe or unsafe (see **Figure 8**). The OAR undertook further consultation to determine the overall safety to operations in the airspace, including the airspace classification.

The consultation determined the airspace operated to an acceptable level of safety and the airspace classification remained appropriate. This does not exclude actions that can be undertaken to enhance the level of safety for operations within the study area.

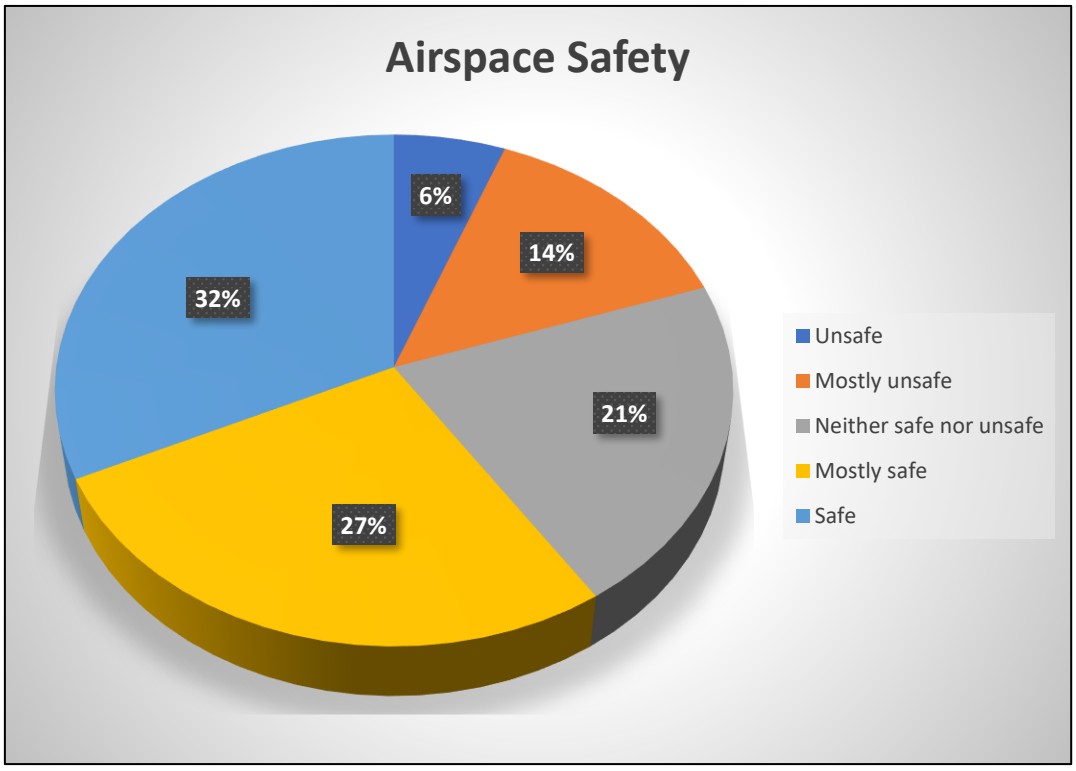


Figure 8: Users rate airspace safety in the study area

10.2 Analysis – Users risks to operations within the airspace

During the additional engagement process, in relation to the associated risks to airspace. safety, stakeholders emphasised the following factors which increased risk and reduced the level of safety when operating in the airspace.

- The improper use of the radio.
- The inability to make or understand transmissions.
- The number of aircraft operating in the vicinity of the aerodrome; and
- The variety activities occurring and pilot actions within the study area.

Regular operators are aware of the flight training activities being undertaken in the area, including the use of the VOR. Users acknowledged this does require additional patience to account for trainees and continuous updating of situational awareness. Users stipulated safe operations are

achieved when pilots, including trainees and their instructors, comply with the regulations and guidelines while operating in the vicinity of a non-controlled aerodrome.

Users advised there are difficulties in understanding a number of broadcasts made by (trainee) pilots where English was not their primary language. Requests to repeat transmissions, confirm aircraft position or intentions leads to frequency congestion. Other occasions when direct requests go unanswered and this does effect pilot's situational awareness as pilots may need to rely on partially understood information.

Non-standard phraseology being used during transmissions was experienced by a number of pilots and ATC. The use of non-standard phraseology, including non-aviation matters on the CTAF, unnecessarily lengthened the transmission and prevented others from broadcasting.

Airspace congestion was a subjective matter which seemed dependent upon the time of operation. The majority of flight training was conducted during the week and this created congestion in the area however, users who operated on weekends or holidays advised the airspace as not congested despite more aircraft (hang gliders, gliders, PJE and paragliders) could be operating in the area compared to weekday operations. ATC also advised that at various times the airspace could be busy.

The Mangalore VOR is directly responsible for additional air traffic operating at Mangalore. The ICAO requirement to use ground-based navigation aids for flight training purposes, including licence renewal, means that Mangalore does encounter additional unscheduled air traffic. As the airspace is non-controlled, users do not know who, what or how many aircraft will be operating at Mangalore when operating in the vicinity.

Other common flying training scenarios encountered by users impacting safety was the use of the airspace by some operators. The example provided was an aircraft undertaking airwork below 5,000 FT between Mangalore and Shepparton. This places the aircraft at an unknown altitude below 5,000 FT AMSL, in an unknown location between the two aerodromes which are approximately 29 NM apart. Aircraft entering the area are likely to remain above this altitude until the location of the lower aircraft is established. While this higher aircraft is developing their situational awareness, a second or third aircraft also entering the area is likely to be another 1,000 FT or 2,000 FT higher. During cooler weather conditions, the risk of icing developing on the wings increases, however without knowing where the lower aircraft is in such a large area, prevents aircraft descending without increasing the risk to operating in close proximity to another aircraft. Although the lower aircraft is complying with the rules of the air, there is a risk to aircraft entering the area.

A further issue discussed was aircraft leaving Melbourne controlled airspace. Near Broadford, there is approximately 19 NM to Mangalore VOR. Pilots are required to establish their situational awareness including aircraft operating in the vicinity. Should the above scenario be encountered, there will be a delay in descending into the Mangalore area. Should a full understanding of the traffic remain unresolved, aircraft are likely to remain high, increasing the risk of icing, particular in cooler weather conditions.

The varying activities undertaken at other ALAs within the study area are well known to local operators. Users believed that risks are inadvertently increased when itinerant aircraft, not conversant with the activities in the area transit through, impacting the circuit or other activities. An example involved aircraft operating along W465, a two-way route between Mangalore and Albury where aircraft fly over Locksley Field and through D376 which surrounds Euroa. Lower operating aircraft on this route may encounter hang gliding and PJE at their respective locations.

Users also highlighted risks to operations when the airspace was quiet, i.e. not congested. Feedback demonstrated during low periods of traffic, pilots appear to relax or become distracted by other tasks and in doing so may not communicate with others as the perception is that there are no other aircraft operating in the vicinity. Failing to maintain good situational awareness increased the

risk of encountering unknown aircraft operating in the area due to a lack of communication. Users stressed that increasing the level of conspicuity between aircraft would assist in maintaining awareness.

10.3 Analysis – Users consideration to improve airspace safety

Users suggested various methodologies to increase airspace safety including:

- Establish controlled airspace.
- Establish another VOR at another location for training purposes.
- Increase surveillance and communication capabilities; and
- Monitor compliance with regulations; improving airmanship.

The establishment of controlled airspace at Mangalore was discussed however the use of Class G which enabled greater flexibility remained favoured by users. There are advantages to establishing controlled airspace however CTA is likely to restrict the movement of others and include a cost that is likely to be paid by the user. Any change to the airspace classification would require extensive consultation prior to implementation. Furthermore, discussions about reported occurrences and the Mangalore Airspace Risk Assessment supported, based on risk, no change to the airspace classification.

The establishment of another VOR was raised a mitigator to reducing the risk to operations at Mangalore. The NRP was perceived by users as a root cause to increasing air traffic at Mangalore due to the unavailability of other VORs. Similar to the above such an outcome would require significant investment capital, the identification of a suitable alternative location and compliance with Part 171 which relates to aeronautical telecommunications service and radio navigation service providers. There were no locations suggested within the study area.

Conspicuity and communication capabilities within the study area could be improved to increase pilot situational awareness. Not all aircraft are ADS-B or transponder equipped. This limits the availability of the most up-to-date information pilots can access when the frequency is congested. Currently, situational awareness is developed through radio broadcasts and ‘see and avoid’ operations. Enabling aircraft to be seen by others will assist pilots with a more informed operation.

The overuse or improper use of the radio creates frequency congestion. Users stated that compliance with Part 91 (previously CAR166) for operations within the vicinity of a non-controlled aerodrome was not consistent. However, users advised that if standard phraseology was consistently used, there would be less frequency congestion and a clearer awareness of the activities in the area.

Consideration of others and improving airmanship was seen as reducing airspace risk. Users should limit their airwork to a location. Generally, aircraft requiring the use of a navigation aid within the study area, will operate at Mangalore or Shepparton and transit to the other location for continued airwork. Operating a single engine aircraft for airwork purposes below 5,000 FT AMSL between two the locations does increase the risk to others operating in the area.

Users advised that flight training companies had enacted policies limiting the number of aircraft operating in the Mangalore area. This meant when a certain number of aircraft have been established as operating in the area, aircraft will continue to another location for training purposes. Upon returning to the Melbourne basin area, they would investigate if further training could be undertaking at Mangalore, should aircraft numbers be reduced.

Discussions held with operators at Mangalore aerodrome reaffirmed the safety culture between stakeholders including the aerodrome operator. Identified safety matters are communicated between agencies and, if necessary, resolved to an acceptable outcome. ERSA outlines information regarding flight procedures and additional information that enhances awareness within the vicinity of Mangalore.

11 Key Issues, Recommendations and Observations

11.1 Mangalore Study Area Airspace Classification and Services

Issue

Examine the appropriateness of the airspace architecture in the study area.

Findings

- The airspace classifications within the study area are appropriate.
- The airspace within the study area contains Class C and Class G airspace. No safety or service issues were identified for aircraft operating in Class C airspace.
- Most of the study area is Class G, non-controlled airspace.
- A summary of the air traffic services within each airspace classification is in Annex B.
- Analysis of recorded occurrences and movement data does not require a change to the airspace classification.
- The establishment of a mandatory broadcast area at this stage will not address identified issues within the vicinity of an aerodrome and likely increase frequency congestion concerns.
- The CASA Consultation Hub survey (the survey) results from respondents were:
  - 63% operated VFR only, 7% IFR only and 30% operated both IFR and VFR.
  - 59% recorded the airspace as mostly safe or safe. 21% as neither safe nor unsafe and 20% as mostly unsafe or unsafe.
  - 25% recorded no airspace congestion, 27% recorded moderate to low or low levels of congestion, 17% moderate congestion and 31% advised moderate to high or high levels of congestion within the airspace.
  - Nearly 90% of respondents were favourable of Class G operations.
  - 43% of respondents advised their aircraft were no transponder or ADS-B equipped. 12% advised their fleet were partially equipped and 45% recorded their aircraft were equipped.

11.2 Operations within the vicinity of a non-controlled aerodrome

Issues

Ineffective, inefficient or a failure to communicate with other aircraft, pilots not adhering to operations within the vicinity of non-controlled aerodromes or awareness of requirements increases the risk to operations within the study area.

Aircraft transiting or operating in the area have no viable options to avoid Mangalore. Mangalore is a central point for aircraft entering or leaving the Melbourne basin area. Several air routes converge at this location and there are limited VFR reporting points to assist with situational awareness.

Mangalore aerodrome is used by many flight training organisations. The VOR brings training aircraft, including pilots undertaking licence renewals, to the area.

Findings

Operations at the various aerodromes and ALAs within the study area vary at each location which involves different types of aircraft, aircraft performance and power. The primary use of each location is as follows:

- Mangalore – Flight training and licence renewal.

- Puckapunyal – Military activities.
- Locksley Field – Hang gliding and paragliding.
- Wahring Field – Gliding.
- Nagambie-Wirrate – Parachute jumping exercises.
- Euroa – Parachute jumping exercises.

Recorded ATSB and Airservices occurrences supported feedback regarding communication issues within the vicinity and circuit area at Mangalore and other ALAs.

- ATSB data between 2015 to 2021 identified 20 airspace related occurrence:
  - Seven incidents related to airspace infringements of RAs. During these events, aircraft were not in normal communications.
  - 12 aircraft separation incidents where seven occurred within the Mangalore circuit area or when on approach. These issues involved a lack of effective communication.
- Airservices data between 2015 to 2021 identified of the 150 reports submitted, 103 involved RA airspace infringements. Most aircraft involved were not in normal communications.

Frequency congestion had been experienced by several stakeholders when operating in the area. The use of nonstandard phraseology by some pilots, requests to repeat transmissions and requests for additional information exacerbates congestion issues. Overtransmission was witnessed by OAR observing operations within the study area.

Mangalore aerodrome is used for flight training and licence renewal purposes. Flight training does require additional time for students to develop aviation phraseology and communicate this information.

Pilot's situational awareness in Class G airspace is developed through radio broadcasts. Unalerted see and avoid had significant limitations and the use of the radio enables alerted see and avoid. Radio communication from other aircraft and ATC enables alerted see and avoid. Frequency congestion limits alerted see and avoid practices, particularly in the vicinity of a non-controlled aerodrome.

The carriage of electronic conspicuity devices may enhance safety, alerted see and avoid practices and further reduce the risk of aircraft operating in close proximity.

CASA has published Advisory Circulars to provide advice and guidance in relation to operations in the vicinity of a non-controlled aerodrome under Part 91 of the Civil Aviation Safety Regulations. The ATSB published in 2013 a pilot's guide to staying safe in the vicinity of non-towered aerodromes which relates to aircraft separation, communication and situation awareness, adherence to circuit and approach procedures.

The topography and the location of the RAs funnel aircraft into a narrower area along the Kilmore-Broadford route, into and out of the Melbourne basin area.

There is one VFR approach point at Kilmore and one reporting point at Heathcote within the study area. There are no VFR routes to assist the movement of aircraft operating in the area.

Additional VFR approach or tracking points would increase situational awareness within the study area. VFR routes could reduce aircraft operating over Mangalore aerodrome.

In the absence of navigation aid options in the region, there are increased numbers of aircraft going to Mangalore to use the VOR which can create airspace congestion.

Some operators have implemented policies that require the identification of aircraft numbers operating in the vicinity before joining circuit or other air work activities in the area.

Planning and awareness of operations in the vicinity of Mangalore provides some mitigation to airspace congestion issues.

11.3 Aeronautical Information Publications

Issues

The Mangalore ERSA entry contains ambiguous or outdated information.

DAH contains outdated information regarding contact data for D333.

Hang gliding activities are undertaken at two locations that are not identified on the Melbourne VNC. The locations are within the vicinity where VFR aircraft transit, increasing the risk of users operating in close proximity.

Findings

A review of the Mangalore ERSA identified the following matters:

- Flight procedures in ERSA related to practice instrument approaches and the addition of 1,000 FT to the altitude prescribed created confusion and inconsistent application by pilots. A similar issue had been identified during the Ballarat Airspace Review 2017. ERSA entries at Busselton and Latrobe Valley contain similar text entries.[19]
- Details for aerobatic activity conducted daily over the airfield and above D333 are not accurate.
- Mangalore ERSA entry identifies that extensive fixed wing flight training is conducted in an area bounded by Seymour, Nagambie, Stanhope, Euroa, Seymour townships. Flight training is not generally in the area south of Mangalore.

The information in the DAH and ERSA for D333 should be amended to show the current contact details. The OAR can undertake this editorial amendment.

Hang gliding activities are conducted at Landscape (near Seymour) for experienced users and Mount Broughton for an intermediate (or higher) level of experience. These locations are under or near where aircraft fly into the study area. The inclusion of hang-gliding symbols at these locations would improve situational awareness.

11.4 Recommendations and observations

CASA applies a precautionary approach when conducting aeronautical studies and therefore the following recommendations and observations are made:

Recommendation 1
CASA Aviation Safety Advisors should conduct a safety seminar at Mangalore and surrounding aerodromes with an agenda that focusses on awareness and safety for operations within the vicinity of a non-controlled aerodrome and the importance of precise and concise radio calls.

Recommendation 2
Enroute Supplement Australia entries at Mangalore, Ballarat, Latrobe Valley and Busselton be amended to remove or clarify the requirements for the addition of 1,000 FT to prescribed altitudes during practice instrument approach procedures.

Observations/Opportunity to enhance regional services.

(1) Local operators should consider the need for additional VFR approach points and/or VFR routes to enhance to enhance situational awareness using the Melbourne VNC and submit requests to Airservices Australia for chart changes. The OAR can assist operators in processing such requests.

[19] Prior to publication of the final version of this aeronautical study, the ERSA effective 8 September 2022 was updated for Ballarat, Busselton, Latrobe Valley, and Mangalore providing clarification to the addition of 1,000 FT for aircraft conducting practice instrument approaches.

(2) The Mangalore Aerodrome operator should amend the ERSA entry for Mangalore to include the flying training area used by local operators. The area should be designed to avoid the circuit area at Mangalore.
(3) The OAR should identify and arrange for the addition of gliding symbols on the Melbourne VNC (and other appropriate aeronautical information publications).
(4) The OAR will update the contact information for Danger Area D333.

12 Conclusion

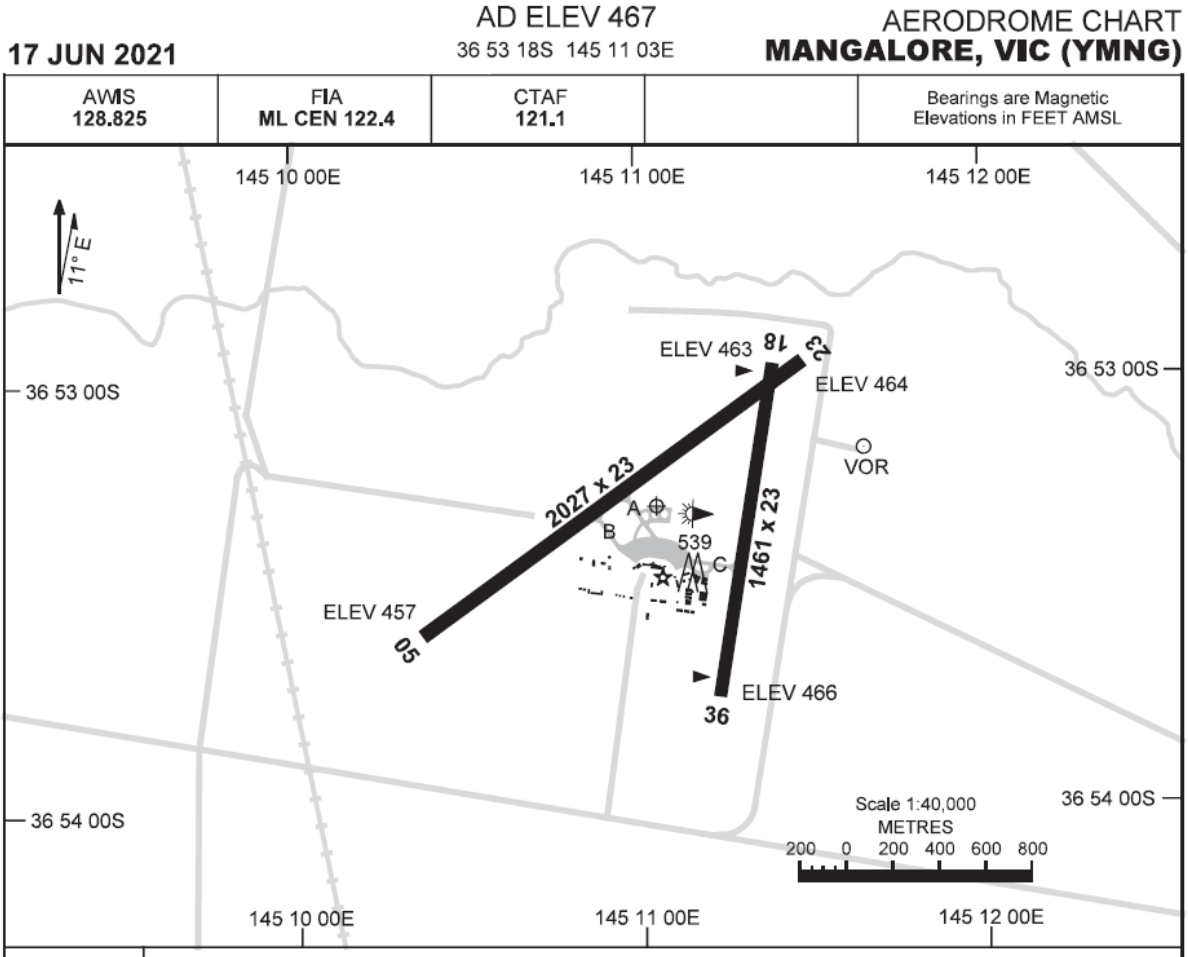
The OAR has conducted an aeronautical study of the airspace within 25 NM of Mangalore airport from the surface to 8,500 FT AMSL.

The aeronautical study complied with the requirements of the *Airspace Act (2007)*, Airspace Regulations (2007), the Australian Airspace Policy Statement (2021), the Minister's Statement of Expectation (2022) and CASA's Regulatory Philosophy.

The study found that the airspace classification remains appropriate however recommendations have been made to enhance the safety of operations within the area, through education, amending aeronautical information and opportunities to enhance situational awareness for all pilots.

The OAR will continue to monitor aircraft and passenger movement statistics, recorded incident data and other information sources to determine the appropriateness of the next airspace risk review.

Appendix 1 Mangalore Aerodrome Facilities



RWY	AERODROME LIGHTING
	ABN : ALTN W/G 8 SEC TAXIWAYS : BLUE EDGE RL : MAN ON RQ , SDBY (12 SEC) (ARO : 0428 863 439)
05 043 223 23	LIRL LIRL
18 178 358 36	LIRL LIRL

NOTES

1. GLIDING OPS 9NM NE OF AERODROME.
2. PARACHUTING OPS AT NAGAMBIE-WIRRATE (YNGW) 300° MAG, 9.5NM FROM AD (WITHIN D366)
3. PARACHUTING OPS AT EUROA (YEUA) 050° MAG, 18NM FROM AD (WITHIN D376).
4. AWIS REQUIRES ONE-SECOND PULSE TO ACTIVATE.

App 1 Mangalore Aerodrome Chart information[20]

[20] DAP East amendment 168 effective 9 September 2021, Airservices Australia, Canberra

App 2:Mangalore aerodrome[21]

[21] Google Earth V 7.3.4.8248 (16 July 2021) Mangalore, Victoria. 36° 53’ 29.50” S 145° 11’ 04.80” E, Eye Alt 4.65km. CNES/Airbus 2021. http://www.earth.google.com [25 March 2022]

Appendix 2 Aircraft Landing Areas

App 3: Puckapunyal Landing Area[22]

[22] Google Earth V 7.3.3.7699 (7 May 2020) Puckapunyal, Victoria. 36° 59' 53.00" S 145° 03' 50.00" E, Eye Alt 2.0km. CNES/Airbus 2021. http://www.earth.google.com [06 October 2021]

App 4: Nagambie-Wirrate ALA[23]

[23] Google Earth V 7.3.3.7699 (7 May 2020) Nagambie, Victoria. 36° 47’ 10.00” S 145° 02’ 19.00” E, Eye Alt 2.3km. CNES/Airbus 2021. http://www.earth.google.com [28 September 2021]

App 5: Wahring Field ALA[24]

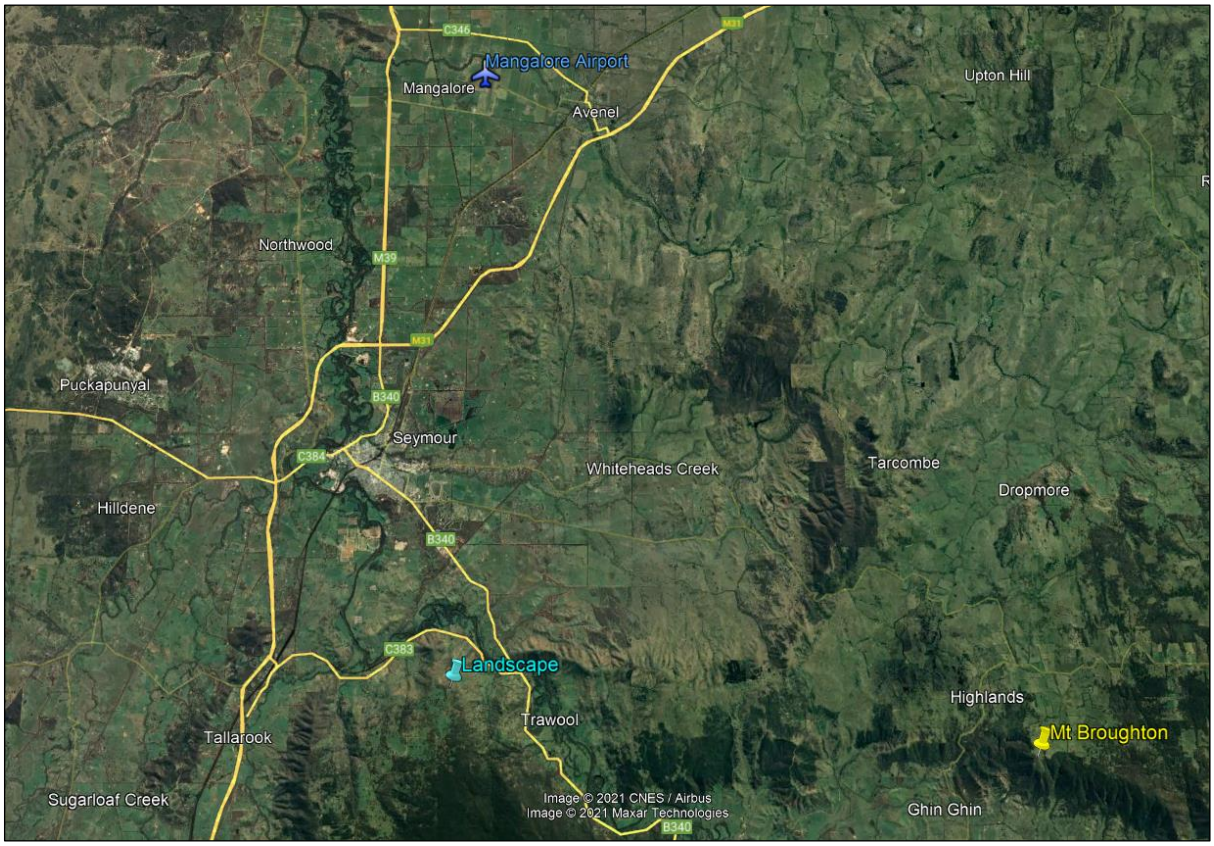
[24] Google Earth V 7.3.3.7699 (7 May 2020) Wahring, Victoria. 36° 40’ 50.00” S 145° 14’ 34.00” E, Eye Alt 2.8km. Maxar Technologies 2021. http://www.earth.google.com [28 September 2021]

App 6: Euroa ALA[25]

[25] Google Earth V 7.3.3.7699 (7 May 2020) Euroa, Victoria. 36° 44’ 38.00” S 145° 30’ 45.00” E, Eye Alt 3.1km. CNES/Airbus 2021. http://www.earth.google.com [28 September 2021]

App 7: Locksley Field ALA[26]

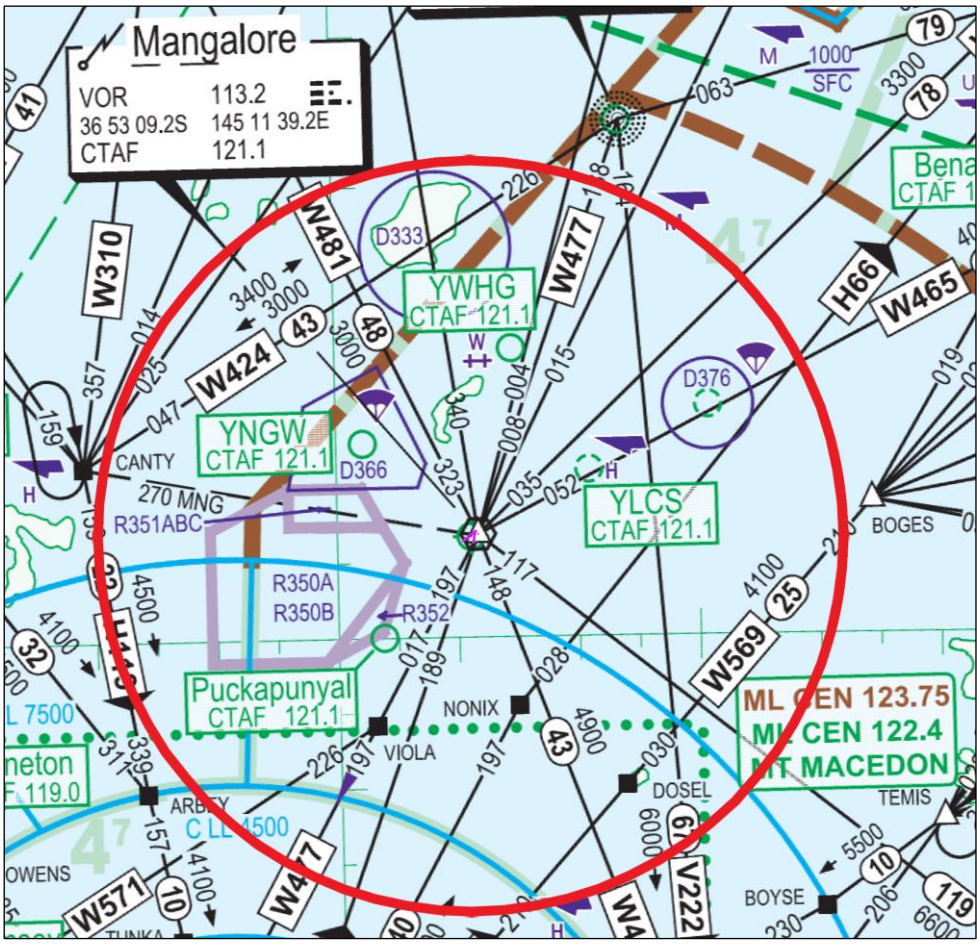
[26] Google Earth V 7.3.3.7699 (7 May 2020) Locksley Field, Victoria. 36° 49' 06.00" S 145° 20' 53.00" E, Eye Alt 3.2km. Maxar Technologies 2021. http://www.earth.google.com [28 September 2021]



App 8: Landscape & Mt Broughton launch locations[27]

[27] Google Earth V 7.3.3.7699 (7 May 2020) Whiteheads Creek, Victoria. 37° 00' 15.73" S 145° 14' 53.84" E, Eye Alt 59.95km. Maxar Technologies 2021 CNES/Airbus 2021. http://www.earth.google.com [4 November 2021]

Appendix 3 Air Routes in the Vicinity of Mangalore



App 9: Air routes used by aircraft operating at below FL200[28]

[28] Enroute Chart Low (ERC-L) 2 effective 17 June 2021, Airservices Australia

Appendix 4 Mangalore Airspace Risk Assessment

The CASA Aviation Safety System (CASS) documents the internal management processes used by CASA to conduct its aviation safety activities, including the management of aviation safety risks and to provide detail as to how CASA carries out the functions and responsibilities referred to in the State Safety Program (SSP). The CASS presents CASA's structured, systemic approach to managing safety and is designed to record, track, and manage industry or sector wide aviation safety (operational) risks.

This document has been prepared out of acknowledgement of a need to baseline and substantiate the level of risk within the airspace surrounding Mangalore. The purpose of this assessment is to identify key airspace hazards which exist around Mangalore. The variety of information sources used as part of this exercise was vital in ensuring a wholistic approach to airspace hazard identification.

The identified hazards were incorporated into the CASS risk assessment framework. The purpose of this was to determine:

- The airspace risks associated with each hazard.
- The extent to which the hazards were present; and
- A final indicative risk determination.

Establish context

For this risk assessment the framework established involved internal and external stakeholders to provide suitable expertise to the risks being considered. This expertise identified hazards and/or existing controls.

Analyse the risk

The OAR analysed the identified hazard, through a risk assessment, to determine the risk associated with the hazard. Due to the unique nature of CASA assessing aviation safety risk (the risk to the public associated with aviation activities in Australia) and the low likelihood/high consequence nature of aviation operations, CASA expands on the traditional consequence/likelihood methodology to determine the appropriate risk level. CASA utilises a three-stage process to analyse aviation safety risks as follows:

- Stage One – likelihood / consequence assessment
- Stage Two – control effectiveness assessment
- Stage Three – exposure assessment

Consequence Criteria Explanations					
Criteria	Insignificant	Minor	Moderate	Major	Critical
Descriptor	No safety implications	Aircraft accident with < 3 fatalities and/or 1 or more serious injuries	Aircraft accident with 3-5 fatalities	Aircraft accident with 6-9 fatalites	Aircraft accident with > 9 fatalities

Likelihood Criteria Explanations					
Criteria	Almost Certain	Likely	Possible	Unlikely	Rare
Qualitative Descriptor	From past experience, it would be unusal for the event to not occur in routine circumstances	From past experience, the event will probably occur in routine circumstances	The event is unusal and should occur at some time	Unusual however, the event could occur under some circumstances	Very unusual event whci could only occur in exceptional circumstances
Quantitative Descriptor	> 10%	1% - 10%	0.1% - 1%	0.001% - 0.1%	< 0.001%

Initial Risk Assessment Score					
	Consequence Criteria				
Likelihood Criteria	Insignificant	Minor	Moderate	Major	Critical
Almost Certain	4	5	6	7	8
Likely	3	4	5	6	7
Possible	2	3	4	5	6
Unlikely	1	2	3	4	5
Rare	0	1	2	3	4

Table 5: Consequence & Likelihood explanations / Initial Risk Assessment Score

Descriptions and Definitions for determining Individual Control Effectiveness					
Individual Control Determination	Very Good	Good	Poor	Very Poor	Unknown
Individual Control Description	Controls are well designed for the hazard and they are considered effective at mitigatin the haxard > 95% of the time.	Control is reasonable designed, improvement necessary to ensure effecitve and reliability. Considered effeective at mitigating hazard 75% - 95% of the time.	Control does not treat the underlying cause(s) of the hazard and/or are not effective. Considered effective at mitigating the hazard 50% - 75% of the time.	Control is not credible and provides no defence against hazard. Considered effective at mitigating hazard < 25% of the time.	Control effectiveness is not known.

Descriptions and Definitions for determining Overall Control Effectiveness			
Overall Effectiveness of all Controls	Effective	Partially Effective	Limited Effectiveness
Overall Effectiveness Description	Multiple (> 4) controls, at least 2 considered Very Good.	Multiple (> 4) controls, at least 1 considered Very Good, or 2 considered Good	Multiple (> 4) controls are determined to be Poor / Very Poor / Unknown, or a minimal number (<= 4) of controls exist, where < 2 are considered Good

Interim Risk Assessment Score			
	Control Effectiveness		
Initial Risk Score	Effective	Partially Effective	Limited Effectiveness
8	8	16	32
7	7	14	28
6	6	12	24
5	5	10	20
4	4	8	16
3	3	6	12
2	2	4	8
1	1	2	4
0	1	2	4

Table 6: Individual & Overall Control Effectiveness / Interim Risk score tables

Exposure Assessment Matrix					
Interim Risk Score	Seldom	Infrequent	Regular	Frequent	Constant
32	32	64	96	128	160
28	28	56	84	112	140
24	24	48	72	96	120
20	20	40	60	80	100
16	16	32	48	64	80
14	14	28	42	56	70
12	12	24	36	48	60
10	10	20	30	40	50
8	8	16	24	32	40
7	7	14	21	28	35
6	6	12	18	24	30
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

Table 7: Exposure Assessment Matrix

Risk Score	Risk Level
> 95	Extreme
60 - 95	High
21 - 59	Medium
< 20	Low

Table 8: Risk score to risk level range

Current Situation					Consequence and Likelihood Assessment			Control Effectiveness		Exposure Assessment		Overall Risk Level	Stakeholders
ID Number	Hazard	Description of Risk	Existing Controls	Consequence	Consequence severity	Likelihood	Initial Risk Score (number between 1 - 8)	Overall Control Effectiveness	Interim Score (number between 1 - 32)	Exposure Description	Final Risk Score	Final Determination	
#01	Frequency congestion	Mishandling the aircraft during a critical phase of flight due to inability to receive or transmit critical information.	CAAP 166 - Operations in vacinity of non-towered aerodrome ERSA entry Mangalore: visiting aircraft PPR to conduct circuit training at aerodrome. Assists with numbers in the area.	Aircraft are forced to hold or make unanticipated tracking changes, or conduct missed approaches.	Moderate	Likely	5	Partially Effective	10	Infrequent	20	Low	Aircraft operators CASA
#02	Lack of transmissions between aircraft within the YMNG area	Pilots do not make transmissions information informing other aircraft of critical flight information	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) ERSA entry Mangalore Local Procedures and Additonal Information recommends all aircraft within 10NM illuminate landing & taxi lights	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticpated proximity of other traffic.	Major	Possible	5	Effective	5	Infrequent	10	Low	Aircraft operators
#03	Pilots making non-standard transmission	Information provided by some pilots results in uncertainty and ambiguity of critical flight information	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) Flying Instructors providing guidance on RT to trainees. CASA Safety Advisors providing briefings on comms related issues.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticpated proximity of other traffic.	Major	Possible	5	Effective	5	Infrequent	10	Low	Aircraft operators
#04	Incorrect operation and/or fault with VHF radio	Pilots incorrectly operate their radio, or their radio has a fault, leading them to believe that they are correctly transmitting, when they actually are not.	Flight training - correct operation of communications equipment Adherance to maintenance requirements Pre-flight checks of aircraft equipment	The pilot fails to be heard, or to hear other traffic, and come within close proximity of that traffic.	Major	Unlikely	4	Partially Effective	8	Seldom	8	Low	Aircraft operators
#05	Procedures around standardised information transmitted by the airspace users often lead to verbose broadcasts with duplicate information	The extended and non standard transmissions can prevent aircraft making timely and accurate transmissions	CAAP 166 - Operations in vacinity of non-towered aerodrome Flight Training Organisations - standards within Operations Manual. Safety Briefings - CASA & Training Orgs?	Aircraft are prevented from transmiting as required, resulting in delays or increased holding. Aircraft are placed in unsafe proximity to one another due to unanticipated positioning or lack or traffic awareness.	Moderate	Likely	5	Limited Effectiveness	20	Infrequent	40	Medium	Aircraft operators
#06	Lack of available taxiways servicing runway thresholds	Aircraft occupy both runways for a prolonged period of time as they enter and backtrack	CAAP 166 - Operations in vacinity of non-towered aerodrome ERSA instruction on reducing runway backtracking.	Inbound aircraft are forced to conduct go-arounds or missed approaches, or hold, due to not being able to land.	Insignificant	Possible	2	Partially Effective	4	Infrequent	8	Low	Aircraft operators Aerodrome operator
#07	Overlapping flying training area and YMNG circuit area.	While trying to avoid traffic within the (area) YMNG CCCT, aircraft infringe the Restricted Area.	Flight planning / avoidance of R351AB boundary (RA boundaries) Surveillance enabling identification of aircraft infringing area. RCO advising of infringements. NOTAMs?	Civil aircraft unknown to those operating with RA come within unsafe proximity of military aircraft and military ordinance undertaking training manoeuvres.	Moderate	Unlikely	3	Limited Effectiveness	12	Seldom	12	Low	Aircraft operators
#08	Overlapping flying training area and YMNG circuit area.	Pilot in Class G airspace loses SA on other training traffic leading to inability to deconflict flight path from other traffic. This leads to the possible development of a collision pair unsafe situation.	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) ERSA entry Mangalore Local Procedures and Additonal Information recommends all aircraft within 10NM illuminate landing & taxi lights. Provides advice where departing aircraft will track & minimum radio broadcasts.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticpated proximity of other traffic.	Major	Possible	5	Limited Effectiveness	20	Infrequent	40	Medium	Aircraft operators CASA
#09	Converging Runways and flight paths	Aircraft taking off from RWY 05 and 36 converge and result is crossing departure paths.	CAAP 166 - Operations in vacinity of non-towered aerodrome ERSA entry Mangalore details minimum radio broadcasts including taxiing, entering & departing. ERSA entry Mangalore instructs use of TXY A and TWY C for specific departure runways.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticpated proximity of other traffic.	Major	Likely	6	Partially Effective	12	Infrequent	24	Medium	Aircraft operators
#10	ERSA discribes practice IFR approaches should add 1,000FT to the altitude	1,000FT in altitude is suggested In an attempt to de-conclict with VFR CCT traffic. This altitude requirement has the potential to introduce different inturpretations on where the 1,000FT height should be calculated.	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) Pilot flight notification and ATC traffic information services (IFR-IFR) Class G ERSA entry Mangalore outlines PPR for visiting aircraft doing circuits, identifies training area, recommends aircraft within 10 NM illuminate landing & taxi lights. Aircraft practicing instrument approaches to add 1,000ft to prescribed altitude to reduce interference with circuit traffic.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticpated proximity of other traffic.	Major	Likely	6	Partially Effective	12	Regular	36	Medium	Aircraft operators CASA Airservices
#11	Increasing levels of VFR and IFR flight training traffic converging the YMNG airspace, immediate surrounds and to utilize the limited ground based NAVAIDS for IFR training.	Pilot in Class G airspace loses SA on other training traffic leading to inability to deconflict flight path from other traffic. This leads to the development of a collision pair unsafe situation.	CAAP 166 - Operations in vacinity of non-towered aerodrome Detection by ADSB surveillance system (traffic to IFR aircraft) Pilot flight notification and ATC traffic information services (IFR-IFR) Class G ERSA entry Mangalore outlines PPR for visiting aircraft doing circuits, identifies training area, recommends aircraft within 10 NM illuminate landing & taxi lights. Aircraft practicing instrument approaches to add 1,000ft to prescribed altitude to reduce interference with circuit traffic.	Aircraft are placed in unsafe proximity to one another due or lack or traffic awareness. Aircraft may be forced to take avoinding action due to anticpated proximity of other traffic.	Major	Likely	6	Partially Effective	12	Infrequent	24	Medium	Aircraft operators CASA Airservices

Table 9:Mangalore Airspace Risk Assessment Results

Appendix 5 Proposed Mangalore Broadcast Area

General

The OAR has determined that the establishment of a 20 NM broadcast area centred on Mangalore is not the appropriate airspace solution. Initial analysis of the proposal has determined the broadcast area may not address the issues and may introduce new risks to the area. However this does not exclude this solution from future considerations.

The continuation of the CTAF Safety Alerting Service is a matter for Airservices Australia consideration. Airservices Australia has advised the CTAF Safety Alerting Service does not represent a long-term efficient use of their resources. Based on the observations made during an onsite visit to Melbourne Centre, including discussions with ATC operating the sector, the OAR concurs with the statement.

The OAR has found the airspace classification at Mangalore is appropriate and provided recommendations to enhance airspace safety.

Mangalore Broadcast Area

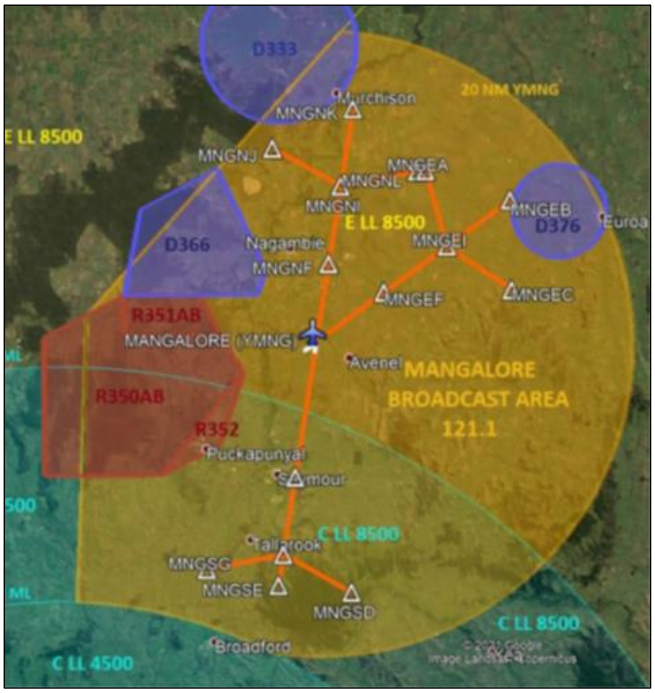
The proposed SFIS submitted by Airservices included the establishment of a mandatory BA for 20 NM centred on Mangalore. The BA was a critical requirement in establishing the SFIS.

The proposed SFIS would be provided to IFR and VFR operating in the non-controlled aerodrome BA using the aerodrome's CTAF. Operated in Class G airspace during prescribed hours of operation based on the requirements of the operating environment. The proposed SFIS would be operated remotely by ATC staff at Melbourne Centre.

All aircraft operating in the BA would be required to comply with existing CTAF and Class G rules and recommendations. All aircraft would be required to broadcast their intentions to enable the SFIS controller to provide aircrew with an enhanced traffic service.

The proposed SFIS would not provide a separation service, clearances or sequence aircraft to/from or in the vicinity of the non-controlled aerodrome. Pilots remain responsible for complying with applicable regulations and responsibilities when operating in Class G non-controlled airspace.

The proposed BA for Mangalore excluded the restricted areas and bordered the western frequency boundary and the controlled airspace steps to the south. The proposed BA is depicted below.



App 10: Proposed Mangalore Mandatory Broadcast Area[29]

Considerations and analysis

The proposed Mangalore BA is based on an assessed risk to IFR/VFR aircraft operations based on the collision risk analysis which examined potential conflicts within 20 NM of Mangalore aerodrome. The analysis, using a probability overlap method, accounted for aircraft flight paths and height differences to approximate a risk of potential collision if the conflict was not managed by the pilots. The modelling methodology is sound and internationally recognised in the aviation sector.

The collision risk analysis methodology assumed the pilot does not manage the conflict. Risk mitigating factors such as pilot licencing requirements, regulatory requirements, navigation, communication, surveillance, or air traffic services were not included as part of the considerations. Other considerations, for example, redesigning or splitting the existing airspace sector did not appear to be included in the proposal, although a Sector Model was considered.

Analysis of the data showed that potential conflicts occurred on the air routes, along instrument approach flight paths and in the Mangalore circuit area. Most of the collision risk occurred within 5 NM of the aerodrome, particularly within the circuit area or on approach. This is a reasonable outcome due to aircraft operating in a critical phase of flight, i.e. landing or taking off, and aircraft converge from outside areas into the vicinity of an aerodrome.

The critical area within 5 NM of the aerodrome still required pilots to manage their own situational awareness and collision avoidance. This suggests the SFIS would not generate a significant change to the existing collision avoidance obligation of a pilot, but it may increase frequency congestion and reduce situational awareness.

The study recognised the varying aviation activities at different aerodromes and ALAs throughout the study area and the need for SFIS communication, frequency congestion would increase. Feedback from users indicated that frequency congestion already existed. Additional ATC transmissions and the requirement of the Euroa CTAF to change from 126.7 MHz to 121.1 MHz would further exacerbate the frequency congestion issue.

The aerodrome operator at Euroa indicated a preference not to change frequency due to congestion issues and the impacts on situational awareness.

[29] YMNG All Phases Safety Assessment Report V1.1 Airservices Australia 2021

The examination of incidents and occurrences within the area identified most airspace incidents occurring overhead or within the immediate area of Mangalore while aircraft were in the circuit or on approach. CIRRIS data showed, on average, more than 68% of the total CIRRIS incidents reported between 2015 to 2021 were for airspace infringements of restricted areas.

The exclusion of the restricted area airspace infringements reports identified 47 other reports submitted for the 2015-2021 period. This equates to an average of 6.7 CIRRIS reports each year or one CIRRIS report submitted every 54.4 days. The common occurrences were information error (9), laser (8) operational deviation and emergency operations (7). Based on the likelihood and consequence of these incidents, this does not indicate an elevated risk to operations within the Mangalore area, assuming an aircraft accident is a rare event.

Consideration was given to the only SFIS in operation at the time of this study at Ballina. The Ballina SFIS assisted in a level of conspicuity that assisted ATC and between suitably equipped aircraft. However, frequency congestion increased due to mandatory broadcasts required by aircraft including those not operating at Ballina aerodrome. Based on evidence and feedback from the Ballina SFIS, the risk of frequency congestion will increase if a 20 NM BA is established around Mangalore.

Overall, Mangalore encounters similar risks to most non-controlled aerodromes. Issues relating to frequency congestion and operations in the vicinity of non-controlled aerodromes are common and more prevalent where flight training is being conducted.

The collision risk analysis showed most potential collision points within 5 NM of Mangalore. Stakeholders have advised of frequency congestion issues, the incident data showed a number of incidents occurring in the circuit area, on approach or in the RAs.

CASA considers these issues would not be resolved if a 20 NM BA was declared.

Appendix 6 Mangalore Consultation Hub Charts

In September 2021 the OAR obtained feedback from various stakeholders via the CASA Consultation Hub. Users were asked for their opinions on various topics when operating within the study area including:

- Flight rules flown.
- Types of operations conducted.
- Regularity of operations.[30]
- Gauging airspace safety, access and efficiency.
- Airspace congestion and factors.
- Class G airspace classification; and
- SFIS operations

Graphs displaying the results are included in this section.

Airspace Safety

20% of the users responded that the airspace in the study area was unsafe or mostly unsafe. Additional consultation was undertaken to determine the overall safety to operations in the airspace, including airspace classification.

The consultation determined the airspace operated to an acceptable level of safety and the airspace classification remained appropriate. Particular issues regarding airspace and frequency congestion were dependent upon the time and day of operation. 80% of users operating on weekends or holidays clearly believed the airspace to be safe or mostly safe. This number halved to 40% for those using the airspace at least once per week.

Mangalore is a training aerodrome and the majority of users are aware of the fact that low time VFR pilots are likely to be operating in the area. In order to address congestion issues and reduce risks to operations, users have enacted various policies including limiting the number of aircraft operating in the area and should the number of aircraft operating in the circuit exceed that recommended, to continue to the next location for air work. Aircraft can return to Mangalore later and see if aircraft numbers have reduced.

Another issue raised was in relation to leaving Melbourne CTA. Mangalore VOR is approximately 19 NM after aircraft leave CTA. There are instances where preceding aircraft have indicated undertaking airwork from the surface to 5,000 FT AMSL at Mangalore. This requires the establishment of communications between aircraft in a short period of time before both aircraft are operating within the vicinity of the aerodrome. Until intentions and positions are established, aircraft coming into the area are likely to delay descent. This does impact airspace safety.

The matter can be and is likely to be exacerbated by:

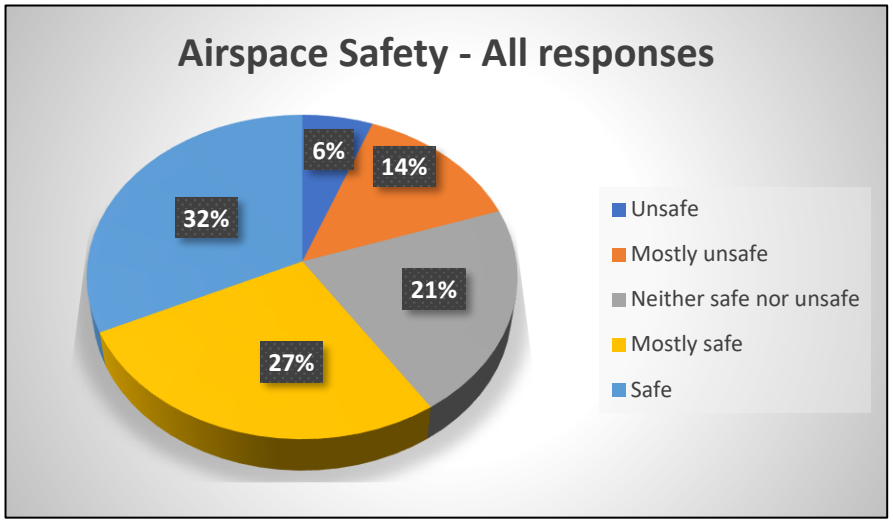
- Additional aircraft entering the area as they are likely to be 1,000 FT higher. This requires more time to descend in the area.
- Remaining at the higher altitudes, particularly during colder conditions will increase icing issues for the aircraft.
- Aircraft conducting airwork indicate operations at and between Mangalore and Shepparton, instead of specifying one location. Shepparton is approximately 29 NM north of Mangalore. Airwork conducted between these locations does use a significant amount of airspace.

Discussions with operators at Mangalore confirms the airspace, particularly the circuit, can become busy however the airspace is safe for aviation operations. The use of correct phraseology and

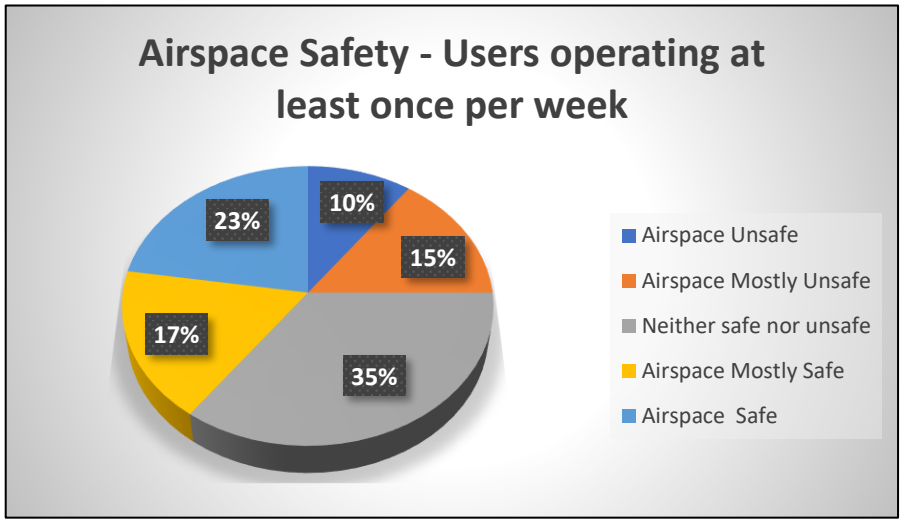
[30] The CASA Consultation Hub received 172 responses for the Mangalore survey. Based on usage, 40 used the airspace at least once a week, 62 on holidays & weekends, and 72 for all other times.

good airmanship within the circuit area will enhance safety related matters. These operators, who regularly use the airspace, had no concerns to operating within the area.

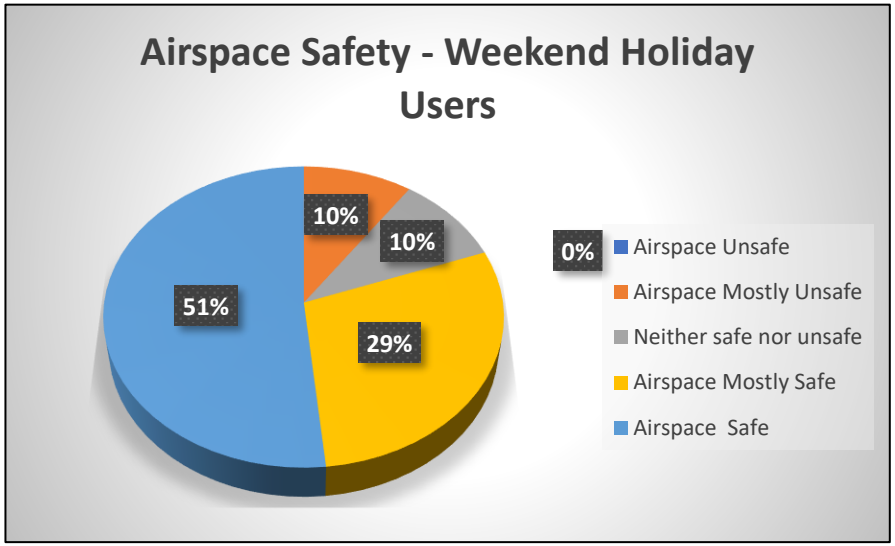
The following graphs show the Consultation Hub responses relating to airspace safety



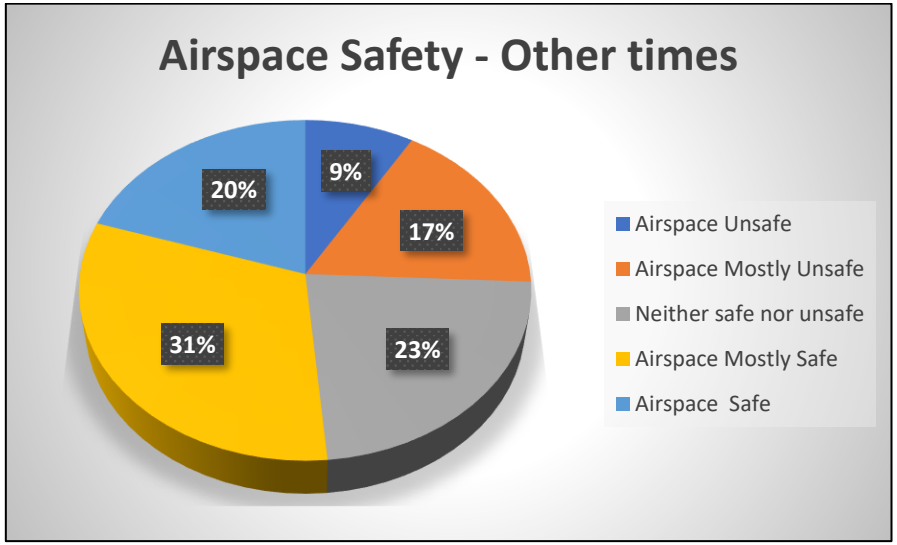
App 11: All responses to airspace safety



App 12: Airspace safety – users at least once per week



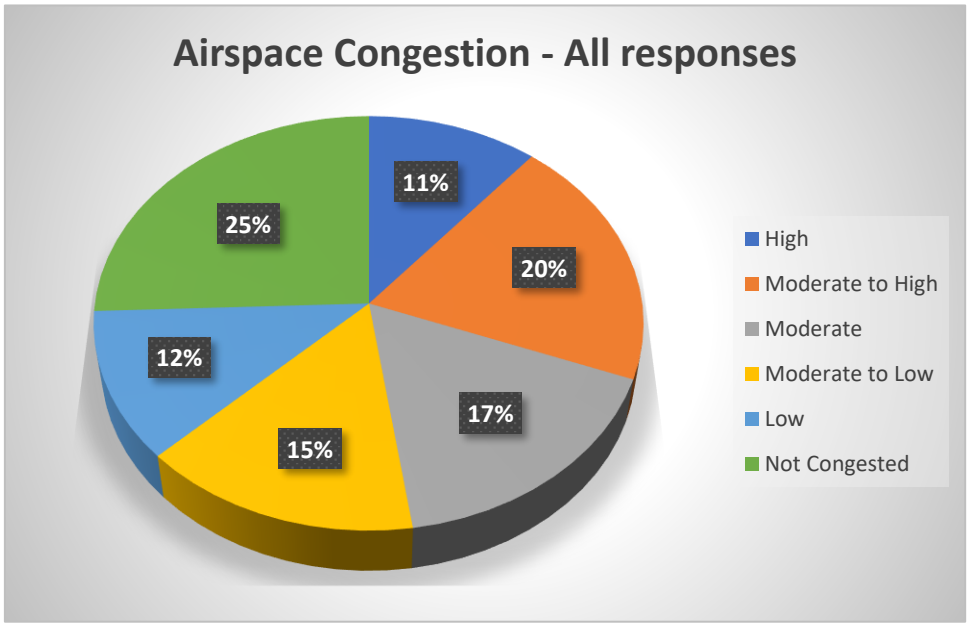
App 13: Airspace safety – weekend/holiday users



App 14: Airspace safety – other users

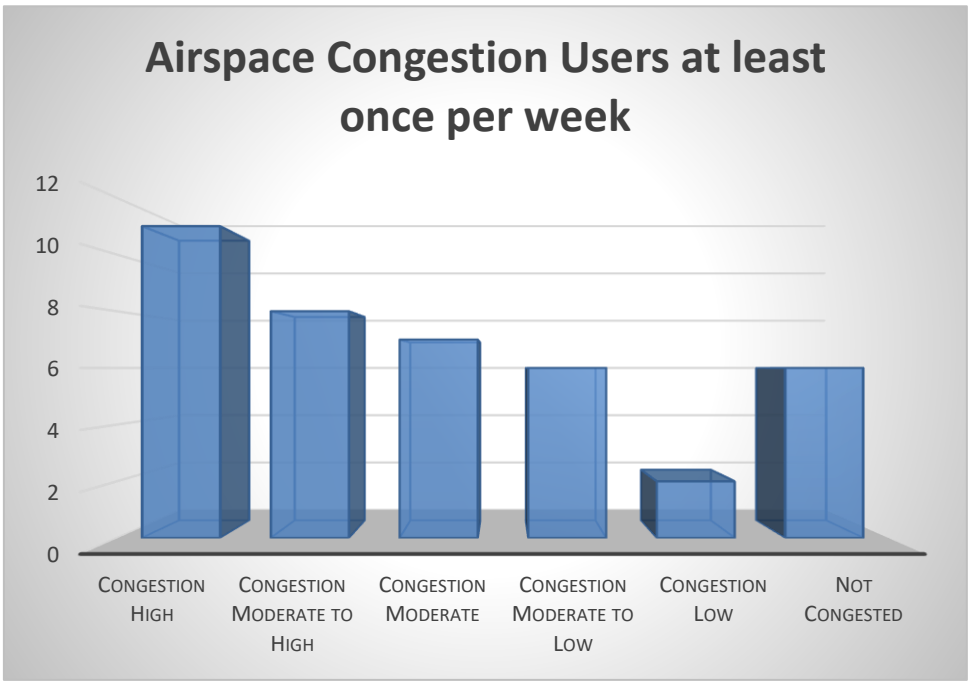
Airspace Congestion

Airspace congestion had a varied response from the Consultation Hub and users identified the issue to be subjective. Overall the Hub recorded 25% of users believed the airspace was not congested and 20% advised congestion was moderate to high. The rest was evenly distributed across the board.

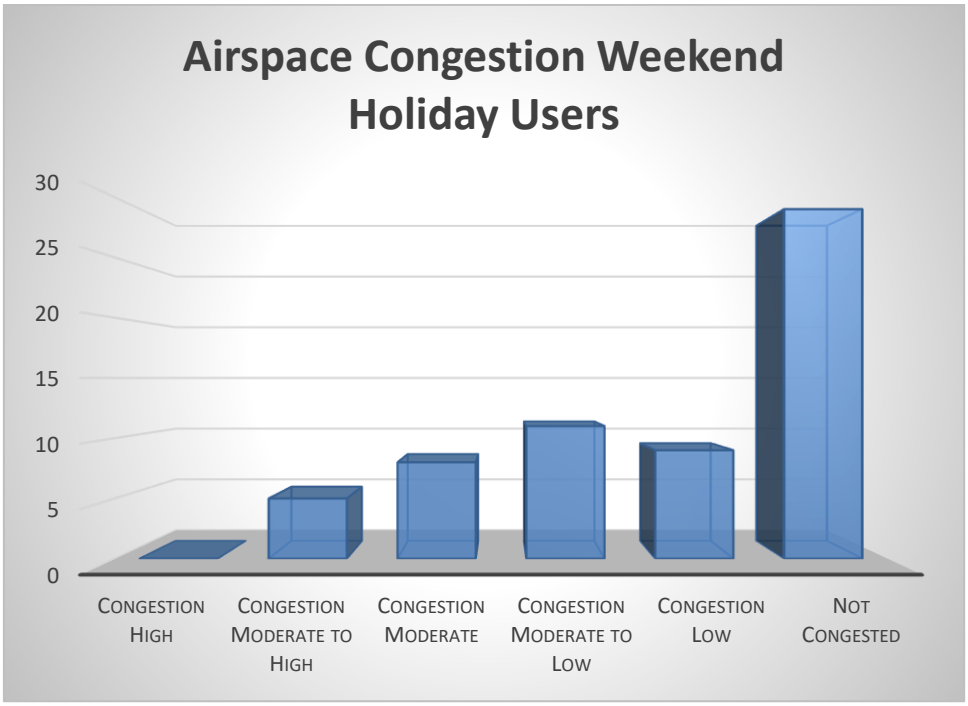


App 15: Airspace congestion - all responses

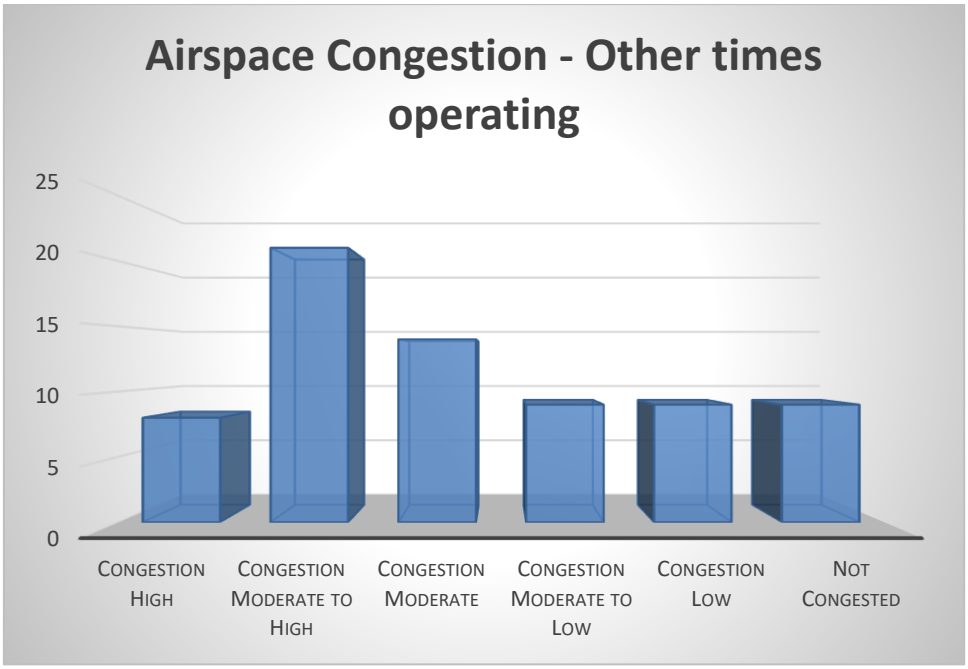
Analysing responses between groups of users focusing on how often the airspace is used shows a difference of opinion. Those who use the airspace at least once per week provided high congestion within the airspace as the highest response. Users on weekends and holidays and those operating on weekends or holidays identified the airspace as not congested for their highest response, while the other users recorded moderate to high congestion as the highest response.



App 16: Airspace congestion response by users at least once per week



App 17:Airspace congestion response by weekend holiday users



App 18: Airspace congestion response by other operating times

Airspace congestion within the Mangalore area is dependent upon the time and day of flying. Regular users experience more congestion than those operating on weekends and holidays. Other users who operate monthly or seasonally might experience congestion however this is dependent on when they fly in the area.

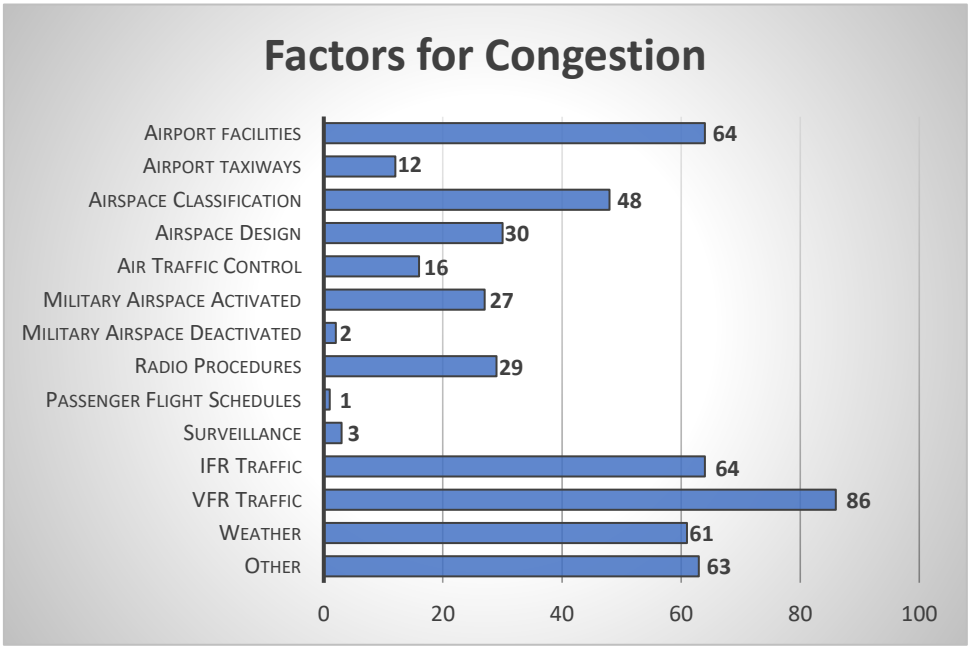
The causal factors of congestion were reviewed. Respondents were invited to identify up to five factors that impact congestion within the airspace. The most common responses were VFR traffic, IFR traffic, airport facilities i.e. nav aids, and weather.

These factors can be interlinked as the airspace classification enables users to manoeuvre as required. The VOR at Mangalore is used for navigation and training purposes.

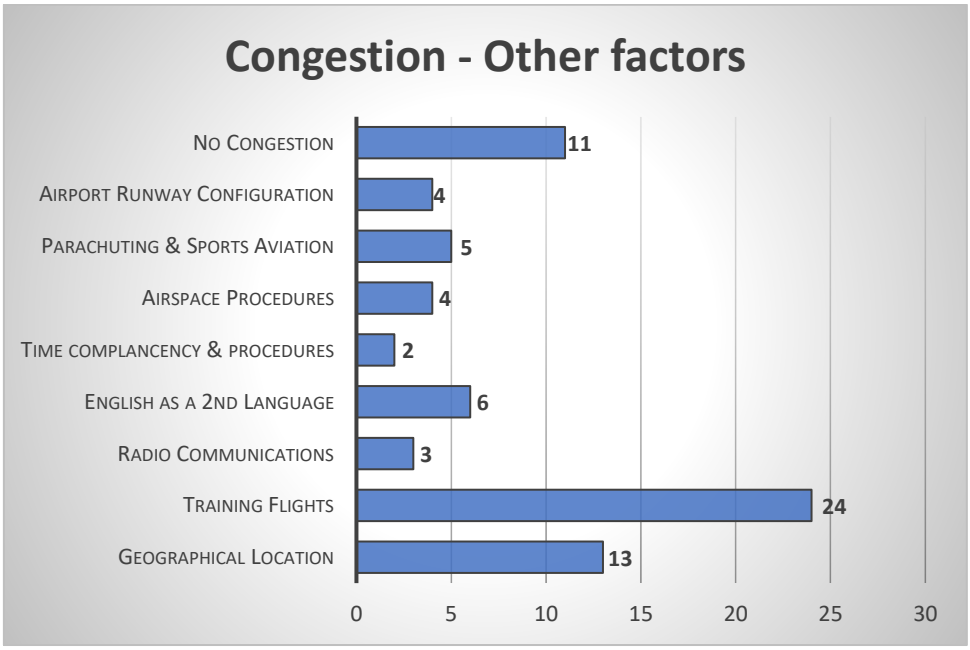
As the closest VOR outside the Melbourne basin, Mangalore does attract a number of aircraft into the area for flight training purposes.

Weather, particularly cloud, does develop given the surrounding topography as identified in Section 4.5. Weather can force aircraft into a narrower area of operation and reduce the vertical limits of operation. While there is a large area for operations to be conducted, when operators advise using a large area for airwork, as described in Section 10.2, weather can create congestion as aircraft wait to confirm other aircraft locations, before descending. This impacts the following aircraft and so forth.

Training flights was perceived as the largest cause of congestion. Limitations on routes that aircraft can follow to avoid Mangalore was noted in the study. Mangalore is a training aerodrome as noted in ERSA. There are a number of pilots with varying experiencing operating in the area. Of note, when expanding 'other' factors, the geographical location of Mangalore and users indicating there was no congestion were notably ahead of pilots where English is a second language and sports aviation activities.



App 19: Factors causing congestion



App 20: Congestion factors - Other

In limiting exposure to airspace congestion some flight training organisations advised their process is to determine the number of aircraft operating in the vicinity of the aerodrome before descending. This increases the safety to operations and enables the aircraft to reassess operational requirements upon the return flight via Mangalore.

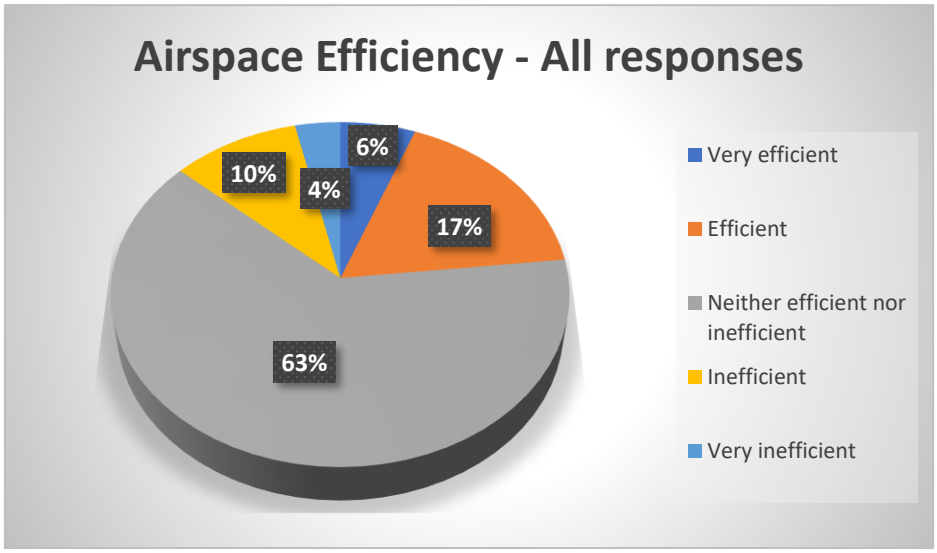
ERSA also indicates for users to make contact in order to establish an optimal time for use of the facilities. Users have advised this system not consistently used because it is not always practical to call before attending.

Airspace efficiency and equitable access

There was clear majority of those surveyed who advised that the airspace was neither efficient nor inefficient. However the users operating in the airspace at least once per week recorded the highest percentage indicating the airspace was very efficient or efficient.

Comments reiterated flight training being conducted at Mangalore and aircraft numbers in the circuit area or within five nautical miles of the aerodrome. Other comments included if participants have experience, know the area and communicate, the airspace is efficient however training aircraft results in that being difficult to achieve. Other comments included the movement of aircraft within the area advising the route structure and VFR points 'direct' aircraft to fly directly to or over Mangalore. Feedback received also indicated airspace efficiency would decline if SFIS was introduced primarily due to additional broadcast requirements.

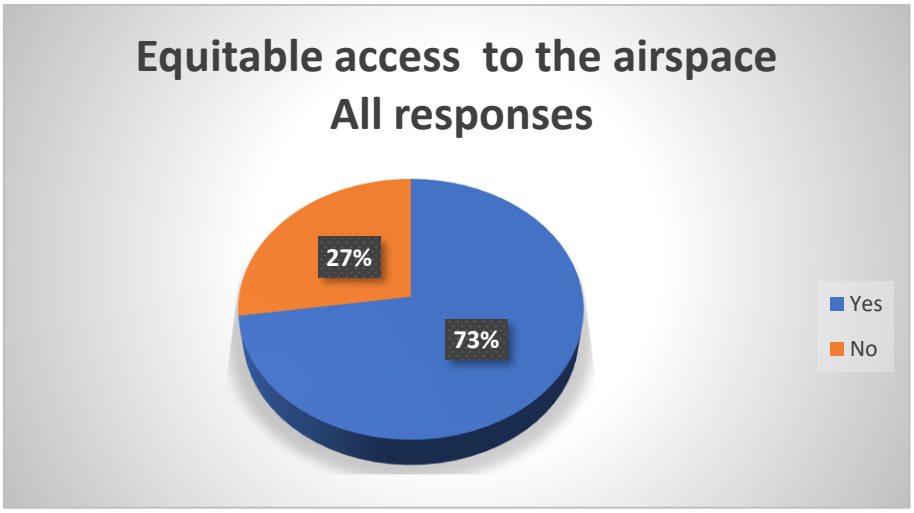
Conspicuity and surveillance were suggested as ways to improve airspace efficiency.



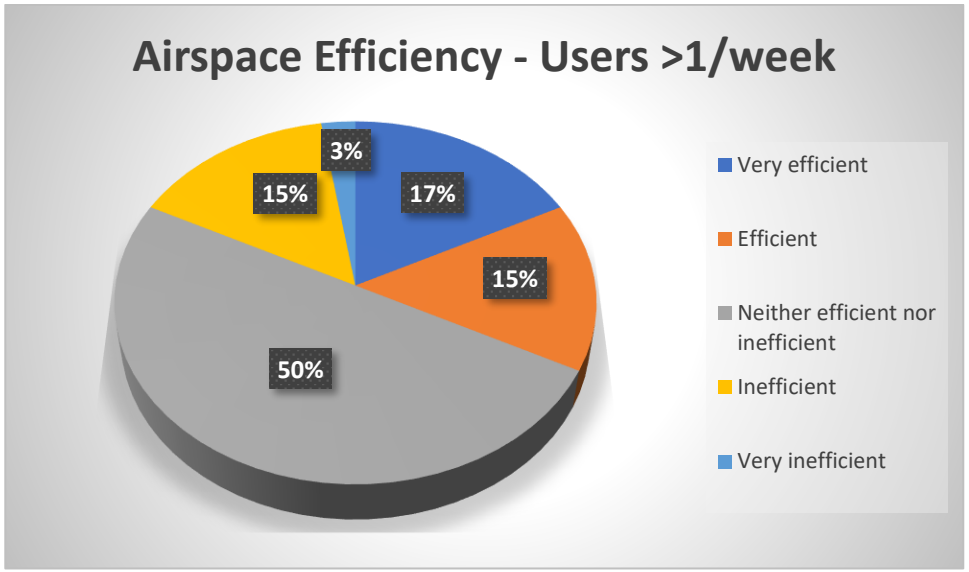
App 21: Airspace efficiency - all responses

The initial review of equitable access to the airspace is shown below. The responses indicated more a quarter of aircraft did not receive equitable access and this is a significant amount. Further analysis revealed the question may have been misleading as a majority of the no respondents referred to the 10 NM area definition of within the vicinity of Mangalore airport and therefore on the CTAF. This does not negate all the no responses. Comments regarding frequency congestion on the CTAF limiting operations are ALAs and aerodromes.

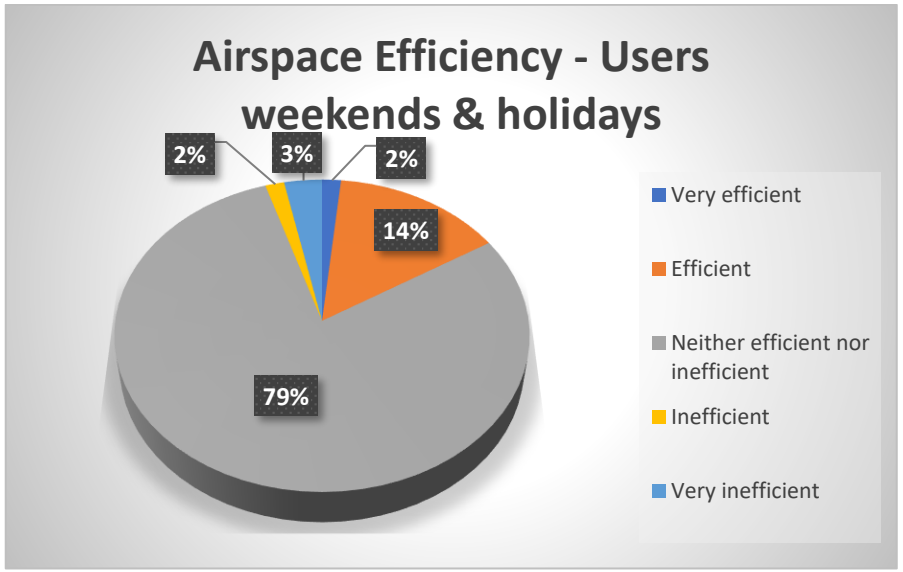
A revised analysis indicated 97% received equitable access to the airspace. Comments about the introduction of SFIS, increasing frequency congestion or mandatory broadcasts is likely to reduce equitable access to the airspace were issues of concern by respondents.



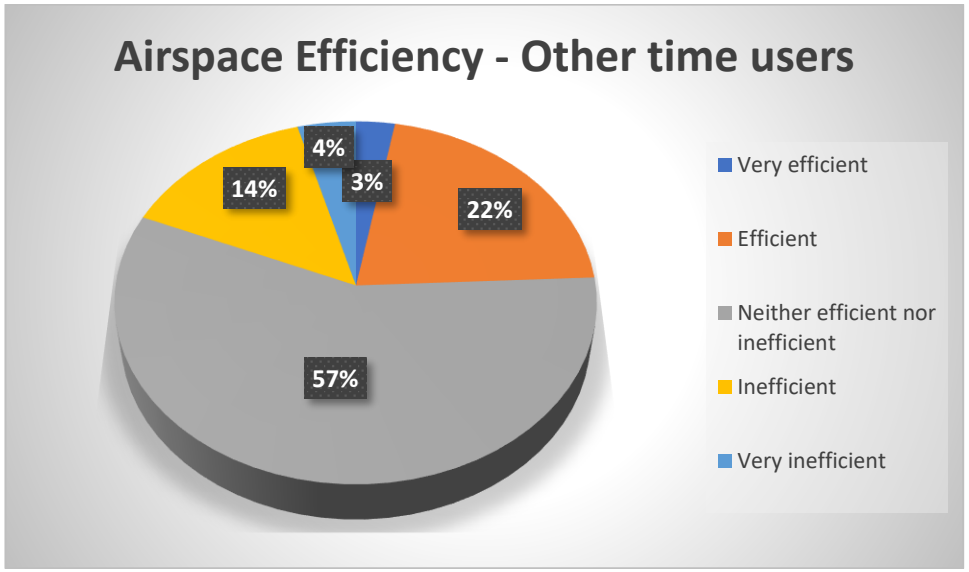
App 22: Equitable access to airspace - all responses



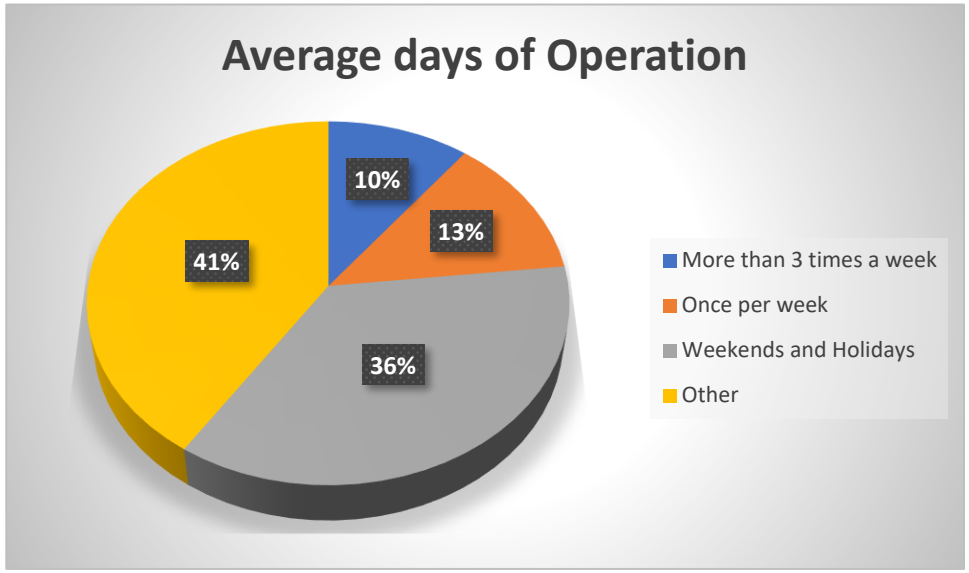
App 23: Airspace efficiency - users at least once per week



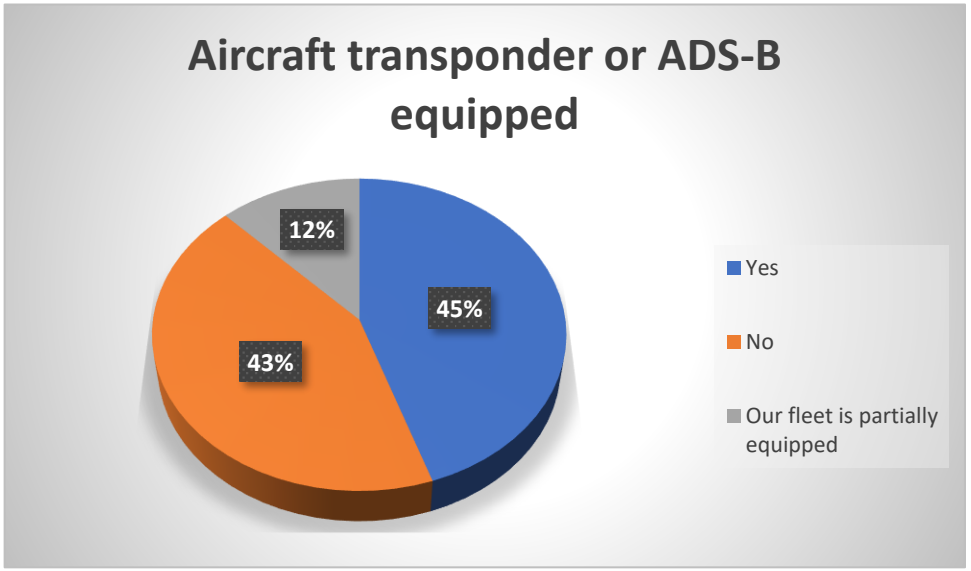
App 24: Airspace efficiency - Weekend/Holiday users



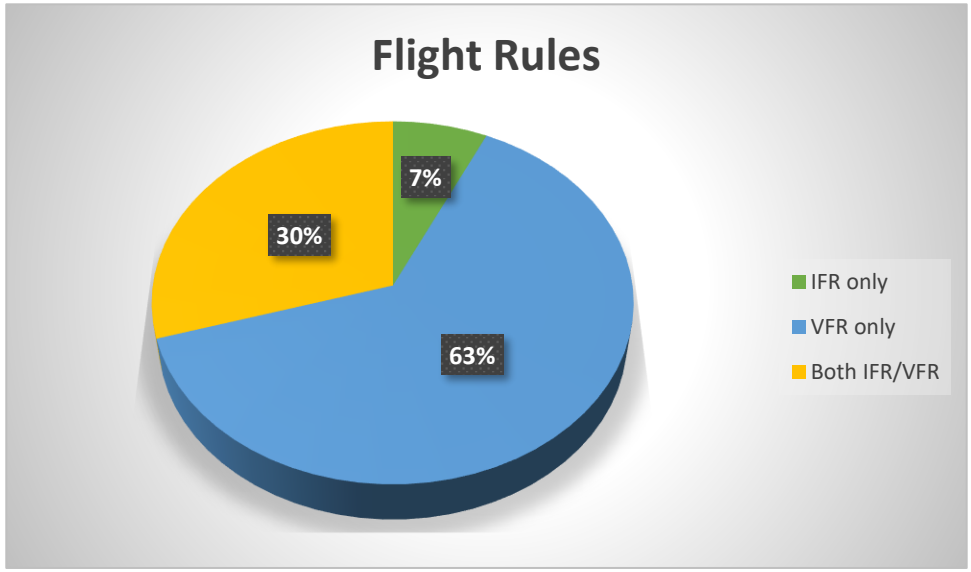
App 25: Airspace efficiency - Other users



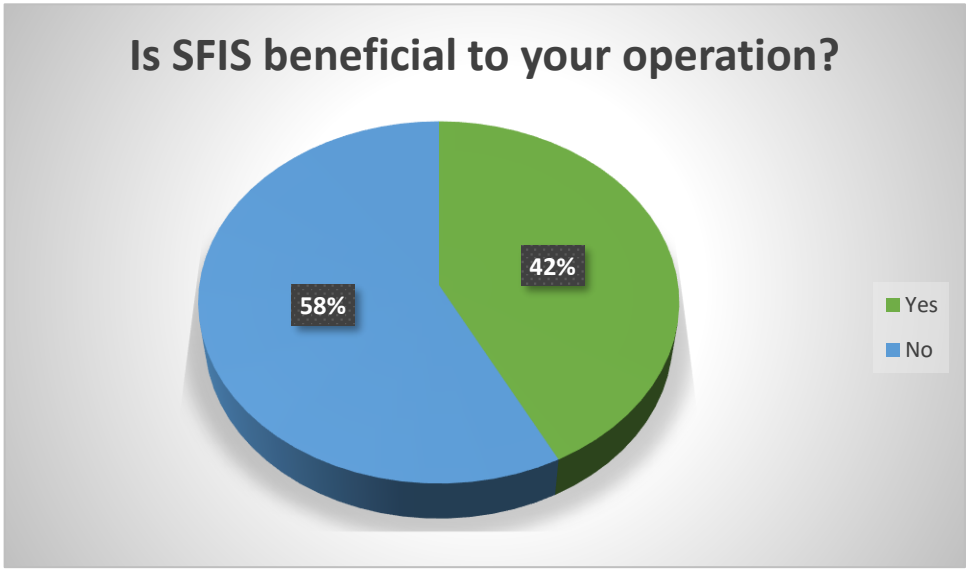
App 26: All users - When airspace is used



App 27: All users - Aircraft conspicuity equipment fitment



App 28: All users - Flight rules flown



App 29: All users - SFIS

Annex A Acronyms and Abbreviations

Acronym / abbreviation	Description
AAPS	Australian Airspace Policy Statement 2018
AC	Advisory Circular
ACAS	Airborne Collision Avoidance System
ACP	Airspace Change Proposal
Act	Airspace Act 2007
ADS-B	Automatic Dependent Surveillance - Broadcast
AFRU	Aerodrome Frequency Response Unit
Airservices	Airservices Australia
ALA	Aircraft landing area
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
BNN	Backup Navigation Network
CAAP	Civil Aviation Advisory Circular
CASA	Civil Aviation Safety Authority
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
FIS	Flight Information Service
FT	Feet
FL	Flight Level
GA	General Aviation
IAL	Instrument Approach and Landing
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IWI	Illuminated Wind Indicator
km	Kilometre
kt	Knot
LL	Lower Level
NOTAM	Notice to air men
NM	Nautical Miles
NRP	Navigation Rationalisation Project
OAR	Office of Airspace Regulation
RA	Restricted Area
RFC	Request for Change
RNAV	Area Navigation
RPAS	Remotely Piloted Aircraft Systems
SFIS	Surveillance Flight Information Service
SUA	Special Use Airspace

Acronym / abbreviation	Description
TAC	Terminal Area Chart
TCAS RA	Traffic Collision Avoidance System Resolution Advisory
TCAS TA	Traffic Collision Avoidance System Traffic Advisory
TIFP	Terminal Instrument Flight Procedure
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VNC	Visual Navigation Chart
VTC	Visual Terminal Chart

Annex B Australian Airspace Structure

Class	Description	Summary of Services/Procedures/Rules
A	All airspace above Flight Level (FL) 180 (east coast) or FL245 elsewhere	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.

Class	Description	Summary of Services/Procedures/Rules
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.

* Not applicable to military aircraft

** If traffic conditions permit, ATC may approve a pilot's request to exceed the 200 kt speed limit to a maximum limit of 250 kt unless the pilot informs ATC a higher minimum speed is required.

Annex C Restricted Areas and Danger Areas Architecture

The declaration of a Restricted Area (RA) creates an airspace of defined dimensions within which the flight of aircraft is restricted in accordance with specified conditions. Clearances to fly through an active RA are generally only withheld when activities hazardous to the aircraft are taking place, or when Military activities require absolute priority.

RAs are generally promulgated at specified times and dates which are detailed in the Designated Airspace Handbook (DAH). However, a TRA may be declared for special events where there may be a public safety issue – such as the Avalon Air Show, the Olympic Games or a police activity that requires control access to airspace in a particular area.

TRAs may have different periods of activation that can occur over a day or multiple days. For example, an air display may require a TRA for a short period of time such as 30-60 minutes. However, an air show, sporting event or military exercise may require several hours each day, over several days for the activity to be completed.

To assist with shared use of airspace, all restricted areas have been allocated a “Restricted Area Conditional Status”. This status will give an indication as to the likelihood of obtaining a clearance to fly through restricted airspace. NOTAMs may be issued to indicate changes to the RA Conditional Status.

The following definitions apply to the conditional status types of RAs:

- **Conditional Status RA 1**: Pilots may flight plan through the Restricted Area and upon request will be granted a clearance from ATC when the area is active unless a NOTAM indicates that a clearance is not available.
- **Conditional Status RA 2**: Pilots may not flight plan through the Restricted Area or expect a clearance from ATC. However, tracking may be offered through the Restricted Area on a tactical basis by ATC unless a NOTAM indicates that a clearance is not available; and
- **Conditional Status RA 3**: Clearance through the Restricted Area is not available except in a declared emergency.

RAs are mainly declared over areas where Military operations occur however, RAs also cater for communications and space tracking operations.

The declaration of a Danger Area (DA) defines airspace within which activities dangerous to the flight of aircraft may exist at specified times. Approval for flight through a DA outside controlled airspace is not required. The airspace remains available for other aircraft to use or operate within however, pilots are expected to maintain a high level of vigilance when transiting or operating within DAs.

DAs are primarily established to alert aircraft on the following:

- Flying training areas where student pilots are learning to fly and / or gather in large numbers.
- Parachute operations.
- Gliding areas where communications with airborne gliders might be difficult.
- Unmanned aerial vehicle testing or operations.
- Weapon firing and rifle ranges.
- Blasting at mine sites.

Annex D ASIR Airspace and Operational Occurrence Summary

Date	Occurrence Type	Summary
12 Jul 2021	Aircraft Separation	While established in the holding pattern, the pilot of a Beech C90 observed a Cirrus SR22 join the holding pattern on a reciprocal track. The SR22 crew received a traffic alert and manoeuvred to increase separation. ATC passed traffic to both aircraft but neither crew reported hearing any radio calls from the other aircraft.
6 Jun 2021	Aircraft Separation	During cruise in IMC, the AgustaWestland AW139 crew received a TCAS RA on a Piper PA44 below conducting a missed approach. The PA44 crew reported making contact and confirming separation prior to the incident with no additional calls from the AW139 and diverted the aircraft to Shepparton. The investigation is continuing.
28 Mar 2021^	Airspace Infringement	The pilot was not in normal communications with ATC and entered restricted airspace.
4 Feb 2021	Aircraft Separation	During approach, the crew of the Piper PA-44 observed the Piper PA-28 on a reciprocal track pass over their aircraft. The crew of the PA-44 increased their rate of descent to increase separation. No radio calls were heard from the PA-28.
31 Jan 2021^	Airspace Infringement	The crew were not in normal communications with ATC resulting in the aircraft entering restricted airspace without a clearance.
19 Jan 2021^	Airspace Infringement	During cruise, the crew were not in normal communications with ATC resulting in the aircraft entering restricted airspace without a clearance.
13 Nov 2020^	Airspace Infringement	The crew were not in normal communications with ATC resulting in the aircraft entering restricted airspace without a clearance.
12 Nov 2020^	Airspace Infringement	The crew were not in normal communications with ATC resulting in the aircraft entering restricted airspace without a clearance.
19 Jul 2020^	Airspace Infringement	The crew were not in normal communications with ATC resulting in the aircraft entering restricted airspace without a clearance.

Date	Occurrence Type	Summary
6 May 2020	Aircraft Separation	During approach, the crew of the Piper PA-28 observed another PA-28 descend in front of them and conducted a missed approach. The second PA-28 also conducted a missed approach and turned towards the first PA-28. The first PA-28 turned to increase separation. While maintaining 2,000 ft, the crew of the first PA-28 again observed the other PA-28 pass behind them in close proximity and manoeuvred to increase separation.
21 Mar 2020	Aircraft Separation	During circuit operations, the crew of the Piper PA-28 observed the Extra-Flugzeugbau GmbH EA 300S turn in front of the aircraft on base. No radio calls were heard from the EA 300S.
7 Mar 2020	Aircraft Separation	During approach, the crew of the PA-44 observed an Extra-Flugzeugbau EA-300 pass vertically off the left wing. The PA-44 crew maintained level flight to increase separation.
22 Feb 2020	Aircraft Separation	During cruise, the crew received a TCAS RA on another aircraft.
19 Feb 2020	Aircraft Separation	The Piper PA-44 and the Beech D95 collided in mid-air. Both aircraft subsequently collided with terrain and were destroyed. The two occupants of the PA-44 and the two occupants of the D95 were fatally injured. The ATSB investigation has been finalised.
19 Feb 2020	Aircraft Separation	While established in the circuit, the crew of the Piper PA-28 observed the Beechcraft 58 entering the circuit in close proximity. The PA-28 made an immediate turn and the B58 conducted a missed approach to increase separation.
23 Oct 2019	Aircraft Separation	During approach, the pilot of the Piper PA-28 sighted the incorrect aircraft and was observed flying above another PA-28 on approach to the same runway, in close proximity. After receiving an alert from an instructor on the ground, both aircraft conducted a missed approach.
20 Oct 2019	Encounter with RPA	During descent, the crew observed a white remotely piloted aircraft operating at 7,000 ft.
9 Mar 2019	Aircraft Separation	During descent, the crew of the Hawker Beechcraft B200 observed three hang gliders on a converging track. The crew manoeuvred to ensure separation was maintained and conducted a diversion to Shepparton.
9 Sept 2017	Airspace Infringement	The aircraft diverted off its planned track and entered restricted airspace without a clearance. ATC were unable to maintain radio contact with the aircraft.

Date	Occurrence Type	Summary
25 Mar 2017	Aircraft Separation	During cruise, the crew of the Augusta AW139 received a TCAS-RA on an aircraft.
22 Dec 2015	Aircraft Separation	The pilot of the PA-28 lost sight of the leading aircraft in the circuit when turning final and passed in close proximity. The crew of the other aircraft conducted a missed approach to re-establish separation.

^ An airspace infringement resulting from an Operational Communications recorded occurrence.

Annex E Stakeholders

The following stakeholders were contacted to contribute to this study.

- Civil Aviation Safety Authority
- Airservices Australia
- Australian Transport Safety Bureau
- Australia Airline Pilots' Association
- Defence
- Moorabbin Aviation Services
- Gliding Federation of Australia
- Recreational Aviation Australia
- Australian Sports Aviation Federation
- Skydive Nagambie
- Skydive Euroa
- CASA Consultation Hub Respondents

Annex F References

Airservices Australia Aeronautical Information Publication Supplement (AIP SUP) H88/21 Ballina (YBNA) Surveillance Flight Information Service/Broadcast Area published 27 July 2021; effective 12 August 2021 retrieved from s21-h88.pdf (airservicesaustralia.com)

Airservices Australia; Australia En-Route Chart Low L2 Effective 17 June 2021 Airservices Australia

Airservices Australia; Australia Terminal Area Chart Melbourne Effective 17 June 2021 Airservices Australia

Airservices Australia Departure and Approach Procedures (DAP) East Amendment 168 Effective 9 September 2021 Airservices Australia

Airservices Australia Designated Airspace Handbook Effective 17 June 2021 Airservices Australia

Airservices Australia En Route Supplement Australia (ERSA) Effective 9 September 2021 Airservices Australia

Airservices Australia Mangalore Radar and ADS-B Surveillance Coverage, May 2021.

Airspace Act 2007 (Cth), Canberra

Airspace Regulations 2007 (Cth), Canberra

Annex 11 to the Convention on International Civil Aviation Air Traffic Services, Fourteenth Edition, July 2016 International Civil Aviation Organization

Australian Transport Safety Bureau (2013) *A pilot's guide to staying safe in the vicinity of non-towered aerodromes*. Retrieved from https://www.atsb.gov.au/media/4117372/AR-2008-044(1).pdf

Australian Transport Safety Bureau, Aviation safety investigations and report 2015-2020 retrieved from Safety investigations & reports (atsb.gov.au)

Aviation Safety Incident Reports 2015-2020 Australian Transport Safety Bureau, Canberra

CASA Aviation Safety System Manual, October 2020, Canberra

Civil Aviation Regulations 1998 (Cth) Part 12, Canberra

Civil Aviation Safety Authority, Advisory Circular 91-10 Operations in the vicinity of non-controlled aerodromes, Canberra 2021 retrieved from Advisory Circulars | Civil Aviation Safety Authority (casa.gov.au)

Civil Aviation Safety Authority, Advisory Circular 91-14 Pilots' responsibility for collision avoidance, Canberra 2021 from Advisory Circulars | Civil Aviation Safety Authority (casa.gov.au)

Civil Aviation Safety Authority, Advisory Circular 91-23 ADS-B for enhancing situational awareness. Canberra July 2020 from Advisory Circulars | Civil Aviation Safety Authority (casa.gov.au)

Civil Aviation Safety Authority, CAAP 166-01 Operations in the vicinity of non-controlled aerodromes Canberra 2019 retrieved from Civil Aviation Advisory Publications | Civil Aviation Safety Authority (casa.gov.au)

Civil Aviation Safety Authority, CAAP 166-02 Pilots' Responsibility for Collision Avoidance in the vicinity of non-controlled aerodromes using 'see-and-avoid' Canberra 2013 retrieved from Civil Aviation Advisory Publications | Civil Aviation Safety Authority (casa.gov.au)

Civil Aviation Safety Authority, Office of Airspace Regulation (2017). Ballarat Airspace Review – August 2017 retrieved from airspace_review_ballarat_1708.pdf | Civil Aviation Safety Authority (casa.gov.au)

Corporate Integrated Reporting and Risk Information System 2015-2020, Airservices Australia, Canberra

Civil Aviation Safety Regulations 1998 (Cth), Canberra

Department of Infrastructure, Transport and Regional Development 2021. Australian Airspace Policy Statement 2021, Canberra. https://www.legislation.gov.au/Details/F2021L01589

Google Earth V 7.3.3.7699. 2021. Victoria, Australia http://www.earth.google.com

Google Earth V 7.3.4.8248. 2022. Victoria, Australia http://www.earth.google.com

Mangalore Conflict Analysis Report, Airservices Australia 2021

Minister's Statement of Expectations for the Board of the Civil Aviation Safety Authority for the Period 31 January 2022 to 30 June 2023 (Cth), Canberra
https://www.legislation.gov.au/Details/F2022L00061

Surveillance Flight Information Service Mangalore, All Phases Safety Assessment Report, Airservices Australia 2021

Surveillance Flight Information Service, Concept of Operations, Airservices Australia 2021

Annex G Stakeholder Consultation / Feedback Register

The following sections are the consolidation of comments or responses received from the draft document, the OAR's response, and disposition to actions to the Mangalore Aeronautical Study.

The OAR received 27 responses through the CASA Consultation Hub and emails in relation to the draft study. Where respondents provided permission for their views to be published, their comments are included below.

The responses varied from seeking clarification of study information to supporting the issues and outcomes of the study, and responses that indicated the contents and recommendations were insufficient given the accident nor do the matters resolve future airspace matters.

The OAR has taken all the comments under consideration including those which would require a national approach towards airspace and air routes. An internal briefing has been provided to management on this feedback for their information.

Stakeholder and Reference

Airspace user. Reference: Annex G.

Comment

Could all of Annex G be published in the draft? There's no content.

CASA Response and disposition

The comment is noted. Annex G is specifically completed after public consultation of the draft. Feedback provided by stakeholders during the initial study preparation is included in the front of the document and not normally listed in the Appendices or Annexes. Your comment is noted and consideration to remove this Annex from future draft versions during consultation is being undertaken to avoid possible confusion.

Stakeholder and Reference

Airspace user. Reference: Whole document.

Comment

The OAR recommendations are all useful however none appear to be of particular relevance to the mid-air fatal crash that precipitated the review. It is therefore logical to conclude that the recommendations are unlikely to reduce the likelihood of a recurrence of that event.

Although outside the OAR brief, the ATSB report encouraging ADS-B transponder use by GA aircraft fell short of mandating TCAS for IFR. This surely is the way forward in the mitigation process.

CASA Response and disposition

CASA appreciates your feedback and the comments are noted.

The OAR will not provide comment on the ATSB investigation into the mid-air collision south of Mangalore. However CASA acknowledges your comments relating to the ATSB report into that incident.

Stakeholder and Reference

Victorian Hang Gliding and Paragliding Association. Reference: Whole document.

Comment

The Mangalore Aeronautical Study 2022 takes a pragmatic and effective approach. The conclusions and recommendations are appropriate, achieving an outcomes-based approach without prescription and user disgruntlement.

Suggested editorial changes made for clarification.

CASA Response and disposition

CASA appreciates your feedback. Editorial changes were made resulting from feedback to assist with clarification.

Stakeholder and Reference

Airspace user. Reference: Whole document.

Comment

I have reached the strong conclusion that the tower at Mangalore needs to be reactivated, maybe during daylight hours.

CASA Response and disposition

CASA appreciates your feedback and your comments are noted.

A review of the airspace classification was undertaken as part of the study. The existing airspace classification is appropriate. The establishment of controlled airspace is likely to restrict the movement of others and include a cost to be paid by users. The recommendations and observations enables managed and incremental actions to be undertaken. This does not exclude changes being made in the future.

Stakeholder and Reference

Airspace user. Reference: Whole document.

Comment

Feedback provided during the consultation process. No further comments to be made.

CASA Response and disposition

CASA appreciates your feedback.

Stakeholder and Reference

Airspace user. Reference: Section 10 Consultation Hub Additional Analysis, Section 11 Key Issues, Recommendations and Observations.

Comment

The primary cause of issues within the Mangalore CTAF is due to poor radio telephony procedure. Pilots are not using standard phraseology when broadcasting on the CTAF frequency and aircraft already operating within the area are not replying to these transmissions by inbound aircraft. Frequency congestion at times exaggerates the problems as does poor language skills.

CASA Response and disposition

CASA appreciates your feedback and your comment is noted. The improper use of the radio including the use of non-standard phraseology and repeating transmissions can lead to frequency congestion on the CTAF. CASA has published advice and guidance in relation to operations in the vicinity of a non-controlled aerodrome that could assist with effective communication, increasing situational awareness and reducing frequency congestion by using standard phraseology.

Pilot awareness and safety of operations within the vicinity of a non-controlled aerodrome is the subject of Recommendation 1.

Stakeholder and Reference

Airspace user. Reference: Whole document.

Comment

The report fails to look holistically at why a particular issue has arisen at Mangalore. Specifically it fails to consider the key reason for aircraft congestion at Mangalore - namely the withdrawal/limitation of access to NAVAIDs in the Melbourne basin. With the closure of NAVAIDs at locations including Wonthaggi, Yarrowee and Philip Island and the booking arrangements implemented at Essendon, Moorabbin and Avalon, all IFR training traffic from Moorabbin, Essendon and other Melbourne basin airports has been forced to use Mangalore as the only unrestricted VOR and NDB within reasonable flight time of a typical IFR training aircraft.

Mangalore is unsuited to host this traffic due to:

- the proximity of controlled airspace and restricted airspace
- its proximity to the northern end of the Eastern VFR Lane and its geographical location being in the middle of the funnel caused by the hills to the east and Puckapunyal to the west
- its designation as a key feed point for approved IFR routes into and out of Melbourne
- the practical removal of VFR and IFR clearances from Moorabbin to/from the north via ML at or above 6000.

A complete aeronautical study should consider the wider demand for training facilities in the Melbourne area and consider if alternative options could be considered including:

(1) Provision of a new, dedicated, training VOR (could be provided on the condition that it is not certified for enroute navigation and that training traffic could work within block altitudes above the area LSALT). This VOR could be placed at WON where presumably Airservices still own the land.
(2) Review the requirement for Class C/E airspace above Avalon such that a corridor was provided for RPT arrivals from the north but the VOR was available above, say, 3500' as Class G for training aircraft to use independently of the ILS below.

As a wider issue, the requirement for ground-based Navaids being required for the initial issue of an instrument rating should be reviewed. Allowing an initial issue based on GNSS approaches only would both suit the needs of the vast majority of pilots seeking IFR training (the vast majority of whom will never fly a ground-based aid approach in their working lives) and remove the congestion at locations such as Mangalore.

CASA Response and disposition

CASA appreciates your feedback and the comments are noted.

A number of the identified points were outside the scope of the aeronautical study, however information gathered through the consultation process identified similar issues from other stakeholders. These matters are to be forwarded to CASA management for their information.

Stakeholder and Reference

Civil Air Australia. Reference: Section 9 Consultation and stakeholder feedback, Section 11 Key Issues, Recommendations and Observations.

Comment

We support the recommendations that CASA have found and many of our affected members would gladly be involved to provide education from an ATC perspective of the airspace and difficulties that it provides.

CASA Response and disposition

CASA appreciates your feedback and the opportunity to collaborate regarding awareness and education.

Stakeholder and Reference

Freedom Airsports. Reference: Whole of document.

Comment

The draft report is appropriate.

CASA Response and disposition

CASA appreciates your feedback and your comment is noted.

Stakeholder and Reference

Airspace user. Reference: Whole of document.

Comment

From what I know about the Mangalore incident it was the flight service controllers who should have been in control and were clearly not. And are now hiding the facts and now changing regulations to make it easier to hide behind the facts.

The traffic is nowhere near what it used to be and CASA is to blame for that. Changing the Regs is not going to solve the problem.

CASA Response and disposition

Your comment is noted. The OAR will not provide comment on the ATSB investigation into the mid-air collision south of Mangalore. The study does not recommend amending the existing Regulations.

Stakeholder and Reference

Recreational Aviation Australia. Reference: Whole of document.

Comment

RAAus welcomes the opportunity to review the draft report based on the information provided in the Mangalore Aeronautical Study September 2021. It is evident that a lot of effort and thought has gone into this report whilst taking advice from all relevant parties affected.

Overall RAAus believed the draft report was fit for purpose. This includes the recommendations, observations, or opportunities to enhance services made because of CASA's analysis of the airspace in the initial study. RAAus is willing to assist CASA with the conduct of the Safety Seminars in the local area as noted in Recommendation 1. RAAus believes Recommendation 2 and the observations will also aid in adding to the situational awareness of pilots flying in this area.

Further to the above points RAAus has the following suggestions that could be implemented to assist in enhancing safety in this area:

- Consider adding the Mangalore VOR to the Airport Vic Airport Bookings page (vic.bookawk.com). This would allow people to plan their usage and to assist in not overloading the system.

- The Mangalore ERSA entry could limit the number of aircraft IFR and VFR) using the VOR at any one time. The addition of the booking system in the above point would help to manage this procedure.
- Airservices or a private entity could consider installing another VOR at a nondescript location within regional Victoria not associated with an airport and outside of controlled airspace that will take away some of the pressure at Mangalore.
- CASA could consider the redesign of the CTAF construct including the standardisation of non-controlled aerodrome vicinities and radio calls.

CASA Response and disposition

CASA appreciates your feedback and your comments are noted. Adding the Mangalore VOR to the Victorian airwork booking page is a consideration for Airservices Australia. Operations within the vicinity of non-controlled aerodromes, particularly standardisation of radio transmissions, will be included as part of Recommendation 1. This enables managed and incremental actions to be undertaken and does not exclude changes being made in the future.

Stakeholder and Reference

Australian Airline Pilots Association. Reference: Whole of document.

Comment

The Australian Airline Pilots' Association (AusALPA) is the Member Association for Australia and a key member of the International Federation of Airline Pilot Associations (IFALPA) which represents over 100,000 pilots in 100 countries. We represent more than 7,100 professional pilots within Australia on safety and technical matters. Our membership places a very strong expectation of rational, risk and evidence-based safety behaviour on our government agencies and processes and we regard our participation in the work of the Australia's safety-related agencies as essential to ensuring that our policy makers get the best of independent safety and technical advice.

AusALPA welcomes the opportunity to comment on the draft Mangalore Aeronautical Study of July 2022.

Communications – the key issue

AusALPA is pleased to see that the study has confirmed that effective and concise communication is the key to managing the collision risk in airspace surrounding the chokepoints created by the reduction of suitable training navigation aids under the Navigation Rationalisation Project (NRP). As we have previously identified, the remaining Backup Navigation Network (BNN) is inadequate to support the mandatory instrument rating training requirements, making traffic concentration inevitable.

In our considered view, there is no evidence that the introduction of either Class E airspace or the locally created hybrid Surveillance Flight Information Service (SFIS) will mitigate the identified communications issues. Instead, it is likely that the introduction of a controller, whether separating or advising on known or visible traffic, may well exacerbate rather than mitigate the existing problem. Most pilots have experienced the situation where a controller or a pilot has inadvertently "stepped on" the radio call of another person and then witnessed the ensuing confusion and delay in ensuring that critical information is correctly passed in a timely manner.

Importantly, while the risks apparent from communications by trainee pilots whose first language is not English require definitive action, we should never overlook the negative contributions by those other local pilots who lack the discipline and knowledge to communicate correctly and concisely.

Broadcast areas

The introduction of Broadcast Areas (BAs), whether mandatory or otherwise, remains problematic when assessing their safety contributions. Setting aside equity of access issues, we are not aware

of any evidence that BAs improve the quality of communications while reducing frequency congestion. Given their apparent popularity of recent times, we believe that more should be formalised about their design, purpose and performance.

SFIS

We have our first SFIS operating at Ballina in what is Airservices' attempted mitigation of a high collision risk to high and low-capacity air transport operations. It remains a local invention that has no ICAO standards and unknown human resource and infrastructure requirements. It is a procedural experiment in its infancy.

AusALPA is not aware of any feedback on the effectiveness of the SFIS in that environment. In the absence of such critical information, we do not support Airservices' proposal for an SFIS at Mangalore or the BA that it requires.

We were drawn to the commentary in Appendix 5 of the draft Mangalore Aeronautical Study that referred to the Airservices' CTAF Safety Alerting Service but provides no greater illumination of its function beyond what one might presume from the title. Searches of the Airservices website yield no further insights. In any event, we were left to ponder on an apparent conundrum – if "Airservices Australia has advised [the OAR that] the CTAF Safety Alerting Service does not represent a long-term efficient use of their resources", how would an SFIS be different?

Practice instrument approaches

AusALPA is a little concerned that the text in the Executive Summary regarding practice instrument approaches reverses the emphasis of subsection 4.4 Enroute Supplement Australia. The text in subsection 4.4 states:

…clarification is required to ensure the standardisation of the procedure when being used at all locations, including the consideration of removing the text.

whereas the text in the Executive Summary appears to prioritise removal over clarification.

Operationally, it would seem prudent to elevate the instrument approach procedure in its entirety to separate the approach operations from the circuit traffic. There is no explanation of why the OAR might favour removal of the provision and no practical or training operational reason comes to mind that would favour such an outcome since it would appear to create unnecessary risks.

Systemic influences

In our previous submission of 30 September 2021, we commented on a range of wider systemic influences that are amenable to further consideration and others that, largely incapable of remediation, should not be forgotten. We accept that the appropriate solutions are beyond the remit of OAR specifically but are capable of some resolution by CASA more generally. We have identified these systemic issues as those related to instrument rating requirements, the BNN, air transport equipage, surveillance and communications. We also commented on flight training in controlled airspace and what we called the Class E conundrum (now somewhat enlivened by the latest 6500' Class E proposal by Airservices).

While we do not intend to repeat the detail of that commentary, AusALPA strongly recommends that the OAR ensures that the relevant sections within CASA that have carriage of the various policy matters that we raised are formally advised of our advice on those matters.

The recommendations

Recommendation 1

While we support the thrust of the recommendation, we do not think that it goes far enough to address the issues.

A safety seminar at Mangalore and surrounding aerodromes is appropriate but it also is warranted at the source aerodromes for visiting traffic. The language standards for foreign students also needs to be addressed.

Recommendation 2

We do not support this recommendation in its current form.

The OAR needs to provide a rational explanation for a preferred solution, as distinct from the current ambivalent wording. Any suggestion by CASA of removing the text seems counterintuitive to us, as does the practice of compressing the vertical extent of the procedure by only varying the minima.

CASA Response and disposition

CASA appreciates your detailed feedback and your comments are noted. The OAR will, on appropriate matters, forward this information to CASA management.

There are no changes to the recommendations.

Recommendation 2 was completed prior to the final version of this study being published. Editorial changes were made to provide clarification and actions that should be undertaken by aircraft conducting practice instrument approaches to Ballarat, Busselton, Latrobe Valley and Mangalore.

Stakeholder and Reference

Airspace user. Reference: Whole of document.

Comment

I am of the belief that Airspace issues are not the prime consideration in this matter.

It is obvious to me, as an experienced ATPL/instructor/training Captain, that the general knowledge of airspace design and the standards of radio procedures and requirements are with some exceptions of a poor to very poor standard on a national basis.

My observations suggest the general standard of radio procedure participation and phrases used (or not used) has fallen significantly over the past twenty-five to thirty (25-30) years. Many pilots do not understand why they have to say, what they say and fail to form a mental picture of what is occurring in their area as a result. As an example, IFR operations upon given traffic on another IFR aircraft MUST establish vertical separation in the first instance if one or both aircraft are climbing or descending.

The responsibility for teaching these procedures rests with flying instructors and their CFI's. There is little or no standardisation at any level and this includes CFI's, Training Captains, and CASA examiners. Until this is addressed, I do not expect to see any significant improvement in how many pilots participate in our airspace system - especially Class G, including CTAFs. Why is it that two CFI's teach different procedures and use of radio? This problem is not confined to GA.

In regard to Mangalore, there are many options that might improve the safety of aircraft using that airspace, such as recommended VFR routes (clear of the airfield), mandatory use of radio, the installation of an ADS-B facility on the ground at the airfield and ATC having the facility to receive and transmit on the CTAF frequency when frequency separation may have contributed to a lack of receipt of required information.

CASA Response and disposition

CASA appreciates your feedback and your comments are noted. The OAR will, on appropriate matters, forward this information to CASA management. Some identified matters are included in the Recommendations and Observations and have also been noted.